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Czech University Of Life Sciences Prague
Faculty of Economics and Management

AGRARIAN PERSPECTIVES XXVI.

COMPETITIVENESS OF EUROPEAN AGRICULTURE AND FOOD SECTORS

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FOREWORD

The tradition of organizing annual all faculty international conferences is now a firmly established part of our long history. In connection with this tradition the 26th Agrarian Perspectives conference will take place at the Faculty of Economics and Management of the Czech University of Life Sciences Prague during the period of 13 to 15 September 2017.

The topic of this year's conference is Competitiveness of European Agriculture and Food Sectors. The wide scope of the conference provides space for authors in many research areas ranging from Economics, Management, and Rural development to Informatics and Systems Engineering. The conference generates not only a platform for discussing theoretical issues, but also for sharing experience and finding new partners for the future cooperation in the field of research.

We are looking forward to listening to the representative keynote speakers from the Czech Republic, Ireland and Hungary, who will address the plenary meeting of the conference in the T Congress Hall on 13 September 2017. Tomáš Doucha from the Institute of Agricultural Economics and Information, Alan Matthews - Professor Emeritus of European Agricultural Policy in the Department of Economics, School of Social Sciences and Philosophy at Trinity College Dublin, Ireland, Petr Blížkovský - director at the General Secretariat of the Council of the European Union and Imre Fertő from the Agricultural Economics and Rural Development Research Unit - Hungarian Academy of Sciences, will provide a good starting point of the conference. They will also, undoubtedly, spark interesting debates and experience sharing which will continue in parallel sessions in the afternoon and the following day.

Round tables - the thematic discussion forums became an integral part of Agrarian Perspectives in 2016 and will continue again this year. At the round tables we will discuss the topic of "soil and life" from the economic, environmental and philosophical points of view.

You are also invited to participate in the optional field trip. We will visit several companies of the agri-food complex and we can also look forward to visiting some beautiful places of cultural interest in the Czech Republic.

In conclusion, I would like to express my strong belief that the 26th Agrarian Perspectives Conference, together with the beautiful environment of our faculty and university campus will create an inspirational framework for all participants and will contribute to the further development of our research areas.

Martin Pelikán

Dean of the Faculty of Economics and Management, CULS Prague

KEYNOTE SPEAKERS ABSTRACTS

Tomáš DOUCHA (CZ)

TOPIC: „Czech agriculture in international under competition among EU countries and at the entrance the CAP 2020+"

Extreme dual structure and a lower economic efficiency are two problems of the Czech agriculture under future conditions of the CAP 2020+. It is proved by the comparison of the FADN-EU data, with the evidence of the influence of lower market labour and land prices in the Czech area. The situation varies by different categories of the Czech farms and different farming systems. Czech large scale, business oriented farms are relatively very efficient applying only profit/economic criteria. However, other criteria of the sustainable development are better fulfilled by small and medium, mainly family farms. The background of the farm economy is economic efficiency of the production of main commodities. Utilising the international networks, the situation is presented for main commodities based on international networks with the participation of the IAEI Prague. To the conclusion, the lower efficiency of the Czech food industry forms a main barrier to increase competitiveness of the whole Czech agrarian sector.

Alan MATTHEWS (IR)

TOPIC: „Putting competitiveness at the heart of EU agricultural policy"

As EU agricultural policy has become more market-oriented and more open to global competition, in particular through an increasing number of free trade agreements, concerns are expressed about the ability of EU agriculture to compete on third country markets and against third country imports. This paper discusses whether these concerns are justified and, if so, is the EU's Common Agricultural Policy doing enough to help prepare EU farmers for greater competition? The paper examines the trade and productivity performance of EU agriculture as well as indicators of its global competitiveness. Direct payments are the most important CAP policy instrument, and the evidence of their impact on competitiveness is examined. The argument that the higher regulatory standards required of EU farmers undermines their competitiveness is evaluated. In conclusion, the paper discusses how support for innovation and competitiveness can become a more central part of the CAP after 2020.

Petr BLÍŽKOVSKÝ (CZ)

TOPIC: „Is agriculture back? Reforming agricultural policy in the European and global context."

The agriculture policy has been seen by many as a policy of the past. Globalised economy and power shift towards emerging economies has changed that perspective. Demography, climate fluctuations and migration flows are part of that change. G20 leaders have recognised this trend. In the European union, a new agriculture policy will be introduced as of 2021. What are the issues at stake?

Imre Fertő (HU)

TOPIC: „Economic crisis and the fragility of comparative advantage of EU agriculture"

We analyze the effects of economic crisis on the stability of product-level comparative advantage in the EU agriculture. Specifically, we examine how economic crisis affect the value of comparative advantage at the start of a new comparative advantage, the length of comparative advantage, and how quickly comparative advantage grows within a relationship. Using annual trade data at the 6-digit HS level for over 28 EU countries from 2000 to 2014 we find that comparative advantages are short lived at product level. Our results suggest that economic crisis has negative impact on duration of comparative advantage, and the New Member States perform better than Old Member States.

ERGONOMICS OF THE EAGRI AGRARIAN PORTAL

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Annotation: The paper deals with the evaluation of the eAGRI portal in terms of ergonomics. Firstly, the concept of ergonomics is defined and analyzed in terms of a large web portal. Subsequently, elements of ergonomics that are related to the web environment are identified. Based on the identification of these elements, portal evaluation methods are formulated. Specific methods for testing usability and accessibility of Web content were chosen in this paper. On the basis of the conducted analyzes, general and technological recommendations which can be applied to the web portal are formulated.

Key words: Ergonomics, UX, usability, accessibility, eAGRI, agrarian web portal

JEL classification: L86; O32; Q10

1. Introduction

The main content of the article is the assessment of the eAGRI web portal ergonomics. The concept of ergonomics is currently widely used in all possible ways, but less so in the field of web applications. Web applications are more likely to refer to usability and possibly also User eXperience (UX) or Human-Computer Interaction (HCI). But how are these terms related?

Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance. Derived from the Greek ergon (work) and nomos (laws) to denote the science of work, ergonomics is a systems-oriented discipline which now extends across all aspects of human activity. Practicing ergonomists must have a broad understanding of the full scope of the discipline. That is, ergonomics promotes a holistic approach in which considerations of physical, cognitive, social, organizational, environmental and other relevant factors are taken into account. Ergonomists often work in particular economic sectors or application domains (IEA, 2017).

The scope of ergonomics exploring man's relationship with the computer is called HCI (Human-Computer Interaction). In this context, the concept of "Visual ergonomics", addressing access to interactive environments by different user groups (children, students, seniors, etc.) is introduced. Visual ergonomics lies on the border between the physical and the mental, respectively Cognitive Ergonomics. Vision is a very basic sense of interactivity with the computer, and Visual ergonomics deals with ideal interface parameters for human vision, both, at technical level (e.g. screen type, its ideal size, resolution, etc.) and psychological/cognitive, i.e. identification of unambiguous graphic symbols (important elements are more eminent, etc.). This scope of ergonomics, i.e. the Human-Computer Interaction, is very closely related to both informatics and information science. Research topics include user interfaces, usability and accessibility of the web and resolution of graphic information (Červenková and Hořava, 2009; Bridger, 2003). These topics are even more pronounced with the increasing use of mobile devices for the use of large web portals (Šimek, Jarolímek and Masner, 2014).

Human-Computer Interaction combines several different disciplines, each of which focuses on a different aspect of creating user interfaces. These disciplines include information science, psychology, sociology, anthropology, design, linguistics, ergonomics, and all other disciplines that focus on the subject (Carrol, 2003).

From analysis of Human-Computer Interaction there is just a small step to the design which is made with a focus on users. This type of design and framework is called User-centered design or Human-centered design (HCD). Human-centered design is an approach to interactive systems development that aims to make systems usable and useful by focusing on the users, their needs and requirements, and by applying human factors/ergonomics, usability knowledge, and techniques. This approach enhances effectiveness and efficiency, improves human well-being, user satisfaction, accessibility and sustainability; and counteracts possible adverse effects of use on human health, safety and performance (ISO 9241-210:2010). Typically, human-centered design is more focused on "methodologies and techniques for interacting with people in such a manner as to facilitate the detection of meanings, desires and needs, either by verbal or non-verbal means (Giacomin, 2014).

According to (ISO 9241-210:2010), the User Experience (UX) can be defined as the perception and reaction of persons resulting from the use or assumption of use of a given product, system or service. Usability is subsequently understood as part of user experience. The scope of applicability according to ISO 9241 Part 11 is the efficiency, effectiveness and satisfaction with which the user achieves the specified objectives in a particular environment (ISO 9241-11:1998).

The more the subject is useful, the less the user has to think about its use and thus more focused on its purpose. Websites should therefore be simple and intuitive to use. The website should be intuitive, understandable and navigable. In any case, the user should not think about where to start the site, where he finds what he is looking for, or what's important on the page. The most visited pages are those that are simple, clear and intuitively manageable (Krug, 2006; Nielsen, 1993). Because usability is primarily focused on specific effects and results, it can be measured quite well. While the user experience is in many ways more subjective and can therefore be measured in a more complicated way.

The usability of the site is closely related to the concept of accessibility. Generally, according to ISO standard (ISO 9241-171:2008), accessibility can be defined as the usability of a product, service, environment or facility for people with the widest range of different abilities. In the context of web content, accessibility can be defined as the state where a webpage is applicable to any user consuming web content, regardless of his or her disability, abilities, knowledge, experience, or imaging capabilities (Špinar, 2004). Accessibility can also be understood as a complex human factor, technology mediating the creation and transmission of web content, web techniques and relevant standards (Thatcher, 2006).

Act No. 81/2006 Coll., Amending Act No. 365/2000 Coll., On Public Administration Information Systems, introduced an obligation for public authorities to make public information in a manner allowing the remote access, so the information related to the public administration is published in a form which enables disabled persons to get to know the necessary information to the extent necessary. The binding accessibility rules were implemented as part of Decree No. 64/2008 Coll. “On the form of publishing information related to the performance of public administration through websites for people with disabilities” (Ministry of the Interior CR, 2008).

Accessibility rules for the purpose of this Decree were set up as a solution to the research project "Accessibility of the Websites of State Administration Authorities" from year 2007. On the solution of this Decree research team represented by domestic accessibility experts participated. Apart from defining accessibility rules itself, the project solution brought valuable insights from the area of domestic accessibility, respectively analysis of the current state of the methodologies, obtaining statistical data on groups of disabled users, analysis of financial impacts of the content accessibility implementation, etc. (Špinar, Saur, Ráček, et al., 2007).

2. Materials and Methods

Based on information listed above it is obvious that for the ergonomics quality assessment of eAGRI web portal we need to apply some usability and accessibility testing methods. In terms of eAGRI web portal, which has particularly informative character, it is necessary to perform testing close to the average web user and also to the primary target group of this portal - to the professional farmers and workers in agriculture.

As the Czech Ministry of Agriculture (2015) states in the so-called Green Report for 2015, the total number of workers on farms is just above the hundreds of thousands. Specifically, it is 100.9 thousand. The Czech Statistical Office (Kotýnek and Chrámecký, 2014) recorded in 2012 more than one million disabled citizens. This is about 10% of the population. Kotýnek and Chrámecký (2014) further state that persons over 60 years of age accounted for almost 59% of the total number of handicapped citizens of the Czech Republic, the second most widespread group was people aged 45-59 years.

The age structure of the agricultural population is a problem not only in the Czech Republic but also in most European countries. In the 4th quarter of 2015, 45-59 years old employees (42.3%) were in the agrarian sector of the Czech Republic, followed by workers aged 30-44 (35.6%). Lower-earning workers were 15-29 years old (11.2%) and older workers, i.e. aged 60 and over (10.9%). In the year-on-year comparison, the share of workers aged 30-44 (by 1.1 pp) and workers of the oldest, i.e. 60+ years (by 1.6 pp) slightly increased. In the category 45-59 years, on the other hand, there was a slight decrease in the share (by 1.5 pp), as well as in the category 15-29 years, i.e. the youngest workers (by 1.2 pp) (Ministry of Agriculture, 2015).

It can be assumed from the information presented that disabled users are also part of the agricultural population. The accessibility of the eAGRI portal is thus a priority not only with regard to legal obligations but also to the real number of disadvantaged people working in agriculture.

According to the above presented facts we chose usability testing methods which are focused on user testing. Specifically, we chose two main methods. Five Second Test as a usability testing method of first user impression and Formalized Thing-aloud test for detailed testing of specific passes through the portal. In terms of accessibility it was mandatory to choose Czech methodological guidelines of Decree no. 64/2008 Coll. on the form of publication of information relating to performance of public administration via web pages for persons with disability - Decree on accessibility.

Five Second Test

The first usability analysis method we applied is a test of the first impression. The Five-Second Test principle is displaying the contents of the entry website for a quick 5 seconds to gather their initial impressions. The reason for five seconds is important because of research studies which demonstrate that website visitors take a very short amount of time, in some cases a fraction of a second, as little as 50 milliseconds, to judge the quality of a website (Lindgaard et al., 2006).

Formalized Thing-aloud test

Nielsen (1993) indicates this test as the single most valuable usability engineering method. This method is used to gather data in usability testing mainly in product design and development, in psychology and a range of social sciences for many years. The Think-aloud method was introduced in the usability field by Clayton Lewis (1982). The method has a host of advantages. Most importantly, it serves as a window to the soul, letting to discover what users think about the design of the web for real. In particular, it is possible to hear misconceptions of users, which usually turn into actionable redesign recommendations: when users misinterpret design elements, it is necessary to change them. Being cheap and robust are huge upsides of qualitative methods such as Thinking-aloud method is, but the flip side is that the method does not lend itself to detailed statistics (Nielsen, 1993). The principle of this method is simple - users which are testing the system talking about their thoughts on the application while executing a set of tasks.

Accessibility analysis

Accessibility analysis is realized in terms of the Czech methodological guidelines of Decree no. 64/2008 Coll. (Ministry of the Interior CR, 2008).

3. Results and Discussion

Both above-mentioned usability tests were conducted by users who did not have any previous experience with the eAGRI portal.

Five Second Test results

Before the first view of eagri.cz web site users did not even know what site they will analyze. Users filled out a questionnaire in which they identified which web portals of Czech ministries they know. No one reported he knew the eAGRI web portal. Users have the first contact with the eAGRI portal just in the Five Second test.

After five seconds spent on the eAGRI portal, all participants reported they noticed the eAGRI logo. Two users said that they are familiar with this abbreviation and they know that it is a portal of the Czech Ministry of Agriculture. Three users who do not know the abbreviation, stated identically that it was probably a website dedicated to healthy eating in schools. Users also noticed photo of Marian Jurečka. Two users correctly identified the photo as a Minister of Agriculture. But three users considered him as Secretary of the State, because this information is presented on the website as a headline next to the photo of the minister.

Formalized Thing-aloud test

As a part of this testing we presented to each user the same seven tasks they had to meet. During the addressing these challenges users described aloud their activities and also feelings with the presented web portal. Testing was always done with one user only, took place in one day. The content and structure of the portal was unchanged during testing. The complete scenario in the form of individual tasks is described below. A complete description of the individual tasks including the results is given by Benda, Šmejkalová and Šimek (2016).

Example - Task 1

> You have to attend a business meeting at the Ministry of Agriculture. But you are unsure where the Ministry is housed. So, you use web Search Engine with "MZE address" keyword and you follow the link to web site eagri.cz. Are you able to find specific address of Ministry of Agriculture on this web?

Example - Task 6

> You represent a company that would like to participate in the public tender for the implementation of the Nitrates Directive. Where you can find detailed information about this public contract?

During this test we also observed time consumption of each task. Measured results were described for each user, including the so-called walkthrough, that is, the navigation path used by the user to achieve the result. The results were then summarized and evaluated. The results of Task 1 and two users are illustrated in the following table.

Table 1. Task 1 results of two users

	Walkthrough	Time con. in sec.
User 1	http://eagri.cz/public/web/mze/, http://eagri.cz/public/web/mze/ministerstvo-zemedelstvi/, http://eagri.cz/public/web/mze/kontakty/organizace/ *Nalezeno*	26
User 2	http://eagri.cz/public/web/mze/, *Nalezeno na stránce*	8

Source: author

Fulfilling other goals has been much more challenging for users. The used navigation paths are very long and therefore will not be listed. The overall results are shown in the table below.

Table 2. Overall results of Formalized Think-aloud test – time consumption in seconds

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7
User 1	26	>180	64	>180	102	>180	106
User 2	8	>180	157	71	154	>180	>180
User 3	17	>180	>180	108	93	>180	38
User 4	34	>180	>180	125	>180	>180	32
User 5	21	>180	142	162	>180	101	97

Source: author

It is clear from the resulting table that the results of the Formalized Think-aloud test are poor. Users are not able to navigate the portal properly and are lost in a too complex content.

The main problem is the extensiveness of the portal and hence its complex structure. Placement of information into different segments or sub-segments of the portal that do not have a unified concept is also confusing. Searching for information on the portal is highly complicated. The user is not able to navigate the portal easily and use the internal search, despite the fact it is functional and uncluttered, is often not able to help the user. Based on the Thing-aloud test results we can indicate the time, what user needs to trace searched information on the portal, as catastrophic (Benda, Šmejkalová and Šimek, 2016).

Accessibility analysis

Accessibility testing was carried out on the basis of the methodological instruction of Decree No. 64/2008 Coll. "On the form of public information related to the performance of public administration through websites for people with disabilities" (Ministry of the Interior CR, 2008). The accessibility of the eAGRI portal is at a very good level. Within testing, only a few violations of the guidelines have been. In the guidelines, all violated rules are labeled as Mandatory and it is therefore necessary to make corrections. Specifically, these are Rules 6, 22 and 28. The violation of almost all mentioned rules occurs repeatedly in the most of the webpages across the tested portal. Rule six is violated namely in sub-portal LPIS, in the Integrated Agricultural Register, and potentially it may occur on the main page of the eAGRI portal, is a navigation object with four last and important Ministry of Agriculture news which are based on image information which rotate on the background. Correction of all mentioned errors may not be difficult and in terms of the law it is absolutely necessary.

4. Conclusion

The analysis shows that the ergonomics of the eAGRI portal are not at a sufficient or even at a good level, especially considering performed usability tests. After visiting the landing page for five seconds basically none of the users was capable to indicate on what web page he is located. Subsequently, the users were mostly completely lost in the tasks. This is mainly due to the largeness, disparity and inconvenience of the portal. Internal search, that is absolutely necessary for such large-scale portals, was in many test cases rather confusing than offered a relevant result. Thus, users needed a disproportionate amount of time to find the information they wanted. In the real situation most users would sooner leave the portal than endlessly trying to trace the necessary information. Compared to that the accessibility of the eAGRI portal is at a very good level. Within the performed testing, only a few violations of the Guidelines have been found but are repeated many times on the portal. In the guidelines, all rules are labeled as "Mandatory" and it is therefore necessary to correct the found errors against the methodology.

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EMPLOYMENT IN THE RUSSIAN AGRICULTURE: JOB SATISFACTION AND RISKS OF JOB LOSS

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Annotation: One of the important areas of researching the social factors of competitiveness of regional agro-food systems is studying the job satisfaction in agriculture of different population groups. The objective of the study is to analyze the degree of job satisfaction in agriculture of different social groups of rural population employed both in the formal and informal sectors of the economy. We consider the risks of job loss and the possibilities of finding a new job, depending on the age, gender and the field of previous employment. The information base of the study is the results of the 23rd wave the Russian Monitoring of the Economic Situation and Health of the Population (RLMS-HSE), conducted in October 2014 – February 2015. The sample is representative, N = 12 908 people. For the purposes of the study, we have formed a subsample consisting of 221 people employed in the agriculture.

Our findings suggest that agricultural self-employment is more attractive for those aged 30-45 and 46-60 years and less attractive for young people. The share of the employed in the informal sector of the agriculture is higher compared to that in the manufacturing. Those employed in the informal sector are to the highest degree satisfied with the amount of their wages. Young people aged 16-29 years are not quite satisfied with being engaged in agriculture. Only 39.0% of the young people aged 16-29 years are satisfied with their professional growth opportunities, 56.1% - with the working conditions, and 31.7% - with the amount of their wages. The low level of satisfaction with various aspects of agricultural employment together with the low attractiveness of the sector in general for young people and skilled workers suggest there will be a “personnel shortage” in the nearest future.

We find that those employed in the agricultural sector are highly dissatisfied with their jobs irrespective of the age. Furthermore, they are more anxious about the possibility of losing their jobs compared to the workers of other sectors of the economy. Almost a half of the employed aged 30-45 years are worried that they will not be able to earn for the living for themselves and their dear ones in the near future. And only 7.7% of those employed in the agricultural sector believe they will find a tantamount job in case of losing the current one. There is a need to create more high-tech jobs in the agriculture, and the structure of the rural economy should be diversified through developing non-agricultural kinds of activity and the social infrastructure.

Keywords: agricultural, employment, job satisfaction, risk of job loss, Russia

JEL classification: J28, J43, J63

1. Introduction

Agriculture plays an important role in the development of the economy and in the provision of a wide range of public goods, such as the agricultural landscape, farmland biodiversity, climate stability, social, economic and cultural viability of the rural society (Hálová et al., 2015). In the time of globalization and economic competition in the food markets, the role of human resources as a unique asset of innovative development of the agricultural sector is increasing. The State Program for the Development of Agriculture and Regulation of the Markets for Agricultural Products, Raw Materials and Food for 2013-2020 provides for increasing the competitiveness of Russian agricultural products in the domestic and foreign markets, sustainable development of rural areas and preservation of labor resources (State Program, 2012). One of the important areas of studying the social factors of competitiveness of regional agro-food systems is examining the job satisfaction of various population groups in the agricultural sector.

Research shows that a high level of job satisfaction leads to increased productivity, and dissatisfaction leads to staff turnover (Wan Ahmad and Abdurahman, 2015). The literature widely represents job satisfaction surveys of the respondents employed in various sectors of the economy (Scott et al, 2005; Aziri, 2011; Douglas and Campbell, 2011). Analyzing the interrelationship between job satisfaction and social-demographic characteristics of the employed is also of scientific interest (Aydin et al., 2012; Joo et al., 2012; Duong, 2013; Saiti et al., 2015; Scott et al., 2005). Very important are the surveys of job satisfaction depending on age and gender peculiarities (Lamont, 2007; Aydin, 2012). The factors and conditions of increasing job satisfaction in the agricultural sector are studied to lesser extent.

In Russia, agriculture is unattractive for young people and persons with higher education because of unfavorable employment conditions. Having left for the city to get educated, young people usually seek employment at urban enterprises. Because of the low level of job satisfaction in the agricultural sector, persons with higher education and skilled workers prefer employment in the city. As a result, those working in the agricultural sector have a lower level of education compared to those engaged in other economic activities. Just 12.7% of those employed in the agriculture have higher vocational education. To compare, in the manufacturing sector the share of the employed with higher vocational education is more than twice as high (26.9%), and for the budget sphere (health care, education, science) the figure is 43.0%. About 32.3% of those employed in the agricultural sector have secondary vocational education, 30.0% have primary vocational education and 25.0% do not have any vocational education at all (only secondary general and basic general education). For those employed in the manufacturing and budget sectors without any vocational education the respective shares are 16.6% and just 9.0%.

Because of the dissatisfaction with the working conditions, the share of the young people of 16-29 years of age in the agricultural sector is low (18.2%), while in the financial sphere it constitutes 34.4%, in the hotel and restaurant business – 31.1%, construction – 24.5%. In the agriculture, the share of the employed aged 60-72 years is the highest (10.9%). The average age of an agricultural worker (43.7 years) is much higher than that in the construction sector (39.3 years) or in the sector of public administration (37.9 years). Attracting youth and skilled personnel requires improving the quality of life in the countryside and providing conditions for greater job satisfaction in the agricultural sector.

The objective of the study is to analyze the degree of job satisfaction in the agriculture of different social groups of the rural population employed both in the formal and informal sectors of the economy. We consider the risks of job loss and the possibilities of finding a new job, depending on the age, gender and the field of previous employment.

The tasks of the study are the following:

- examine the structure of the employed in the agriculture according to the status of employment;
- investigate the degree of satisfaction with agricultural employment depending on the age;
- assess the degree of anxiety of those employed in the agricultural sector concerning the possible loss of job.

2. Materials and Methods

This study is based on the micro-data of the nationwide Russian Monitoring of the Economic Situation and Public Health conducted by the National Research University "Higher School of Economics" (RLMS-HSE) (Russian Monitoring of the Economic...). The information base of the study is the results of the 23rd wave of the Russian Monitoring (RLMS-HSE) performed between October 2014 and February 2015. The sample is representative, N = 12 908 people, 5 752 of which (52.4% of the respondents) were employed or had other gainful occupation at the time of the survey. For the purposes of the study, a subsample was formed of 221 people employed in the agriculture, hunting and forestry. The object of the study is persons aged 16-72 years employed in the agricultural sector. In order to make a more in-depth analysis of the age-related differences in employment, those employed in the agriculture were divided into four age groups: young people (16-29 years), adults (30-45 years), persons of the pre-retirement age (46-60 years) and retired workers (61-72 years). The structure of the employed comprises 18.6% of persons aged 16-29 years, 34.1% of those aged 30-45 years, 39.5% - 46-60 years and 7.7% of those in the age of 61-72 years. The study is carried out by analyzing the multidimensional distributions of the respondents' answers with the use of the SPSS 17.0 application software package.

3. Results and Discussion

3.1. Structure of the employed in the agriculture by the employment status

According to methodological guidelines of the Federal State Statistics Service (Rosstat), employed in the agricultural sector are considered those who work in agricultural organizations or organizations providing services to agricultural organizations, in independent farms, as well as those engaged in self-employment without establishing a legal entity and persons producing agricultural products in their households for sale or exchange (Agriculture, Hunting.., 2015).

92.7% of the young people aged 16-29 years and all of the retired workers in the age of 61-72 years are employed by companies and organizations belonging to the formal sector. The share of those aged 30-45 years employed in the formal sector is the lowest (85.3%), for those aged 46-60 years the figure is 86.2% (Table 1).

Table 1. Structure of the employed in the agriculture by the employment status depending on the age (per cent of the respective age group)

	16-29	**30-45**	**46-60**	**61-72**
Employed in the formal sector	92.7	85.3	86.2	100.0
Employed in the informal sector, including:	7.3	14.7	13.8	0.0
Entrepreneurship or self-employment	0.0	18.2	25.0	0.0
Employed by an officially registered individual entrepreneur	66.7	36.4	41.7	0.0
Employed by an unregistered individual entrepreneur, or data is not available	33.3	45.5	33.3	0.0

Source: own processing based on the results of the RLMS-HSE

Analyzing the structure of the employed in the informal sector, we arrive at the following conclusions. Firstly, self-employment or individual labor (entrepreneurial) activity in the field of agriculture is more typical of the persons aged 30-45 years (18.2% of the total number of the employed in the informal sector) and 46-60 years (25.0%) compared to the young people. Secondly, a considerable part of the employed in the informal sector is employed by officially registered individual entrepreneurs. Thirdly, unofficial employment in the informal sector is higher for those aged 30-45 years (18.2% of the employed in the informal sector). This suggests that the share of the employed in the informal sector in the agriculture (11.8%) is higher than that in the manufacturing (5.4%) and budgetary (health care, education, science) (2.0%) sectors, but lower than in trading (22.3%). This is because of the existence of a high share of micro-organizations mainly localized in rural areas that allow being engaged in agricultural activities with minimum costs. Employment in the informal sector is typical of the people with low competitive positions in the labor market. Informal employment is often concentrated in the segment of unskilled jobs and has pronounced sectoral specifics (agriculture, services, trade). For agricultural workers, especially those who live in rural areas, informal employment is the optimal strategy for increasing their income, allowing them to combine their paid employment with working at their personal subsidiary farms producing agricultural products for personal consumption or for sale.

The majority of those employed in the agricultural sector are employed on the basis of officially registered employment contracts (94.4% of the respondents), but among the persons aged 30-45 years, the share of the officially registered employees is somewhat lower (93.8%). Getting older, people prefer to have a stable and guaranteed employment, which is why the share of those employed by enterprises or organizations of the state or municipal ownership is on the rise with the age: employed by state or municipal enterprises are 46.7% of the persons aged 46-60 years, 32.8% of the persons of 30-45 years of age and just 28.9% of the young people aged 16-29 years. The share of the young people aged 16-29 years employed by private agricultural companies is the highest (73.7%) because they prefer an easier and less formalized employment in exchange for acquiring some skills and qualifications.

3.2. The degree of job satisfaction in the agriculture

Job satisfaction is the person's perception of the results of doing the job, of the process of doing the job, and of the external environment of doing the job. Job satisfaction or dissatisfaction includes both positive and negative attitudes towards the job in general and its individual components (Aziri, 2011). Different degrees of job satisfaction or dissatisfaction may require applying different models of management and motivation strategies. Labor motivation and job satisfaction are considered as social resources that should be taken into account in the context of the organizational culture and when managing the efficiency and quality. The degree of job satisfaction is a reflection of the difference between the employee's job expectations and what he/she actually experiences doing the job. Employees may be totally satisfied with some aspects of their job, but completely dissatisfied with other ones (Lamont, 2007).

Many papers consider age and gender as explanatory variables of job satisfaction along with other factors (Scott, 2005; Lamont, 2007; Aydin, 2012). The degree of job satisfaction and that of various aspects of the job differ with the age because of the different standards, values and social roles of the different age groups. Differences in terms of job requirements and the job (labor activity) itself also produce a significant impact on the degree of job satisfaction for people belonging to different age groups.

To analyze the degree of satisfaction with various aspects of being employed in the agricultural sector, we have distinguished the shares of the representatives of the different age groups that had opted to answer "generally satisfied". The results suggest that the retired workers of 61-72 years of age are to the largest extent satisfied with all the aspects of their job, with the exception of the amount of their wages, they are the least satisfied with their remuneration compared to the representatives of the other age groups (27.8%) (Table 2).

Table 2. The degree of job satisfaction in the agriculture depending on the respondents' age
(share of the "generally satisfied", per cent of the respective age group)

	16-29	**30-45**	**46-60**	**61-72**
Job in general	58.5	65.3	63.2	72.2
Working conditions	56.1	58.6	54.0	66.7
Wage	31.7	41.4	33.3	27.8
Career opportunities	39.0	50.7	45.9	55.6

Source: own processing based on the results of the RLMS-HSE

In the 30-45 age group, 58.6% of the respondents are satisfied with their working conditions, 50.7% with their career opportunities, 41.4% with the amount of their wages, and 65.3% are satisfied with their jobs in general. Persons of the pre-retirement age (46-60 years) demonstrate lower rates of job satisfaction. Only 45.9% of them are satisfied with their career opportunities, and every third of them is satisfied with the amount of the wage. Young people aged 16-29 years are to the lowest extent satisfied with all the aspects of their jobs, except for the amount of their wages (satisfaction with the amount of the wages is the lowest among those aged 61-72 years). Only 39.0% of the young people of 16-29 years of age are satisfied with their career opportunities, 56.1% with the working conditions and 31.7% with the amount of their wages.

So, the degree of job satisfaction in the agricultural sector depends, on the one hand, on the objective characteristics of the employment and the workplace, on the duties performed, and on the other hand, on the personal characteristics of the respondents, on the level of their aspirations and achievements. Sometimes, dissatisfaction with the job or some of its individual aspects can be a motivation for seeking another job. To illustrate this, 6.7% of the employees aged 30-45 years and 9.2% of those in the age of 46-60 years would like to switch to another job. The most willing to change their jobs are the youngest employees of the agricultural sector: every sixth of them (17.1%) in the age of 16-29 years wishes to change the occupation. At the same time, the young people aged 16-29 years are quite satisfied with their lives (56.1% of the respondents). Less satisfied with their lives are the persons aged 46-60 years (44.8%) and 30-45 years (48.0%). This is probably due to the peculiarities of the stages of the life cycles of the individuals.

Rural residents are extremely dissatisfied with their well-being. Among the employees aged 30-45 years, only 17.3% are satisfied with their well-being, and for those aged 46-60 years the share is 20.7%. Young people of 16-29 years of age are also dissatisfied with their well-being (19.5%). To the largest extent satisfied with their well-being are the persons aged 61-72 years employed in the agricultural sector (22.2%), which is partially due to the fact that they receive their old-age pensions. Those employed in the informal sector are to a larger extent satisfied with their remuneration than employees of the formal sector. Compared to men, women are more often satisfied with their jobs in general, and less often with their career opportunities.

3.3. The degree of anxiety of losing the job

Our findings suggest that it is those employed in the agricultural sector that are the most anxious about losing their jobs compared to other sectors of the economy, their share being 38.9% as against the manufacturing sector (27.7%), the budgetary sector (health care, education, science) (25.3%) and trading (21.6%). Age differences among the employed in the agricultural sector should also be noted. Much more anxious about losing their jobs are the persons of 30-45 years of age, as opposed to the young people aged 16-29 years, who are the least anxious about the possibility of being fired (29.3%). Young people are more positive, optimistic and confident in their abilities. Those aged 30-45 years are more anxious about losing their jobs because they feel a high responsibility for the well-being of their families, children and parents. Almost a half of the employed of 30-45 years of age (48.0%) are anxious that they will be in no opportunity to provide themselves and their loved ones with the most necessary in the nearest future. Among the persons aged 46-60 years, the share of those anxious about their future well-being is somewhat lower (41.4%). People employed in the agricultural sector are much more anxious about providing their families with the most necessary, compared to the employed in other sectors of the economy. Very anxious about their future well-being are 44.8% of the employed in the agriculture, 34.4% of the employed in the manufacturing sector and 33.5% of those employed in the budgetary sector. And only 7.7% of those employed in the agricultural sector believe that in case of losing their current job they will manage to find a job that is no worse. To compare, the shares of those believing in successful new future employment are 10.2% in the manufacturing sector, 15.0% in the budgetary sector and 15.2% in the trading one. As for the employed in the agricultural sector, the belief for finding a new job decreases with the age. To illustrate this, believing that they will find another job no worse than the current one in case of being fired are 4.0% of those of the pre-retirement age (46-60 years), 5.6% of the retired workers (61-72 years), 9.4% and 13.2% of the persons aged 30-45 and 16-29 years, respectively.

4. Conclusion

Agricultural workers have a lower level of education, and the share of men among them is higher than that of women, especially in young ages. The agricultural sector is featured by a relatively high share of the employed in the informal sector because of their localization in rural areas and due to the prevalence of small-scale commodity agricultural production. Young people are predominantly dissatisfied with their jobs, but satisfied with their lives in general. Older people employed in the agricultural sector are, on the contrary, more satisfied with their jobs and to a lesser extent with their lives. Irrespective of the age, those employed in the agriculture are more anxious about the possibility of losing their jobs and about their future well-being than those employed in the manufacturing or other sectors. Agricultural workers are less sure that they will manage to find a new job no worse than the current one in the case of their firing.

Persons of the pre-retirement and especially retirement age are more exacting in terms of the availability of social guarantees and the level of social security, therefore, the share of them being employed by companies of the state or municipal ownership in the formal sector is high. Greater satisfaction with the various aspects of their jobs among the persons aged 46-60 and 61-72 years does not prevent them from being anxious about the possibility of losing their job and difficulties with finding another one. The employed in the age of 30-45 years are somewhere between the young people aged 16-29 years and those ages 46-60 years in terms of the social and employment attitudes and preferences. Having families and the need to support their children, they prefer to have a steady employment with an acceptable wage.

In view of this, the agricultural sector is in need of creating highly productive jobs to satisfy the employment interests of the people with different levels of education and skills and with different preferences. To avoid the outflow of rural residents to the city, it is important to further improve the quality and availability of the services of the rural infrastructure and create new high-tech jobs in the field of non-agricultural activities.

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FARMERS’ RISK PERCEPTION AND RISK MANAGEMENT STRATEGIES IN SLOVAK AGRICULTURE

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Annotation: Managing risk is an important part of farming that includes the process of identification, analysis, assessment, mitigation and monitoring of agricultural risks. Within agricultural policies, various measures contribute to reducing risk for farms, either because they help to reduce the frequency of risk exposure, or mitigate its consequences on farms’ income. The main objective of the paper is to analyze the farmers’ perception of risks in agriculture, significance of various risk types, and risk management tools applied to mitigate the agricultural risk. The questioner survey is used to analyze the Slovak farmers and compare the results to the similar surveys provided in Hungary, Poland, Netherlands, Spain and Germany. The results might contribute to the improvement of risk management tools in EU, which has become one of the priorities of Common agricultural policy. The results are processed by using the non-parametric statistical tests, Kruskal–Wallis test, and Mann–Whitney U test.

Key words: agriculture, risk perception, risk management tools, questionnaire survey.

JEL classification: Q13, Q14, Q18, G31

1. Introduction

Risks that are relevant in agriculture have different characteristics and can be classified in different ways (production risk, price risk, income risk, institutional risk, financial risk, environmental risk, human risk). They are very rarely completely independent from each other, especially when considering their impact on income variability (Hardaker et al., 2015). The spectrum of risks may increase due to climate change impacts, frequent agricultural policy reforms, dynamic markets and consumer trends, as well as increased costs in agriculture (Špička, 2010, Váryová et al., 2015). Individual’s perception of risk can highly influence their investment and business decisions. In this regard, farmers tend to use different risk management tools or risk avoiding strategies to minimize the influence rate. Risk mitigation, coping resp. risk management is the process of selecting an appropriate strategy or combination of strategies amongst the available alternatives to decrease the impact of the risk factor on individual´s business activities, financial situation, income and welfare. Farm size, age, innovativeness and risk aversion determine the alternative option of risk management strategy by farmers (Pennings, 2008). The scientific interest in the area of risk in agriculture and risk management strategies has risen in the last years. Many studies in different countries were conducted on risk perceptions and risk management in European agriculture, for example in the Netherlands, Norway, Germany, Austria, Hungary or Lithuania (Meuwissen, et al., 2001; Flaten, et al., 2005; Pálinkás and Szekély, 2008; Scharner et al., 2016; Girdziute and Miceikiene, 2016). It may reflect the actual development of Common Agricultural policy (CAP) measures. The CAP 2014-2020 has clearly positioned risk management measures into rural development program in Regulation No. 1305/2013, with the shift from the income support measures, when risk management instruments moved from the first to the second pillar. The CAP initiative in mitigation of agricultural risks has stimulated scientific research in this area (Finger, Lehmann 2012; Meuwissen et al., 2011; and others). The paper summarizes the results of questionnaire survey research that was conducted since January 2016 till January 2017. The survey methodologically follows the research of Palinkas and Szekely (2008), who used the psychometric paradigm focusing on individuals´ risk perception measured by socio-economic scaling. The main objective of the paper is to analyze the farmers' perception of risks in agriculture, including the intensity of impact of agricultural risk factors, and application of risk management tools to mitigate the agricultural risk.

2. Materials and Methods

The data used in the analysis consists of the answers of questionnaire survey of Slovak farms focused on the intensity of impact of risk factors, and the use of risk management tools by Slovak farmers. The information about structure of Slovak agriculture from the point of legal form, size of utilized agricultural area (UAA) and production orientation was obtained from the Ministry of Agriculture and Rural Development of the SR. The questionnaire survey consists of closed questions that provide respondents with a fixed number of alternatives from which they can choose one or more alternatives. In the vast majority of cases, the Likert scale is used, to express respondents' views on the intensity of risk exposure. Risk sources could be rated from 1-7 (without impact – very significant impact) based on the intensity of impact on agricultural income. The rating from 1-3 describes only low impact of risk factor, 3 – 5 moderate impact of risk factor, and 5-7 a significant impact of risk factors. The target group of survey consists of agricultural companies of primary production operating in the Slovak Republic. The questionnaire survey was conducted online, since the January 2016 till January 2017. The results are processed by using the non-parametric statistical tests, Kruskal–Wallis test, and Mann–Whitney U test.

$$H = \frac{12}{N(N+1)} . \frac{\sum_{j=1}^{n} Rj^2}{n_j} - 3(N+1) \quad \textbf{(1)}$$

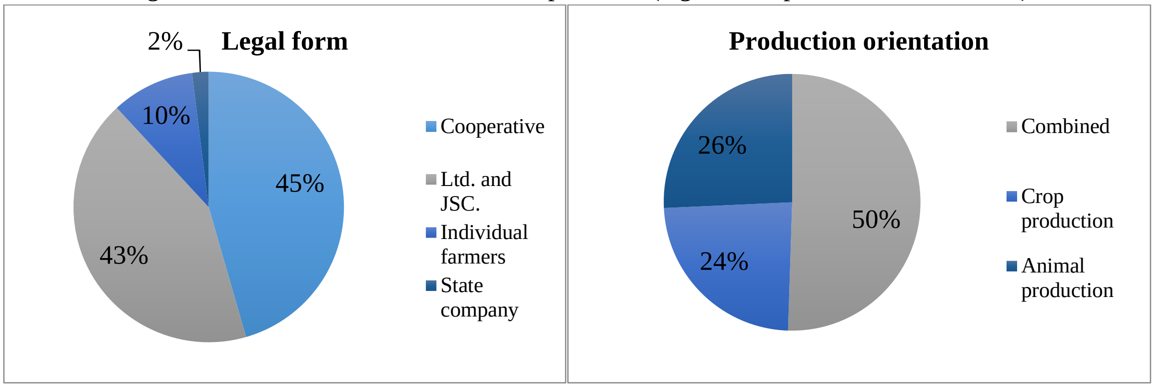
$$U = n_x n_y + \frac{n_x(n_x+1)}{2} - R_x \quad \textbf{(2)}$$

Rj^2 is the sum of the order of each selection group, n_j is number of observations in group, N is total sample size, n_x, n_y is sample size X or Y, R_x is rank of the sample size X. The test are used to accept or reject the hypotheses about statistically significant differences in risk perception from the point of size of farm and production orientation. H_0 hypothesis assumes that there are no differences in the mean values (respondents' opinions) within the test group. Differences are tested at alfa = 0.05. If p - value < 0.05, we reject the H_0 hypothesis and accept alternative hypothesis H_1 that assumes that there are differences between at least one pair of mean values within the test group. If p - value ≥ 0.05, the null hypothesis H_0 is accepted. It means that there are no statistically significant differences between the mean values of tested groups.

3. Results and Discussion

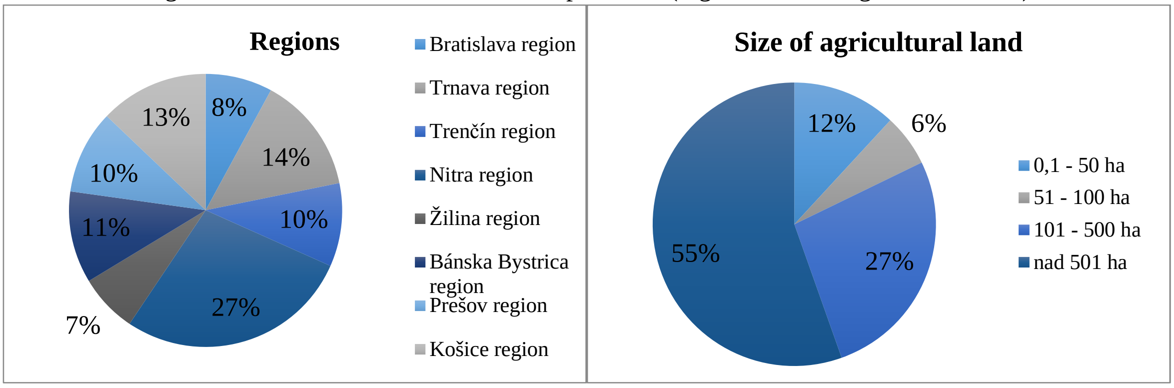
The questionnaire survey was offered to 640 Slovak agricultural companies, however only 101 respondents participated on the research. The 45 % of farms have legal form of a cooperative, 43 % of farms have the legal form of a joint stock company or a limited liability company, 10 % of respondents act as individual farmers and 2 % of respondents are state companies. The majority of farms have combined production orientation (plant and animal production, 50.5% of respondents) almost 24 % of farms are focused only on the crop production, and 25.7% are livestock farms (Figure 1). The farms in the tested sample are located in all 8 regions of Slovakia. The regional structure is shown in Figure 2. Based on the size of the agricultural land, the respondents are divided to farms operating on more than 501 hectares (55.4 %), 101-500 ha (26.7%), 51-100 ha (5.9 %) and 0.1 - 50 ha (11.9 %).

Figure 1. General information about respondents (legal form, production orientation)



Source: own processing

Figure 2. General information about respondents (regions, size of agricultural land)

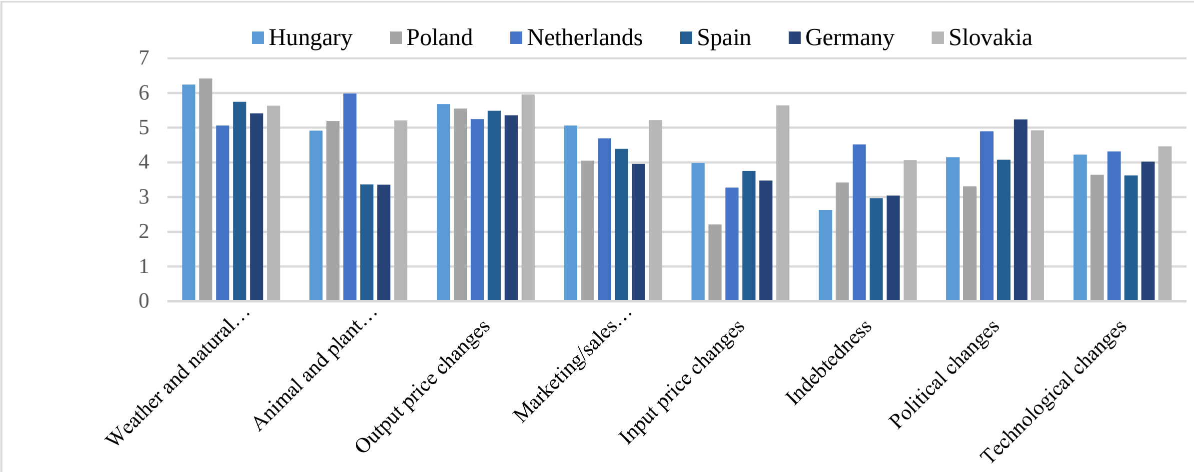


Source: own processing

The majority of companies are large farms with an area over 501 hectares. Therefore we decided to test the statistically significant differences between 2 groups of farms – operating on more than 500 ha, and less than 500 ha (44.6). Moreover, we tested the statistically significant differences between groups divided by the production orientation. After the general information about respondents, the questions included several risk sources which could be rated from 1-7 (without impact – very significant impact) based on the intensity of impact on agricultural income. Respondents rated the following risk sources: *weather and natural changes, animal and plant diseases, output price changes, input price changes, marketing/sales difficulties, indebtedness, political changes, technological changes, environmental risks, human risks.*

The respondents consider the output price changes (changes in the prices of agricultural products on the market), and input price changes (changes in production costs, labour costs, land rents, fodder prices, fertilizer prices, etc.) to have the greatest impact from the selected risk sources. Respondents also consider weather and natural changes to have very high impact on agricultural income (5.63 on average), as well as marketing/sale difficulties (5.22), and animal and plant diseases (5.21). The rating of farmers undoubtedly reflects the development of Slovak agricultural sector in the previous years, that has been characterised by increased price volatility, very unstable weather (floods, hailstorms, rainfall, or extreme drought), lower revenues from the sale of own products due to decrease in gross agricultural production in current prices, with considerable decrease in animal production, as well as plant production. In the opinion of farmers, the lowest level of impact with the average value of 3.81, indicating moderate impact, have environmental risks (costs of water / soil pollution, waste disposal, costs of environmental damage, etc.).

Figure 3. Intensity of impact of risk factors (scale 1-7)



Source: own processing

The questionnaire survey results are compared with the study of authors Palinkas et al. (2008) who applied a similar survey in the Hungary, Poland, Netherlands, Spain and Germany. From the comparison can be concluded that the Slovak respondents consider the risk factors output price changes, input price changes, marketing/sales problems, political changes and technological changes to have greater impact on the agricultural impact than in the other countries. The difference is obvious mainly when rating the risk factor input price changes. The Slovak respondents rated the factor to have significant impact on their income, while the rest of the countries perceive it only as a risk factor with moderate or low impact. The risk of weather and natural changes is perceived more significantly by respondents from Poland, Hungary and Spain. Somewhat minor meanings refer to the risk factor for participants in the survey of the Netherlands and Germany, although there is only a very small difference between the average rating of the respondents. Animal and plant diseases is attributed as having large impact on agricultural income in Poland and the Netherlands, while the same applies to political measures in Germany, and to marketing difficulties in Hungary.

Table 1. Comparison of risk perception in different countries

	Hungary	**Poland**	**Netherlands**	**Spain**	**Germany**	**Slovakia**
Weather and natural changes	6.24	6.41	5.06	5.74	5.41	5.63
Animal and plant disease	4.91	5.19	5.98	3.36	3.35	5.21
Output price changes	5.68	5.55	5.24	5.48	5.35	5.95
Marketing/sales problems	5.06	4.05	4.69	4.39	3.95	5.22
Input price changes	3.98	2.21	3.27	3.75	3.47	5.64
Indebtedness	2.63	3.42	4.52	2.97	3.04	4.06
Political changes	4.15	3.31	4.89	4.07	5.23	4.92
Technological changes	4.22	3.64	4.31	3.62	4.02	4.46

Source: own processing, Palinkas et al. (2008)

For each risk factor were stated the hypotheses (H_0, H_1) about statically significant differences from the point of production orientation and size of utilized agricultural area (UAA). H_0 hypothesis assumes that there is no difference in perception of intensity of risk factor between different production orientation (plan, animal, combined), or size of UAA (0 – 500 ha, more than 500).

Table 2. Statistically significant differences of perceived intensity of risk factor

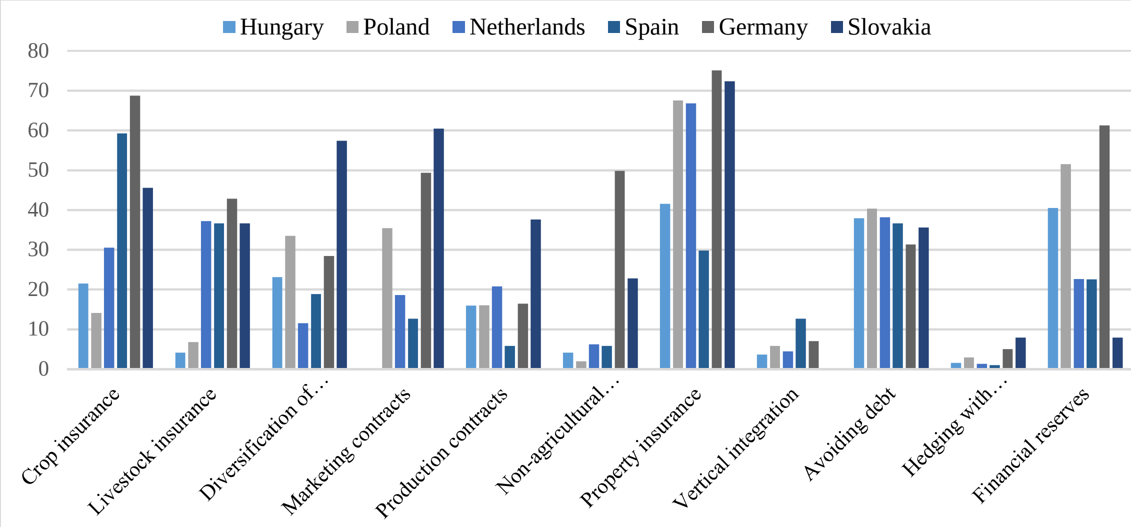
	P - value		***Hypotheses***	
Risk factor	Production orientation	Size of UAA	Production orientation	Size of UAA
Weather and natural changes	**0.000**	**0.010**	$\mathbf{H_1}$	$\mathbf{H_1}$
Animal and plant diseases	0.330	0.947	H_0	H_0
Output price changes	0.364	0.065	H_0	H_0
Input price changes	0.916	0.584	H_0	H_0
Marketing/Sales problems	0.156	0.416	H_0	H_0
Indebtedness	0.156	0.930	H_0	H_0
Political changes	0.406	**0.033**	H_0	$\mathbf{H_1}$
Technological changes	0.195	0.268	H_0	H_0
Human risks	0.878	0.432	H_0	H_0
Environmental risks	**0.050**	**0.015**	$\mathbf{H_1}$	$\mathbf{H_1}$

Source: own processing

From the results of tests, the statistically significant differences in intensity of impact of risk factor *weather and natural changes* were proved between different groups of production orientation, as well as size of the UAA. We can conclude that companies oriented on crop production perceive the impact of weather fluctuations on the agricultural income more intensively than companies with animal production. The statistically significant difference in perception of the risk factor exist also between companies with combined production and animal production. The results of test (p-value = 0.381) means there is no statistically significant difference in perception of risk factor between companies oriented on crop production and combined production. Farms with an area more than 501 ha consider the impact of risk of weather and natural changes to have greater impact on the agricultural income. The results of test are in accordance with the economic theory that the crop oriented farms with large area of UAA are very sensitive to weather changes, which have in recent years caused the deterioration of production and decreased agricultural income. Political risk is perceived as a factor with higher intensity of impact on farms operating on less than 500 ha. The statically significant difference exists between groups divided based on the size of UAA, however there is no difference in perception from the point of production orientation. A statistically significant difference in the intensity of the impact of environmental risks is also proved. Farms with an area of more than 501 hectares, focusing on crop production or combined production, perceive environmental risks more intensively. There was no statistically significant difference in the intensity of impact of risk factors: animal and plant diseases, output price changes, input price changes, marketing/sales problems, company indebtedness, technological changes and the human risks. The next part of our survey was focused on the risk management tools used by farmers to mitigate the agricultural risks. The summarisation of results is presented in Table 3 and Figure 4.

The property insurance (72.3%), including insurance of buildings, machinery, agricultural technology. was indicated as risk management tool applied by the high percentage of farmers in Slovakia. However, the crop and livestock insurance is used by much lower number of survey respondents (45.5% and 36.6%).

Figure 4. The application of risk management (mitigation) tools



Source: own processing

To the often used risk management tools belong the marketing contracts and diversification of production. In the marketing contracts the price and quantity of purchased agricultural commodities are agreed even before the end of the production process. Production contracts that give the buyer the right to control and manage the agricultural production process are used by smaller percentage of respondents (37.6%). Mostly, respondents diversify their agricultural production (57.4%) with the objective to distribute the risk to smaller parts. Non-agricultural activities are carried out by 22.8% of the respondents of the questionnaire survey. The results show that 43.6% of respondents spend their effort to minimize costs, and focus on the agricultural production with low input costs. 35.6% of respondents prefer low indebtedness of company and avoid raising capital by debt securities or using bank loans. The risk mitigation tool with the lowest percentage of usage is trading on the financial markets (option trading, futures) and creating financial reserves to cover potential future unexpected costs.

Table 3. Use of risk management tools in agriculture, comparison of countries (%)

	Hungary	**Poland**	**Netherlands**	**Spain**	**Germany**	**Slovakia**
Crop insurance	21.5	14.1	30.5	59.2	68.7	45.5
Livestock insurance	4.1	6.8	37.2	36.6	42.8	36.6
Diversification of production	23.1	33.5	11.5	18.8	28.4	57.4
Marketing contracts	38.5	35.4	18.6	12.6	49.3	60.4
Production contracts	15.9	16.0	20.8	5.8	16.4	37.6
Non-agricultural production	4.1	1.9	6.2	5.8	49.8	22.8
Property insurance	41.5	67.5	66.8	29.8	75.1	72.3
Vertical integration	3.6	5.8	4.4	12.6	7.0	-
Avoiding debt	37.9	40.3	38.1	36.6	31.3	35.6
Hedging with financial derivatives	1.5	2.9	1.3	1.0	5.0	7.9
Financial reserves	40.5	51.5	22.6	22.5	61.2	7.9

Source: own processing Palinkas et al. (2008)

The range of instruments applied by farmers to manage risks related to agriculture show that property insurance, crop insurance and livestock production is widespread in all countries. Crop insurance is used by the vast majority of respondents from Germany and Spain. Respondents from the Slovak Republic are less focused on livestock insurance than the Dutch and German farmers, but the percentage (36.6%) is several times larger than the use of livestock insurance products in Hungary and Poland. It is important to note that the authors' study was carried out in 2008, when the products of agricultural insurance offered in Hungary and Poland could be less developed than nowadays. The great difference between respondents' answers is evident in the diversification of production. While 57.4% of respondents from Slovakia diversify their production, in other countries the percentage of the use of this risk management tool is relatively low. Agricultural production in the Netherlands (11.5%) and Spain (18.8%) is poorly diversified and more specialized in individual primary production areas. Marketing contracts are rarely used to ensure sales in the Netherlands and Spain, however almost third of respondents from Hungary and Poland use this risk mitigation tool. Clearly the highest percentage of usage of the instrument is in SR (60.4%). Similarly, the use of production contracts is more frequent among respondents from Slovakia than in other countries, although there are smaller differences between studied samples. The non-agricultural production is used by approximately half of respondents from Germany, representing almost 2-times more farmers than in Slovakia. Respondents from Slovakia are significantly lagging behind other countries when creating financial reserves (other than mandatory). The percentage (7.9%) is very low compared to Germany (61.2%) or Poland (51.5%).

4. Conclusion

The paper analyses the farmers´ perception of agricultural risks and the use of risk management tools to mitigate their impact on income of agricultural companies in primary sector. On the questionnaire survey participated 101 agricultural companies of different size, production orientation, legal forms, located in all 8 regions of Slovakia. The results of the survey show that to the factors with the highest impact on agricultural income belong the output price changes, input price changes, weather and natural changes, animal and plant diseases or marketing/sales difficulties. The average values of rating show that factor having moderate impact on agricultural income involve technological changes, political changes, indebtedness and human risks. None of selected risk sources has been considered as a factor with on low impact. It supports the general opinion that the agricultural risks have significant impact on production process and income, therefore should be prevented or mitigated by the use of risk management tools. From the comparison of results of Slovak respondents with the results of survey in Hungary, Poland, Netherlands, Spain and Germany from 2008 is obvious that the perceived intensity of impact of risk factors has increased. The results may reflect the development in agricultural sector in recent years characterised by increased price volatility and very often weather changes. Similar studies, focused on identification and importance of risk factors, have been provided by many authors in different countries before. Coble et al. (1999) surveyed U.S. crop farmers and indicated the price risk and yield risk with highest significance. Meuwissen et al. (2001) analysed the Dutch farmers and came to the similar result with the highest score on output price risk and disease of plant and animals on second position. Flaten et al. (2005) asked Norwegian organic and conventional farmers and found out that institutional and production risks were perceived the most. Patrick et al. (2007) surveyed U.S hog farmers who identified the price risk and environmental risk to have the highest impact on agricultural income. We can conclude that also nowadays the price and production risk are perceived the most by agricultural primary producers, however also other risk types such as environmental risk, political risk or marketing and sales problems are getting on importance.

The statistically significant differences in perception of weather and natural changes, and environmental risks have been proved from the point of production orientation. The companies oriented on crop production and combined production perceive the impact of weather fluctuations, as well as environmental risks on the agricultural income more intensively than companies with animal production. From the point of size of UAA, the statistically significant differences in intensity of impact of weather and natural changes, political changes and environmental risks have been proved. Farms with an area more than 501 ha consider the impact of risk of weather and natural changes, and environmental risks to have greater impact on the agricultural income. Political changes are perceived as a factor with higher intensity of impact on farms operating on less than 500 ha. In the last part of the survey we analysed the use of risk management tools and compared the results of Slovak respondents with other countries. The majority of Slovak respondents use the property insurance, marketing contracts and diversification of production as a risk management tools to mitigate or prevent the risks. However only low percentage of farmers hedges against the risk with the use of financial derivatives, or create financial reserves to cover unexpected losses. The great difference between respondents' answers is evident in the diversification of production. While 57.4% of respondents from Slovakia diversify their production, in other countries the percentage of the use of this risk management tool is relatively low.

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ADOPTION OF ORGANIC AGRICULTURE: AN EXPLORATION OF THE FACTORS INFLUENCING CONVERSION TO ORGANIC FARMING IN THE LIGHT OF THE CONVENTIONALIZATION DEBATE

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Annotation: A considerable body of literature about organic farming has emerged in the past two decades to better understand how farmers choose between two alternatives, 'adopt' or 'do not adopt. The literature has mainly focused on the classical comparison of conventional and organic farmers. Although new research suggests that the factors influencing decision making process of farmers under conversion should be taken into consideration, the corresponding literature in research is underrepresented. The dynamic development in organic agriculture since 1980s has brought an argument so-called conventionalization hypothesis into the literature for the accelerated organic movement. In the study, we aim to identify the factors influencing conversion decision among farmers in the context of the conventionalization literature, and to empirically investigate whether there are tendencies towards conventionalization. Quantitative analysis of primary data from 394 Turkish raisin producers by using multiple comparison tests showed significant differences between the farmer groups. The results of the multinomial logit model revealed implications with respect to basic determinants of the conventionalization such as farm size, specialization, and profit-oriented characteristics. Additionally, results indicated that 'in-conversion' farmers (the newcomers) likely behave in line with the theory by showing less concern about environmental issues.

Key words: Organic farming, conversion decision, conventionalization, Turkey, multinomial logistic regression.

JEL classification: O33, Q16

1. Introduction

Organic farming, as a promising alternative to conventional farming, is associated with vital socio-economic and ecological contributions to sustainable development of agriculture. On the one hand, the implementation of organic principles fulfills visions of sustainable agriculture thereby enhancing resource conservation and cost efficiency (Brožová, 2005). On the other hand, marketing of organic crops serves growth prospects by improving farmers' financial conditions (Crowder and Renagold, 2015), as well as consumers' health and quality of life (Mäder et al., 2002; Kilcher, 2007). The organic movement has started in the first half of the twentieth century as a movement to develop alternatives to the conventional farming systems (Klonsky and Tourte, 1998). Over the past two decades, practices in organic farming expanded rapidly, broadened its scope and switched from a marginal social movement to an advanced alternative to conventional production systems (Sutherland, 2013). As the result of this process, many former conventional farmers went through a conversion period of minimum two years and became organic farmers. This conversion process had number of agronomic, economic, and administrative consequences, since the farming system with its agronomic practices has changed, farmers had to seek for the market channels, and controls were implemented. Known from experience the types of farms converting to organic showed specific characteristics and influenced the group of established organic farmers (Padel, 2001). As a side effect of becoming a mainstream farming system, concerns about the structural development of the organic sector were announced: The main critique of the so called 'conventionalization hypothesis' is that organic farming is transforming into the direction of conventional farming systems and thereby losing its original values, characteristics, and its positive environmental impacts (Buck, Getz and Guthman, 1998). In the late 1990's, some researchers have argued that the penetration of agribusiness capital into organic agriculture, as well as the rapid growth of organic farming may lessen its sustainability, such as its ecological and social dimensions, due to the increasing incorporation of elements of conventional agriculture to the organic practices (Buck, Getz and Guthman, 1998; Tovey, 1997). The operations with respect to conventionalization bring the "substitutionizm" (Goodman, 2000), which leads to intensified production practices of commodities by substituting farm activities from system redesign into the low input use in the United States (US). Thus, bifurcation divides organic farms into two categories: the "deep organic" and the "organic lite" (Guthman, 2004). While organic farming is an established farming system with growing markets in the EU and the US, it also spreads in transformation and developing countries. And with a spread of organic farming, we might observe similar conventionalization processes as in industrialized countries examined, which we will investigate by the case of the organic sector in Turkey. Turkey is one of Europe's largest suppliers of organic products in the world with about 1 200 000 hectares of total organic land area. In 2014, the country has ranked as the fifth highest country in growth of organic agricultural land in Europe. There is a considerable size of land under conversion to organic cropping, particularly for olive, grape, and cotton production. More than 9 000 hectares of organic grape land, which represents 4.5 percent of the total world's grape growing area, granting 4 252 820 tons of grapes annually, is located in Turkey making the country rank sixth among the table grape production countries. Thereof, 3,877 hectares are converted, 5,303 hectares are still under conversion (FiBL-IFOAM, 2016). An increasing number of Turkish farmers are adopting organic systems, although they encounter lower yields and higher variable costs (Bayramoglu and Gundogmus, 2005; Yercan and Özden, 2015). This study investigates the factors influencing the rapid increase of organic farming among raisin producers to see whether there is an existence of conventionalization theory. Thus, our study contributes to this argument by addressing how Turkish organic farming, as a key-example of Europe's largest suppliers of organic products, interrelates to recent organic developments, and to what extent shifts in production practices in organic agriculture of transition countries support the conventionalization hypothesis.

2. Materials and Methods

2.1. Study area and data collection

Data examined in this paper were collected as a part of a larger questionnaire survey among Turkish raisin producers in the province of Manisa. The comprehensive surveys of 394 farmers in the seven districts were conducted via face-to face interviews from January to April 2016. The sample includes 144 conventional, 131 organic and 119 in-conversion farmers. Farmers' current stance on the organic farming practices comparing to conventional practices were asked to respondents. Attitudes and motives towards differing farming practices were assessed through a series of statements measured with five-point Likert scales, from strongly disagree (1) to strongly agree (5).

2.2. Statistical analyses

In the study farmers were classified into three groups based on their current farming system: conventional, organic, and in-conversion. Descriptive statistics were used to analyze key characteristics of the different groups. For the questions state farmers' attitudes and motivations for conversion a principal component analysis (PCA) was employed to pool and reduce the number of predictors to a smaller number of factors. Two components related to attitudes (environmental orientation and profit motivation) were used in the statistical tests. Differences between the groups were identified by applying multivariate analysis. The comparison between pair groups (conventional-organic, conventional-in-conversion, and organic-in-conversion) were analyzed by performing t-tests for the mean of continuous variables, and chi-square tests for categorical variables. Additionally, logit regression analyses were conducted to test the hypothesized determinants for their significance as predictors of the conversion decision. Logit regression is frequently applied to identify socio-economic phenomena, particularly for investigating the relationship between dependent categorical variables and explanatory variables (Greene, 2003). The variables selected to employ statistical tests have been derived from the previous empirical research literature on the conversion related to conventionalization. To this, we proposed three groups of variables: socio-demographic characteristics, environmental attributes, and attributes related to profit motivation of the farmer groups. Given the importance of the former country-specific research, we included age, farm size, educational status, and Environmental awareness of farmers (Turkyilmaz, Bardakcioglu and Nazligul, 2003; Sezgin et al., 2011; Bektas et al., 2015) into our framework. As the main arguments focused on farmers' preferences on environmental attitudes and profit orientations (Koesling, Flaten and Lien, 2008; Läpple and Rensburg, 2011), besides socio-demographic characteristics, selected economic and non-economic aspects were included as independent variables.

3. Results and Discussion

3.1. Descriptive Statistics and pairwise comparison tests

The sample statistics of the variables used in the multivariate analysis and logit estimation are reported in Table 1 for each of the three groups.

Table 1. Descriptive statistics of explanatory variables

Characteristics		**Conventional Farmers (C)**		**Organic farmers (O)**		**In-conversion farmers (IC)**		**Pairwise comparison** *(Between groups)*
		N=144		*N=131*		*N=119*		
Variables	Unit	Mean	Std.-dev.	Mean	Std.-dev.	Mean	Std.-dev.	
Farmland	daa	72.74	79.03	166.02	187.96	153.57	198.92	** (C-0, C-IC)
Grapeland	daa	41.00	33.69	57.31	44.26	63.52	46.22	****** (C-0, C-IC)
Age	Years	53.75	10.57	56.17	9.367	46.04	11.11	****** (C-IC, O-IC)
Farming experience	Years	32.73	12.47	35.93	10.66	25.64	11.64	***** (C-O, C-IC, O-IC)
Higher education	0/1	0.25	0.043	0.18	0.38	0.65	0.47	* (C-IC, O-IC)
HH size	no.	3.05	1.26	3.41	1.69	3.99	1.43	** (C-O, C-IC, O-IC)
Off-farm income	0/1	0.35	0.48	0.65	0.48	0.49	0.50	* (C-O, C-IC, O-IC)
Crop diversity	0/1	0.55	0.49	0.76	0.42	0.65	0.47	* (C-O)
Farm animal	0/1	0.26	0.44	0.44	0.49	0.43	0.49	* (C-O, C-IC)
Soil test	0/1	0.26	0.44	0.52	0.50	0.19	0.39	* (C-IC), O-IC)
Environm. orientation†		0.16	1.03	0.12	1.02	0.07	0.89	******(C-O, C-IC, O-IC)
Profit motivation†		0.15	0.70	-0.78	0.78	1.05	0.47	******(C-O, C-IC, O-IC)

Source: own calculation

Note: Mean and standard deviation are given in parentheses in the columns labeled. Difference indicates whether a significant difference exists in the means of variables of the three groups. Between-group differences calculated with multiple comparisons tests; t-test was used for continuous variables, and chi-square test was used for discrete variables.

// ***: p<0.1/0.05/0.001.*

† indicates variables extracted by several attitudinal statements and loaded as constructs by employing Principal Component Analysis (PCA).

The mean values for the whole sample indicate that, the farmers are on average about 52 years old and the average years of experience in farming practices is about 32. The pairwise comparison of the farmer groups based on selected variables reveals some notable differences among the three different groups. The mean scores in the groups are reported along with the results of the significance tests. Results relating to the age show that, the *newcomers* (farmers in-conversion process) are younger than conventional farmers, and have less farming experience than both organic and conventional groups. Our results concerning farmers' education status indicates the higher education of the in-conversion group in comparison to the other groups. Looking at the farm structure and production characteristics, the results from the pairwise comparisons indicate that farmers in the different groups have significant differences in terms of land size, household size, as well as diversity in the farm activities. The results related to the total land size, grape land size, household size, off-farm income, and the availability of livestock show that the organic and in-conversion groups of farmers compared to non-adopters have significant differences. The findings of the attitudes of farmers concerning environmental orientation and profit motivation also suggest differences between the groups.

3.2. Results of the multinomial logit model

We estimate the individual effects of the attributes on the decision to convert to organic farming on the two groups of regular organic farmers (O) and of farmers in conversion (IC) by a multinomial logit regression with the group of conventional farmers (C) as reference group. The logistic regression coefficient (β), the significance level (P), and the odds ratio (exp (β)) for categorical and numeric variables are presented in Table 2, for the group of organic as well as the in-conversion farmer groups whereby the conventional farmers were assigned as the base group. The value of exp (β) (the odds ratio) with the significant level of P value (<0.1) shows the change in the odds resulting from a change of one unit in the predictor (independent variable).

Table 2. Results of the Multinomial logit model (Base category is conventional farmers[a]).

Variables	**Organic farmers (O)**			**In-conversion farmers (IC)**		
	Coefficient	p-value	Odds ratio	Coefficient	p-value	Odds ratio
Farmland (daa)	0.09***	**0.001**	1.009	0.011***	**0.001**	1.011
Grapeland (daa)	- 0.008	0.229	0.992	-0.001	0.927	0.999
Age	**0.011**	0.696	1.011	-0.059	0.167	0.942
Farming experience	0.011	0.646	1.011	0.032	0.347	1.032
Higher education	0.355	0.403	1.426	**2.338*** **	**0.009**	0.97
HH size	**0.231***	**0.052**	1.260	0.239	0.193	1.270
Off-farm income	**1.167*** **	**0.002**	0.311	**-2.107*** **	**0.000**	0.122
Crop diversity	- 0.178	0.644	0.837	0.257	0.639	1.294
Farm animal	**- 0.816** **	**0.015**	0.442	-0.395	0.448	0.674
Soil test	-0.478	0.313	0.620	**1.873** **	**0.023**	6.510
Environmental Orientation	**0.706*** **	0.000	2.026	**0.476***	**0.079**	1.610
Profit motivation	**1.078*** **	**0.000**	0.340	**3.640*** **	**0.000**	38.090
LR Chi-Square		469. 710				
P > X222		0.000				
Pseudo-R^2		0.767				
Percentage predicted correct		78.9				
Collinearity statistics		VIF<3.5				

Source: own calculation

Note:

*Note: [a]: Number of observations in the analysis for the conventional group is 144, for the organic farmer 131, and in-conversion farmers 119. β values reported as coefficient estimates, exp(β) values reported as odds ratio, */ **/ ***: p<0.1/0.05/0.001*

The evidence in Table 2 suggests that there are significant socio-demographic and structural characteristics of the respective groups, in relation to the comparison group that make significant difference for the decision to convert from conventional to organic production. The logit model results confirm that, the farmland owned is of specific relevance in the organic and in-conversion farmers' decisions. The significance of the land area is supported by earlier empirical results that greater total land size cultivated is one of the important reasons for conversion decisions (Best, 2008; Koesling, Flaten and Lien, 2008). In contrast, Burton, Rigby and Young (1999), and Pechrová (2014) suggest smaller farms are more likely tend to practise organically. A study conducted by Fertô and Forgács (2009) also found that the size of the farm has a negative effect on the choice between conventional and organic. Grapeland size has no significant result from the multinomial regression tests. This result implies that grapeland size is a robust indicator of adoption over time. Besides conventionalization tendency, higher size of total agricultural land and significant relation with the conversion might be explained by farmers' risk-taking behaviour. The small land holdings in organic grape production might indicate the practice of organic agriculture as a small-scale family farming activity. The result show that farmers in-conversion have a higher education level than conventional and established organic farmers, which is in line with the literature. Fertô and Forgács (2009), Koesling, Flaten and Lien (2008), Mzoughi (2011) mentioned the importance of the higher education in the probability of conversion to organic farming. Our regression result concerning education is also in line with the study by Sezgin et al. (2011), which implies education as significant parameter affecting Turkish farmers' decision on agricultural innovation adoption. Similarly, Turkyilmaz, Bardakcioglu and Nazligul (2003) emphasize the significant importance of education level in adopting innovations. To illustrate the situation of farmer education, the country-wide statistics report that only about 14% of the farmers have higher education in Turkey (Isin et al., 2009). In contrast to these studies, Burton, Rigby and Young (1999) did not find a significant impact of education on the decision to convert to organic farming. In sum, the results suggest that education is an effective indicator of the conversion over time and higher education increases the probability of adopting organic farming practices.

The results show that available off-farm income reduces the willingness to convert to organic farming. The current empirical research on adoption and conventionalization does not provide any conclusion on the effects of income. The results suggest that farmers willing to convert intend to use organic farming as a full-time farming strategy. Farms with other income sources seem to rather stay in the conventional farming system and use income diversification for the maintenance of the family income. This finding reflects specific situation of the research area. The province of Manisa has been formed as an industrial, cultural, and commercial city. The large industrial enterprises located in the province provide farmers job opportunities, besides their farming activities. Therefore, opportunities for the farmers either go to fulltime-organic farming or maintain the conventional farm and look for other options than agricultural work is rather a question of preferences. The existence of livestock farm animals, either self-consumption or presence as a production system, results in less probability of conversion into organic agriculture. The logit results give significant evidence for organic producers, whereas the value is not significant for the in-conversion group. The results concerning diversity in crop production gives almost parallel results with respect to the animal farming, in line with the findings of Pietola and Lansink (2001) who suggest monoculturing in agricultural production to reduce the likelihood of farmers' producing organic. The farmers who produce other crops, for instance cereal crops in larger land holdings, might have opportunities to maximize profits by achieving economies of scale. A significant result obtained regarding soil tests shows that the respondents of in-conversion group conducting soil tests very likely opted organic practices (Odds ratio = 6.51). The converters benefit from the area payments to implement sustainable agricultural practices such as conducting regular soil tests and investments in modern irrigation systems. Therefore, they take advantage of being registered for organic conversion and conduct regular tests to benefit from the payments (MoFAL, 2013). Results show organic farmers are depicting environmental concerns, but in-conversion farmers are less influenced in their decision by environmental issues. This might partly indicate a trend towards less environmental concerns of the *entrants* in organic sector. However, the difference between in-conversion farmers and conventional farmers is still significant at the 10% level. Similarly, Best (2008) addresses an increasing share of German organic farmers with less environmental concerns over time. Similar results have been found by Läple and Rensburg (2011) for Ireland, and Mzoughi (2011) for the case of France. Significant results for the profit motivation show high relevance for the choice of adoption for the in-conversion group (Odds ratio=38.09), as well as for the organic farmers (Odds ratio= 0.34). In-conversion farmers' attitudes towards organic farming are significantly influenced by profit motivations. Profit maximization goals in the study by Flaten et al. (2006) have perceived higher importance among the late *entrants* while the early adopters ranked profit goals very low. Padel (2001) highlights the importance of profit for the conversion decision of the late adopters. Conversely, Läpple and van Rensburg (2011) found the motivation concerning profit is significantly negatively related to earlier conversion, whereas it increases the probability of conversion by the late adopters. Profit motivation of the early adopters are also emphasized in the study by Aoki (2014); she concludes that early adopters who are initiated through governmental provisions were more profit oriented than the followers.

4. Conclusion

Our study concludes for the case of organic production in Turkey that the conventionalization hypothesis can be supported. Giving attention to the overview of the farmer and farm characteristics, and environmental and economic attitudes, we imply that organic farms reproduce the salient characteristics of conventional agriculture particularly by increasing their land size, practicing less diverse farming activities, and showing profit-oriented approaches. Farmers defined as *newcomers* likely behave in line with the theory by showing less concern about environmental issues. As such, they express a higher level of the profit orientation, therefore, it is fairly concluded that farmers in the study represent tendencies to conventionalization.

Organic farming in Turkey has started with the European importers' demand. The first certified organic products complying with the private standards of European control bodies were supplied by aim meeting European export market requirements. Most of the early adopters of organic standards followed the requirements of the importers and were thereby consulted by buyer representatives. Thus, organic farming initiated as a top-down transfer of the production practice with passive participation of the contracted farmers. Today domestic consumption remains limited, and majority of the organic crops in the country is intended to produce for the European Union as the largest export market. In the meantime, besides the export market-led approach, government-facilitated policies have become important for farmers to convert their production system into organic agriculture. To this, while some producers clearly choose organic production for philosophical reasons, others adopt organic methods because public funds and subsidies encourage them to convert. Providing farmer support with conversion subsidies is one area of policy common to both European countries and Turkey which recently resulted to increase the number of the converters. In addition to that, majority of the farming system is still characterized by the family-based ownership and operations that is similar to many countries of Europe, but different than the US agricultural system.

The formulation of the conventionalization hypothesis was introduced first referring to the Californian producers' case in the US. During the time, the evidences appeared as the cases from European countries. Moreover, in early research, conventionalization is viewed as problematic, especially in Europe, where the converting farmers are supported by public funds. At this point, we highlight the importance of comparison of the organic farm structures of various countries to observe and draw conclusions on comparability regarding the diverse organic farming systems. Organic farming systems in Turkey show similarities, but also differences to European countries. There might be significant differences depending on the different country-profiles. Therefore, the investigation of the conventionalization hypothesis in the context of cross-country comparison, where the organic agricultural activities have accelerated trends would help to better understand the concept of this theory also for such countries.

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THE LABOR MARKET INFLUENCE ON AGRICULTURAL PRODUCTION: CARCHI PROVINCE CASE

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Annotation: This present research work was carried out in Ecuador - province of Carchi, aim "To determine the technical importance of labor market in the rural sector and the intensive use of labor in relation to priority crops that reactivates agricultural economy of the Province of Carchi". We further analyzed the economic importance of crops, the amount of manpower needed for priority crops, and the participation of manpower in agriculture sector and its influence on agricultural production from a technical and economic point of view.
A quantitative methodology, was applied through MICMAC software for crop prioritization, in order to determine the quantity of labor per crop as a costs -function evaluated with econometric models, which resulted into, four priority crops of economic importance: potato, beans, peas and maize; We further analyzed the average quantity of labor required to produce and cultivate a hectare of land (with a labor size of 45 laborers/ha in the case of beans and 150 laborers/ha in the case of potato).
On the other hand, we discovered that labor force participation in the agricultural sector is about 30% of the urban population, which is a technical indicator that labor is one of the contributing factor to production and economic development of the community.
In conclusion, we highlighted the dependence factor of labor on production, and the need to improve production systems through training in agricultural mechanization, so as to overcome difficulties pose to system due to geographical conditions.

Keywords: APUs, Labor force, Labor market, Production system, SPSS software

JEL classification: J23, J43, J46

1. Introduction

In less developed economies, agriculture is the main sector that generates employment of about 43% of the total population and represents 36% of gross domestic product (GDP), which is a precondition to pump-in more man-power in the agricultural sector of such economy. In addition, agriculture serves as a source of raw materials for several industrial sectors that benefit from agricultural growth with particular emphasis on countries that are in development stages which requires little technology and increase in physical capital. (Malikov et al., 2016)

Another important factor as cited by Braha (2017). In Albania, for example, agriculture employs more than half of the population and represents about a quarter of production in economic output. Despite this, the agricultural sector faces significant challenges, the prevailing limitations of agriculture include small and fragmented farms, rural migration, underdeveloped labor productivity, limited technological level, and low interest in investment in the agricultural sector.

Agriculture is crucial to the economy of Carchi, "The cost of labor is significant, but varies among provinces, since the wage differs; (Manzano, 2009), it is a strategic activity for wealth development that satisfies the need for food and raw materials for finished goods. Consequently, the growth of the industrial sector and the added value given to products for marketing would stimulate the growth of the country's agricultural sector.

According to Rendón (1976), "labor needs are directly determined by four factors: agricultural area, crop composition, physical yields and the degree of mechanization, (...) Labor needs vary considerably from month to month as a result of the seasonality of agricultural activity".

“Almost every long-term growth in crop and livestock production comes from investment that expands capacity and from technical changes that increases output-input ratios” (Timmer, 1998); for instance, textile, food processing and other agriculturally based industries require little technology and physical capital that are relatively labor intensive (Malikov et al., 2016); and “in virtually all underdeveloped economies, agriculture is an existing industry of major proportions” (Bravo, 2008).

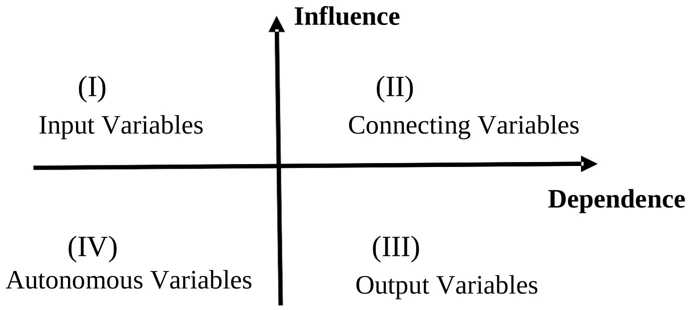
The main objective of this research is to analyze technical importance of the rural labor market and the intensive use of labor in relation to priority crops that affect agricultural economy of Carchi province.

2. Materials and Methods

In order to determine priority crops in Carchi province, we used “The structural analysis method through the collective efforts of group of experts, who first discussed before selecting and defining important variables that form part of the system, thereafter, evaluate the direct influence that each one of the variables exerts on the rest and finally, their interrelations are processed” (Quintero and López, 2010), identifying variables and the interrelationships between them with the help a software (MICMAC).

Structural analysis according to Arcade et al (2014). “Is a methodology supported by experts with proven experience in a particular area, who participated in the process that consists of three phases: Inventory of variables or factors, Description of the relationships between variables and finally, identification of the essential variables (…) These experts evaluated the direct influences between all variables according to the intensity of the existing affection with strong influence rated as (3) median (2) weak (1) or null (0).

Figure 1. Influence/Dependence Map



Source: Arcade, J. et al, 2002

In addition, a quantitative analysis was carried out to determine the quantity of labor per crop as a cost function, using secondary information from the National Institute of Agricultural Research (INIAP) and justified by the application of structured surveys based on simple random sampling, with the following equation:

$$\frac{Z_2 * S_2 N}{e_2 N + Z_2 * S_2} \quad \textbf{(1)}$$

The experiment's results validate the initial hypothesis. A sample of 2,395 rural workers were selected from the population of Carchi province. The information on labor by crop in terms of costs was obtained through descriptive statistical analysis, with coefficient of determination and correlation coefficient (Little, 1978).

In order to analyze the participation of the labor force in the rural sector, the number of workers per hectare produced on a daily basis was estimated, "from the total number of calendar days of the year, while holidays and weekends were deducted" (Synek, 2003).

The analysis and interpretation of the results was done by a software package SPSS 22.0 and the interrelated analysis between variables using an econometric model with multiple linear regression through MS EXCEL. Likewise, the multivariate descriptive method was used to provide simple summaries of information with two or more related variables to estimate future projections.

$$y = b_0 + b_1 * x_1 + b_2 * x_2 + b_3 * x_3 + \dots\dots . . b_k * x_k \qquad \textbf{(2)}$$

3. Results and Discussion

Agricultural sector is one of the major axes for economic development. When analyzing realities of certain developed countries it was observed that: “Agriculture plays a very important role in economic development of the Soviet Union. Agricultural land occupies 13% of the territory, 26% of the population lives in rural areas of Russia. Labor productivity in the agricultural sector of the developed countries tend to be lower than in other sectors of the economy” (Gollin et al., 2014, cited in Blinova, 2016) that generates a significant imbalance between the demand and the supply of labor in the rural economy. Agricultural is characterized by temporary and seasonal jobs to a greater extent than other sectors of the economy” (Bellit, 2014, Blinova, 2016).

Similarly, “The present-day rural labor market is plagued with shortage of man-power, poor employment opportunities and seasonality of core activities” (Blinova, 2016).

A critical look at few agro-based European economy, such as the following: “Albania is endowed with natural resources, such as fertile land, and suitable climatic conditions for agricultural production. Abundance of natural resources combined with low labor costs provides good grounds for intensification of agricultural activities”. (Braha, 2017, p. 8). In Czech Republic, we noticed a “sharp decrease of labor input in conventional farming than organic farming. A successful organic farming enhances number of work force while group with negative index is lesser” (Kostlivý, 2017).

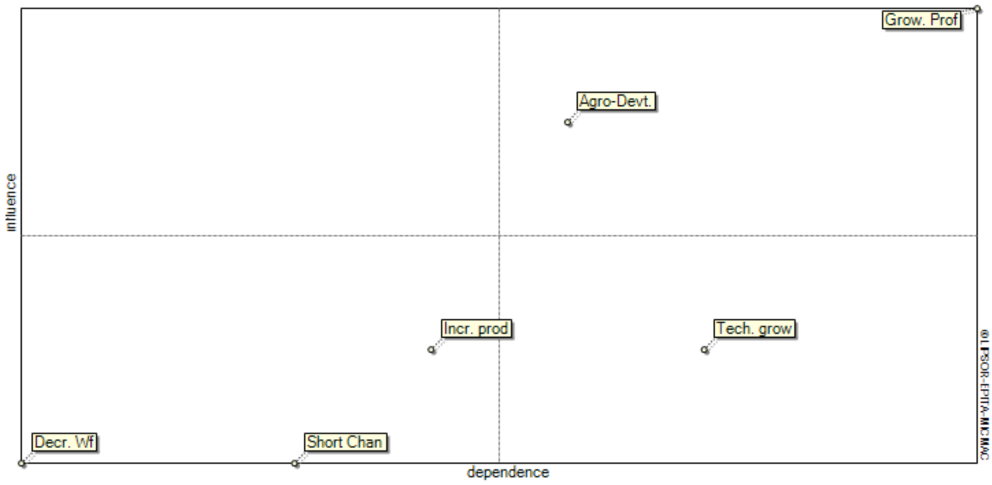
At the global level, agricultural sector is one of the most important sector of the economy. In Ecuador and particularly in the province of Carchi, agricultural production generates economic development, but it is necessary to improve and guarantee the strengthening of the productive-commercial processes to advance the well-being of the farmers, increase labor force, modernize the agricultural sector and promote the marketing of agricultural products.

To attain agricultural development, it is necessary to strategize productive chains that supports rural sector and improve their suppliers to the industry, since their main problem is commercialization, for this they need to improve their productive capacity and product quality. They should also strengthen producer associations to work together and achieve economies of scale, as well as bargaining power.

Subsequently to the research, for prioritized crops, the variables identified were analyzed with the help of MICMAC, (a cross - impact matrix) to determine the important crops based on the trends they present in relation to the labor requirement.

However, we discovered that influence and dependence variables appears on the Cartesian plane of the map, which resulted to 3 groups of variables: connecting variables (Increase in profitability and development of agro-industry), out-put variables which is an evidence of (growth in technology) and autonomous variables (increase in production, and a resulting reduction of labor, due to short fall in marketing channels); there is a strong direct influence between: agro-business development, manpower reduction, short marketing channels and Increased profitability. Invariably, the development of agro-Industrial can reduce the use of labor depending on the type of crop and topography of the land, which in turn would enhance market, this is an added value provided that the product and its consequence will increase profitability.

Figure 2. Influence and direct dependence between variables



Source: Own estimation, 2017

The influence and dependence map shows that we do not have out-put variables, rather, we have three autonomous variables, two connecting variables and one of result, which allows us to select the crops with economic importance in the province in order of magnitude as follows: 1) potato, 2) dry beans, 3) dried peas, and 4) soft corn.

The analysis of occupied Agricultural Production Units (APUs) shows in the table 1 that all the crops produced in land spaces less than 1 hectare, are the crops with greater percentage of priority in respect to the total APUs such as the soft maize, nevertheless, in absolute values the most representative crop is the potato.

Table 1. Prioritized crops according to agricultural production units

Crops	**Indicator**	**Total**	**Less than 1 hectare**	**1 hect. to less than minus 2 hect.**	**2 hect. to less than minus 3 hect.**	**3 hect. to less than minus 5 hect.**	**5 hect. to less than minus 10 hect.**	**Percentage in respect to total**
Potatoes	APUs	4,166	1,311	762	516	542	507	87%
	Hect. Cultivated	6,846	523	789	742	955	1,259	62%
Dry beans	APUs	2,313	371	289	265	298	401	70%
	Hect. Cultivated	3,168	102	177	239	346	594	46%
Green beans	APUs	267	80	34	28	33	37	79%
	Hect. Cultivated	1,868	118	157	168	237	366	56%
Soft corn	APUs	891	446	159	83	74	72	94%
	Hect. Cultivated	1,331	181	171	141	199	282	73%

Source: MAGAP - National Information System, 2017

From the descriptive analysis corresponding to 2,395 population sample, we discovered that: The quantity of labor is in a maximum of 150 labor force for the cultivation of potatoes and a minimum of 45 labor force for maize, pea and beans. The typical error is in the range of 0.08 to 0.95 and the standard deviation ranges from 2.02 to 23.31; because the production systems are focused on the ones that uses lower amount of labor process, considering the fact that the prioritized crops are planted in the province in topographic conditions different from each system.

We observed the range in the number of labor force from 78, 40, 5 and 35 for potato, soft maize, pea and beans respectively. However, the coefficient of variation is acceptable in each case.

Table 2. Descriptive statistical analysis

Indicator	Potatoes	Dry beans	Green beans	Soft corn
Average	113	67	48	63
Typical error	0.95	0.52	0.08	0.49
Median	120	68	47	65
Mode	120	60	50	45
Standard deviation	23.31	12.82	2.02	11.95
Sample variance	543.27	164.41	4.07	142.85
Ranking	78	40	5	35
Minimum	72	45	45	45
Maximum	150	85	50	80
Coefficient of variation	20.63	19.13	4.21	18.97

Source: Own survey, 2017

The labor force participation in rural agriculture was analyzed through the interpretation of data in SPSS, table 3 shows that 29.6% of the population are engaged in (agriculture and livestock farming) in the rural sector of the province of Carchi, others are dedicated to activities in the field, and it is related to results of the Census population and housing INEC (2010) that showed a 32.3% difference between men and women.

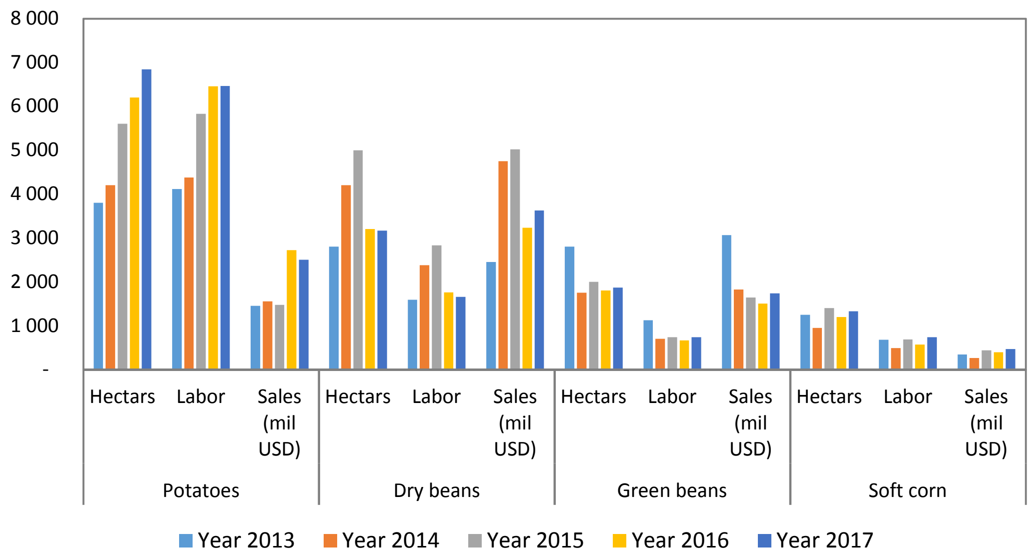
Table 3. Labor force participation in rural agriculture

Activity	Frequency	Percentage
Farmer	542	22.6
Rancher	167	7.0
Tailor	58	2.4
Builder	140	5.8
Carpenter	58	2.4
Merchant	381	15.9
Driver	177	7.4
Salesperson (Hawker)	66	2.8
None	806	33.6
Total	**2395**	**100.0**

Source: Own survey, 2017

Figure 3 shows that the labor force used in potato cultivated hectares grew in parallel progression, perhaps because of the crop location as it was planted on the topography of a soil that does not allow it to incorporate technology and therefore continues to use labor force. In other crops, it was observed that as the cultivated hectares increases, the labor force decreases, keeping sales stable or increasing, indicating that a level of efficiency has been achieved based on the modernization of their production processes.

Figure 3. Labor force per hectare cultivated per crop



Source: INEC – MAGAP, 2010

In order to estimate permanent wages, annual labor was divided into 251 days, calculated by deducting holidays in the last 5 years, which in Ecuador corresponds to 114 days. (Synek, 2003)

The number of fixed labor depends on the number of hectares cultivated and the price of the product on the market. If the sales increases, the volume of production will increase and therefore the need for labor force will increase, resulting in a greater number of fixed wages.

Table 4. Permanent job per hectare cultivated

Year	Labor force per crop				Permanent job	PEA agricultural Carchi	Hectares cropped	Sales dollars / year
	Potatoes	Dry beans	Green beans	Soft corn				
2013	4,117	1,587	1,120	677	7,500	8,113	10,650	7,313,236
2014	4,375	2,380	700	491	7,946	8,135	11,100	8,385,287
2015	5,833	2,833	733	688	10,088	8,155	14,000	8,569,722
2016	6,458	1,760	660	569	9,447	8,171	12,398	7,850,921
2017	6,462	1,659	740	739	9,600	8,186	13,213	8,336,818

Source: INEC - National institute of statistics and censuses Ecuador, 2010

Since the coefficient of determination is close to one, it is considered that the model is reliable for forecasting the independent variables evaluated (i.e. number of hectares and sales of the product), so with the equation generated, we can predict the number of labor required per crop. Both cultivated hectares and sales affect the number of fixed wages, because their P value is 0.05 in the multiple regression analysis.

Table 5. Multivariate descriptive method

Regression Statistics	
Multiple Correlation Coefficient	0.98657
Coefficient of determination R^2	0.97332
R^2 adjusted	0.96570
Typical error	351.17678
Observations	10

Variance Analysis						
	Degrees of freedom	**Sum of squares**	**Average of squares**	**F**	**Critical value of F**	
Regression	2	31493285.7	15746642.85	127.68	3.1021E-06	
Waste	7	863275.9	123325.13			
Total	9	32356561.6				
	Coefficients	**Typical error**	**Statistic t**	**Probability**	**Lower 95%**	**Higher 95%**
Interception	2499.189	982.390	2.5440	0.0384	176.203	4822.17
Variable X 1	0.0003	0.0001	2.4758	0.0425	0.000	0.0005
Variable X 2	0.8157	0.0511	15.9488	0.0000	0.694	0.9366

Source: Own estimation, 2017

A critical analysis from technical and economic point of view, shows the influence of the rural labor force on the agricultural production with reference to minimum wage paid in Ecuador, which is classified as follows: Unified Basic Salary, in 2017 corresponds to 375 dollars (Ministry of Labor, 2016), plus the thirteenth remuneration equivalent to the annual income divided by 12 months (375 dollars) plus the fourteenth remuneration equivalent to a Unified Basic Salary (375 dollars) and from the second year, the reserve funds corresponding to the annual income divided by 12 months (375 dollars), generated an annual total income per worker of 5,250 dollars in the first year.

Of this value, a worker is taxed 9.45% as Social Security and the employer assumes 11.15%, which totals 1,082 dollars per year, which according to the analysis of the fixed wages of agricultural activities are not reported to the System of Remuneration online because it is an informal job. Considering the estimate of 9,600 permanent jobs generated by agricultural activity in 2017, according to table 4, there is a negative effect for the worker and social security of approximately 10,382,151 dollars (1,082 dollars per 9,600 permanent jobs).

At the same time, the fixed wages generated by agricultural activity surpass the identified demand for the economically active population in the province, which corresponds to 8,186 people, which is met by migrant workers from Colombia.

Finally, the fixed wage refers to the projection for the year 2017.Agriculture produces capital of about 41,471,006 dollars a year (9,600 fixed jobs x 18 dollars per day x 20 days x 12 months) that boost the local economy, Since it allows family support and therefore the consumption and saving capacity, as well as investment capacity in fixed assets (housing or land).

4. Conclusion

The findings in this study indicates that there is a direct relationship between the use of rural labor in the agricultural sector of the Carchi and the number of Agricultural Production Units, in turn the crops prioritized in the province generate influence on the need of wages depending on the demand for products in the market, the selling price, the climatic situation and the use of technology according to the geographic condition of soils. On the other hand, agricultural activity is capable of generating an average of 9,600 fixed jobs being an informal activity, which exceeds the demand for work required by the Economically Active Population of Carchi which is estimated at 8,186 people, whose differences are satisfied with migrant workers from Colombia.

The informal nature of agricultural sector and labor system jeopardizes worker and Social Security because they do not receive up to 10 thousand dollars per year. For this reason, the stability and development in agriculture affects the economy in that hauls in a capital base approximately 41 million per year that day laborers use in family support and strengthens the economy of the province.

Finally, we consider that it is possible to improve the productive situation of the province by providing more sources of labor, i.e. formalize labor relationship with workers and even incorporate agricultural mechanization to make agricultural production costs efficient and effective, which should be evaluated in terms of cost benefit to the producer.

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EVALUATION OF CZECH FRUIT PRODUCERS' ENVIRONMENTAL DISCREPANCIES

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Annotation: The purpose of this paper is to identify and assess the benefits of application of the GLOBALG.A.P. standard in the environmental area and sustainable agriculture in the CR with emphasis on fruit producers. Its partial goal includes evaluation of discrepancies of environmental nature according to the GLOBALG.A.P. standard by inspecting domestic fruit producers' certification. The methodology is based on summarizing, synthesizing and analyzing the protocols containing the findings from the conducted certification audits of the GLOBALG.A.P. standard between 2007 and 2015 in 25 fruit-producing enterprises in total. The number is limited by the number of the certified subjects in the given period. Overall, 285 environmental discrepancies have been identified. The conducted analysis suggests that, during the period of the enterprise's continuous retention of certification, the number of discrepancies within the framework of environmental aspects of agricultural activity of the GLOBALG.A.P. standard has been continually decreasing (from 68% in 2008 to 15% of overall discrepancies in 2015). A significant number of these deficiencies that is the failure to fulfil the requirements of the GLOBALG.A.P. standard, can be characterized as conflicting with the legal code of the CR. The potential value of sanctions per producer based on the discrepancies discovered has been calculated. Their extent on average and in total for individual sub-areas reaches liquidating amounts for producers. However, it has been confirmed that continual application of the GLOBALG.A.P. standard reduces the occurrence of such sanctioned discrepancies and thus contributes to the creation of competitive advantage for certified fruit producers in Czech and consequently European agricultural conditions.

Key words: agriculture, environment, GLOBALG.A.P., certification, sanction

JEL classification: Q01, Q10, Q59

1. Introduction

Competitiveness of European agriculture does not lie in higher production yield only, but also in the aspects of management that are in line with the sustainable agriculture requirements.

The benefits of agriculture are occasionally difficult to separate from other economic activities due to their specific environmental impact, mainly in terms of soil and water quality and the state of biodiversity (OECD, 2008). "Air pollution" is the first problematic area. Approximately 40% of European methane emissions (CH_4) originate in agriculture as do 64 % of N_2O emissions, predominantly from animal production (Anon, 2004). Carbon dioxide and carbon monoxide (CO and CO_2) from the consumed fuels and energies could be added to the methane emissions (CZP UK, 2013). On the contrary, grassing arable land over, for example orchards, reduces emissions by binding carbon (Kubat & Klier, 2004).

"Water pollution" forms another group (Stigter et al., 2008). The integrated approach is required in this area (Stoate et al., 2009) as well as farmers' motivation to introduce environmentally-friendly methods in order to reduce the release of contaminants into water resources. Nevertheless, the decrease in the consumption of fertilizers in the central European countries at the end of the 20th century contributed to a considerable decline of nitrates and phosphates in surface water (Stalnacke et al., 2004). The third group contains "soil degradation", mainly erosion, its compaction and densification (Turtola et al., 2007). Approximately 70 % of domestic agricultural land is endangered by a medium to high risk of water erosion (Rompaey, 2007), as much as 40%

of farmland in Moravia and 10% in Bohemia might be endangered by wind erosion. 30-50% of agricultural land in the CR is affected by compaction caused predominantly by inappropriate use of agricultural machinery on wet soil (OECD, 2008).

The fourth group contains "biodiversity". According to Kivinen et al. (2007), crop diversity helps to create habitats for different animal and plant species. The so called semi-natural landscape elements such as boundary strips, hedges, meadows and shrubberies strongly influence biodiversity of agricultural landscape. A decrease of natural landscape features is also significant as these influence the microclimate, function as shelterbelts and provide refuge to wild animal species (Billeter et al., 2008; Rodriguez and Wiegand, 2008; Tscharntke, 2005). Assessment of energy efficiency of agriculture, including water and energy consumption, is included in an individual group.

In relation to the environment in the constituent countries, agriculture has been discussed for example by Turceková et al. (2015), Zinovchuk and Orel (2016), Adolwa et al. (2017), frequently in correlation with organic farming and sustainable development (Zagata, 2010; Hrabánková and Boháčková, 2009). Other authors have investigated the impact of cultivating individual commodities on the environment (for example Pulkrábek et al., 2011).

One of the instruments that can be used in this area in order to support positive activities connected with the environment is an internationally recognized standard GLOBALG.A.P. which has been applied in the CR since 2007, predominantly with fruit and vegetable producers. This private standard focuses on application of good agricultural practice, protection of the environment, ensuring food security, animal welfare (in animal production) and maintenance of health and safety at work. Its development in Czech conditions is also influenced by the project NAZV QG 60148 „Support for implementation of the EUREPG.A.P/GLOBALG.A.P. standard in agriculture in CR" undertaken at the FEM CULS between 2006 and 2009.

However, thus far there has been no study in CR based on real data to evaluate the practical impact of its application. The purpose of this paper is to identify and assess the benefits of application of the GLOBALG.A.P. standard in the environmental area and sustainable agriculture in CR with emphasis on fruit producers. Its partial goal includes evaluation of the discrepancies of environmental nature according to the GLOBALG.A.P. standard by inspecting domestic fruit producers' certification. The research questions are established as follows: (1) Can the fulfilment of the GLOBALG.A.P. standard environmental requirements be beneficial to agriculture-sustainable development and to an enterprise? (2) Which environmental areas of domestic fruit production demonstrate malpractices with regard to the GLOBALG.A.P. standard and with relevant valid legal regulations?

2. Materials and Methods

The methodology is based on summarizing, synthesizing and analyzing the protocols containing the findings from the certification audits of the GLOBALG.A.P. standard conducted in the Czech Republic between 2007 and 2015 in 25 fruit-producing enterprises in total. The number is limited by the number of certified subjects in the given period.

The progress in time has been investigated in the acquired data. Anonymous audit data have been provided by the National Technical Working Group of CR (hereafter referred to as NTWG). NTWG is a sole contact place not only for the GLOBALG.A.P. organization, but also for general public with regard to interpretation, application of the standard requirements, and other areas. In CR, the NTWG was established in 2006. Its members consist of representatives from Czech universities (CULS, UCT), certification organs, independent specialists and non-profit organizations (Czech Society for Quality, r.s.).

The evaluation of discrepancies has been conducted based on the analysis of the so called statement of findings (416 in total). Every identified discrepancy recorded upon inspection is characterized verbally by the inspector and is assigned to a particular standard point. For the research purposes, the data were classified according to the type of a discrepancy at first. Overall, 625 discrepancies have been identified, 285 of which were environmental. The data evaluation consists of two parts. The first contains the discrepancy development analysis and the second concerns the analysis of the essence of the discrepancies with the subsequent determination of problematic areas in accordance with the Czech legal code. Furthermore, qualitative analysis of discrepancies has been conducted as well as calculation of the potential extent of overall financial sanctions in cooperation with the inspection organs from the Ministry of the Environment. For this reason, the highest sanctions possible have always been reduced by the coefficient 0.25 in order to achieve real figures applied in real life.

3. Results and Discussion

The set of collected data, that is 625 discrepancies, has been classified into the discrepancies of environmental nature and the so called other discrepancies which represent a discrepancy in terms of ensuring food security, employee welfare or health and safety at work. Considering the fact that the enterprises receive their certification gradually, it is not possible to create a longer time sequence with a constant number of enterprises. Therefore, the development of the number of the identified discrepancies in certification inspections is expressed as the average number of the discrepancies identified per enterprise (see Table 1). The observation refers to the period from 2007, when the first certificates were awarded in CR according to the GLOBALG.A.P. standard, to 2015.

Table. 1. Development of the average number of identified discrepancies per enterprise

Year	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Average number of discrepancies in total	5.8	5.3	5.2	3.8	4.3	4.8	2.5	2.1	1.9
Average number of discrepancies environ. aspect	3.2	3.6	2.8	2.0	2.0	1.8	0.5	0.8	0.2
% env. asp. *	55 %	68 %	53 %	53 %	47 %	38 %	18 %	37 %	12 %

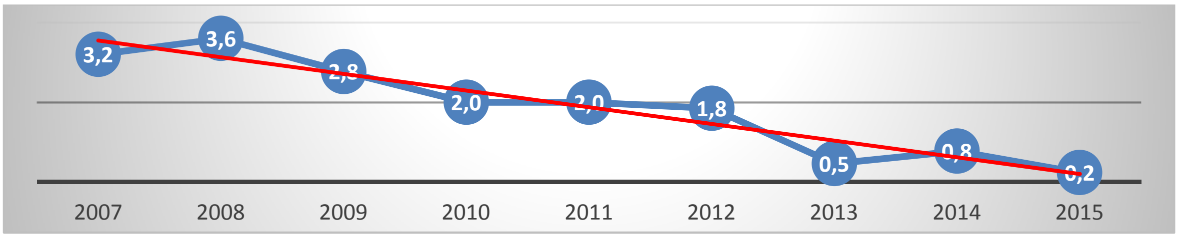
Sources: own research, 2016

*Note: * the percentage ratio of the average number of discrepancies of environmental nature to the average number of the total discrepancies*

Figure 1 illustrates the development of the average number of identified discrepancies referring to the environmental aspect of agricultural activity per enterprise during certification inspections in the given calendar year.

It is evident from the graph that the development of the average number of environmental discrepancies is decreasing with time which is also verified by the declining linear trend function. This indicates strong orientation of the GLOBALG.A.P. standard towards the concept of sustainable agriculture. In the last three monitored calendar years, the average value of these discrepancies per enterprise did not reach 1. Extremely low values were recorded in 2013 and 2015.

Figure 1. Development of the average number of identified discrepancies of environmental nature per enterprise



Sources: own research, 2016

This implies that an environmental discrepancy was identified in every second enterprise in 2013, whereas in 2015 this occurred in every fifth company only. These values contrast sharply with those recorded between 2007 and 2009, when the average value of the discrepancies referring to the environmental aspect of agricultural activity oscillated around 3, which means approximately three environmental discrepancies per certified enterprise. It is interesting to examine the development of the ratio of the average number of environmental discrepancies to the total identified discrepancies between 2007 and 2015. After five years of maintaining the standard, the decline in the ratio of environmental discrepancies to the total identified discrepancies was lower than 38 %, while in 2013 and 2015 the ratio attained mere 18 %, or 12 % respectively. It is thus evident that with time the amount of danger to the environment in the monitored certified enterprises has significantly decreased.

Subsequently, it was necessary to categorize 282 environmental discrepancies according to where or in connection with what the discrepancy was identified. Therefore, the following are the four thematic subgroups: storing and manipulation with chemicals, fertilizers and fuels; application of agrochemicals and fertilizers; waste management and recycling; impact of the agricultural activity alone on the environment. The classification of the discrepancies into these categories is illustrated in Table 2.

Table 2. The number of environmental discrepancies in individual categories

Labelling	**Category of discrepancies**	**Number**
STC	Storing and manipulation with agrochemicals, fertilizers and fuels	100
AGR	Application of agrochemicals and fertilizers	43
WAS	Waste management and recycling	30
ENV	Impact of agricultural activity alone on the environment	109
Total discrepancies		282

Sources: own research, 2016

With regard to “***Storing and manipulation with agrochemicals, fertilizers and fuels***”, 100 discrepancies in total have been identified which represent approximately 36 % of the total number of the identified discrepancies. These concerned the following areas: unsatisfactory state of storing premises and their labelling in accordance with legal requirements (33 discrepancies), incorrect and hazardous storage of chemical substances (51 discrepancies), inadequate qualification of persons for storing and manipulation (8 discrepancies), absence of storage evidence control (8 discrepancies). The maximum sanction rate in all cases is 1 million Czech crowns. Thus: (1 mil x 0.25) x 100 discrepancies = 25,000,000. Provided that these discrepancies were identified by the state inspection organs and -consequently penalized at the usual maximum one-quarter rate, the total value of legally declared penalties would amount to 25,000,000 CZK. Incorrect storage of hazardous chemical substances as well as unsatisfactory state of storage premises and their labelling contribute most significantly to the sanction. In total, they account for nearly 85 % of the above mentioned sum.

The average fine per enterprise within this category then amounts to 1,000,000 CZK (between 2007 and 2015), which is circa 110,000 CZK per enterprise per year.

The subgroup "***Application of agrochemical substances and fertilizers***" comprises 43 discrepancies which represent approximately 15 % of the total number of the identified discrepancies. Absence of control of the application records as well as missing documentation connected to spraying (21 discrepancies), lack of qualification of the personnel applying the substances (6 discrepancies), inadequate qualification and calibration of agricultural machinery and measuring devices for applying the substances (9 discrepancies), and the missing risk analysis in the application of various types of products (concerns solely the requirements of the standard – without any sanctions by the supervisory organs) were the problematic areas observed. The maximum sanction rate for the first two groups is 1 million CZK, for the third group 200 thousand CZK.

The sanction is calculated as follows: (1 mil * 0.25) * 27 discrepancies = 6,750,000 CZK plus (200 thousand * 0.25) * 9 discrepancies = 450,000 CZK.

The potential total sum representing an income for the government budget would in total amount to 7,200,000 CZK for the period between 2007 and 2015. The average sanction per enterprise constitutes 288,000 CZK, which is 32,000 CZK per company/year.

The subgroup "***Waste management and recycling***" contains 30 discrepancies. This concerns minor although regularly repeated occurrences of discrepancies. These included an unprocessed waste management plan of the enterprise or an action plan for a permanent and targeted reduction of waste, combining hazardous and community waste and insufficient sorting of waste (please see below, 5 discrepancies), uncontrolled hoarding and storing various types of waste and overall disorder on company premises (please see below, 6 discrepancies) as well as the non-existence or insufficient labelling, detachment and security of the location allocated for storing waste (please see below, 7 discrepancies). Some of the discrepancies concerned only a breach of the standard, however, in 18 cases this concerned a breach in a legal regulation.

The sanction is calculated as follows: (50 mil * 0.25) * 5 discrepancies = 62,500,000 CZK plus (1mil * 0.25) * 6 discrepancies = 1,500,000 CZK plus (1mil * 0.25) * 7 discrepancies = 1,750,000 CZK.

The potential total sum representing an income for the government budget would then in total amount to 65,750,000 CZK. The average sum per enterprise constitutes 2,630,000 CZK for the period between 2007 and 2015, which is circa 292,000 CZK per enterprise per year.

"***The impact of agricultural activity on the environment***" is the largest subgroup of environmental discrepancies. It comprises 109 discrepancies in total, which is 39% of the total 282. The discrepancies concerned the relationship of the enterprise to biodiversity on cultivating lands and in the surroundings, education with regard to protection of the environment, and monitoring of energy consumption, absence of environmental risk assessment, inadequate ensuring of soil and water protection, and protection of nature against contamination. This subgroup contains a number of discrepancies which are not in breach of the law order of CR; however, their disobedience (as prevention) might ultimately result in the future threat to the environment. In cooperation with a representative from the Czech Environmental Inspectorate, 44 discrepancies have been identified which would potentially result in sanctioning of the enterprise and 10 discrepancies which are considered a breach of law. The sanctions defined by the law no. 114/1992 Sb. on protection of nature and landscape reach the maximum level of 1 million CZK.

The potential total sum would amount to 5,250,000 CZK. Inadequate ensuring of soil and water protection and protection of nature from contamination constitutes approximately 50% of this sum. The average sum per enterprise represents 210,000 CZK, which means 23,300 CZK/enterprise and year.

Discussion of the results with other researchers' results is not possible, because the same research hasn´t been realized in other countries. Some authors solved energy aspect of standard GLOBALG.A.P. e.g. Bayramoglu and Gundogmus (2009) or Kizilaslan (2009), but it is only one side of this topic and it is not comparable.

4. Conclusion

The conducted analysis suggests that, during the period of the enterprise's continuous retention of certification, the number of discrepancies within the framework of environmental aspects of agricultural activity of the GLOBALG.A.P. standard has been continually decreasing. The decrease in their contribution to all the discovered discrepancies is also evident, which amounted to as much as 68% in 2008 and to mere 15% of overall discrepancies in 2015. A significant number of these deficiencies, that is the failure to fulfil the requirements of the GLOBALG.A.P. standard, can be characterized as conflicting with the legal code of the CR. Had these problems failed to be identified through the inspection of the GLOBALG.A.P. standard, but ascertained by one of the state inspection organs, they would have been sanctioned. Therefore, the potential value of sanctions per producer based on the discrepancies identified has been calculated. Their extent on average and in total for individual sub-areas reaches liquidating amounts for producers. Regarding the sanctions in the period between 2007 and 2015, the sample enterprises could have contributed to the government budget by the total of 103,200,000 CZK, which means 4,128,000 per enterprise. On average, the sanction amounts to 458,700 CZK per enterprise per year. However, it has been confirmed that continual application of the GLOBALG.A.P. standard reduces the occurrence of such sanctioned discrepancies and thus contributes to the creation of competitive advantage for certified fruit producers in Czech and consequently European agricultural conditions.

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CONTROLLING AS A MANAGERIAL TOOL IN AGRICULTURAL BUSINESSES

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Annotation: The success of agricultural businesses nowadays largely depends on the quality of their management. The future of a successful business is primarily based on the knowledge of the functioning of its own in-house management system. At this point, the controlling could be applied as a tool for managing business subjects. Controlling offers opportunities for continuous improvement, reveals the drawbacks in business and plays an important role in terms of feedback, which helps to look into the future. The aim of this paper is to evaluate the extent of controlling application as a managerial tool in agricultural businesses and to assess the knowledge of business managers in this field. The research is oriented on businesses operating in the agricultural sector in the Slovak Republic. The purpose of this paper is to gain reliable knowledge of controlling, enabling deepen knowledge in analysed area. With the aim of examination controlling as a management tool were selected commonly used scientific methods of empirical research. We applied a questionnaire survey. For estimating results of the questionnaire form statistical methods were applied.

Key words: agricultural businesses, controlling, questionnaire survey

JEL classification: Q13, M21

1. Introduction

Present time is characterized by great progress and advanced society (Dytrt et al., 2016). The necessity to develop managerial approaches which will be oriented on achieving a long-term success of the company is becoming in economic theory and practice more and more important (Synek, 2011). Despite efforts for continuous improvement, it appears that the traditional management of business performance based primarily on financial management hit its limits and lately in the world are beginning to promote new non-traditional indicators, methods and models, based primarily on non-financial, strategic and often and qualitative indicators, methods and models. The secure long-term prosperity and company performance should be at least equal importance with which they dealt with the operational and financial problems (Zámečník and Rajnoha, 2015). Controlling today is an important part of the business management system (Teplická, 2011). Its role is in the business important because it allows for coordination between functional areas and provides relevant and up-to-date information for management. Shifting controlling with management or control would be undoubtedly wrong. Control represents only one of the controlling tools (Porubský, 2011).

Controlling is a tool for managing the economic system, which allows to recognize not only the effects of economic and non-economic factors, but also to identify their future development, to analyse the deviations from the required trend and to prepare corrective steps (Sedliačiková, Vacek and Sopková, E, 2015). Operating controlling should inform the management about the changes in the businesses environment at the time and finds out impact these changes to basic economic indicators of company (Dolinayová and Ľoch, 2015). Controlling includes all instruments and methodological mechanisms that serve to fulfil its mission. Different forms of application can be mutually intersecting, supplementing, but can be also implemented independently of each other and in relation to different levels in the enterprise (Chrenková, 2010). Control processes, as part of controlling operations, can also be performed on the basis of real-time comparisons with the reality of the past period, but lacking the target parameter which represents aims and expectations of management or owners (Grznár and Foltínová, 2009). The advantage of controlling is that the entrepreneur does not rely on information from previous periods, which are mostly misleading and biased, but on the basis of planned data with a future orientation (Sedliačiková, 2010).

The history of management methods application in agriculture shows that the agricultural enterprises of the Slovak Republic and the Czech Republic applied costs control (Škorecová, 2015). Agricultural holdings in market economy are under extensive pressure of competition. As a result of this fact they are looking for new approaches to improve internal processes, steering them with the intention of continuously respond to emerging situations. Controlling represents significant tool for coordinating these processes in agricultural enterprises (Pataky, 2003).

2. Materials and Methods

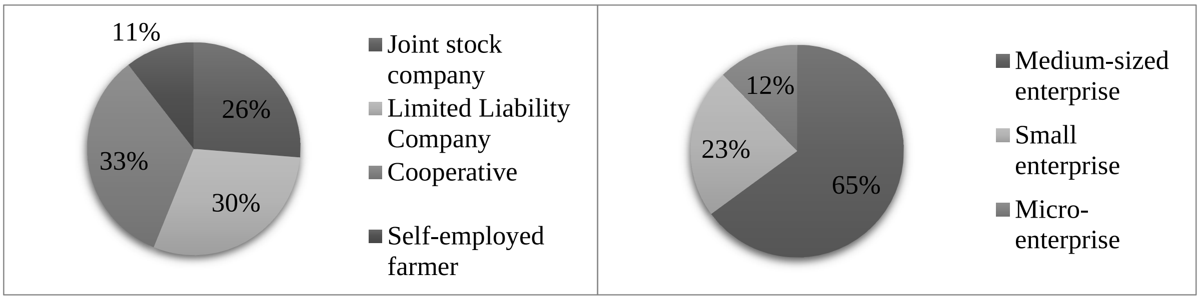
The aim of the paper is to evaluate to which extent is controlling used in agricultural businesses and what is the knowledge of companies' leaders (head of the economic divisions, accountants, directors, controllers) about this modern management tool. In order to achieve stated objective, research is addressed to refer to the real situations of farm practice and to provide relevant data for assessment of this area of research. For obtaining data the questionnaire survey was applied, which is relatively often used technique of empirical research. The object of the survey are business entities operating in the field of agriculture on the territory of the Slovak Republic. In order to achieve a higher questionnaires survey response rates, all agricultural enterprises were contacted by telephone requesting for completing questionnaire. Next step was sending questionnaire in electronic form. This approach was applied in order to inform representatives of individual farms about the purpose of filling out the questionnaires and to achieve proper approach in answering questions. Totally were contacted 135 farms by telephone. The return rate was 42%, which represents 57 completed questionnaires that obtained a number of relevant data.

For the processing of the results of the questionnaire survey statistical program SAS was used and within it, the Chi-square test and Fisher's test were used to identify the correlations between the achieved results. The hypothesis H0 says that there is not statistically significant dependence between the variables and hypothesis H1 confirm the significant dependence. We used the Fisher's test where it was not possible to apply the Chi-square test (the range of the sample was less than 50 or abundance in each class was less than 5). We used the Kruskal-Wallis test in order to determine whether the differences found in the sample are statistically significant or can only be the result of randomness. The H0 hypothesis declares sequence equality and H1 confirms the presence of at least one division different from the others.

3. Results and Discussion

Respondents who answered questions in the questionnaire were divided by legal form of business and by size criterion (number of employees). From the Figs. 1 and 2 is obvious distribution of respondents in terms of legal form and size according to the recommendations of the European Commission (less than 10 employees - micro-enterprise, less than 50 employees - small enterprise, less than 250 employees - medium-sized enterprise, more than 250 employees – large enterprise).

Figure 1. Division of enterprises in terms of legal form of business and size (number of employees)



Source: own processing

Forty (70%) respondents of total 57 representing agricultural holdings think that there is a difference between the concepts of control and controlling. The remaining 17 respondents (30%) do not distinguish between these two terms. Respondents who answered question positively should further describe how these two concepts differ. It can be stated that those who answered this request have correct notions about the differences of the given terms. Majority of respondents perceive controlling as a system or managerial tool and consider that control is just one of its tasks. Controlling is broad-spectral and affects all areas of business. While control is focused only on the past and achieved results or applied processes, controlling is oriented towards the future, planning and managing future processes. Contrary to control, controlling not only reveals deviations, but proposes steps to reduce their potential appearance in future. With these replies, respondents confirmed that one of the main controlling task is to analyse deviations, as stated by the theory. Respondents further stated that controlling is focused on coordinating business and is a systematic activity aimed on guiding the business activities in order to reach predetermined goals. Likewise, many authors have different opinions in their publications and papers, also professionals from practice did not concur at all points. Porubský (2011), who based on the study of various domestic and foreign authors concluded that the basic function of controlling is the coordination of partial management systems, and that in any case it is not possible to identify controlling with control, control is just one of its tools. From mentioned can be said that respondents who expressed their opinion on the difference between control and controlling had correct thought about its relationship.

Regarding this we have tried to find out whether the difference between control and controlling is perceived differently by leading economic segments, owners and directors and other representatives of agricultural enterprises (controller, accountant). The Chi-square test of independence did not confirm the dependence that means we accept the H0 hypothesis. Whether the representatives of agricultural enterprises distinguish between control and controlling is independent of their status and their position in the enterprise.

Table 1. Dependence between the position of respondents in the enterprise and the perception of difference between control and controlling measured by the Chi-square test

Statistic	**DF**	**Value**	**Prob**
Chi-Square	2	0.7660	**0.6818**

Source: own processing

We further investigated what respondents consider as the primary objective of controlling. The findings from the literature study dealing with this issue have led us to formulate three basic objectives, namely: adherence to external and internal standards, control of efficiency and its analysis as well as systemic management of entrepreneurial activity in the achieving of target indicators. Based on the options offered in the questionnaire, respondents should sort the controlling goals from the first to the last (third) place. To determine authentic results, data obtained from the questionnaire were exposed to a Kruskal-Wallis nonparametric test, which revealed that the null H_0 hypothesis of the distribution at the 0.05 significance level cannot be rejected, which means there is no difference in the order of goals, and respondents consider all goals equally important.

Table 2. The difference between order of goals measured by the Kruskal-Wallis test

Kruskal-Wallis Test	
Chi-Square	1.622
DF	2
Pr > Chi-Square	**0.4444**

Source: own processing

In consideration of determining whether agricultural enterprises apply controlling activities, even though they stated in the questionnaire that there was no controlling in their business, we give another question to the respondents. On a scale of 0-5 they should evaluate the importance of their activities. Since in our case we have applied the ordinal variable and after performing the normality test we found that this is not a normal division, the Kruskal-Wallis nonparametric test was applied again. We are interested in the differences in activities' importance carried out in their business. This test revealed that there are statistically significant differences, as shown in Table 3.

Table 3. The difference between importance of implemented activities measured by the Kruskal-Wallis test

Kruskal-Wallis Test	
Chi-Square	55.5435
DF	11
Pr > Chi-Square	**<.0001**

Source: own processing

Based on the respondents' replies representing agricultural holdings in Slovakia, it can be stated that activities oriented on comparing spent costs and achieved performances have the priority position. One of the main areas of controlling is also cost controlling, which enables farmers to quantify how much the costs should be reduced to reach the break-even point, as say Foltínová and Špička (2014). According to the survey Váryová et al. (2015) agricultural entities apply principles of cost controlling covering intra-organizational accounting, budgets and cost calculations, but with a lot of weaknesses. Recommendation for improvement and higher quality of information support of cost controlling in agricultural entities in Slovakia have been provided. Respondents additionally mentioned other activities as: realization of qualitative decisions on production and acquisition, budgeting and implementation of results-oriented controls, cooperation in the cost calculation, as well as communication on financial and non-financial business indicators. Bestvinova (2012) emphasizes that controlling in order to overcome various obstacles that are consequences of the economic crisis, change the extent and priority of their role, ergo activities. The author argues that strategic planning needs to be strengthened, as well is needed to apply reporting not only of financial indicators, but also of non-financial indicators to measure company performance. It is also necessary to improve the costing and budgeting methods. Our survey shows that these activities have been ranked by respondents at the top of the list.

On the question, whether controlling is implemented in those companies represented by respondents answered 70% negative and 30% positive. Those who answered positively should further indicate whether there is a comprehensive controlling system in their business. Twelve respondents stated that the controller's activities were performed as a cumulative function and 5 respondents stated that there was a separate controlling division in their enterprise (in all cases it was a joint stock company with a number of employees from 50 to 250). In two cases is controlling applied at the level of operational management (line character), in two cases at top management level (staff character) and in one case combined. Implementation of controlling in economic practice is generally low in Slovak SMEs, confirm Sedliačiková, Vacek and Sopková (2015). Medium enterprises from the point of view of size and production are frequently recognising the benefits and effects of this instrument.

In connection with this fact we consequently examined whether application of controlling depends on the size of the business. Our goal was to find out if there is a difference between enterprises performing and non-performing controlling due to their size. Therefore, we investigated the dependence between these two factors and we used the Fisher's test. Fisher's test revealed the dependence between enterprise's size and controlling, that means whether the enterprise's controlling is dependent on its size, so the H1 hypothesis at the 0.05 level of significance cannot be denied.

Table 4. Dependence between enterprise size and controlling existence in enterprise measured by Fisher's exact test

Fisher's Exact Test	
Table Probability (P)	0.0052
Pr <= P	**0.0475**

Source: own processing

Seventeen respondents from 57 surveyed, have implemented controlling and the remaining 40 do not. Respondents who answered negatively to the question whether in the company they are representing is controlling implemented, should further indicate the reasons for rejection of its implementation into the enterprise. In order to express their opinion, they had to choose from three options and one alternative answer. Previous answers indicate that controlling in Slovak agricultural enterprises is not a preferred managerial tool, our goal was to find out what the main reasons are and why business entities operating in agricultural sector are rejecting this tool. In the case of agricultural enterprises that do not have implemented controlling, answered 12 respondents (30%) that it is due to high costs, 15 respondents (37.5%) wrote reason as insufficient knowledge from this area and 13 respondents (32.5%) think that the enterprise which they represent do not need to introduce controlling at all. Only one respondent did not use alternative answer. A dismissive attitude to the introduction of controlling may be the result of ignorance but also fear of something new and unknown. The decision to implement controlling in an enterprise can be negatively affected by misconceptions about high costs. Practical experiences point out that controlling does not need high amount of costs, just those costs correctly spent at the right place and at the right time. Therefore, it is important to know how to persuade people and point out that the application of controlling will clarify and operationalize whole system of planning and evaluating the results of work.

When inquiring whether businesses are interested and whether they are involved in the field of controlling education, we met with 17 positive and 40 negative answers. Of those respondents who answered this question positive was 71% those who have controlling implemented in the company and are interested in this issue, and 29% of those who think that controlling introduction and implementation in the business would cause high costs. It is possible to assume that this are companies following new management trends, do recognize this modern tool and are aware of its benefits and therefore are interested in this area. In connection with this question, we further examined the dependence between whether the enterprise has implemented controlling and whether managers are educated in this area. The Chi-square test confirmed the dependence, and thus the H1 hypothesis at the significance level of 0.05 cannot be denied.

Table 5. The dependence between the controlling existence in enterprise and education in this area, measured by the Chi-square test

Statistic	**DF**	**Value**	**Prob**
Chi-Square	1	19.2332	**0.00001**

Source: own processing

4. Conclusion

Finally, it can be stated that agricultural companies recognize controlling and know how it differs from control, even though they do not have deeper knowledge in this area. The position of individual representatives does not affect how this term is explained in agricultural holdings, as indicated by the Chi-square test. Chrenková (2011) confirms that in many of the definitions of the various authors there can be observed the common elements, of which stated the fact that it is the new approach or a management system within the enterprise, which should to assist in decision-making of the enterprise management and the supervisory staff. Controlling is considered to be a key tool for the proper functioning of the organization, yet it has not found its greater application in agricultural companies. Only 30% of the companies from our sample have implemented controlling and in most cases the controller's activities are realized only as a cumulative function. The research results confirmed that controlling implementation is depending on the enterprise size and therefore it is not appropriate to focus on micro and small businesses, but especially on medium and large enterprises with a greater precondition for applying this tool. The reason for the rejecting attitude of agricultural enterprises is mainly their misconceptions that controlling is connected with high costs and inadequate knowledge in this area. For microenterprises and most small businesses was confirmed that they do not consider the introduction of controlling as important and beneficial. Education in this area is mainly concerned with business units using this modern tool, as evidenced by the applied Chi-square test, confirming the dependence between the existence of controlling in the enterprise and education in this area. Lastly, however, we can state that even if the representatives of the agricultural enterprises declared that they do not have implemented controlling, they perform activities that are included in it.

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ANALYSIS OF CHANGES IN OFFICIAL AGRICULTURAL LAND PRICES IN THE CR IN YEARS 2009-2017

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Annotation: The main objective of the paper is to evaluate quality changes of land resources on re-evaluated/updated areas of the CR in chosen time period. The main goal was divided into partial goals: a) To find out the change average official land price /OLP/ (economic indicator of agriculture soil quality) per cadastral areas and to verify statistical significance of impact of quantitative and qualitative agriculture land changes on land price rate. b) to identify the main reasons for the degradation of agricultural land. The research uses primary data from Czech Office for Surveying, Mapping and Cadastre (2008-2016), OLP per cadastral area in Decree of the Ministry of Finance on determining land prices (2009-2017) and secondary data from Ministry of Agriculture. The data were processed using comparison methods, regression and correlation analysis, and weighted means method, resulting in a proposal of quantitative degradation factor. There was OLP Index of updating cadastral areas in five regions in the interval (0. 99; 0. 54) between years 2009-2014. The main causes of the decline of cadastral OLP by more than 10 % (35.76 % of all negative changes in five analysed regions) were: Erosion processes with loss of fertility loess soils, economic activity on the slopes (42.9 % of cases), more detailed soil evaluation exploration (38.6 %), increasing the slope of agricultural land due to building modifications (8.6 %), inappropriate agro-technical practices and inadequate crops structure on the agricultural land in combination with land profile (7.1 %). It can be stated, that excessive decreases of quality agriculture land and loss of land quality due to anthropological processes in production important areas have a significant influence on the change of land quality. Based on the soil evaluation exploration results: There was a decrease of regional OLP (region OLP index <1) in four regions in 2009-2014. During the period 2016 to 2017 the OLP declined already in nine regions.

Key words: Agricultural land, re-evaluated, quality, official price, loss, erosion, regression.

JEL classification: Q15, Q24

1. Introduction

Land degradation is a complex phenomenon that manifests in many ways. Numerous efforts using a variety of approaches have attempted to characterize the facets of land degradation over the last few decades. Gibbs and Salmon (2015) recently reviewed approaches to the development of land degradation indicators (e.g. expert opinion, satellite derived NPP, biophysical models, and abandoned cropland). Land Degradation is one of the major forms of environmental degradation all over the world. It is a complex process involving multiple causal factors, among which climate variability, soil quality and land management play a significant role (Reynolds and Stafford, 2002). Sutton et al. (2016) solves the economic impact of agriculture on global GDP. The land degradation measure suggests that we have lost $6.3 trillion per year of ecosystem service value to impaired ecosystem function. Agriculture amounts to 2.8% of global GDP. With global GDP standing at $63 trillion in 2010, all of agriculture represents $1.7 trillion of the world's GDP. Our estimate of lost ecosystem services represent a significantly larger fraction (~10%) of global GDP. This is one reason the economics of land degradation is about a lot more than the market value of agricultural products alone.

Negative processes of land degradation and violations not only reduce the area, the quality and the cost of agricultural land, but also have a negative impact on the economic efficiency of agricultural production. International experience confirms the need for the regulatory framework for ensuring the maintenance and reproduction of soil fertility and land reclamation, to provide support for those agricultural producers who introduce technologies that contribute to the reproduction and maintenance of soil fertility (Bessonova and Mereshchenko, 2014).

An increasing share of people and economic activities are attracted by the cities. This fact shows positive aspects and at the same time causes challenges, mainly in reference to the soil whose ecosystem services can be disrupted when the land cover is modified. Therefore, urbanization is a critical issue for the land management (Iannucci, 2016). Soil erosion by water is one of the major threats to soils in the European Union, with a negative impact on ecosystem services, crop production, drinking water and carbon stocks. The main soil loss rate in the European Union erosion-prone lands (agricultural, forests and semi-natural areas) was found to be 2.46 t ha-1 yr-1, resulting in a total soil loss of 970 Mt annually (Panagos et al., 2015). According to Voltr (In: MoA, 2012) a production on agricultural land is negatively influenced by a relatively higher land grab on fertile lands than plots in marginal areas.

Europe (2012) in comparison with other world areas is characterized by unambiguously highest share of arable land (58.7% of Agricultural Land Fund, ALF) which is characteristic for more intensive production management in European states. An extent of permanent cultures (3.2 % of ALF) is comparable with other continents. Countries and permanent grass growths are logically in smaller extent (38.5 % of ALF) (FAO, 2012, online 2014).

Changes in expression of land quality are a consequence of bonitation map updating of agricultural land in the CR. The land quality is economically expressed by an official price of agricultural land (AL). The updated official prices reflects a change of agri-economic parameters of agricultural land. Annually price changes of about 1% acreage of agricultural land in the CR are usually published (CCC, 2014). The official land price meets its full application not only in property and fiscal relations but also in the land conservation and a qualitative new definition of economic relations among the landowners, users and the state in the CR and Slovakia. The need of updating is evoked by the necessity to re-evaluate some kinds of real properties including agricultural land so as it would be possible to express the value of assets during the administration of property law, for legal persons and also for natural persons (Bradáčová, 2007).

The main objective of the paper is to evaluate quality changes of land resources on re-evaluated areas of the CR in chosen time period The main objective was divided into partial goals: a) to find out the change average official land price (OLP) (economic indicator of agriculture soil quality) in catastral areas and to verify statistical significance of impact of quantitative and qualitative agriculture land changes on land price rate. b) to identify the main reasons for the degradation of agricultural land.

2. Materials and Methods

The research uses primary data from the Czech Office for Surveying, Mapping and Cadastre (COSMC, 2008 - 2016), OLP per cadastral area in Decree of the Ministry of Finance on determining land prices (2009 -2017) and secondary data from the Ministry of Agriculture (Voltr, 2012).

a) Will express cadastral OLP index (share of the price before and after updating quality AL). Units: the tenth digit.
b) A price change index (I_{OLP}) in selected cadastral areas of the CR will explain an extent of mainly qualitative changes of agricultural land in 2008 – 2013. It will be calculated in selected regions only per the cadastral areas where OLP was updated. It will be ensured on base of chain index (official prices before and after updating).

c) Within the framework of regression and correlation analysis relations among variables will be found out: /1/ An exogenous variable (*x*) will be set as an average official land price per cadastral area (cadastral OLP). An endogenous variable will be I_{OLP} in cadastral areas. /2/ Exogenous variable (*x*) will be set as a cadastral OLP. An endogenous variable will be a change of acreage of agricultural land in cadastral areas (before and after updating). A statistical significance of estimated structural parameters will be performed in the regression analysis by Student t-test, where null hypothesis is defined as H_0: $b_1 = 0$, therefore relationship does not exist. T-test proves the statistical significance of the regression coefficients of simply linear regression model at the significance level $\alpha = 0.05$. Used significance level derives 5% willingness to accept statistical discrepancy. Then p-value calculation follows, it means probability by which the null hypothesis is true. The p-value results of the test is compared to the chosen level of significance α. The null hypothesis is rejected when the p-value of the test drops below this level. If the significance $p < 0.05$ is achieved then the whole model is statistically significant.

d) Decrease of quality land (it increases the OPL) and decrease of less quality land (it decreases the cadastral OLP). An aim of calculation is to determine from how many per cents a change of land quality or a change of land acreage influences the resulting OLP of all updated territories of the region. Because of "different effect" of decreases of land on OLP it is not possible to use pyramidal price analysis. Therefore: The collection of cadastral territories per particular regions will be divided into two collections. A collection A will contain an extent of quantitatively above-average land in ha (areas with OLP per cadastral OLP > than calculated „average cadastral OLP" of updated cadastral territories of the region) and the collection B represents an amount of less valuable land in ha. "The calculated average price" corresponds with an arithmetical average of all updated cadastral OLP in the region area in the period before updating. A *quantitative degradation coefficient (k)* characterizes an influence of physical decrease of agricultural land (AL) on the resulting change of cadastral OLP after re-evaluation of area (updating).

$$\mathrm{k} = \frac{+(\,I_B * \mathrm{B}) + (-1) * (I_A * \mathrm{A})}{\text{area B} + \text{ area A}} \qquad \textbf{(1)}$$

where a change index per touched cadastral areas (I_A, I_B) will be found out as an average value of a change of acreages of cadastral areas before and after updating (%). The decrease of quality AL decreases the resulting OLP of touched cadastral territories of the region. Therefore in the collection A is (-1). If „k"<1, then there are decreases of qualitatively valuable lands within updating.

e) A data analysis (MoA CR, Czech Chamber of Commerce, 2008-2013). Reasons for changes of cadastral OLP in selected CR regions by more than 10 % and their count will be found out.

f) For each cadastral territory in the Czech Republic (on average 13,060), the official price and the area of agricultural land were assigned in every year 2009 to 2017. A calculation of regional OLP will be stated from the relation of weighted average:

$$Regional\ OLP = \frac{\sum_n^N (OLP_n * area_n)}{\sum_n^N area_n} \qquad \textbf{(2)}$$

where *n* = a number of cadastral territories in the region; *N* = Total number of cadastral territories in individual years 2009-2017, OLP = average official land price according to present price regulation; *Area* = the present acreage of cadastral territory. Source: Degree of the Ministry of finance of the CR; COSMC, (2009-2017).

The calculated annual regional OLP will be used for a year-to-year price comparison within an index analysis method (chain index). An output will be value rounded to 4 decimal position.

3. Results

3.1. Analysis of changes of official agricultural prices in 2009-2014

A more detailed analysis of qualitative changes of AL derived from changes of OLP was realized only in those regions which fight with decrease of quality of AL in a long term (Voltr, 2012; Pírková, 2013).

215 OLP changes in 5 CR regions have been analysed (result: cadastral OLP index). They were results of updating of qualitative soil properties in the monitored area (about) 1% of AL). The biggest change of OLP of the updating cadastral areas (measured by a chain index regarding to an extent of updated area) was found in Zlín region ($I_{OLP\ (2009\text{-}2014)}$ = 0.9047, Table 1) and vice versa the smallest in Central Bohemian. Decrease of OLP in South-Moravian region was lower by 1.5 percent point in Zlín region. The biggest decrease of AL happened in Zlín region (-1.85 p.p.), in Central Bohemian region (-1.67 p.p.), and in South-Moravian (-1.56 p.p.) at this time (Table no.1).

Table 1. OLP index (I_{OLP}) and agricultural area index per cadastral areas after updating of qualitative soil properties (2009 -2014)

CR regions	$I_{OLP\ (2009\text{-}2014)}$	Agricultural Area Index (2008-2013)	k
South-Moravian	0. 9217	0. 9844	-0.5645
Olomouc	0. 9555	0. 9882	0.2748
Zlín	0. 9047	0. 9815	-0.0071
Moravian-Silesian	0. 9331	0. 9916	0.4189
Central-Bohemian	0. 9724	0. 9833	0.2469

Source: COSM (2008-2013), Price decrees (2009-2014), See Materials and Methods: b), d).

A partial task is to find out whether it is possible to prove a statistically significant relation between the values of OLP index per cadastral areas and cadastral OLP in five selected regions (Table 2).

Table 2. Results of variable regression: The cadastral OLP index and the cadastral OLP

Results of regression with depended variable: Cadastral OLP index. R = 0.223011. R^2 = 0.04973430. adjusted R^2 = 0.04527296 . F (1.213) = 11.148. p < 0.00099. Standard error of estimate: 0.15139						
N=215	**b***	**Standard error**	**b**	**Standard error**	**T (213)**	**p-value**
Absol. term			0.103480	0.02347	44.0737	0.00000
Cadastral OLP	-0.22301	0.06679	-0.00935	0.00280	-3.3388	0.00099

Source: COSMC (2008-2013). Price decrees (2009-2014), Output from static software: Statistica, version 12

In the whole collection of data from five regions (215 cadastral areas) a statistically significant relation has been quantified and proved. The function has a form: OLP index = 0.10348 - 0.009359 OPL. The relation has been confirmed on a significance level $\alpha = 5\%$. A correlation among variable is weak ($R^2 = 0.045$). The cadastral OLP change is explained from 4.5% by a size of average official price (OLP). Coefficient of determination is low in the selected function (a straight line). Only slightly better results were found for second order polynomial functions: $y = 0.2393x^2 - 4.7722x + 115.55$, $R^2 = 0.0962$.

A direction of regression straight line (a regression coefficient) states that in every other average price (OLP) in a cadastral area higher by a unit, a decrease of its price index by 0.00935 percent points will happen.

Further it was investigated whether the above mentioned official price (OLP) influences also the extent of decrease of agricultural land. No statistically significant relation has been proved between both monitored variables nor is it objectively possible to express it in numbers in a regression equation. It is not possible to reject a null hypothesis (H_o = relation does not exists) because at a significance level $\alpha = 5\%$ the value „*p*“ is in independent variable (OLP) less than 0.05.

It is possible to find out in what way decreases of quality or less-quality agricultural land of cadastral areas influence the resulting change of OLP of updated cadastral areas in the region (*quantitative degradation coefficient "k"*, equation /1/, Results: Table no. 1). Decrease of land quality in all monitored updated territories of the CR is invoked by both the qualitative degradation itself and the amount decrease of quality AL. In all regions where values of degradation coefficient "k" are negative it is hold that degradation of land by physical decrease of above-average quality lands by exemption from the Agricultural land resources is proved (South-Moravian region, Zlín region). Vice versa in Olomouc region, Moravian-Silesian, and Central-Bohemian region decrease of above all less quality land happens.

The main causes of the decline of OLP by more than 10 % (35.76 % of all negative changes in five analysed regions) were: (1) Erosion processes with loss of fertility loess soils, economic activity on the slopes (42.9 % of cases), (2) more detailed soil bonitation exploration (38.6 %), (3) increasing the slope of agricultural land due to building modifications (8.6 %), (4) inappropriate agro-technical practices and inadequate crops structure on the agricultural land in combination with land profile (7.1 %) (own calculation according to the Chamber of Commerce CR in years 2009 - 2014).

3.2. Changes in official prices of AL in CR regions in 2009-2017

Results of updating processes in the CR have reflected in the final average official price of CR regions. The calculated values (chain price indexes) are introduced in the Table 3. The re-evaluation of AL is realized on c. 1 % of AL. The impact of these qualitative changes on the final regional OLP is not therefore so pronounced like an impact on the cadastral OPL itself. The Regional OLP index moved in an interval (0.9868; 1.0022) in 2009-2017. Before an administrative price increase in 2015 a regional OLP change was recorded in 4 CR regions. In 2016 and 2017 a year-to-year decrease of regional OLP already in 8 or 9 regions.

Table 3. Region OLP change in the CR in years 2009-2017

Change period in CR regions	**2010/ 2009**	**2011/ 2010**	**2012/ 2011**	**2013/ 2012**	**2014/ 2013**	**2015/ 2014**	**2016/ 2015**	**2017/ 2016**
South-Moravian region	1	<1	<1	<1	<1	>1	<1	<1
Olomouc region	<1	<1	<1	1	1	>1	<1	<1
Central-Bohemian region	1	1	1	<1	1	>1	<1	<1
Hradec Králové region	1	1	1	1	1	>1	1	<1
Zlín region	<1	<1	<1	<1	<1	>1	<1	<1
Usti region	1	1	1	1	1	>1	>1	>1
Pardubice region	1	1	1	>1	1	>1	<1	<1
Moravian-Silesian region	>1	<1	1	1	<1	>1	1	1
Liberec region	<1	>1	>1	1	1	>1	>1	<1
Region Vysočina	<1	1	1	1	<1	>1	<1	1
Pilsen region	1	1	1	1	1	>1	<1	<1
South-Bohemian region	1	1	1	1	1	>1	>1	>1
Karlovy Vary Region	1	1	1	1	1	>1	<1	<1
Czech Republic	1	<1	1	1	<1	>1	<1	1
The number of regions with negative regional OLP change	4	4	3	3	4		8	9

Source: Pírková. I. (2013), own calculations according to: Price decrees (2013-2017), COSMC (2012-2016)

Note: Regional OLP Index < 1 (price decrease), Regional OLP Index >1 (price growth), Equation /2/

4. Conclusions

Results show a problem of agriculture land cultivation in areas which serve as a base for food production in the CR. In the most fertile areas of the Czech Republic (South Moravian Region, Zlín Region), there is a reduction of the gross rental effect (primary quality indicator), the most of all regions in the Czech Republic (Voltr, 2012). The authors of the article analyzed the official prices of agricultural land (secondary quality indicator). It was found out that the higher the official price in the area, the higher its decrease ($R^2 = 0.0962$). In these areas, the reduction of above-average land quality ($k < 0$) is also the most. The main cause of soil degradation are climatic conditions in the countryside, poor soil management, and the inhibition of livestock production in the 1990s. An analysis of prices in the regions of the Czech Republic was found: During the period 2016 to 2017 the regional OLP declined already in nine regions in the Czech Republic (while in four regions in 2009-2014).

In the next phase of the research, it will be explore determinants (for example: crop structure on AL, melioration or lease relations with land) which have influence on changes in the official prices of the AL.

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DETERMINANTS OF SELF-SUFFICIENCY AND FOOD SECURITY IN POLAND

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Annotation: Food security is a key challenge to the agriculture of the European Union, including Poland. Each state is obliged to ensure food security to all its citizens. Poland's accession into the European Union gave rise to an increase in the food security of the country. Poland is a major manufacturer of agricultural commodities in the European Union. The country has great potential in terms of the area of agricultural land. However, there is a number of obstacles to the growth of production and yield. One of them involves an unfavourable agricultural structure and the dominance of small individual farms. Granted, there have been many favourable changes in Polish villages since the country's accession to the EU, but some options have not been employed yet.

The main purpose of this paper is to present food security in Poland. It was found that Poland has generated surplus as regards food production. However, it was highly diversified, depending on the types of products. As a result of increase in food production and household income, in Poland, the percentage of food expenses in general expenditure is on a decline. Food self-sufficiency has been analysed in terms of agricultural production, followed by the presentation of the balance of foreign trade in agri-food products. Attention has also been devoted to the factors behind food security, including, inter alia, the economic availability of foods in the context of people's income and the percentage of food expenses.

Key words: food security, agricultural production

JEL classification: Q10, Q11, Q17

1. Introduction

Food is a key product of humanity, with the majority of people all around the world being primarily focused on trying to obtain or produce it. Food security is among the most important social needs. The times when a man primarily obtained food from whatever the land yielded are long gone. At the outset of agriculture, in a primitive, natural economy focused on self-supply, the exclusive aim of production was to satisfy the basic needs of a peasant family. Every man produced for himself, and the responsibility for providing for one's family was assumed by its members. However, as the industry developed, the social distribution of work deepened. Peasants could not only satisfy the needs of their own consumption but also that of his farm by purchasing industrial goods. This was the reason for the development of relations based on goods and money and the growth of markets and commerce but also thereafter the social inequalities in people's access to food deepens (mainly due to very unequal incomes) and food waste in some parts of the world also (for example in Europe it is sorely common phenomenon (Gołębiewska, 2017)). According to Śmiechowska (2015) every year in the European Union about 50% of food is wasted. The contacts of agricultural farms and their environment developed as well (Gołębiewska, 2010) and the environment itself set up higher and higher expectations on specialised farms. In the 21th century, there are units in which food production is conducted at the "bidding" of a man who is responsible for its quantity (and quality). Food security is a key challenge for agriculture all around the world, including the European Union, and it is presently regarded as global public good, and the role of each state is to ensure food security to its citizens. Clapp (2017) argues that the interest of politicians in food self-sufficiency increased in a number of countries after an extreme instability of food prices in the years 2007-2008. The issues analysed in this study is important, especially due to economic and social reasons.

According to Leśkiewicz (2012), repeated international declarations concerning reduction in the rates and number of starving people manifests the gravity of the problem, but it above all points to the hardship associated with solutions. After all, hunger and malnourishment do not result from food deficiency in the sense that it does not exist; rather it is the result of improper distribution and prices. For the same job, people living in Europe or in the United States receive much more salaries than Africans who can not afford to provide their families with minimal food. It should also be emphasized that valuable food, which is needed for proper development, is more expensive and more difficult to access than junk food. According to Sitarz and Janczar – Smuga (2012) globalization of the economy is an important factor in increasing the number of food safety hazards caused, inter alia, by increasing the economic distance between poor and wealthy people. The main challenge for food security in the future, as in present times, does not consist in insufficient production; rather, as argued by Meyers (2016), it consists in increasing access to safe food to starving people and also there is a need for early identification of emerging food safety issues in order to prevent them from developing into health risks (Marvin et al., 2009) what will reduce morbidity.

The purpose of this study is to present and evaluate the concept of food security in Poland. Attention was devoted to food production in its very first link (agriculture). Conditions for food production were determined as regards the acreage of arable land. There were new possibilities in which food production (including yield) can be increased. Attention was drawn to factors that condition food security, including, *inter alia,* the economic availability of food.

The authors are aware that this is only a glimpse of several aspects that condition the tendency of food security, as it would also be essential to discuss, among others, demographic changes, what they mean both to consumption and food production, changes in the prices of foodstuffs in reference to the changes in household income, food waste, supply stability, etc. Each and every one of those issues may constitute a separate research subject that will be conditioned by many factors. However, due to the extensiveness of those subjects, this study focuses only on the selected aspects of food security.

2. Materials and Methods

Desk research was the main research tool. It focused on official statistics, reports, analyses, publications, statistical yearbooks, etc. The analysis of tendencies in basic trends related to the subject of research. Basic time series methods were employed, including average change. The study referred to the data statistics of the Central Statistical Office (GUS), studies and information from GUS, information from the EUROSTAT, and available literature.

Ensuring food security concerns both agricultural production, the activities of food industry, and other sectors (e.g. commerce). Diverse and sustainable agriculture is the foundation of food security. Therefore, this study mainly addresses the aspect of production (agriculture – sale) and supply (household income).

The following research objectives were adopted:

- the analysis of the area of arable land per one resident in the world in the years 1961-2013, with specification of the changes that occurred during that period,
- the specification of harvest level as a strategic product in ensuring food security,
- the determination of changes in the percentage of food expenses in general expenditure in Poland in the years 2004-2015.
- analysis of the connection between the area of sowing, yield and grain harvest in Poland.

3. Results and Discussion

3.1. Food security

Less than 200 thousand years ago there was archaic homo sapiens that dealt with hunting and foraging. Little by little, humans resigned from searching from ready-made products of nature and turned towards food production. This gave rise to a lifestyle change, from nomadic to sedentary. This change was also caused by climate changes, as a result of which large groups of people settled near fertile river basins (Strużek, 1966; Wojnarski, 2004; Szpak, 2007). Joint effort in large groups have also contributed to greater security against natural elements and better food security.

In the 21st century, food security in the international arena is associated with the human right to food and the possibility of providing it. Impossibility of providing food is not strange even in the most developed countries in the world. Therefore, there are efforts to counteract this food deficit both in the European Union and as part of the United Nations (Leśkiewicz, 2012). The problems related to food security have alread been discussed by a number of authors (e.g. Michna, 1988; Appendini, 1994; Herdt, 1998; Małysz, 2009; Kowalczyk, 2009; Conway, Wilson, 2012; Mikuła, 2012; Michalczyk, 2012; Ghose, 2014; Wilkin, 2015; Sadowski, Baer-Nawrocka, 2016; Schmidhuber, Tubiello, 2007; Brunstad et al., 2005).

In 1984, the World Bank posits that ”food security has to do with access by all people at all times to enough food for an active and healthy life”. This definition was extended by the FAO, which argues that “food security is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food” (www.hungergeneration.com).

Availability is another major aspect of food security. During the last decades, tendencies in food production per capita were generally positive in the majority of regions. However, the rate of increase in Africa was slightly lower during the last 20 years. In the majority of countries and regions, the high availability of food is associated with a relatively low frequency of malnourishment (FAO, 2016).

3.2. Arable land, harvest, and crop production

Both in the past and at present, arable land constitutes a natural foundation for the development of human civilisation (Smutka et al., 2014). It is also necessary from the viewpoint of ensuring food security.

According to the FAO, some 12% of the globe’s land surface in the world (1.6 billion ha), is used in food production. Despite the fact that a significant part of land surface is potentially beneficial for agriculture, many areas are covered by woods or they protected due to ecological premises or they are a part of urban areas (FAO, 2015). Therefore, the majority of countries cannot continue to be self-sufficient in terms of food, e.g. due to lack of natural resources.

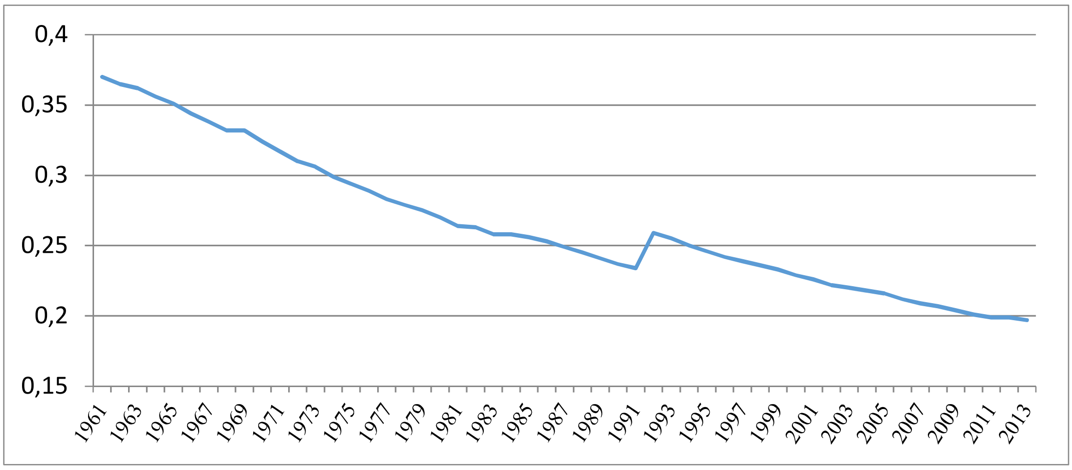
In total, 28 countries of the European Union occupy around 174000 thousand ha of arable land (which is slightly more than 40% of the total area of the European Union). Around 60% of them was used as arable land (http://ec.europa.eu/eurostat). The largest resources of arable land in 2015 are located in France. Poland is on the fifth place in Europe (Statistical…, 2015), which manifests a high production potential.

In certain countries, including Poland, there is a number of obstacles to the increase of production. Despite the obvious impact of natural factors, one of the main barriers in the development involves unfavourable agriculture structure and the dominance of small, privately owned farms. Despite the fact that there have been many beneficial changes in the countryside since Poland entered the EU, there are still unused possibilities, such as the area of households. In many EU countries, farmers have experienced low supply of land. According to Rovný et al. (2015), a significant number of Slovakian farmers declare their readiness to expand and increase the area of their farms. This also concerns farms in Poland.

As regards the use of arable land to provide food to the society, it is important to know what is the area of such land per capita. According to the data of the World Bank (2013), the area of arable land per capita in the world decreased significantly from 0.37 ha in 1966 to 1.19 ha in 2013 (Figure 1).

In the EU countries, on average 1 per capita is 0.22 ha of arable land (FAO, 2015). According to Bruinsm (2009), and further sluggish fall in crop area is anticipated. Unless this changes as a result of potential increase in biofuel demand. In Poland, Matyka and Kopiński (2014) also confirms a similar tendency of, estimating that the area of agricultural land will continue to decrease. However, the level of yield will increase.

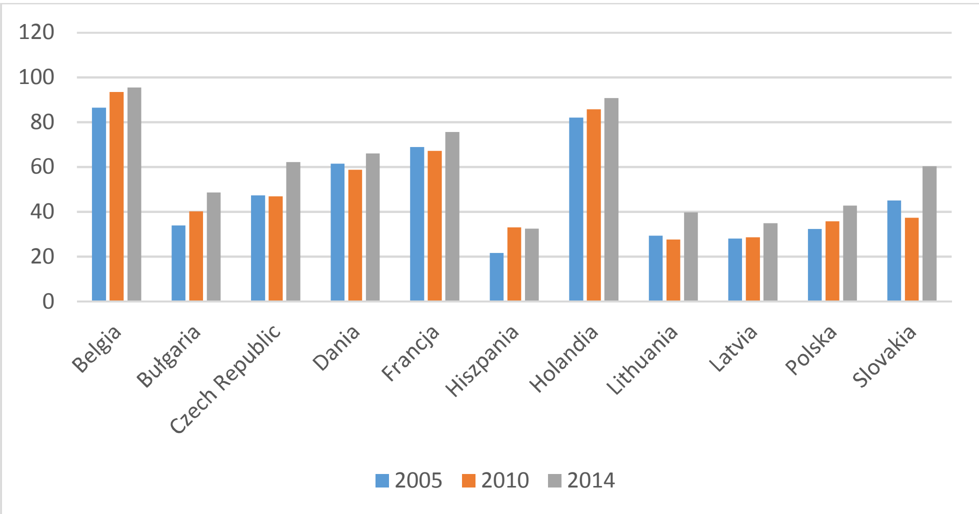
Figure 1. Changes in the area of arable land per 1 inhabitant of the world (ha)



Source: World Bank, 2017

Poland is one of the countries where there is potential for increased productivity in agricultural production. This shows a comparison of cereal yield in selected EU countries (Figure 2). Data show that many countries have significant opportunities for productivity growth, such as Belgium or the Netherlands.

Figure 2. Changes in cereal yield in selected EU countries

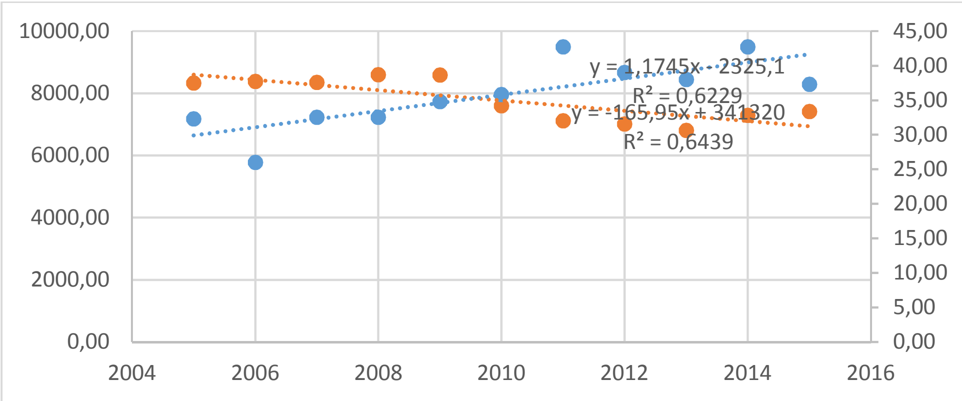


Source: Statistical Yearbooks of Agriculture 2005,2007, 2010, 2016, GUS, Warsaw, 2017

The analysis was also carried out on the level of yield, sown area and size of grain harvest in Poland (Figure 3). It was found that the decrease in sown area by 1 million ha was associated with an increase in yield of 5.6 dt. It was also investigated whether the reduction in the area of cereal crops was related to harvested crops. The results indicate that the collections did not decrease in the case of sowing area reduction, and vice versa. This indicates the possibility of compensating the reduction of the area of sowing with the increase in yield.

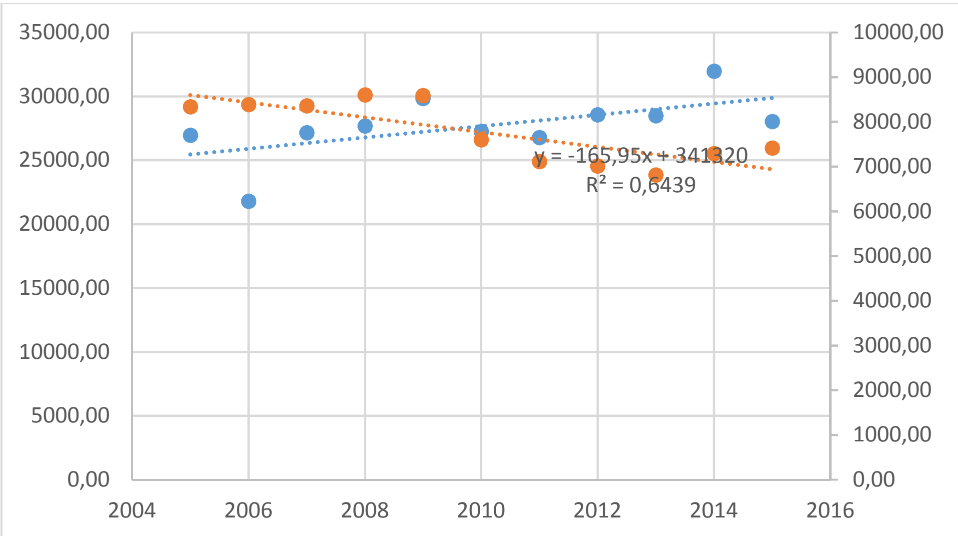
Most of the food consumed in the world is grown locally. Where local production is insufficient to meet demand, trade has contributed to filling the gap. The scale of trade in agri-food products is considerable today. As Smutka and others (2015) point out, the Czech agricultural sector is currently able to cover the domestic demand for temperate zone products in about 70%.

Figure 3. Changes in area and yield in Poland in 2004-2015



Source: own calculations based on GUS data, 2017

Figure 4. Changes in the area of sowing and grain harvest in Poland in 2004-2015



Source: own calculations based on GUS data, 2017

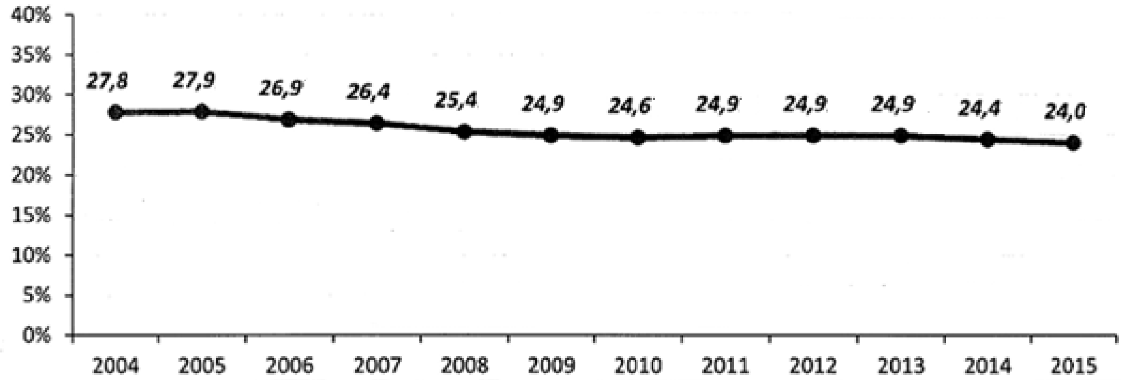
In Poland, after the integration with the European Union, a significant increase in trade is observed. The value of exports of agri-food products in 2016 amounted to EUR 24.18 billion and was more than 5 times higher than in 2004, while the value of imports in 2016 amounted to EUR 17 billion and was more than 4 times higher than in 2004. Most of the trade in these products (81% of exports and 70% of imports) concerned EU countries (Łopaciuk, 2017).

3.3. Expenses on food

Proper food supply does not guarantee food security for households. Access to food depends inter alia on income, food prices and the ability of households and individuals to gain access to social assistance. The income situation of households is a factor that clearly differentiates the level and structure of expenditure (Figure 5). This implies a greater burden on the budgets of the poorest families on food.

In Poland, since the entry into the EU, the share of food expenditure in total expenditures has decreased (by almost 4 percentage points in the period 2004-2015). This may indicate an increase in the wealth of Polish society, as Grzelak (2016) points out that there are significant differences between food security and income inequalities. These relationships were evident in the less developed countries and were related to the demand side for food. For similar conclusions reached in his research Rose (1999) who stated that hunger indexes fall sharply with increasing income.

Figure 5. Changes in share of food expenditure in total expenditure in Poland



Source: Situation of households in 2015 in the light of results of the survey of household budgets, GUS, Warsaw, 2015

4. Conclusion

A self-sufficient country should not rely only on its own production. In most countries, there is no possibility of self-sufficiency due to lack of natural resources. The main resource in food production is the land. Its limited resources can be a barrier to production. Poland in terms of land resources has a favorable situation. Among EU countries we rank 5th in terms of land resources. On the other hand, the main barrier to production growth, apart from the obvious environmental impact, is the unfavorable agrarian structure and domination of small farms. It is also related to the productivity achieved in both plant and animal production. For example, cereal yields in Poland are 2.5 times lower than in Belgium or Holland.

An important aspect of food security is the level of income. It will indicate the possibility of spending money on food purchases. The results of changes in the share of food expenditure in total expenditures in Poland show that the situation in this area slightly improves, as in the analyzed years 2004-2012 this share decreased.

In many EU countries, including Poland, there are opportunities for growing cereals, which may lead to an increase in production despite the decline in crop yields.

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THE AGRICULTURAL SECTOR IN POLAND – ANALYSIS SELECTED MACROECONOMIC DATA

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Annotation: The aim of this article is to present of macroeconomic analysis of agriculture in Poland. The main part of the paper examines the structure of supplies provided to the sector and the structure of demand for agricultural products in the light of input-output tables for the years 2000, 2005 and 2010.

The input-output tables were taken from the World Input-Output Database and Central Statistical Office of Poland. Analysis of input-output helped capture the direction of these flows between agriculture and other sectors of the economy. Internal circulation in agriculture is still dominant in the Polish agricultural sector. This sector is at a stage of transformations towards modernity. In the material supply of agribusiness, the role of the service sector must first increase. Transitions are slowly moving in the desired direction. The internal structure of flows changes. The input-output model is an important instrument for assessing economic phenomena. It shows the interdependence in the sector that determines its development. Poland still has unused production capacity in agriculture. High potential of the agricultural sector is associated with a relatively low macroeconomic efficiency. Improving efficiency is most likely due to improved productivity of labour. There is a lack of parallel technology improvement. The modern agricultural sector is characterized by low direct consumption and low self-sufficiency. It is characterized by strong relationships with other sectors of the economy.

Key words: input-output tables, agricultural sector, macroeconomics

JEL classification: E16, Q10

1. Introduction

Many issues of the economic policy require the analysis with separation of branches of economy and disaggregation of macroeconomic structures. The share and the meaning of particular sectors of the economy in food production is presented in 'A Concept of Agribusiness' by H. Davies and R.A. Goldberg from 1957 (Davis and Goldberg, 1957). In this book R. A. Goldberg presented an interbranch input-output table based on Leontief's theory of interbranch flows (Leontief, 1936). His model gives the possibility to analyse complex systems and is based on an observation that the economy is made up of many production branches, activities of which are mutually associated. These linkages result from the fact that the production of branches is used as expenditure in others). The input-output model (flows between sectors) consists of four parts (Czyżewski and Grzelak, 2012).

The precursor of input-output methods was F. de Quesnay, who published 'Tableau Economique' in 1758. Then, it had been improving until W. Leontief proposed a complete model for the economics (the Leontief model) used up to this day. Later, Dorfman, Samuelson and Solow expanded the Leontief model with optimisation methods. In 1988 International Input-Output Association was established. Originally, the method was applied in a centrally planned economy. However, presently, it experiences a renaissance also in capitalist countries. Furthermore, it is expanded to take into account international analyses or environmental issues. A systematic growth in the quality and the frequency of uniform input-output data presented in the form of World Input-Output Database (WIOD) and satellite accounts recorded in ca. 40 countries significantly improves the potential for the further development of methods based on inter-branch flows and increases the possibility of new applications (e.g. economical and ecological modelling, global value chain analyses or research concerning the ability of economies to implement innovations and the innovation diffusion processes). Future development of input-output methods will probably relate to the construction of more complex global systems of Multiregional Input-Output type (Lenzen, Pade and Munksgaard, 2004; Peters and Hertwich, 2009; Dietzenbacher, Los, Lenzen, et al., 2013).

An input-output analysis based on assumptions of general balance theory makes it possible to analyse generated macroeconomic effects, budget redistribution processes, relations between particular sectors and their environment and the impact global processes have on the economy through export and import (Czyżewski and Grzelak, 2012). It allows us to define the scope of self-supply or interrelations between the sectors when taking a subject-oriented and a dynamic approach. When assessing the distribution of products of given sectors (especially consumption or accumulation), it is possible to analyse their position in the economy. Based on the input-output table we can also examine the structure of direct and indirect current outlays, capital expenditures, and specify the effectiveness of different types of outlays. Product intensity (material intensity) coefficients are used for this purpose. These coefficients are used to determine the effectiveness of particular sectors, their role in shaping development processes in the economy (Czyżewski, 2011).

There is also a possibility of using the input-output model to make assessments for particular regions. Polish literature provides examples of using input-output flows for regional research (Malaga, 1992; Tomaszewicz and Trębska, 2005; Zawalińska, 2009) and to analyse the agricultural sector (Woś, 1973; Lonc, 1985; (Czyżewski and Helak 1991; Kujaczyński, 2008; Czyżewski and Grzelak, 2009; Mrówczyńska-Kamińska and Czyżewski, 2011).

As the economy is picking up steam, agriculture cannot develop without flows of resources that are provided from outside and, on the other hand, the national economy, as the whole, needs modern and efficient agriculture. The nature and the strength of relations between agriculture and its environment have a substantial effect on its transformations. The most important problem is thus optimising the proportions between agriculture and all the departments providing production measures and production services it needs (Baer-Nawrocka and Mrówczyńska-Kamińska, 2015). The ways of the development of global agriculture suggests that, along with the socio-economic development of a particular country, the share of agriculture in the agricultural production will decrease at the expense of increasing the sphere of industry and services (Tomczak 2004, 2005).

The purpose of the present paper is to analyse the position of the agricultural sector in Poland on the basis of inter-branch input-output tables of the Central Statistical Office for 2000, 2005 and 2010. The tables for 2015 have not been published at the time of completing this publication.

2. Materials and Methods

A set of five indicators (Woś, 1979) can be used to assess the level of development and modernity of the sector and illustrate its importance in the economy. These are figures illustrating the production potential (employment, gross fixed assets and investment outlays) and output (gross output) and gross output (gross value added). In this paper we focus most on gross output and gross value added. Further analyzes are devoted to these two dimensions.

$$X_A = x_r + x_p + \sum_{i=1}^{n} x_i b_{ir} + \sum_{i=1}^{n} x_i b_{ip}$$

where:

- X_A - global output of food economy,
- x_r - global production of agriculture,
- x_p - global food industry production,
- x_i - the output of *i*-branch related to agriculture and the food industry, indirectly involved in food production (i + 1, ..., n, n ≠ r, p)
- b_{ir} - factor determining the flow of products and services of the *i*-th branch (s) to agriculture, expressed in percentage. Demand for intermediate i-th department,
- b_{ip} - factor determining the flow of products and services of the *i*-th department to the food industry.

The research was based on the input-output method and inter-branch input-output tables. The period of 2000-2010 was analysed. Data came from the Central Statistical Office and were additionally supplemented with information from Eurostat.

Flows to agriculture were determined on the basis of interbranch flow balances. The analysis related to material flows between different spheres forming agribusiness. In a classic perspective it consists of three areas (spheres): I – agricultural supply (producer goods and services), II – agriculture and III – food industry (Davis, Goldberg, 1967; Bear-Nawrocka, Mrówczyńka-Kamińska, 2015). The analysis covered material inflows to agriculture from the first sphere of agribusiness, that include products of fuel and energy, metallurgical, electrical and mechanical engineering, transport equipment, chemical, building materials, services, construction, forestry and other industries. Then an analysis was conducted with regard to inflows to agriculture from the second sphere, namely a so-called internal trade, and inflows from the third sphere, that is the supply of agriculture in products of the agricultural-food industry.

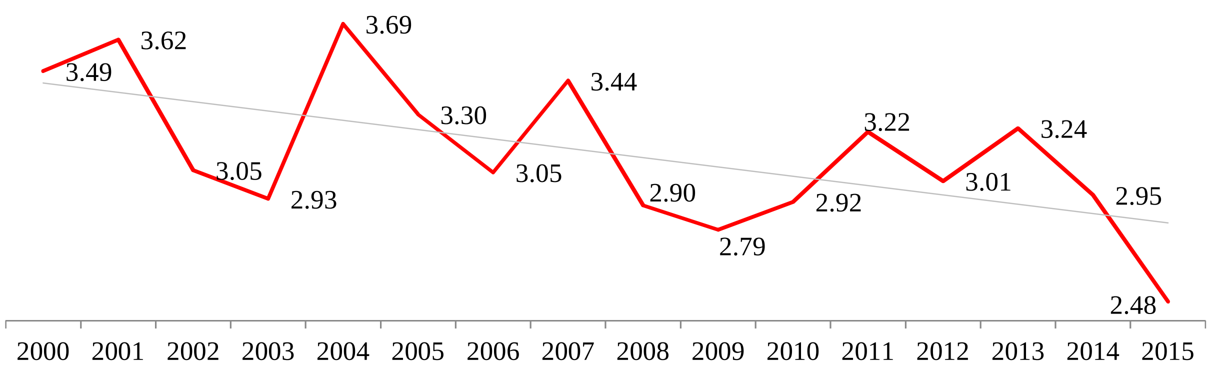
3. Results and discussion

This part presents the role of agriculture in the Polish economy. More detailed information about the situation of Polish agriculture is included in the annex (Tables A1-A2). Figure 1 depicts a percentage share of this sector in generating gross value added (GVA). This share clearly decreases with the passage of time1. It is worth adding that the share of GDP decreases as well – from 3.5% in 2000 to 2.5% in 2015. The number of persons living solely off agriculture also decreases. It was estimated that they constituted 10.6% of the population in 20162.

[1] On the other hand, this trend looks differently in the case of food industry. Its share is stable.

[2] The dependence between the share of agriculture in the national income and the level of gross added value per capita can be depicted by the logarithmic function whose values decrease asymptotically to zero (Mrówczyńska-Kamińska, 2013).

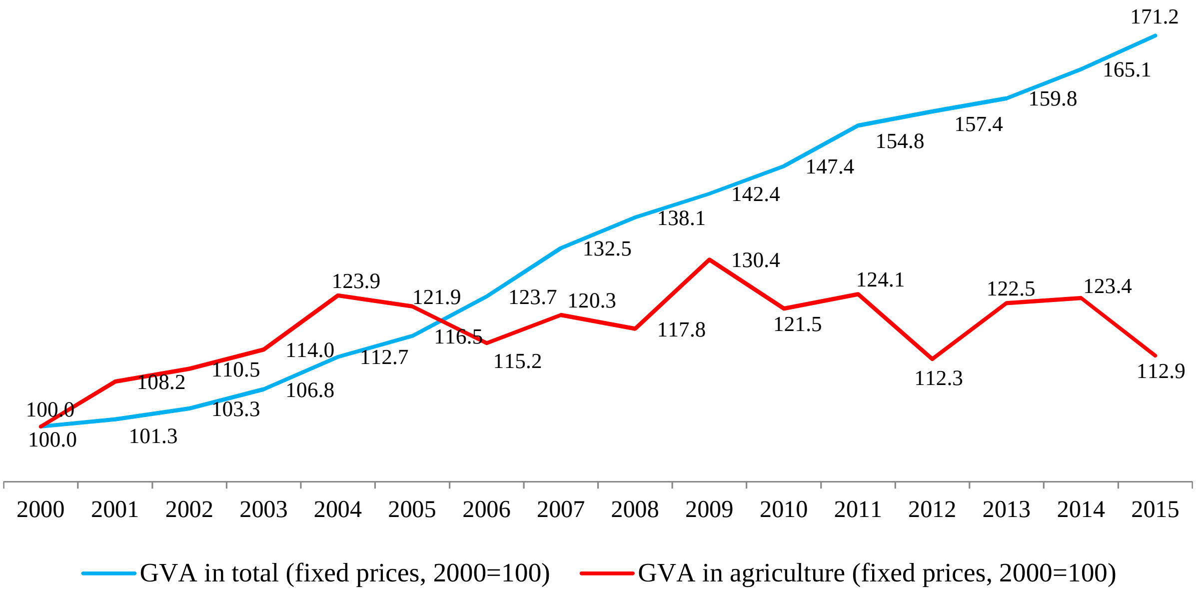
Figure 1. The percentage share of agriculture in creating gross value added (GVA)



Source: prepared on the basis of data of the Central Statistical Office.

The analysed decreasing trend was supplemented by Figure 2 presenting dependencies between these values in fixed prices.

Figure 2. The share of agriculture in creating gross value added (GVA) in fixed prices



Source: prepared on the basis of data of the Central Statistical Office.

Table 1 complements both of the above figures. This table summarizes the GVA (basic price in million euro) values for selected years 2000, 2005, 2010 and 2015. These values have steadily increased in the analyzed years.

Table 1. Gross Value Added (GVA) in Polish agriculture (basic price in million euro)

Items	**2000**	**2005**	**2010**	**2015**
Gross Value Added (basic price in million euro)	4,665	6,092	8,236	7,857

Source: EUROSTAT.

Subsequently, the costs incurred in the production process and the value of agricultural production over time were analyzed (Tables 2-3 and Figure 3). It seems from the data of the Central Statistical Office that employment costs in 2000 generated the volume amounting to 20% of the value of global production (expressed in base prices). Material costs constituted 63% of the value of global production (expressed in base prices). Self-supply (products of agricultural origin) constituted 42% of material costs. Industrial processing products constituted 30%, and commercial services and repairs - 18% of material costs. In 2005 employment costs accounted for 10% of this volume. Material costs amounted to 52% of the value of global production. On the other hand, it is worth emphasizing that the largest group of material costs in 2010 were agricultural products and food products used throughout the production process (self-supply, respectively ca. 35% and ca. 20%). They we followed by chemical products (10%), retail trade (6%) and transport (6%). Electric energy accounted for 3% of material costs. These costs constituted more than a half of the value of global production expressed in base prices (57%). Depreciation of fixed assets accounted for 10%, and employment costs - 5% of the value of global production.

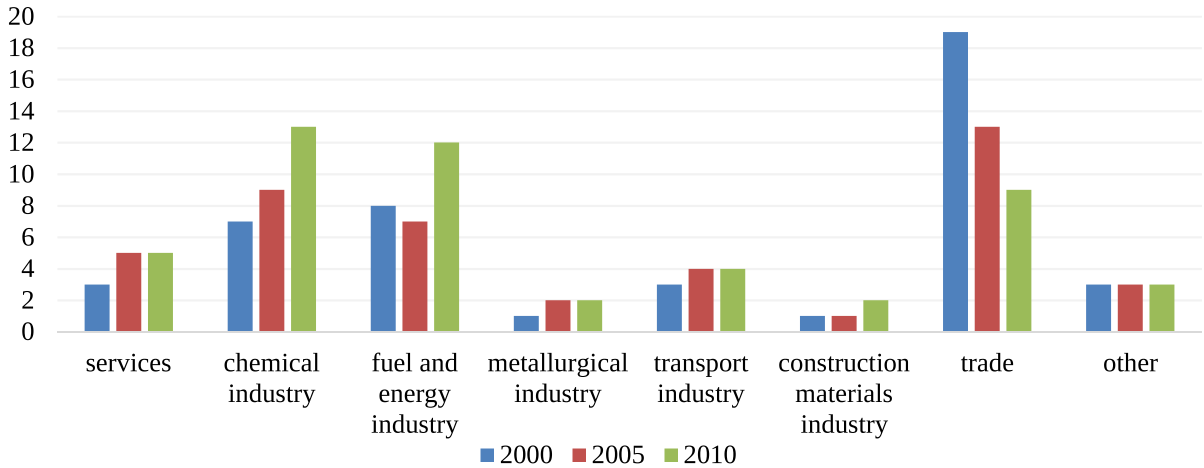
Table 2. The balance of global production in agriculture (current prices, thou. zlotys)

Items	**2000**	**2005**	**2010**
Material costs	39,954,843	42,093,987	54,438,813
Depreciation of fixed assets	6,341,961	8,657,101	9,930,516
Costs related to employment	4,483,194	5,681,572	5,309,130
…	…	…	...
Gross Value Added	22,140,608	36,331,230	42,678,332
Global production in base prices	63,419,610	80,655,357	99,860,390

Source: based on data from input-output tables of the Central Statistical Office.

It is worth noting that at the beginning of 2000-2005, GVA had the fastest growth rate (1.6), followed by the rising value of production (1.3). In 2005-2010 the value of aterial costs (1.3) was the fastest growing.

Figure 3. The structure of flows matrial from the first area (sphere) to agriculture in Poland (%)



Source: based on data of input-output tables from the Central Statistical Office.

Table 3 shows a decrease in the self-sufficiency of the analyzed sector, as the importance of the second sphere (agriculture) declined. This is a positive phenomenon for the economy. Favorable are the upward trends in the share of the first and third spheres (the biggest improvement). This demonstrates the gradual development and improvement of modern Polish agriculture. However, against the background of the EU-15, this development is still insufficient (Table 4).

Table 3. Structure of material supply of agriculture in Poland (%)

Items	**2000**	**2005**	**2010**
from first area (sphere) to agriculture	45.6%	44.6%	43.1%
from second area (sphere) to agriculture	42.4%	38.6%	33.4%
from third area (sphere) to agriculture	12.0%	16.8%	23.5%

Source: own calculation.

Table 4. The structure of the input-output in agriculture in Poland and in the EU-15 in 2000 and 2010 (%)

Items	Years	From agricultural supply (producer goods) – first area	From agriculture – second area	From food industry – third area
Poland	2000	47.6	39.7	12.6
	2010	43.1	33.4	23.6
EU-15	2000	53.5	25.6	20.8
	2010	56.3	23.1	20.5

Source: own calculation.

As the economy grows, agriculture can not develop without the streams of resources that flow to it from the outside. On the other hand, the national economy, as a whole, needs modern and efficient agriculture. The nature and strength of the links between agriculture and the environment affect its transformation. The high level of self-sufficiency (self-seeking) of Polish agriculture shows that it is not modern. This is confirmed by numerous studies and publications by Polish scientists (Mrówczyńska-Kamińska, 2010, Czyżewskia and Grzelak, 2007, 2012). It should be noted that the agriculture in Poland is still strongly regionally differen-tiated (Mrówczyńska-Kamińska, 2010).

Table 5 presents ways of managing agricultural production. The indirect demand (indirect consumption) was a dominant part. However, this share decreased with time at the expense of the growing share of the final demand. A positive phenomenon is a surge in the value of export. It is also worth taking into consideration that the level of self-supply of agriculture remained at a stable level, which is not a positive phenomenon across the economy as a whole.

Table 5. Creation and distribution of agricultural supply in Poland (basic current prices, millions of zlotys)

Items		2000	2005	2010
Creation	agricultural production	57,723 (91.0%)	80,655 (91.8%)	99,860 (88.7%)
	import	5,730 (9.0%)	7,207 (8.2%)	12,664 (11.3%)
Supply		63,453 (100.0%)	87,863 (100.0%)	112,525 100%)
Disposals - intermediate demand	food and tobacco industry	25,248 (39.8%)	32,425 (36.9%)	39,058 (34.7%)
	agriculture	15,638 (24.6%)	16,257 (18.5%)	18,973 (16.9%)
	other branches	3,018 (4.8%)	2,487 (2.8%)	3,824 (3.4%)
	TOTAL INTERMEDIATE DEMAND	43,904 (69.2%)	51,169 (58.2%)	61,855 (55.0%)
Disposals - final demand	consumption	18,854 (29.7%)	33,461 (38.1%)	42,451 (37.7%)
	export	1,839 (2.9%)	4,467 (5.1%)	7,478 (6.6%)
	increase in tangible assets	-1,173 (-1.8%)	-1,454 (-1.7)	658 (0.6%)
	gross fixed capital formation	28 (0.0%)	219 (0.2%)	83 (0.1%)
	TOTAL FINAL DEMAND	19,549 (30.8%)	36,693 (41.8%)	50,670 (45.0%)

Source: based on data from input-output tables of the Central Statistical Office.

3. Conclusion

The analysis of data for the purposes of application interbranch (flows between sectors) input-output tables allowed to capture the direction of flows between agriculture and other sectors. One can clearly observe that the internal structure of flows changes. Internal trade (self-supply) still has a large share. However, the agricultural sector is at the phase of transformation. A further growth in importance of services in the sphere of agribusiness is desirable, so is further improvement in efficiency of work in agriculture. Poland has unused production capacities in agriculture. A high potential of the agricultural sector is related to a relatively low macro-economic efficiency. The effectiveness may improve most rapidly by improving work efficiency. At the same time, no parallel improvement with regard to new technologies is clearly visible. Modern agriculture is characterised by strong relations with other sectors of economy and low sustainability. Therefore, a growth in the importance of services and a decrease in self-supply are desired.

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ANNEX

Table A1. Key information about agricultural sector in Poland

Years	Utilised agricultural area (thou. ha)	Labour input (thou. AWU)	Intermediate consumption (basic price in million euro)	Fixed capital consumption (basic price in million euro)	Agricultural output (basic price in million euro)
2000	**17,812**	**2,495**	**7,809**	**1,223**	**12,244**
2005	**15,906**	**2,292**	**8,960**	**1,353**	**14,928**
2010	**15,534**	**1,915**	**11,515**	**1,482**	**19,618**
2011	15,134	1,915	14,122	1,473	22,900
2012	15,050	1,915	14,304	1,502	22,681
2013	14,609	1,937	14,446	1,544	24,077
2014	14,558	1,937	14,675	1,622	24,086
2015	14,545	1,937	14,341	1,681	22,226

Source: prepared on the basis of data of the Central Statistical Office and EUROSTAT.

Table A2. Labour and farmland inputs in Polish farms in 2015 (regional approach by province/voivodeship)

Items	Employees in agriculture per 100 ha UAA	Average size of farms in ha
POLAND	**16.1**	**10.5**
Dolnośląskie	9.3	16.2
Kujawsko-Pomorskie	9.9	15.4
Lubelskie	21.2	7.6
Lubuskie	8.5	20.9
Łódzkie	18.3	7.6
Małopolskie	50.4	3.9
Mazowieckie	15.5	8.5
Opolskie	9.8	18.2
Podkarpackie	44.6	4.7
Podlaskie	11.8	12.1
Pomorskie	8.2	19.0
Śląskie	27.8	7.4
Świętokrzyskie	30.8	5.6
Warmińsko-Mazurskie	6.6	22.8
Wielkopolskie	12.0	13.4
Zachodniopomorskie	5.3	30.0

Source: prepared on the basis of data of the Central Statistical Office and The Agency for Restructuring and Modernisation of Agriculture (ARMA).

ECONOMIC ASPECTS OF BLACK CHOKEBERRY GROWN IN MARGINAL AREAS OF SLOVAKIA

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Annotation: The aim of this paper is through the scientific techno-economic analysis ex ante to evaluate proposal of model composition and operation of Black Chokeberry plantations in marginal conditions in Slovakia and point out the production and the economic capacity of the commodity if increasing the viability and sustainability of the agricultural entity operating in the production and economic areas.

The formation of a single European market permit the usage of comparative advantage in agriculture and favor of those who have better geographical and soil and climate position Increasing the participation of Slovakia in the EU single market requires to enhance the efficiency and competitiveness of the agri-food sector. This also applies to restructuring and risk diversification of agricultural production. Long represented crops on arable land in marginal areas in Slovakia are being replaced by innovative businesses to medicinal herbs, soft fruit plantations as well as others on the market desired products. Important role should play also non-traditional Black Chokeberry (Aronia melanocarpa).

According to some sources Chokeberry is seen as a new "superfood". Chokeberry fruits have great potential in the future of a healthy diet, and chokeberry can be grown even in areas to an altitude of 1 000 m. It does not freeze even at – 37o C. There exist a real assumptions that there will be a demand for Chokeberry and that the soil contained in unfavorable marginal conditions of Slovakia will be used more efficiently. In the past, Chokeberry was grown mainly in Eastern European countries. Especially after 1940, Chokeberry began to grow more in the Soviet Union, with the 18 000 ha of its plantation, mainly used for the production of vitamin C. The second country with 5 000 ha of this kind of crop was Poland.

Subject of a scientific paper is dedicated to the model of plantations while production parameters and valuation inputs and outputs are applied to the environment of farms in mountain and foothill areas of Slovakia. Traditional methods for assessing the economic efficiency of production of agricultural commodities (indicators of profitability, cost performance) and their mutual comparison are used in analytical validation. The main methods of returns evaluation of costs to establish the orchard are dynamic methods for assessing the economic efficiency of investments.

The research results bring indicators of economic efficiency of cultivation Black Chokeberry. Interesting conclusions are comparison of economic indicators which evaluate the cultivation of Chokeberry and conventional agricultural crops. Contributions highlight the possibility of substitution of conventional crops grown on arable land by Chokeberry plantations. From the perspective of investors is interesting the pessimistic scenario of techno-economic evaluation of chokeberry plantations. Internal rate of return exceeds more than 10% return on invested capital into the business in the seventh year of planting the orchard. If the initial investment expenditure is higher on investment in network protection against air raid of birds, value of internal rate of return may be higher than 20%. Research results are interesting also because of their practical relevance in terms of agricultural holdings.

Key words: Black Chokeberry, economic aspects, unfavorable marginal conditions

JEL classification: Q19

1. Introduction

The accession of Slovakia to the European Union has changed the view of agricultural production in mountain production areas, which have a limited production structure. The characteristic feature of these production areas is low soil fertility, which does not allow the use of conventionally grown crops in terms of economic efficiency. The situation on the market for agricultural primary products and food products has forced a change in the structure of the production of land-based farmers. This concerns especially the less fertile - mountain and foothill regions of Slovakia, where is created space for growing lesser-known cultural or divorced fruit trees and where soil-climatic conditions are suitable for growing such plants.

The aim of the scientific paper is to evaluate ex-ante financial and economic analysis of the proposal of a technological and economic model for the establishment and operation of the Black Chokeberries plantation in the marginal conditions of Slovakia and to point out the production and economic possibilities of this commodity in increasing viability and sustainability of the agricultural subject operating in the production- area.

Black Chokeberry (Aronia melanocarpa) originates from the eastern part of North America. It entered Europe at the turn of the twentieth century (Kulling et al., 2008). Most occurs mainly in wet forests and marshes. It is used in landscaping, as well as in orchards in fruit gardens for direct consumption as well as for processing. The leaves are colored in orange to crimson red in autumn. The aroma fruits can be used all over the production of jams, juices, syrups, food colors, dried teas, and so on. For commercial purposes, in the past, Chokeberry was grown mainly in Eastern European countries. Particularly after 1940, the arsenic began to grow to a greater extent in the Soviet Union, when almost 18,000 ha of plantation of Chokeberry, mainly used as a raw material for the production of vitamin C, was planted. The second country with the highest proportion of the Chokeberries plantation is Poland, with 5,000 hectares of plantation (in 2005) of this commercially interesting but still unusual plant.

Juice of Chokeberry beries has a wide range of potential healing and therapeutic effects on human health (Bräunlich Marie, 2013). There are many studies (e.g. Kulling and Rawel, 2008; Zheng and Wang, 2003; Kowalczyk et al., 2004), which confirm the high antioxidant activity of Black Chokeberry fruit. Consumption of Chokeberry fruits has also a positive effect on the elimination of risk factors for cardiovascular disease (Kokotkiewicz et al., 2010; Kulling and Rawel, 2008). The study of men with mild hypercholesterolemia who regularly consumed juice from Chokeberry (six weeks, 250 ml per day) confirmed a significant reduction in total serum cholesterol, LDL cholesterol and triglycerides levels, while HDL2 cholesterol levels increased (Skoczyńska et al., 2007). Other studies have highlighted the antidiabetic activity of Chokeberry juice, as in diabetic rats (Valcheva-Kuzmanova et al., 2007), as well as in noninsulin patients (Simeonov et al., 2002), which show the suitability of Chokeberry consumption, but also as a nutritional supplement for the treatment of diabetes mellitus type II. Interesting are also the results of tests that confirm that anthocyanins obtained from Black Chokeberry have antimutagenic activity and antiproliferative effects in the treatment of colon cancer (Bermudez-Soto et al., 2007; Malik et al., 2003).

In the available scientific research databases there is a very low number of information regarding the economy and the return on the cost of setting up and operating on the Black Chokeberry plantations. By Cooperative extension service University of Kentucky - College of Agriculture, the amount of sales revenue of the Chokeberry plantation depends on the marketing channels that are key to achieving the profitability of production. The total planting costs of one acre of plantation are estimated at 10,000 USD. According to the European Central Bank, the average annual USD-EUR exchange rate in 2016 was 0,9033. One hectare represents 2.471058 acres. By simple calculation, we find that the initial investment for the establishment of 1 hectare of the Black Chokeberry plantation is 22 220 Eur. These investments relate to the preparation of land, the purchase of seedlings, the installation of irrigation systems. This amount may be higher than the so-called Additional costs associated with procurement of collection containers, packaging, transport, but also costs of crop protection against wild animals, especially birds.

2. Materials and Methods

The ex-ante financial decision making methods make it possible to objectivise the choice of one of several possible options. The aim of the investment project's assessment is to compare the total investment expenditure with the planned revenue over the economic life of the investment. Seeing that the black chokeberry plantation is "silvicultural entity of permanent vegetation with a fertility time of more than three years", investment costs for setting up the plantation will be reflected in operating expense in the form of depreciation write-offs. The model calculates the linear depreciation of the plantation from the third to the 14th year of vegetation.

Parameterization of project inputs

- Plantation spacing of bushes 3 x 1 m. By decreasing the dimensions at the expense of the manipulation area for collection and haulage of the production (8 x 6 m), of the technique turning area (6 x 6 m) and the expense of the road (width 3 m), the estimated number of planted bushes per hectare is 3 200.
- The area of the plantation which is the subject of the project is 1.8 ha.
- The project has two alternatives. The first alternative does not count towards spending on wild bird protection measures. In the case of an alternative to setting up a safety net, we calculate 13,000 Eur per 1 ha, from that 11,000 Eur for material consumption and approximately 2,000 Eur for work.

Initial investment costs include planting and care costs for the first and second growing seasons:

- The first growing season - the year of outplanting
- Enrichment with organic fertilizers (manure) before outplanting approx. 15 tons. h $^{-1}$.
- Fertilization with industrial fertilizers before the outplanting of cultivars in the amount:
  - Superphosphate 18% = 0.4 t. ha^{-1},
  - Potassium sulphate = 0.4 t. ha^{-1},
  - Caliche ammonium = 0.3 t. ha^{-1},

Secondary costs of tractor and other machinery:

- The delivery and manual layout of manure
- Manure transport
- The spread of industrial fertilizers
- Transport of industrial fertilizers

Preparatory work:

- Landscaping, including deep plowing and soil adjustment,
- Admeasurement of land

Own outplanting of plantation

- The cost for buying seedlings

- The expenditure on wooden pegs
- The personal expenses occuring during the plantation
- The cost for wooden chips and its application

Second Vegetation Year:

- Seed material for planting extinct seedlings and personal costs for planting (expectation of 1% drop out).
- Personal costs for bush cuttings.
- Skiving costs between bush rows (4x per year).
- Consumption and costs of spreading industrial fertilizers (0.4 t ha^{-1}).

Cost parameterization in a fertile plantation year

- Consumption of industrial fertilizers (0.4 t ha^{-1}),
- Personal costs for bush cutting and harvest work,
- The cost of ancillary activity is regarding following: skiving between bush rows, spreading industrial fertilizers and tractor work during harvest.

Parameterization of production and plantation yield

- This technological-economic project calculates within the period of 13 years of plantation fertility with an average annual production per 1 bush of 4.78 kg, representing 15.3 tonnes yield per hectare (0.00478 t x 3200 bushes). In the first year of fertility, we plan 1kg of yield per bush, and we plan with yield increasing until the sixth year. In the period between sixth to tenth years it is expected to have a stable, average yield of 5.9 kg per bush. From the eleventh to the thirteenth year of fertility, we plan with a gradually yield decrease (- 5% p.a).
- The estimated average annual yield during 13 years plantation utilization is 27.6 tonnes on 1.8 hectares.
- By fixing the price, we approached with a pessimistic scenario, using a low unit price. In the first year of fertility (in the third year from the plantation), we expect a realization price of 0.5€ per 1 kg of berries. We also plan that this price will grow by 5% every year, and in the period from fourth to thirteenth year of fertility will be at 0.58€ per kg. With a good marketing, the price per 1 kg of berries can reach 3€ per kg.

Quantification of project investment costs:

$$IVP = \sum_{i=1}^{t} \frac{IE_i}{(1+r)^i} + \frac{NLPt - T}{(1+r)^t} \qquad \textbf{(1)}$$

where: *IE* = Investment expenditure in the year *(i)*,
t = Project construction time,
r = Discount rate, or calculated interest rate (in our project 10%),
NLP = Cost for disposal of the plantation at the end of its life
T = Tax effect from income trading reducing of plantation disposal costs

The key criteria for assessing the economic efficiency of the model of the construction and operation of the black chokeberry plantation are considered to be the return time with discounted investment income, net present value and internal income rate. (Gurčík, Ľ., Et al., 2012).

Pay-back period time with discounted income from investment:

$$\text{PBT} = z\text{-}1 - \frac{\sum_{i=1}^{z-1} NCF_i}{NCF_z} \tag{2}$$

where: NCF_i = Net cash flows in the year i of construction and planned life of the project,
NCF_z = Net cash flow in the year when cumulated net cash flows reach positive value
z = The order of the year in which cumulated net cash flows reach positive value

We can express the **net present value** (*NPV*) with a mathematical relationship:

$$\text{NPV} = \sum_{i=1}^{t} \frac{NCF_i}{(1+r)^i} \tag{3}$$

where: NPV = Net Present Value
t = Lifetime of the project
r = Discount rate, resp. calculated interest rate (in our 10% model)

The internal yield percentage is equal to 100 times of the discount rate "k", which is an unknown variable in the equation for calculating the net present value that is equal to zero. The risk sensitivity analysis measures the sensitivity of the net present value, the internal yield percentage, and the payback time of the model to the variance of the individual uncertain input variables, which was increased by 10%.

These were the following determinants:

- investment expenditure,
- intenzification costs (industrial fertilizers, chemical protection ....)
- personal expenses,
- costs of ancillary activity (mechanization),
- the cost of production.

3. Results and Discussion

The planned cost of setting out the plantation in the first year of its lifetime (assumption of planting of the first growing year) is 11 931 Eur per 1 hectare. If we count an alternative of the construction of protection net, costs resp. expenditure on 1 ha will increase to 25 685 Eur. The net present value of alternative A (investment costs without protection nets against wild birds) is Eur 20 797, which is 13 903 Eur more than the same indicator for alternative B (including building protection nets). If input prices fall by 10%, it is assumed that net present values may drop up to 16,453 Eur.

Table 1. Costs of care for the full fertility of plantation

Item	Measure unit	Amount in m.u.	€.MU^{-1}	Cost together
Year planting cost per ha	ha	1.8	11 931	21 476
Costs in the 2nd growing season	ha	1.8	754	1 357
Costs without protection nets	**ha**	**1.8**	**12 685**	**22 833**
Costs of protection nets against wild birds in the 3rd growing year	ha	1.8	13 000	23 400
Costs including protection nets	**ha**	**1.8**	**25 685**	**46 233**

Source: Authors

The internal yield percentage for alternative B is 7.85% lower, at which the alternative A has a value 20.91%. The payback period, calculated as a reimbursement of capital expenditures discounted by the net cash flows, is with the alternative A 8 vegetation years, including the year of outplanting. By the alternative B, the payment period is in the 12th year of vegetation.

Table 2. Change in the resulting economic indicators of the economic efficiency of the investment caused by the change of inputs by 10%

Alternative	**Measure of index**	**Difference B - A**	**Risk Sensitivity Factor**				
			Investment expenditure	Intensification costs	Personal costs	Auxiliary activity	Decline in production prices
			The change in the resulting economic indicator activated by an increase in input (output) by 10%				
Net present value in EUR			**Change in net present value in EUR**				
A	**20 797**	-13 903	-2 751	**-229**	-1 068	-941	**-15 878**
B	**6 895**		-8 272	**-241**	-1 189	-988	**-16 453**
Internal yield percentage			**Change in internal yield percentage**				
A	**20.91 %**	-7.85 %	-1.92%	**-0.11%**	-1.16%	-0.51%	**-8.02%**
B	**13.06 %**		-3.65%	**-0.10%**	-0.69%	-0.45%	**-7.73%**
Payback time in years			**Change in payback time**				
A	**8.13**	3.46	0.55	0.03	0.51	0.16	**3.27**
B	**11.59**		*	0.06	0.98	0.27	*

Source: Authors

* The payback period is greater than 15 years, i. The difference is greater than 3.41 years

4. Conclusion

The aim of the scientific article was to evaluate the economic efficiency of investments for the establishment and operation of the black chokeberry plantation in the marginal conditions of Slovakia. Two alternatives were modeled. Second, alternative B has a higher primary capital expenditure calculating with procuring and building up a protective network, which protects berries from wild birds. In alternative A, we count with a mechanical and acoustic screens, but the volume of berries in both alternatives is unchanged. The plantation area is 1.8 hectares, while the plantation model takes into account the natural and economic conditions of the marginal - mountain and under mountain areas in Slovakia.

The conclusions of the analysis confirm the relatively high profitability of option A. The value of net present value, at a discount rate of 10% and a vegetation period of 15 years (of which 13 are fertile years) is at the level of 20,797 EUR; the internal yield percentage is at a level of almost 21% and the payback period is after sixth fertile years, which means 8 years after outplanting. The most sensitive determinant and thus most influencing the development of net present value, internal yield and return time can be seen as the increase or decrease of the price of production.* The most unsignificant effect on the values of the resulting indicators is the change of intensification inputs. This result confirms a fact reffered by many botanist that this plant that is not demanding for soil quality, irrigation, weather conditions and is resistant to diseases.

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DO SOCIO-ECONOMIC CHARACTERISTICS OF FARMERS CORRELATE WITH THEIR PERCEPTION OF THE BENEFITS THAT THE COCOA COOPERATIVE OFFERS? EVIDENCE FROM TOCACHE, PERU

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Annotation: Cocoa cooperatives in the Tocache area (east of Peru) are important participants in higher-value cocoa markets. The objectives of this study are, first, to statistically determine factors that assess the underlying attitudes of the cocoa farmers to better comprehend their evaluation of a cooperative's performance, and, second, to understand whether the farmers' socio-economic characteristics correlate with the perceived benefits of a cocoa cooperative in the Tocache area. The results confirm that cocoa farmers' socio-economic characteristics correlate with the perceived benefits of the cocoa cooperative in the Tocache area. The analyses suggest that although some farmers have a higher cocoa profit, they were less satisfied with their cooperative's services compared to members who are older, have less education, have fewer family members, or were farmers for a longer time, and they are more dependent on their cocoa crop. Managers and board members of the *Central Cacao de Aroma* cooperative may find it helpful to focus on farmers' socio-economic characteristics and pay particular attention to dissatisfied farmers. Strategies to correct deficiencies within the cooperative to meet the external market standard for quantity and quality of cocoa should be developed.

Key words: Cocoa, cooperative, coca, Peru, cluster analysis, Independent-T test

JEL classification: C13

1. Introduction

Cocoa is the origin of a global supply chain where processors have a high level of control over the governance of the cocoa food chain. In Europe, major chocolate corporations retain a higher share of added value. Consequently, processing occurs in Europe, but cocoa production is primarily concentrated in Latin American and African countries (Coq-Huelva *et al*., 2017). In developing countries, cooperatives have long been identified as important institutional actors in agriculture (Schmidt *et al.*, 2015) because they are stable channels for selling production (Alho, 2015). Especially in the Peruvian jungle, cooperatives play an important role as suppliers of farm produce, enablers of economies of scale, marketers of agricultural commodities, and providers of services, such as storage and transport (Attman, 2015). These small cooperatives are in charge of collecting cocoa from their own partners to fulfill the *Central Cacao de Aroma* Cooperative's cocoa orders, whose key strategy is to increase farmers' incomes by improving farmers' access to markets.

Hernández-Espallardo *et al*. (2013) stated that satisfying farmer members is crucial to the survival of agricultural marketing cooperatives. They observed the perceived transaction costs are more important in creating member satisfaction than the producer price. Alho (2015) mentioned that heterogeneity in agricultural producer organizations leads to the question of which factors constitute benefits for the members in modern farmers' cooperatives. Consequently, the objectives of this study are, first, to determine factors to better comprehend how cocoa farmers evaluate the cooperative's performance, and, second, to understand whether their socio-economic characteristics correlate with the perceived benefits of cocoa cooperatives in the Tocache area. Such a perspective is appropriate because the farmers' response to any institutional improvement will likely enhance the quantity and quality of the sector (Quarmine et al., 2012).

1. Materials and Methods

Data on cocoa farmers were collected through a cross-sectional survey in Tocache, Peru. The survey involved interviews with 150 associated cocoa farmers. Primary data were gathered between January and June 2015 in six districts within the Tocache area in San Martin, Perú, where the cooperatives are located. Farmers were approached randomly at cocoa farms and interviewed face-to-face. The sample size for this study was calculated according to the following assumptions: the total population of the cooperatives in the six districts within the Tocache area included 630 associated cocoa farmers; there was a sampling error of 5% with a 95% confidence interval. The study uses a Likert scale questionnaire ranging from 1 (strongly agree) to 7 (strongly disagree) to measure the perceptions of internal and external factors related to the cooperative through which cocoa farmers distribute their crops. Indicator scales were developed by a wide-ranging review of the prior literature (Arcas-Lario *et al.*, 2014). These scales were adapted during a pre-test phase. We also have included personal, household, socioeconomic, institutional and marketing variables (Table 1).

Table 1. Summary Statistics (n=150)

Variable	Description	Min	Max	Mean	S.D.
Age	Farmer's age (years)	20.00	82.00	45.43	11.36
Education	Farmer's education (years)	0.00	16.00	7.49	3.44
Cocoa_income	Percentage of cocoa income (%)	0.10	1.00	0.84	0.20
Land	Cocoa land (Ha)	0.50	14.00	3.04	1.76
Organic_prod	Tons of organic cocoa production (TN/Ha/Year)	1.00	16.00	3.16	2.63
Conventional_prod	Tons of conventional cocoa production (TN/Ha/Year)	1.00	11.00	2.41	2.01
Experience	Experience in cocoa cultivation (Years)	2.00	30.00	7.84	4.13
Cocoa_prof	Cocoa profit (Soles/Year)	400.00	25600.00	5986.11	2923.62
Cocoa_price	Cocoa Price (Soles/Kilo)	7.00	9.00	7.53	0.50
Household	Number of household members	1.00	5.00	3.41	1.28
Coca	Years of coca cultivation	1.00	20.00	5.03	3.59
Income	Total income (Soles/Month)	130.00	9500.00	1150.22	1028.45

Source: Own elaboration based on primary data

First, principal component analysis (PCA) was employed to discover the basic structure that underlies the measures of the cooperative services. The reliability of the resulting factors was tested using Cronbach's α measure of internal reliability consistency. Next, hierarchical and Ward method cluster analysis using the cooperative services factors were performed to obtain the members segment. Finally, analyses included an independent sample t-test for comparing two group means.

2. Results and Discussion

To determine the factors that can strengthen the *Central Cacao de Aroma* cooperative, an assessment of the cocoa farmers' underlying attitudes was conducted. For the Kaiser-Meyer-Olkin (KMO) statistic is 0.937, and factor analysis yielded a four-factor solution, explaining 70.24% of the variance in the data. The internal consistency was verified using the Cronbach's alpha indicator (Table 2). Regarding the convergent validity, each factor loading was over 0.5.

Factor 1 includes items that refer to services related to "cocoa quality and cooperative management" (α=0.953). Export markets tend to demand a higher quality product from specific types of soils and microclimates, and most importantly, through specific cultivation, harvesting, and post-harvesting practices (Barham and Weber, 2012). Thus, farmers' access to specialty markets depends on quality and quantity. High-quality cocoa is well-fermented, dried, and free from disease, contamination, and other physical defects (Quarmine et al., 2012). With regard to quality, *Central Cacao de Aroma* and small cooperatives found that the best results were achieved if farmers deliver unprocessed, wet cocoa beans to the stock centers, which then ferment and dry the beans using uniform schemes (Melo and Hollander, 2013). Each stock center has the capacity and the machinery (cocoa fermenters, solar and liquid petroleum gas dryers, and multi-certification compliant storage facilities) to comply with international buyers' standards for quality and quantity (Melo and Hollander, 2013). Later, small cooperatives supply the adequately fermented and dried beans to the *Central Cacao de Aroma Cooperative*.

Table 2. Varimax rotated component matrix for PCA

Item	Mean	Communalities	Factor 1	Factor 2	Factor 3	Factor 4
Cooperative (Coop.) provides transportation facilities	2.41	0.830	**0.85**	0.18	0.22	0.20
Coop. has standards at cocoa processing	2.37	0.832	**0.81**	0.20	0.24	0.20
Coordination level within the coop.	2.25	0.867	**0.80**	0.21	0.27	0.22
Coop. manager's leadership	2.58	0.741	**0.79**	0.12	0.32	0.15
Coop. develops a post-harvesting management	2.41	0.785	**0.74**	0.32	0.13	0.09
Coop. has a high management level	2.60	0.757	**0.66**	0.27	0.25	0.23
Coop. has certifications that validate the cocoa's quality	2.11	0.632	**0.61**	0.24	-0.06	0.08
My interventions as a member in the general assembly are considered	2.99	0.775	0.31	**0.79**	0.03	0.16
Frequently I intervene in the general assembly	2.98	0.818	0.31	**0.74**	0.26	0.23
The coop. always explains decisions that may affect its members	3.16	0.813	0.21	**0.72**	0.19	0.38
I attend all meetings of the general assembly as a member	2.86	0.772	0.21	**0.68**	0.35	0.19
Coop. has competitive agricultural and management training programs	3.07	0.827	0.26	**0.68**	0.30	-0.03
Coop. provides programs aimed to educate members	2.84	0.791	0.31	**0.67**	0.30	-0.14
I am well informed about the results of the coop.	3.23	0.643	0.34	**0.66**	0.27	0.19
There is cooperation among coop. members	3.15	0.821	0.15	0.29	**0.81**	0.19
Good direction and leadership of coop. managers	3.00	0.765	0.14	0.27	**0.77**	0.09
Coop. establishes good planning and objectives	2.91	0.776	0.39	0.40	**0.68**	0.00
My relation with the coop. is a long-term partnership	2.38	0.733	0.20	0.36	**0.63**	0.38
I participate at the coop. on decision making	2.87	0.699	0.26	0.40	**0.62**	0.04
The services that the coop. provides help to achieve your business goals	3.04	0.836	0.28	0.26	0.15	**0.80**
I am very happy with the price paid by the coop. for the cocoa delivered	3.15	0.821	0.38	0.22	0.16	**0.78**
I am very satisfied with the price paid for the cocoa delivered	3.03	0.746	0.38	0.30	0.09	**0.68**

Source: Own elaboration based on primary data

The second factor represents the "information, control, and trust" (α=0.949) component. Peruvians use their knowledge of local markets, labor availability, local growing conditions, and other agricultural, social, and economic variables to maximize their opportunities and minimize risks (Melo and Hollander, 2013). Agricultural cooperatives allow a peculiar relationship between the organization and its members, who are simultaneously the owners, users (buyers and sellers), controllers, and beneficiaries (Arcas-Lario et al., 2014). Thus, members have the last say on key decisions and are well-informed, elected, or appointed leadership positions (transparency) (Attman, 2015). Cooperatives are more effective in helping resource-poor farmers gain access to resources and technologies through meetings and courses for increasing yields through better management (Barham and Weber, 2012). Services such as agricultural information support, provision of input and credit, training, technology transfer, and monitoring and evaluation of projects contribute to agricultural improvement (Buadi et al., 2013). For instance, extension agents providing technical assistance and training serve as the key information source by transferring technical knowledge and cooperative information to the members.

The third factor pertains to the "relationship with the cooperative and continuity" (α=0.913). Social goals may include the desire to interact with other members and to develop personal relationships (Arcas-Lario et al., 2014). These social goals may include the desire to interact with other members and develop personal and business relationships (Hansen et al., 2002). These interactions and relationships are considered easier to develop in rural areas because the social, cultural, ethnic, and economic backgrounds of the farmers are more similar and homogeneous and the communities are more stable (Schmidt et al., 2015). Tocache cooperatives with directorates who were elected by a majority of the votes in their own social capital-based structures responded to the concerns of their constituents (Melo and Hollander, 2013).

The fourth factor includes items referring to "services and payment satisfaction" (α=0.807). The most obvious reason farmers join co-ops is to satisfy economic goals or to improve financially (Hansen et al., 2002). In this context, many farmers in Tocache depend not only on the cooperative to commercialize their products but also on the intermediaries who offer local market prices. Middlemen who intend to supplant quality by focusing on quantity (Melo and Hollander, 2013) provide attractive prices to capture cocoa farmers' production. Usually, the cooperative pays member growers the current local market price. After the cocoa has been exported and the contracts are paid, the cooperative subtracts its cost and its initial payment to growers from the total sale revenue. From the remaining revenue, the cooperative calculates a premium per kilo of the product sold to the cooperative to pay member growers (Barham and Weber, 2012) for their loyalty.

After obtaining the four components using the PCA technique, hierarchical clustering was used to inspect the agglomeration schedule. A dendrogram tool was used in the analysis, which allowed us to determine that a two-cluster solution was optimal. Next, a K-means cluster analysis using Ward's method was performed with initial cluster centers resulting from the hierarchical procedure. The perceived quality of a service may depend on users' socio-economic characteristics, and service provisions may need to be tailored to different users based on their demographics (Buadi et al., 2013). It is important to have knowledge of each farmer, the household, the land, and the crops, among other characteristics (Melo and Hollander, 2013). Therefore, the differences in socio-demographic characteristics of the farmers were analyzed in relation to the clusters to which they belong. Table 3 presents the profile of cocoa farmer segments according to the following: (1) dimensions of intrinsic and extrinsic perceptions of the cooperative and (2) the socio-economic characteristics of the segments determined by an independent sample t-test, which provides evidence that each cluster is distinctive.

Segment 1 (51.4% of the sample) can be typified as "satisfied" cooperative members. The second segment (48.6.3% of the sample) can be profiled as "dissatisfied" members who acknowledge they gave a low evaluation for all four obtained components, compared to their counterparts. Dissatisfied cocoa farmers are not content with the services, relationship, and services and payment of their cooperative. The main reasons could be the board's insufficient skills, lack of information, and relatively high costs of selling to the cooperative (e.g., high quality demands, delayed payment, and transport to warehouse) (Donovan and Poole, 2014).

Table 3. Profile of cocoa farmers segments (n=150) on dimensions of intrinsic and extrinsic perceptions of the cooperative and socio-economic characteristics

	Cronbach's α[b]	Dissatisfied members	Satisfied members	T	Significance
Factors					
Cocoa quality & coop. management[a]	0.93	2.82	1.80	11.55	***
Information, control, & trust[a]	0.90	3.46	2.20	14.81	***
Relationship with the coop. & continuity[a]	0.89	3.35	1.96	15.41	***
Services and payment satisfaction[a]	0.82	3.55	2.05	17.50	***
Socio-economic characteristics					
Age		44.22	46.58	-1.77	*
Education[a]		7.83	7.16	1.64	*
Cocoa_income		0.82	0.87	-1.82	*
Land[a]		2.76	3.35	-2.84	***
Organic_prod[a]		2.69	3.47	-1.88	*
Conventional_prod		2.44	2.16	0.92	N.S.
Experience[a]		7.78	7.90	-2.49	N.S.
Cocoa_prof		4381.69	4228.70	0.43	N.S.
Cocoa_price		7.56	7.50	0.895	N.S.
Household[a]		3.61	3.21	2.72	***
Coca		4.57	5.53	-1.81	*
Income[b]		1169.68	1141.65	-1.82	*

*Source: Own elaboration based on primary data; Significance: *** p≤0.01, * p≤0.10, N.S. Non-significant*
Note: [a] Assumption of homogeneity of variance was violated; [b] Approximate exchange rate PEN to USD rate for the study: 2.835 PEN (Central Reserve Bank of Peru, 2015)

Age can also be considered an indicator of farming experience (Gebremedhin et al., 2009). We noticed that satisfied farmers are older than their counterparts (p<0.10). Additionally, education and farm size have often been cited as socio-economic characteristics that distinguish adopters from non-adopters (Sturm and Smith, 1993). In contrast, García-Yi (2014) said that high income from coca cultivation allows parents to educate their children (García-Yi, 2014). In the Acopagro cooperative, which is one of the best cocoa cooperatives in San Martin, Perú (Higuchi et al., 2010), the hypothesis that education level can influence the probability of becoming a cooperative member is positively rejected because education had no significant impact on satisfaction. These former coca farmers depend on the cooperative to commercialize their cocoa due to their basic education and their willingness to learn more techniques. We notice that satisfied farmers are less educated than their counterparts (p<0.10).

Further, Peru is endowed with a favorable land-labor ratio (Higuchi et al., 2010). Cocoa land represents a form of internal capital accumulation, and satisfied members have more cocoa land compared to their counterparts (p<0.01). These satisfied cocoa farmers depend mostly on income from the cocoa crop (p<0.10), compared to traditional staples, such as bananas, cassava, coffee, palm, maize or rice. Although satisfied farmers receive lower total income compared to the dissatisfied farmers (p<0.10), satisfied farmers also produce more organic cocoa (p<0.10). Finally, in general, coca yields three to four suitable harvests per year, is easy to transport, and grows very well with minimal input (Sturm and Smith, 1993). As noted in the results, satisfied cocoa farmers were coca producers for longer than the non-satisfied ones (p<0.01), who survived decades of violence in the Tocache area.

3. Conclusion

This study highlights the important role that cooperatives in Tocache play in developing former coca farmers' capabilities to participate in higher-value cocoa markets. It seems that cocoa farmers' socio-economic characteristics correlate with the perceived benefits of cocoa cooperatives in the Tocache area. Outcomes show that, despite having higher total income and cocoa profit, farmers were less satisfied with their cooperative's services. Additionally, findings indicate that satisfied members are older, have less education, have fewer family members, were coca farmers for a longer period of time, and depend on their cocoa crop more than their counterparts. It seems that farmers' socio-economic characteristics themselves do not fully capture reasons for satisfaction with their cooperative. Cocoa farmers who belong to the cooperative were concerned about learning competitive, sustainable techniques that extend beyond their limited education or their total dependence on their cocoa production. It may be helpful to managers and board members of the *Central Cacao de Aroma* cooperative to focus on farmers' socio-economic characteristics and pay particular attention to dissatisfied farmers. A strategy to correct deficiencies within the cooperative to meet the external market requirements for the quantity and quality of cocoa that the external market requires should be developed. Periodic meetings at the cooperatives should be instituted to promote loyalty among members and to avoid side selling to the intermediaries. Listening to member feedback at the meetings or assemblies will help monitor member satisfaction related to cooperative-provided services and prices. This monitoring will improve the cooperative system by meeting the external market requirements for the quantity and quality of cocoa and fostering trust and loyalty among the members.

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BIOBUTANOL FROM LOCAL BIO-WASTES

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Annotation: The objective of this article is to specify period between introduction and decline of biobutanol market allowing to investors decide about volume of investments into processing facilities. Such decision must take into account political support to waste processing, GHG savings, competitiveness and divestments from already owned processing alternative as bio-gas, bio-diesel, bio-ethanol, hydro-treated vegetable oil or solar energy to power vehicles. Therefore, Boston Matrix was modified according to support for fuels in renewable energy directive or by Paris agreement about greenhouse gasses (GHG) reduction. Investments and divestments can be derived by from relationships in matrix of Hofstede's intercultural indices, which modify time of both political and industrial reaction. Political approval considers carbon by GHG limit and investments of industry are motivated by lacking protein in EU. Negative EU balance of nitrogen will influence reaction of industry. Demand for nitrogen from oilseed rape may extend use of recent FAME processing facilities by improvement of its quality by biobutanol. This is just one example of evaluation of relationships between mental approaches and chemical complementarity of technologies.

Key words: waste, butanol, circular economy, alternative, substitute, investment.

JEL classification: Q42, O13

1. Introduction

Nature stores energy to sugars with lower and to fats with higher condensation. If both sugars and fats are not consumed as food or feed, they become bio waste. Biobutanol can be processed from sugars in biological waste. Biobutanol can also be used for standardisation of biofuels by simple blending without any chemical treatment. It can be used for fuel processing either as first generation biofuel from field crops or as second generation biofuel from biological waste. Oppose to USA, which have recognized its value already, other countries do not use biobutanol for bio-waste conversion into fuel blends improving ROI for investors. Costs of fuel processing can be demonstrated by fact that blending of biobutanol with cooking oil in your garage can produce fuel for your car, which complies with norm. Therefore, the objective of this article is to specify period between introduction and decline of biobutanol market allowing to investors decide about volume of investments into processing facilities (Campos et al., 2012; Higashide et al., 2011).

The Paris Agreement (United Nations Framework Convention on Climate Change, 2015) has been described as an incentive for fossil fuel divestment. It is understood that fossil fuels should be replaced either by biofuels or by solar energy. Directive 2009/28/EC (RED I) supporting renewable energy was in line with the Paris agreement, proposal of RED II, abstaining from biofuels grown at fields threatens investments into biofuel processing. Therefore, deep quality parameters of biofuels and analysis of market forces is needed to stabilize always changing political support (Machek et al., 2014).

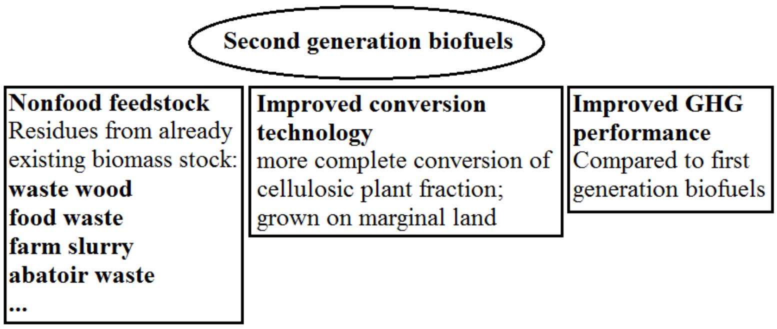
Table 1. Forecasted energy consumption by petrol engines

	APB	NAP OZE
Total energy consumption (gasoline, diesel, biofuels, electricity)	262 PJ	268.3 PJ
Consumption of renewable energy in transport in 2020 year (10 % e.c.)	26.2 PJ	26.08 PJ
Traditional ethanol	11.5 PJ	4.17 PJ
Modern ethanol	-	1.2 PJ
Biomethan from biogas	3.2 PJ	0.04 PJ
Traditional biofuels	21.8 PJ	15.89 PJ
Percentage of traditional biofuels	8.3 % e.c.	5.9 % e.c.
Modern biofuels	4.4 PJ	10.24 PJ
Percentage modern biofuels	1.7 % e.c.	3.82 % e.c.
Double counting of biofuels from waste	8.8 PJ	20.48 PJ
Percentage modern biofuels under double counting	3.3 % e.c.	7.63 % e.c.

Sources: Action plan for biomass (APB), 2012; National Action Plan for Renewable Energy (NAP OZE), 2012

Boston matrix, also known as four quadrant analysis or BCG matrix was proposed by Boston Consulting Group in the United States in the 1960s to evaluate chances of different size of competitors. BCG matrix is well describing recent competitors by relation between market share and market growth, which is based on indexes or trends. But, innovations are often not part of trend. Model of five forces (Porter, 2008) is oriented on future markets of new entrants and substitutes is replacing statistical arguments by scenario of roles of companies with capability saturate whole market. Porter's five forces analysis can be used to narrate data of bio-waste conversion to biobutanol for ROI at fuel market in USA as the biobutanol is sold there already. For other markets, a market share of biobutanol depends on turnover of bioethanol and fatty acid methyl esters (FAME) as an alternatives. Therefore, it is too early to mark biobutanol as new entrant in EU. Still, waste processing potential by biobutanol technology oppose to bioethanol one is great as stems out of further analysed performance in comparison with environmental policy targets. Table 1 shows forecasted energy consumption by petrol engines (e.c. – energy content).

Figure 1. Characteristic of 2nd generation biofuels



Source: Own processing

ROI of global investments into products with potential to substitute former ones can be derived from model of diffusion of innovations (Bass, 1969). But, shown discrepancies in political support do not allow to use model of Bass for bioeconomy, circular economy and GHG savings. Ansoff (1958) matrix monitors both mature and future markets and products for specialised born globals. None of these frameworks is suitable for products with multiple properties, including of wastes, which are sold in circular economy. Farmers do not develop GHG savings of vegetable oils fast. Other processing technologies are progressing with approximately similar speed (Figure 1).

Therefore, further text will focus more on adaptation of processing technologies for conversion of wastes into products, while decreasing emissions of GHG (Tables 1 and 2).

Table 2. Modern fuels from residues of biomass and classified biomass for petrol engines

Fuel	**Technology of conversion**	**Raw material**	**Period of installation of relevant processing developing market**		
			Implemented	**Possibly implemented to 2020**	**Expected implementation after 2020**
Bioethanol	Aerobic fermentation, distillation	Straw, lignocellulosic residues cellulosic residues of urban and industrial wastes	YES (in EU)	YES	YES
Bio-methane	Anaerobic fermentation, gas purification to methane quality (CNG)	Slurry, manure, sewage sludge, biodegradable part of urban and industrial wastes, technical raw glycerine, burns of distilleries	YES (in EU)	YES	YES
Synthetic biofuels BtL	Gasification, carbonization, torrefaction, fast pyrolysis, hydrothermal carbonisation and its combinations	Straw, lignocellulosic residues and fibre, maize spindles, chaff, biodegradable part of communal and industrial waste, technical raw glycerine, resin from tallow oil	NO	NO	YES

Source: Directive 2009/28/ES on the promotion of the use of energy from renewable sources, 2009

2. Materials and Methods

Assortment of fossil fuels for ignition engines is broadened by ethanol E85 fuel in Czech Republic.

1. Gasolines
   - Normal (BA-91, Natural 91, Regular);
   - Super (BA-95, Natural 95, Premium);
   - Super Plus (BA-98, Natural 98, Super);
   - Special (BA-91 S – orange - red, contains VSRPA additive, which is replacing led for older engines);
2. E85 (Ethanol 85).
3. Premium fuels Optimal, EFECTA 95, MaxxMotion 100plus, V Power Nitro and others should:
   - Packages of additives with selected properties improve fuel quality above minimums, which are set by norm;
   - Differentiate supplier;
   - Impress by enlarged portfolio of own sold fuels, especially customers who have problem to find own way in offer of fuels.

Biofuels are renewable oppose to fossil fuels, but its development is still in introductory period. Profitable first generation of biofuels is produced from sugar or starch. Profitability of second generation of biofuels is yet to be developed. Second generation biofuels can be bioethanol originating from lignocellulosic biomass, Btl (biomass-to-liquid) from heat processing of biomass and hydrogen from renewable resources. All technologies producing second generation biofuels are still under development. But, already now it is clear that investments will be enormous opposed to first generation fuel processing. Therefore, commercialisation of political will, which is supporting second generation biofuels, is still far and difficult. Energy, environment and profitability of companies need to part of evaluation method. Therefore, it is excluded that second generation will become alternative fuel before 2020 year. Share of additives (Table 3) according to norm EN 228 for gasoline shows limit of max. 2.7 % (weight) of oxygenates if bioethanol is added to fuel. E10 fuel is sold in German speaking countries according to norm E DIN 51 626-1.

Table 3. Gasoline types and content

	E5 (EN 228, E DIN 51 626-1)	**E10 (E DIN 51 626-1)**
Bioethanol	max. 5.0 % vol.	max. 10.0 % vol.
Ethers with min 5 C atoms	max. 15.0 % vol.	22.0 % vol.
Total content of oxygen	max. 2.7 % weight	max. 3.7 % weight
	Must be sold until 2018	Can be sold

Source: EN 228, 2008

Parameters of E85 fuel has to comply with norm ČSN P CEN/TS 15293 and contain 70–85 % vol. of bioethanol. Biobutanol belongs partly to second generation biofuels. It is true that biobutanol can be produced from sugars and starches by *Clostridium acetobutylicum* in ABE (Acetone-Butanol-Ethanol) process like bioethanol. Raw materials for ABE fermentation are differently accessible for microorganisms:

- starches from potatoes, maize, cereals or rice,
- sugar from molasses and whey,
- lignocellulosic form straw and timber.

It is strong pressure to consider molasses as waste. This is bad example how wastes are defined. It would be better to distinguish costs of waste processing oppose to price for which it is sold in circular economy. Price of products from waste in circular economy should be distinguished according to quality parameters of substitutes or alternatives before real investment, processing and supply will be done.

3. Results and Discussion

It was shown how technologies for processing of secondary biofuels very investment intensive, except of biobutanol. The closest product of waste processing with identical technology is bioethanol. But, biobutanol outperforms bioethanol (Table 4). Low price of waste favours its local processing as transport is expensive. Further, the need to sum turnover from main product, by-product and waste-product according to rules of circular economy has led to modification of portfolio matrixes and models (Table 3). C:N is known ratio balancing digestion of macro nutrients. The better C:N the less leftovers, which would warm the climate as wastes. As sun burns more at equator an abundance of C is generated there. Malaysian palm oil producers do not include burned tropical forests into GHG savings from replacement of fossil fuels by biofuel from palm oil. Solar technologies do not include into GHG balance pollution from its waste processing. Technology of soybean and oil seed rape (OSR) processing are saving 73 % of GHG and protein. OSR decreases 80% dependence of EU on imported soybean protein for feed purposes to 50%. This decreased dependence has happened when biofuels were supported as OSR skins contain high content of protein.

Table 4. Identification of factors from a list of competitive advantages bioethanol compared to biobutanol

Bioethanol	**Biobutanol**
Resources	
Sugary crops	Sugary crops
Starchy	Starchy
Lignocellulosic	Lignocellulosic
Properties	
GHG savings	GHG savings
Absence of sulphur	Absence of sulphur
Absence of polyaromatic hydrocarbons	Absence of polyaromatic hydrocarbons
	Higher calorific value
	Not hygroscopic
	Can be added to diesel fuel
	Less O_2 content
	More similar to gasoline

Source: Own processing

Depending on development and culture of society different products are dominating the market. Global companies are converging from fossil to renewable raw materials while local administration from fossil to circular economy of wastes. Culture and nutrition are common denominator allowing compare both global and local society. Impact of compromises in processing of wastes for conversion of local society to circular economy are discussed in this article. Attributes of culture are marked in rows and columns of table 3 according to abbreviations of Hofstede's (2010) intercultural indices. Long term objectives (LTO) represent readiness of individual to wait for institution, while indulgence shows instrumental attitude. Therefore, biobutanol and bioethanol risk prone entrepreneurs (uncertainty avoidance - UAI) in USA are not damaged by administrators of institutions who have transferred rest of production facilities to East Asia. Leading individuals (individualism – collectivism - IND), like Elon Musk operate with close value chain to avoid impact of administrators. Large investments are always available for leaders of fossil economy (dimension of masculinity – femininity – MAS). PDI (power distance) represents isolation between top administrators and bottom of operators who are blind to industry development either fossil of biofuel one. Indulgence is positive extreme on bipolar scale oppose to negative joy from lynch. Culture of indulgence allows entrepreneurs to come up with market solutions. Negative extreme of lynch punishes them for non-standard behaviour. Recent proposal of RED II proposing to close down OSR sector of biofuels oppose to USA, which is developing biobutanol and solar energy and other innovations much stronger and faster than shows that indulgence – lynch is really important parameter for portfolio analyses. Bioethanol, biobutanol, solar energy, soybeans and OSR are example, where institutions of USA tolerate instrumental attitudes towards innovative products, which is not true for EU. GMO are not included as they facilitate process without considerable difference of product.

Table 5. Culture and nutrition alternatives for transition from fossil to circular economy

	LTO		**Indulgence**	
	C (carbon)	GHG savings	Diversity	N (protein)
UAI			Biobutanol, bioethanol (USA)	
IND		Solar transport and household with support of solid fuels		
MAS	Palm oil (Malaysia)			
PDI	Gasoline, LPG, CNG	BTL, Bioethanol		Soybeans, OSR

Source: Own processing

Investors should take into account culture of country (Machek and Hnilica, 2015). Local wastes processing in circular economy generates not only renewable energy, GHG savings but, balances indirectly human diet and volume of food.

4. Conclusion

The objective of this article was to specify period between introduction and decline of biobutanol market to allow local investors decide about volume of investments into facilities allowing them to transit from fossil to next economy. Biobutanol production and use in local economy favour its properties (Table 4) allowing to standardise oil, including of waste animal fats into fuels. Investors into biobutanol may take into account fact that local culture don't see HVO at global markets yet. Similarly, interconnectedness of sugars and fats at markets of local waste processing into products is not well understood yet. Advanced technologies are either forbidden or not negotiated yet in EU oppose to USA. Advanced solar technologies were developed in one company against will of institutions in USA (Vance, 2015), while GMO are pursued by trade negotiations from USA to EU market. Therefore, pro-innovative culture was built into proposed portfolio analysis (Table 5). Main arguments for biobutanol as product: There is more sugar and starch biomass available for biobutanol production as for biodiesel. Bioethanol and biobutanol production from lignocellulosic waste biomass is subject of research as it is not profitable yet. Therefore, chemically processed HVO will get market share sooner than biobutanol, probably. Market share for biobutanol is opened in 10 % volume besides 90 % of gasoline in planned fuel E10. But, relatively old vehicles in Czech Republic are not suitable for E10 yet. The main advantage of biobutanol is conversion of bio-waste to product: Minimal volume of biofuels in blend with fossil fuel with excise duty rates are set by law 201/2012 Sb. in Czech Republic. Besides subtracted excise duty from biofuels producers are receiving income from sold energy and agriculture subsidies. If recent EU negotiations declare molasses as waste material the market for both bioethanol and biobutanol will be opened. Lobby is needed. Public opinion is asking for full ban of first generation biofuels from field crops but, without investments into biobutanol technology a price hikes may occur. Local investments into biobutanol technology are repayable as its exploitation time is not limited due to its environmental, energy and biohazard effects. Recently, biobutanol can be sold as thinner and additive. Limitations for all biofuels are availability of biomass and legal definition of wastes. Impact of indulgence on analyses of product performance may improve precision of forecasting if it elaborated in future research.

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HYDROTREATED VEGETABLE OIL (HVO) FOR LOCAL BIO-WASTES

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Annotation: The objective of this article is to specify period between introduction and decline of HVO (Hydrotreated Vegetable Oil) market allowing to investors decide about volume of investments into processing facilities. This decision is difficult due to changing political support to technologies of waste processing, circular economy, bio-gas, bio-ethanol, biodiesel and solar energy for vehicles. Therefore, technical indices of fossil raw materials, materials from nature, and waste deposits were evaluated in modified Boston Matrix. Repayment of investments into HVO technology is better than maintaining facilities producing FAME (Fatty Acid Methyl Ester) or purchase of diesel from global markets. FAME and diesel were considered as substitutes, while vegetable oil, biodimethyl ether, biodiethyleter and synthetic diesel as alternatives to HVO. HVO is saving GHG and producing protein for feed if nitrogen rich raw materials as oilseed rape are processed. The feed proteins are by-product of biofuel production as EU it is 80% dependent on import of soy meal. Negative EU feed protein balance and better fuel quality will stimulate investors to replace FAME by HVO technology.

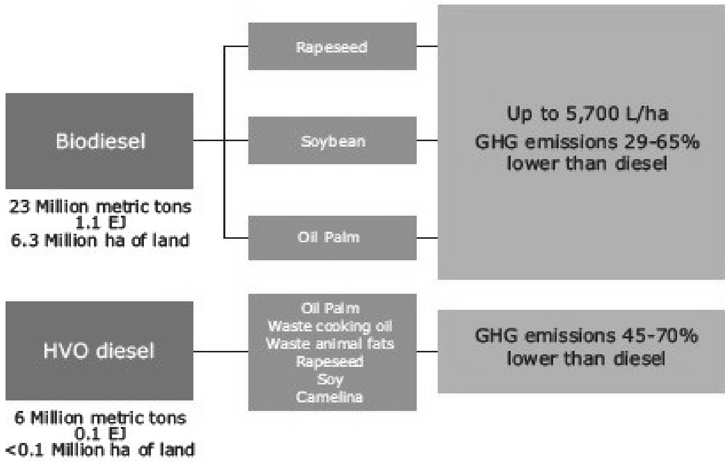
Key words: waste, HVO, circular economy, alternative, substitute, investment.

JEL classification: Q42, O13

1. Introduction

Excessive sugars and fats become bio waste. HVO (Hydrotreated Vegetable Oil) is fuel of high quality, which can be processed as first generation biofuel from field crops or as second generation biofuel from biological waste. HVO as new fuel was included into norm for diesel EN 15950:2014, which was renamed to „Paraffin diesel from synthesis or hydro-thermal treatment“. No excise duty is charged for pilot HVO projects yet because of its high sustainability potential (Kim et al., 2013; Hönig, Pexa and Linhart et al., 2015). The Paris Agreement (United Nations Framework Convention on Climate Change, 2015) has been described as an incentive for fossil fuel divestment. It is understood that fossil fuels should be replaced either by biofuels or by solar energy. Renewable Energy Directive 2009/28/EC (RED I) supporting renewable energy is in line with the Paris agreement. Proposal of RED II, which is abstaining from biofuels grown at fields, threatens investments into biofuel processing. Therefore, deep analysis of biofuel quality parameters and analysis of market are needed to stabilize always changing political support (Alptekin et al., 2015; Clark et al., 2015). BCG matrix (Boston Consulting Group, 1960s) is well describing recent competitors by relation between market share and market growth, which is based on indexes or trends. Innovations oppose to recent competitors are often not part of trend. Model of five forces (Porter, 2008) is more oriented on future markets of new entrants and substitutes. Their roles are replacing statistical arguments by scenario of market saturation. Porter’s five forces analysis can be used to narrate data of conversion to HVO for ROI (return on investment). Total turnover of innovation at global market substituting former technology is derived by model of diffusion of innovations (Bass, 1969). But, shown discrepancies in political support do not allow to use model of Bass for bio-economy, circular economy and GHG savings. Ansoff (1958) matrix monitors both mature and future markets and products for specialized born globals. None of these frameworks is suitable for products with multiple properties, including of wastes, which are sold in circular economy. Therefore, GHG savings from bio-economy are often stopped due to disputes about its real impact. Still, other processing technologies are under development with approximately similar speed (Figure 1).

Figure 1. GHG savings by biodiesel and HVO



Source: Souza et al., 2015

Performance criteria of HVO and biodiesel (Figure 1) in different chemical compounds (Figure 2) are set as policy targets (Table 1).

Table 1. Forecasted energy consumption by diesel engines

	APB	**NAP OZE**
Total energy consumption (gasoline, diesel, biofuels, electricity)	262 PJ	268.3 PJ
Consumption of renewable energy in transport in 2020 year (10 % e.o.)	26.2 PJ	26.08 PJ
Traditional diesel (RME, SME, PME, HVO)	10.3 PJ	11.72 PJ
Modern biodiesel (UCOME, TME, HWVO, HEFA)	1.2 PJ	9 PJ
Traditional biofuels	21.8 PJ	15.89 PJ
Percentage of traditional biofuels	8.3 % e.c.	5.9 % e.c.
Modern biofuels	4.4 PJ	10.24 PJ
Percentage modern biofuels	1.7 % e.c.	3.82 % e.c.
Double counting of biofuels from waste	8.8 PJ	20.48 PJ
Percentage modern biofuels under double counting	3.3 % e.o.	7.63 % e.o.

Sources: Action plan for biomass (APB) and National Action Plan for Renewable Energy (NAP OZE), 2012
Note: % e.c. - percents of energy content; RME - Rape seed Methyl Ester, SME - Soy Methyl Ester, PME - Palm Oil Methyl Ester; HVO - Hydrotreated Vegetable Oil and fat; UCOME - Used Cooking Oil Methyl Ester; TME - Tallow Methyl Ester; HWVO - Hydrotreated Waste Vegetable or animal Oil; HEFA - Hydroprocessed Esters and Fatty Acids

Directives 2009/28/ES and 2009/30/ES are claiming methodology, which is proving decrease of GHG (Greenhouse Gases) pollution of crops gown for fuel production, including of indirect land use change (ILUC) the most for each different crop. For example, for oilseeds for biofuel production is proposed ILUC factor 55 g $CO_2.MJ^{-1}$. Recently, FAME (Fatty Acid Methyl Ester) from oilseed rape generates emissions of about 45–50 g $CO_2.MJ^{-1}$. It means that added ILUC factor would decrease GHG savings of FAME from oilseed rape close to zero for all sold blends of FAME with diesel (2, 4 and 6 %). Recent proposal of renewable energy directive (RED II) also reduces biofuels volume made from food biomass to 5 % e/e and increases GHG saving quota for newly built processing facilities. RED II also expects support for second and third generation biofuels with low ILUC factor. Reporting of ILUC emissions of low emission biofuels between EU member countries is perceived as an investment protection measure up to 2020 year.

Commission and Parliament of EU have approved many directives protecting air pollution from fuels in last ten years (Table 2).

Table 2. Modern fuels from residues of biomass and classified biomass for diesel engines

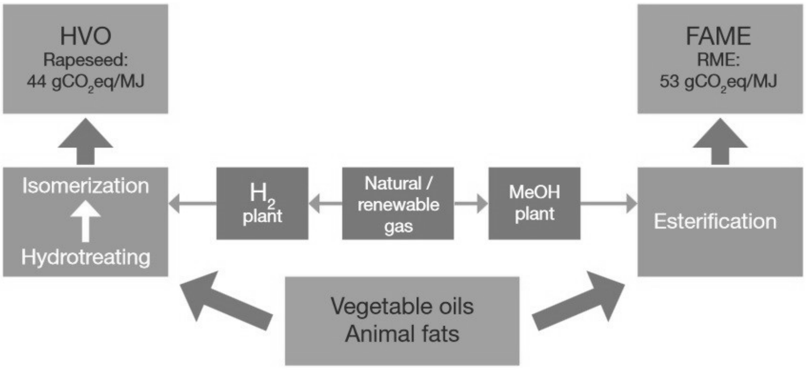
Fuel	**Technology of conversion**	**Raw material**	**Period of installation of relevant processing developing market**		
			Implemented	**Possibly implemented to 2020**	**Expected implementation after 2020**
FAME	Transesterification	Waste vegetable oils and animal fats, eventually fats of I and II category	YES	YES	YES
HWVO, HEFA	Hydrogenation, hydro treatment, izomeration, metathesis	Waste vegetable and animal fats, eventually fats of I and II category, esters, fatty acids, and similar products	YES (in EU)	YES	YES

Source: Directive 2009/28/ES, 2009

Therefore, refineries fulfilling GHG saving quotas have no other option than to blend fossil fuels with biofuels, which are made from food biomass recently. Other measure decreasing GHG emissions from transport is 6 % to year 2020. Pressure on both improved fuels and vehicles allows to reach GHG saving target. GHG emissions of biodiesel will decrease due to increased content of FAME in diesel either from 15 to 20 % vol. or from 25 to 30 % vol. after new fuel norm will be implemented. HVO is competitor of FAME. Norm allows blends of HVO with fossil diesel up to 30% recently. Therefore, HVO may also decrease GHG emissions objectives for biofuels until 2020. But, technical standards for such advanced biofuels as HVO still needs to be approved to clarify rules for its use. It is expected that due to excellent quality of HVO the norm for fossil fuels will increase cetane number and cetane index. Further, point of 95 % of distilled content of distillation curve will decrease, while content of polyaromates will reduce limit for total content of aromates. The implementation of norm will occur according to economic situation and approval of related directives and norms in EU.

HVO is produced by synthesis of molecule of hydrogen with molecule of fat. This process is associated with the reduction of the carbon compound. Different reactions may produce different products if hydrogen reacts with triglycerids (fats) (Figure 2). Properties of HVO are much closer to high quality diesel without sulphur content or to synthetic GTL diesel (Gas to Liquid) than to FAME.

Figure 2. Simplified scheme of inputs and outputs of esterification and hydrotreating for biofuel production



Source: Neste Oil Corporation, 2014

2. Materials and Methods

Raw materials for FAME and HVO production are compared from point of view resources and properties of final fuel product. Also costs and counting of GHG emission saving factors are taken into account from cultural point of view. Meaning of wastes, transport costs and release of stored carbon are structured according to intercultural indices (Hofstede, 2010), which are distinguished according to enculturating (PDI, IND, MAS, and UAI) and acculturating (LTO and indulgence) effect. Long term objectives (LTO) represent institutional, while indulgence instrumental attitudes of individuals. Expensive transport of cheap waste favours its local processing. Further, the need to sum up turnovers from product, by-product, and waste-product in calculation of circular economy has led to modification of portfolio matrixes and models (Table 4). C:N of macro nutrients can prevent climate warming of planet if balanced and waste is converted to products in circular economy oppose to cartel agreements of owners of raw materials in traditional economy.

FAME and diesel were considered as substitutes of HVO, while vegetable oil, biodimethyl ether, biodiethyleter and synthetic diesel as alternatives. Assortment of fossil fuels for diesel engines at Czech market is influenced by following properties of diesel:

- Diesel of B, D, and F class are distributed according to season of the year in temperate climate region.
- Arctic diesel of second class is distributed in arctic region throughout the year.
- FAME (Fatty acid Methyl Ester) pure biodiesel is abbreviated as B100 or Biodiesel.
- Blend of diesel with 30 % of FAME is abbreviated SMN 30, B30 or Biodiesel too.

Values of standard fuel properties are set in directives 2009/28/ES and 98/70/ES in current wording, especially 2009/30/ES. Both directives are implemented into national laws, especially to fuel law and air protection law.

3. Results and Discussion

Volume of produced biodiesel from waste animal fats (AFME – animal fat methyl esters) is about 2 %. Profitability of such methyl ester depends from more than 80 % of total production costs on price of fat. Therefore, producers are trying to decrease costs by processing of waste fats or non-edible fats. Difference in final biofuel production must not fell below values set by ČSN EN 14214 (FAME) for diesel engines. But AFME have troubles to comply with this norm. Especially, low temperature properties, carbonization of pistons shortens life cycle of engines if decarburization of pistons and nozzles is not done regularly. Waste animal fats can be bought from cafilerias and as by-product of fish, beef, pork, poultry meat processing from slaughter houses. Problems of fuel quality are solved if waste animal fat is processed by HVO instead of FAME technology (Baladincz and Hancsok, 2015) due to high cetane number, good low temperature properties and protection of nozzles (Table 3).

Table 3. Identification of factors from a list of competitive advantages HVO compared to FAME

FAME	HVO
Resources	
Vegetable oils (rapeseed, palm…)	Vegetable oils (rapeseed, palm…)
	Waste fats
	Waste vegetable oils
Properties	
GHG savings	GHG savings
Absence of sulphur	Absence of sulphur
Absence of polyaromatic hydrocarbons	Absence of polyaromatic hydrocarbons
	High cetane number
	Good low temperature properties
	No damage to nozzles

Source: Own processing

Traditional economy is shown by fossil fuel suppliers and by Malaysian palm oil producers who present burned tropical forests as GHG savings. Solar technologies are merging interests of both individuals and institutions. Technology of soybean and oil seed rape (OSR) processing are producing C, 73 % of GHG and protein. 80% dependence of EU on imported soybean protein for feed purposes was decreased to 50% when biofuels were supported as OSR skins contain high content of protein. Rows and columns of Table 3 are marked according to abbreviations of Hofstede's intercultural indices (Hofstede et al., 2010). Depending on development and culture, especially uncertainty avoidance (UAI) transfer of production to East Asia may reverse and HVO can be processed locally. If the infrastructure is innovatively rebuilt, than leading individuals (individualism – collectivism - IND) like Elon Musk, convince institutions to switch from liberal to innovative attitude. Large investments are always available for leaders of productivism (masculinity – femininity – MAS) who often collapse market infrastructure for short time usually. PDI (power distance) represents isolation between top and bottom of society, which allows to develop industry either fossil of biofuel one according to decision of politicians. Indulgence is positive extreme on bipolar scale opposing joy from harming of others. Culture of indulgence allows to entrepreneurs to come up with market solutions (Procházka, Smutka and Steininger, 2011).

Table 4. Culture and nutrition of alternatives transiting fuel economy from fossil to renewable

<table>
<tr><th></th><th colspan="2">LTO</th><th colspan="2">Indulgence</th></tr>
<tr><td></td><td>C (carbon)</td><td>GHG savings</td><td>Diversity</td><td>N (protein)</td></tr>
<tr><td>UAI</td><td></td><td colspan="2">AFME</td><td></td></tr>
<tr><td>IND</td><td></td><td colspan="2">Solar transport and household with support of solid fuels</td><td>DME, DEE</td></tr>
<tr><td>MAS</td><td></td><td>Synthetic diesel</td><td></td><td>Vegetable oil as fuel</td></tr>
<tr><td>PDI</td><td>Diesel</td><td colspan="3">FAME</td></tr>
<tr><td>Global</td><td colspan="4">HVO</td></tr>
</table>

Source: Own processing

Large PDI doesn't allow to reverse recent EU proposal of RED II closing down oilseed rape sector of biofuels, while indulgence allows entrepreneurs in USA to develop HVO. Global fuel companies have introduced HVO to global fuel markets recently without letting consumers to know about it to avoid cultural reaction. Consumers don't complain due to both GHG saving and feed protein production. Therefore, HVO is not blocked by cultures at global market. But, investors needn't take into account culture of country if product has positive externalities as local wastes processing not only renewable energy, GHG emissions savings but also for direct or indirect balancing of human diet and volume of food in circular economy.

4. Conclusion

The objective of this article was to specify period between introduction and decline of HVO market allowing global investors decide about investments into conversion of processing facilities from fossil to renewable economy. Derived ROI of HVO for investors is based on zero impact of culture at global markets if synergy effect of decreased GHG emissions and improved fuel quality. HVO is saving GHG emissions and producing missing N as at global markets it is not blocked by intercultural indices, while advanced technologies are ruined and exported with political approval at closed EU market. Will of institutions to innovate is stronger promoted in EU but less controlled in USA. The lacking control in USA didn't collapse advanced solar technologies emerging in one company (Vance, 2015). Localisation of waste collection will improve return of investments into HVO processing. Recent investments into FAME processing facilities stay competitive until food biomass will not be prohibited for biofuel use. AFME will not be processed by FAME processing facilities as its quality is not competitive with HVO. It was shown that HVO can convert any fat containing waste biomass to high quality fuel. Therefore, HVO may reach market share also in developing countries sooner than locally produced biobutanol. Vegetable oil, biodimethyl eter and biodiethyl eter will not be implemented as engine must be adapted and electricity will power vehicles sooner, especially in developing countries. Number of suppliers is evidence that HVO lobby is not needed. Shown relationship between listed properties and indulgence on market penetration by HVO may improve precision of forecasting if found in both the local or the global economy. Relationship between culture and physical properties for forecasting should be elaborated in future research. Explosiveness of hydrogen is limitation of local HVO processing. Still, small explosion is better than big one. This logic allows also to self-made ammunition.

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DOES SIZE MATTERS FOR CREATING INCOME AND VALUE ADDED? CASE STUDY OF INDIVIDUAL FARMERS IN THE CZECH REPUBLIC AND POLAND USING FADN DATA.

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Annotation: Although Czech Republic and Poland were part of the eastern Soviet bloc before 1989, system of agriculture production was different. Different historical development has effect on today's structure of agricultural production. Polish agriculture is characterised by high share of individual producers in the sector working on small plots. Individual producers in the Czech Republic utilise larger fields. Main aim of the contribution is to answer the question, whether Czech farmers are able to use advantages from economies of scale, secure higher income and create higher value added. Among secondary aims belong: (i) determination of main influencing factors of farm income and value added creation; (ii) proposition of possible strategies leading to increase in income and value added. Based on the gained results, it can be concluded: (i) there is a great variation in Polish agricultural holdings between different size groups; (ii) Czech agricultural holdings have much larger land resources compared to Polish farms; (iii) Polish agricultural farms are engaged in intensive agricultural production, while Czech farms in extensive production; (iv) polish farms achieve higher per hectare production and added value in all groups of farms, although Czech farms achieve higher income per farm and per labour input; (v) Czech farms in each group of farms achieve higher profitability of production thanks to economies of scale and specialization on low input and low value added production; (vi) net value added evince increasing trend among most size groups. Enhancing collective actions might belong among strategies how to improve competitiveness in EU as well as value added.

Key words: FADN, Czech Republic, Poland, individual farmers, family farms, value added, inverse relationship, economic size.

JEL classification: Q12, Q14

1. Introduction

Although Czech Republic and Poland were part of the eastern Soviet bloc before 1989, system of agriculture production was different. In the Czech Republic, agriculture went through collectivisation process and producer cooperatives of soviet type were established. After 1989, during the transformation processes, collectivised land was returned to its original owners. Some individuals decided to start their private farming activities both on returned and leased land (Chaplin, 2004). Different structure of Polish agriculture is given by differences in historical development after the 2nd World War. After 1947, Polish agricultural policy was slowly changed with the goal in collectivisation. Intensive collectivisation lasted until 1956, when the political leadership changed and new agricultural policy emerged. The importance of large production co-operatives was diminished, most of co-operative members left and started with individual production (Bański, 2009), that system survived until nowadays.

Table 1: Individual Agricultural Producers – Czech Republic, Poland (2005 – 2015)

		2005	**2009**	**2011**	**2013**	**2015**
Amount of farmers	CZ	29,318	29,430	26,609	26,076	25,473
	PL	1,782,300	1,765,900	1,651,700	1,502,474	1,404,933
Agricultural land (%)	CZ	26.40%	28.10%	28.20%	28.10%	27.00%
	PL	85.70%	87.80%	88.40%	90.80%	91.00%
Average size (ha)	CZ	32.7	34.9	36.8	39.2	37.1
	PL	7.6	8	8.3	10.34	10.35

Source: Czech and Polish Statistical Office, own processing

Different historical development has effect on today's structure of agricultural production. Polish agriculture is characterised by high share of individual producers working on small plots. Individual producers in the Czech Republic utilise larger fields. In both countries, individual farmers increased share on total agricultural land over last decade (Table 1). In 2015, Czech individual farmers cultivated about 27% of the total agricultural land and in Poland this value exceeded 90%. Czech producer cultivated in average 37.1 ha (13% increase in the period 2005 – 2015); while average Polish producers cultivated only 10.35 ha (34% increase in the period 2005 – 2015).

The situation raises a question, whether Czech farmers are able to use the advantages from economies of scale, secure higher incomes and create higher value added. Historically, value added was created by farmers through livestock production. More recently, farmers create value added through investments in processing facilities (Roe, 2005). Before the accession, family farms in Central-European countries had low production potential due to the limited land and capital resources (Erjavec et al., 2003). But as labour and land is becoming relatively expensive, those production factors are being replaced by capital as capital is relatively cheaper. But as capital could not be limitedly available for small farmers, they may be pushed to leave production of basic crop products (for example cereals) and consider new alternatives in the use of land instead (Omel and Värnik, 2009).

Polish producers face problem connected to limited amount of land in comparison to Czech producers. Based on the FADN data the article shall investigate whether Czech producers are better-off due to economies of scale or worse-off due to phenomenon called inverse relationship (IR). IR was originally defined in India, where negative connections between farm size and its corresponding activity was observed (Mahmood et al., 2014). No clear conclusion was observed in available literature connected to Central European region. Ženka et al. (2015) found higher labour productivity in Czech regions dominated by smaller farms, Gordon and Davidova (2004) found no evidence of corporate farms being less efficient than family farms; while Štolbová and Míčová (2012) concluded that large LFA farms were found to be more efficient than the small ones due to larger diversification of activities. Based on the gained knowledge, profitability and value added creation of smaller Polish and larger Czech family farmers will be examined using Farm Accountancy Data Network (FADN) data.

2. Materials and Methods

Main aim of the contribution is to answer the question, whether Czech farmers are able to use the advantages from economies of scale, secure higher incomes and create higher value added (main aim). Among secondary aims belong: (i) determination of main influencing factors of farm income and value added creation; (ii) proposition of possible strategies leading to increase in income and value added.

The article is divided into 2 main parts. First part presents theoretical and historical framework. The second part compares Czech and Polish individual producers, their effectiveness, outputs generating value added and other main structural differences. Authors sourced information from publications of Czech and Polish Ministry of Agriculture, Polish Central Statistical Office and publications and database of Czech/Polish Farm Accountancy Data Network focused on data of individual producers. Comparability of values is given by unified European methodology. FADN methodology classifies producers into 6 groups according to their economic size (ES6) measured by standard output. The analyses includes 5 largest groups: (G2) *small* (with standard output 8,000 ≤ € < 25,000); (G3) *medium-low* (25,000 ≤ € < 50,000); (G4) *medium-high* (50,000 ≤ € < 100,000); (G5) *large* (100,000 ≤ € < 500,000); (G6) *very large* (≥ 500,000). The smallest one (G1) is not included as relevant data are not collected in the Czech Republic and those farms are mainly operated for additional income and tax benefits in Poland.

The research is based on data from Czech and Polish FADN databases published by responsible national institutions: Czech Institute of Agricultural Economics and Information (UZEI) and Polish Institute of Agricultural and Food Economics – National Research Institute (ARiMR). For the purpose of this contribution following indicators were used: farm net value added per hectare (FADN code SE415); farm net income per hectare (SE420) and output profitability indicator calculated as family farm income per hectare (SE420) divided by total output per hectare (SE131). Farm net value added (FNVA) is understood as the main economic indicator that measures level of income and production efficiency of farmers as FNVA remunerate work, land and capital (paid or own fixed factors) allowing comparison of the farms no matter whether the production factors are coming of family or non-family sources (Hloušková, Lekešová and Slížka, 2014).

3. Results and Discussion

The demands of the market economy, international competition, accession to the European Union, but above all the expectations of the agro-food industry and consumers push the requirements not only in qualitative way but these factors also push effectiveness of agricultural production (Poczta and Wysocki, 2000). Thus, the article addresses the problem of the level of production efficiency in individual, sometimes also called family farms depending on their economic size in Poland and the Czech Republic, based on FADN data.

The basic premise for running agricultural commodity production is to obtain a sufficient income for the farmer's family. Implementing the above conditions requires adjusting the organization of the work process to conditions and available factors of production. Efficiency is reached by implementation of proven agricultural techniques into the farming process (Sawa, 2000). Positive results in efficiency ratios can be obtained by extensive, smallholder and intensive farms (high unit production and high inputs). However, due to the profitability of production, high fixed costs and the technological progress, expanding family farms with limited access to agricultural land must aim to maximize production and minimize expenditures (Wójcicki, 2001).

It is possible to observe large divergence between farms in particular size groups among Polish farms. There are not so many differences among Czech size groups (see Table 2). Czech individual farm are characterized by significantly higher utilised agricultural area (UAA) compared to Polish farmers of the same size group. In the largest group of farms (G6), Czech individual farmers hold more than 4.5 times more land. Share of rented land on total utilised area was larger in the Czech Republic, smallest farms rented almost 47% of UAA, very large farms rented 76%, while individual farmers rent between 18% (G2) and 37% (G5) of UAA land in Poland. Czech producers utilise larger areas and reach better productivity (yield/hectare) by low labour-intensive crops (i.e. cereals, maize, potatoes, etc.) as an effect of economies of scale. On contrary, their farm net value added and family farm income remains behind Polish producers.

In the groups (G2) and medium-sized farms (G3), labour input per farm (both paid and unpaid) is higher in Poland. Medium-high (G4), large (G5) and very large (G6) Polish farms evince smaller unpaid labour input (SE015), but simultaneously evince larger paid labour input (SE020) although significant difference in farm size exists.

Table 2: Selected standard indicators in individual farms in Poland and Czech FADN in 2014

SE CODE	ITEM	Unit	Small (G2)		Medium-low (G3)		Medium-high (G4)		Large (G5)		Very Large (G6)	
			8<€<25		25<€<50		50<€<100		100<€<500		€> 500	
			CZ	PL	CZ	PL	CZ	PL	CZ	PL	CZ	PL
SE015	Unpaid labour input	FWU	1.33	1.55	1.60	1.80	1.93	1.91	2.19	1.93	2.65	1.89
SE020	Paid labour input	AWU	0.02	0.10	0.13	0.19	0.26	0.47	1.45	1.77	6.07	8.62
SE025	Total utilised agricultural area	Ha	28.5	14.9	43.5	26.8	74.7	44.9	191.5	87.5	512.7	111.0
SE030	Rented U.A.A.	Ha	13.3	2.7	22.6	7.0	41.5	14.1	128.9	32.0	390.9	24.4
SE120	Stocking density	LU/ha	0.48	1.21	0.52	1.71	0.61	1.75	0.59	1.30	0.88	6.18
SE131	**Total Output**	**EUR/ha**	**641.0**	**1,155**	**847.9**	**1,552**	**945.4**	**1,952**	**1,067**	**3,088**	**1,352**	**7,769**
SE135	Total outp. – crop & crop prod.	EUR/ha	331.9	673.5	528.3	721.7	657.6	882	801	1,254	1,059	1,348
SE206	Total outp. – livestock & lives. prod.	EUR/ha	239.5	465.9	247.0	817.9	260.0	1,060	247.1	1,821	286.2	6,418
SE256	Other output	EUR/ha	69.6	15.3	72.6	12.4	27.8	9.5	18.7	12.5	7.4	3.9
SE275	Total intermediate consumption	EUR/ha	569.6	754.9	626.9	966.0	666.2	1,207	685.8	2,076	805.3	5,759
SE281	Total specific costs	EUR/ha	284.7	484.1	323.3	672.8	370.8	886.5	396.3	1,682	510.2	5,093
SE336	Total farming overheads	EUR/ha	284.9	270.9	303.5	293.1	295.4	320.5	289.4	392.2	295.2	666.6
SE360	Depreciation	EUR/ha	189.4	252.9	171.8	257.6	165.9	264.1	132.4	265.7	87.6	485.0
SE410	Gross farm income	EUR/ha	549.1	699.6	635.1	877.8	659.2	1,034	745.2	1,306	851.2	2,243
SE415	**Farm net value addend**	**EUR/ha**	**359.8**	**446.8**	**463.3**	**620.2**	**493.3**	**769.9**	**612.8**	**1,042**	**763.6**	**1,758**
SE420	**Family farm income**	**EUR/ha**	**331.2**	**392.1**	**432.2**	**555.9**	**412.7**	**678.9**	**486.3**	**876.6**	**586.0**	**1,280**
	output profitability indicator		52%	34%	51%	36%	44%	35%	46%	28%	43%	17%
	Family Farm Income per labour input (FWU+AWU)	EUR	6991	3541	10869	7487	14080	12809	25576	20731	34453	13726

Source: Own processing based on CZ and PL FADN data

Based on available data it can concluded, that intensive agricultural production and higher labour input can be explained by significantly higher stocking density (SE120), total production (SE131) as well as production costs per hectare (SE275+281+336+360). In comparison to Poland, Czech family farms has characteristics of extensive agriculture production.

Polish agricultural holdings also achieve higher farm net value added and family farm income per hectare of UAA. The smallest per hectare difference in value added (SE415) is observed among smaller group. For 2 largest groups value added is doubled in Poland. Although Polish farmers evince much higher production intensity, their profitability ratio is smaller in all types of farms. This is explained by significantly higher costs of agricultural production. In the group of small farms (G2), Czech farmers evince by 33% lower per hectare costs, about 1.392 euro compared to 1.763 euro. But among the smallest farmers difference is the smallest. As size goes up, difference increases. Largest farmers evince 6 times higher total costs. Czech producers slightly increases total costs as size goes up, but total increase was only 369 EUR in 2014. On contrary, per hectare costs increased from EUR 1763 by small farms to 12,000 EUR by very large farms.

Polish farmers has higher depreciation costs and intermediate consumption. Much cheaper production costs of the Czech farm are undoubtedly due to a larger scale of production. Czech farmers does not need to specialize in intensive production, as extensive approach secures reasonable income for less work. On contrary, farmers need to run intensive production to gain acceptable income from smaller farms in Poland. Although Polish farms are characterized by higher production intensity, the Czech farms evince higher output profitability. Therefore it can be stated that economically more efficient farms are able to generate greater economic surpluses. Presented results are not only influenced by significantly larger portion of livestock production in Polish agriculture (SE206), but is also influenced by the fact, that Polish farmers are able to outreach Czech output at crop production (SE135). In both countries, producers focus mainly on cereals and oil-seed crops. Besides that, Polish producers focus on cultivation of fruit and vegetable, while Czech producers harvest rather forage crops or sugar beet. Polish advantage is also determined by large areas under accessible cover (glasshouses, frames and plastic tunnels). In 2011, 5,148 ha were covered in Poland (0.03% of agricultural land), while only 49 ha (0.001% of agricultural land) in the Czech Republic. More labour- intensive production (mostly vegetables and fruit) also increase possibilities of direct sales to final consumers. For example, in Poland, farmer markets exists for decades and their tradition was not really interrupted. Almost on everyday bases farmers come to cities and sell their products all year long (mainly fruits and vegetables or partially processed products).

From the mid-term perspective (table 3) it is observed, only small (G2) and medium low (G3) farms face negative trend in net value added development, in other groups net value added has increasing trend. Although the trend description has low index of determination for Polish G3, the smallest producers (G2) clearly face negative development trend.

Table 3: Net Value Added, euro/ha

EUR/ha	**2010**	**2011**	**2012**	**2013**	**2014**	**Y (linear)**	**R^2**
Small (G2); CZ	317	348	-262	416	360	15.358x+189.74	0.007
Small (G2); PL	600	639	630	513	447	-43.158x+695	0.676
Medium low (G3); CZ	383	409	430	451	463	20.185x+366.72	0.986
Medium low (G3); PL	651	705	712	677	620	-8.9256x+699.88	0.136
Medium high (G4); CZ	399	512	521	528	493	20.552x+429.11	0.375
Medium high (G4); PL	730	799	818	802	770	8.3095x+758.85	0.143
Large (G5); CZ	432	569	632	622	613	41.385x+449.4	0.629
Large (G5); PL	909	988	1,023	1,127	1,042	40.316x+896.91	0.649
Very large (G6); CZ	501	544	750	816	764	79.786x+435.54	0.786
Very large (G6); PL	1,525	1,735	1,689	2,694	1,758	142.42x+1452.29	0.235

Source: Own processing based on CZ and PL FADN data

4. Conclusion

Based on the gained results, it can be concluded:

- There is a great variation in Polish agricultural holdings between different size groups.
- Czech agricultural holdings have much larger land resources compared to Polish farms.
- Polish agricultural farms are engaged in intensive agricultural production, while Czech farms in extensive production.
- Polish farms achieve higher per hectare production and added value in all groups of farms, although Czech farms achieve higher income per farm and per labour input.
- Czech farms in each group of farms achieve higher profitability of production thanks to economies of scale and specialization on low input and low value added production.
- Net value added evince increasing trend among most size groups. There is not clear evidence why net value added has decreasing trend among G2 a G3 in Poland.

According to Klepacki (2006), amount of farm is important to exploit economies of scale, reduce production costs and improve product quality and competitiveness, which subsequently effects income of agricultural families. Klepacki's statement could be proved by presented results. Farm income (SE420 per farm) is larger in the case of Czech farmers, although total output and value added is smaller. From that perspective it can be concluded that Czech producers specialized in low input agricultural production (wheat, oilseed rape, corn) and gained competitiveness on European level (Kotyza and Slaboch, 2014). On contrary Polish producers are still focused on high input production which leads toward competiveness in higher value added products (Slaboch and Kotyza, 2016). But simultaneously inverse relationship theory can be supported. Polish smaller farms where gained higher gross expenditures and higher gross returns similarly to Pakistani example (Mahmood et al., 2014).

From short-term perspective it can be stated, that Czech producers are employing profit benefit maximization strategy, where they left input intensive production and specialized in low vale added and low labour demanding operations. Due to their land availability farmers can afford this kind of specialization. While in Czech Republic farmers made this decision more or less voluntarily, in Poland higher value added was the only possibility how to secure convenient income. But was Czech decision correct? Can low value added production secure farmers needs also in long-run, mainly under discussions about changes in financing the Common Agricultural Policy?

In both countries farmers miss integration in co-operative structures, such as common purchasing, bargaining, marketing or processing. These kind of individual actions are time consuming and therefore not effective on the farm level, not speaking about marker failures and oligopolistic structure of purchasing and processing industry. In both countries this strategy could further improve value added and increase competitiveness on the European market (Huml, Vokačova and Kala, 2011). Although in Poland join actions are supported from Rural Development programme (Czubak and Bajan, 2016), no significant results are observed (Kotyza, 2016).

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CHALLENGES AND OPPORTUNITIES FOR RURAL SLOVAK WOMEN IN AGRIBUSINESS

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Annotation: The submitted scientific paper is focused on the research of circumstances in which Slovak women conduct business in the fields of agriculture and rural development. The major objective of the paper is to evaluate the status of the agricultural entrepreneurial environment in the Slovak Republic, with concentration on business entities owned by women or for which they act in managerial positions. An additional objective is to define the position of rural women in the frame of the Slovak agribusiness environment. The data are obtained from our own research carried out through a questionnaire survey. This survey was implemented at 34 companies in which rural women are carrying out their own businesses. Results were analysed using statistical methods (Friedman test). Outcomes of the research state that rural women feel insufficient support both from the state and from the European Union. The majority of women-owned businesses belong to the category of micro-companies or small companies (according to number of employees). The legal form of business is first of all about individual farming. The women in these businesses prefer crop production, and they conduct this business on leased land, which corresponds with the overall situation and tendencies in the Slovak agricultural sector.

Key words: agriculture, agribusiness, opportunities, rural development, rural women

JEL classification: J160, Q10

1. Introduction

The number of women worldwide who are acting as managers is significantly smaller in comparison with men, even though this number is gradually rising and many measures have been taken in order to improve the status quo. Despite this, even in the field of agriculture and rural development we can find rural women who are excellent and well-known businesswomen. In Europe, there are more men involved in entrepreneurial positions than women. According to the European Commission (2009), entrepreneurs make up about 8% of the female labour force compared to 16% of men. Nevertheless, women have managed to have a high level of qualification over the last decades and have gained their principal positions in economics, politics, education, science, etc. Schneiderová (2012) states that never before have there been so many female staff members and so much female potential in the leadership market as today, and the growth still continues. Today more women than men are coming out of universities and colleges, often even with better educational credentials.

To analyse and evaluate the position of rural women as entrepreneurs is demanding, since comparable international data are still lacking. This includes information about the number of businesses owned and controlled by women across countries, as well as the size of entities managed by them, sectorial specialization, basic performance measures, etc. This is mainly due to the fact that specific surveys related to data collection for females have not been carried out; additionally, there are difficulties in retrieving information about owners from standard business demography statistics, and there is an absence of international definitions of male and female-owned enterprises (OECD, 2012).

In Slovakia, women's involvement in business activities is visibly increasing. The representation of women in business activities ranges from 20–25% of the total number of businessmen. In general, women start their professional careers as self-employed; they continuously develop their own business potential and create new job opportunities for others, and gradually they are successfully implementing their business. Strážovská (2010) claims that undoubtedly we can integrate women-dominated businesses into the category of small businesses. From the point of view of global importance, small companies play an especially important role within national economies. So we can state that in this sense women may play a crucial role at the level of societal development.

Women working in agriculture can act as independent farmers, or they can hold management positions, representing both the physical and administrative workforce. Women choose agriculture for their profession because their family owns a farm and they have to be involved in the production cycle. Another reason to work in farming stems from the fact that rural woman often have no other employment opportunities. According to Lukeš (2005), it is important for women that the management of their own farms fulfils all the prerequisites necessary to take into account their family life. In this connection, women have a positive perception of the work flexibility due to the enterprise's being their own business entity, and they appreciate the independence, feel job satisfaction if the business is going well, experience personal growth, and enjoy the income and prestige. Some women initiate a business because they have a "good idea", others because of job dissatisfaction, or they are jobless. Other women start with an individual business and eventually initiate a partnership or joint business, or they become part of a family business. Sometimes it is their own decision to start a business because they themselves or other family members are unemployed.

The main objective of this paper is to evaluate the position of rural women in the sectors of agriculture and rural areas and to point out the entrepreneurial environment in the Slovak Republic with concentration on the agri-food companies in which the women are owners or acting in managerial positions.

2. Materials and Methods

The research data are obtained from our own research carried out through a questionnaire survey, which was implemented in 34 agricultural entities in which Slovak women are conducting their own businesses. They represent companies from the whole of Slovakia. The selected sample of enterprises includes micro-, small-, and medium-sized enterprises. Micro enterprises were in the selected sample 64.7%, small enterprises were 26.5% and medium-size were 8.8%. The form of their business is mainly a self-employed farming operation - 44.1%, a cooperative - 20.6%, or a limited liability company - 23.5%. Businesses are mainly aimed at crop and animal production but are also doing business in agro-tourism and the provision of services.

Other data are obtained from Food and Agriculture Organization, Organization for Economic Cooperation and Development, Eurostat, and International Labour Organization. For the purpose of evaluating the results of the questionnaire survey, methods of scientific analysis and synthesis were used, including the Friedman test for statistical analysis.

Friedman Test

In order to compare a few basic files based on dependent sample files, assuming the normal distribution of basic files, the Friedman test is a good method. The Friedman test consists of arranging the observation on each block separately and determining the order of Tij values ij x within the i block. The relationship is valid:

$$\sum_{i=1}^{n}\sum_{j=1}^{k} T_{ij} = \frac{nk\,(k+1)}{2} \tag{1}$$

It was used for the following relationship as the test criterion:

$$Q = \frac{12}{nk\,(k+1)} * \sum_{j=1}^{k}\left(\sum_{i=1}^{n} T_{ij}\right)^{2} - 3n\,(k+1) \tag{2}$$

which has for hypothesis H0 asymptotically 2 χ – distribution with k - 1 degrees of freedom.

The tested hypothesis H0 is rejected at the level of significance α if the value of the test criterion Q $\geq \chi 2a$ (k-1), where $\chi 2a$ (k-1) are critical values $\chi 2$ distribution with k - 1 degrees of freedom.

3. Results and Discussion

Doing Business as Rural Women

For women to conduct business is not a simple task, which is true for Slovakia as for the entire world. It is harder for women to devote themselves to their own businesses because they additionally have to take care of families and especially of children, for whom they are usually the primary caregivers. Even in contemporary society the prejudice remains that women should be devoted to households and men should provide the main source of family income. Particularly in rural areas this opinion is firmly established, although we can say that in the last six decades the situation has slowly changed. Owing to this fact, even in Slovakia we can find a number of women who are acting as entrepreneurs and successful managers.

Women own less land and smaller farms than men. The smallest proportion of women as a farm owner is in the Netherlands, at 6%, and the highest in Lithuania, up to 50%, which shows that in the latter country women have good conditions for doing business in agriculture. In Slovakia, 18% of women are the owners or managers of farms. On average, women hold smaller farms than men, not only in terms of hectares of land, but also from an economic and social point of view (turnover, number of employees). The average size of farms owned by men in Europe was 12.88 hectares in 2010, with only 5.84 hectares of farmland on average owned by women. Regarding economic size, male-owned farms in Europe in 2010 had an average turnover of EUR 24,275, and women-owned farms had a turnover of EUR 8,846 (European Commission, 2011).

Women Entrepreneurs in the Agricultural and Rural Development Sector

From the results of our questionnaire survey, it was found that Slovak women in the agricultural business as a rule have a university degree, mainly from the branches of agricultural studies, such as crop production, animal production, agricultural economics, farm management, etc. The age of businesswomen is between 40–60 years, and they tend to do their business as individual farmers, which gives them independence that is highly appreciated. The size of their businesses is mostly considered to be micro-enterprises or small enterprises. They prefer to work in the field of crop production, but on rented land, with an average area of 370 hectares. This is significantly higher as represents the average of female farms in Europe, (5.84 hectares). It can be the result of the transition process when state farms had been privatized, or when some parts of cooperative farms had been broken into smaller independent units.

Women in the field of agriculture have respectful experience with farming, which is probably due to their higher age, which resulting from a questionnaire survey, and number of years linked to their practical experience. Respondents to our survey reported an average of 21 years of practical skills in agriculture. The average number of years of business practice or in a management position is a bit lower (12 years). The diversification of production on female-managed farms is generally low. The farms led by women have achieved moderate profitability in terms of business results. Farming for these women usually means the continuation of family traditions. However, farm management for rural women is not easy, and according to answers from the questionnaire, if these women were to start a business again, most likely they would select a different business area. While it may seem that women are not involved in larger program or project activities, such as those funded by the European Union, this assumption is incorrect. Respondents reported leading a number of projects, through which new innovation strategies have been introduced. In this case, the female project participants would appreciate that the tendering process for project approval be more transparent and administratively less demanding.

When looking at the issue of gender inequality, rural women in business do not feel any discrimination, and they also ignore some statements with regard to there being a gender gap in business negotiations; however, they do feel that they have limited skills in the processes of negotiation. Our group of respondents is not in line with the idea that gender issues have an effect on subsidy allocations or on obtaining other various forms of support or loans from government. What they actually do feel is that representatives of various institutions are dealing with them in a more polite way in comparison with men. Women are also considering themselves as emancipated in their families and in society. Here it must be highlighted that this is expressed despite an awareness that the gender pay gap was 13.4% in 2015 and that women occupy only 29 seats out of 150 seats in the Slovak National Council. However, rural women claim that men in general underestimate their physical and intellectual predisposition to become successful entrepreneurs and also tend to see women as individuals who have to take care of their families rather than function as equal business partners.

Opportunities and Threats for Businesswomen in Agriculture

In the questionnaire survey, women from the sample of companies were asked what business threats they consider as the biggest and which opportunities they see as the most supportive for developing their future business opportunities. For these questions, respondents selected from several statements to which they could assign a value from 1 to 5, with 1 being the smallest threat and 5 the greatest threat; for opportunities, 1 meant fully agree and 5 meant totally disagree.

To find out which opportunities and threats the respondents considered to be the most important, the answers were evaluated by the Friedman test. This calculation helped to find if there were any differences between respondents' perceptions of individual threats. For the resolution of this issue, it was necessary to establish the following hypotheses.

H0: There is no difference in perceived threats.

H1: There is a difference in perceived threats.

The results are demonstrated in Table 1.

The P-value is compared with $\alpha = 0.05$. As shown in the table, p-value $<\alpha$, meaning that H0 is rejected and H1 is accepted. This means that there are significant differences in the perception of individual threats.

Table 1. The evaluation of business threats by Friedman test

Q (Observed value)	38,0572
Q (Critical value)	15,5073
DF	8
p-value (Two-tailed)	<0,0001
Alpha	0,05

Source: SAS, own calculation

Table 2 shows which threats the respondents consider to be the smallest and largest.

Table 2. Summary statistics on business threats for rural businesswomen

Variable	Mean	Std. deviation	Mode	Median
Competition	2,9118	1,2155	3	3
Absence of subsides	3,6471	1,2031	3	4
Tendency of declining in agriculture	3,5588	1,3527	5	4
Insufficient state support	4,0000	1,1807	5	4
Climate changes	3,3529	0,9173	3	3
Lack of arable land	2,6176	1,3710	3	2,5
Lack of workforce	3,6176	1,3487	5	4
Fluctuating price development	3,7941	1,2255	5	4
Adverse natural conditions	3,1176	0,9134	3	3

Source: SAS, own calculation

As the biggest threats, rural businesswomen identified insufficient state support, lack of a young workforce, and volatile price developments. On the other hand, they identified competition and lack of arable land as the smallest threats. The modus is the most frequently answered answer; for example, competition was rated by the highest number of respondents by the number 3. The median represents the mean, where half of the respondents evaluated competition worse than 3 and half better than 3.

For opportunities, the same approach was used, as shown in Table 3. Friedman's test was applied in order to find out whether there is a difference in the perception of individual opportunities. P-value <α, meaning that the zero hypothesis is rejected, so there are significant differences in the perception of individual opportunities. This is further analysed in Table 4.

Table 3. Evaluation of business opportunities by Friedman test

Q (Observed value)	16,9872
Q (Critical value)	9,4877
DF	4
p-value (Two-tailed)	0,0019
Alpha	0,05

Source: SAS, own calculation

For the best opportunities, the respondents identified larger national financial support and the arrival of a young qualified generation to the sectors of agriculture and rural development. The least attractive opportunity seems to be organic farming, despite the well-known fact that the best results in this field are achieved by women in Slovakia. This attitude may reflect the fact that the consumption of organic farming products is lower, owing to a less developed market and high (unaffordable) prices for consumers.

Table 4. Summary statistics on the opportunities for doing business by rural women

Variable	Mean	Std. deviation	Mode	Median
Involvement in EU projects	2,4118	1,2090	3	3
Greater national financial support	1,8824	1,0945	1	1
Diversification of activities	2,6471	1,3230	3	3
Organic farming	2,9706	1,3814	3	3
Arrival of young qualified generation	2,1765	1,2178	1	2

Source SAS, own calculation

Strengths and Weaknesses of Businesswomen in Agriculture and in Rural Areas

The strengths of businesswomen in agriculture and in rural areas stem from their passion for nature, indicated by 32 out of 34 respondents. The women also considered their strengths to be sound organizational skills (31 respondents), good communication skills (30 respondents), and flexibility (30 respondents). The skill for lobbying was defined to be the weakest business ability; 23 respondents expressed that they feel weakness in this area. This refers to business meetings with suppliers of agricultural inputs, as well as with purchasers of farm outputs. This is in line with a statement of Kadlečíková (2011), who claims that women's business strengths are the following: women are more independent than men, they have good communication skills, they are good organizers, and they have a capacity to motivate people in a positive way. In addition to this, according to our findings women are demonstrably more responsible, and they tend to achieve higher education than men, who prefer to immediately start with business.

For women who deal with business activities in the fields of agriculture and in rural areas, the most significant weaknesses they indicated were an overall unfavourable environment for entrepreneurship, insufficient financial support from the Ministry of Agriculture and Rural Development, limited capital, difficult access to land, and the lack of a young workforce.

One of the meaningful findings from the survey is that women are starting to be active in public life and they try to influence the improvement of the business environment for young farmers and small farmers, and to play an active role in the preparation of new legislation affecting agriculture and rural areas. Examples include networks such as the Rural Platform, rural parliament, young farmers' associations, etc., in which the main leaders are very devoted young rural women with their own businesses. The network Rural Platform is organized according to needs, such as well-publicized roundtables, where resolutions are sought for certain challenging issues. From their own initiatives it was accepted that there be a change in the Constitution related to the protection of land as a natural resource and not treated as a trade commodity.

4. Conclusion

Across countries, there are more male than female entrepreneurs, and the share of women who choose to run a business has not increased substantially in a number of states. The significant number of newly created female-owned entities fell during the financial and global economic crises in the period of 2008–2011. This was linked to the fact that women are managing smaller farms than men, and in general during the financial crisis the most fragile agricultural enterprises in terms of bankruptcy were the smallest ones. This effect was so strong that the number of women farm owners or managers dropped from 18% in 2010 to 10% in 2015.

Women´s entrepreneurship policies are often simply conceived as a subset of policies for start-ups and for very small firms. The assumption that female business owners want to stay small is misleading for policy. There is a substantial pool of women who are eagerly pursuing growth strategies for their companies (Gatewood et al., 2009). A stronger focus should be placed on instruments that can help female businesses to realize their aspiration for growth. Examples of growth-focused initiatives for female-owned enterprises of all sizes would be: favourable lending ceilings and public credit guarantees; rules ensuring that small, female-owned firms have access to public procurement; and tax credit schemes for capital investments.

If rural women were to be more involved in agriculture and rural development, this could lead to an improvement in their social and political status, as well as having a positive effect on their family's well-being. No less important is the fact that this would lead to new job opportunities, to increased employment in rural areas, and to economic growth. But on the other hand, an unexpected event for example a health crisis in family, increases the demand for labor provided by women, thus making them more time poor. The model and numerical simulations show that a deterioration in a woman's time constraint will have an adverse effect on agricultural output of the household. This occurs because most women respond to an increase in household work by reducing their work hours on the farm and by reducing their leisure time. The latter outcome is expected to have a negative effect on women's physical and mental health, which will then cause a decline in their productivity on the farm (Arora, 2016).

Therefore, it is necessary to provide rural women with the required space for self-realization, in order to ensure for them lifelong education, including refreshment and informative courses, with the aim of supporting rural women's involvement in EU program activities, as well as supporting innovative knowledge-based initiatives and strengthening their roles as the creators of economic, productive, social, and cultural values.

In general, businesswomen have higher levels of educational attainment in comparison with men, but it has to be acknowledged also that their overall experience in managing a business is more moderate. Women often have different reasons than men for starting a business. More women than men become entrepreneurs because of necessity, e.g. through heritage, unemployment, family situations, etc. Women who take care of families and children appreciate the flexible work hours that are afforded by self-employment. Another reason for women to start their own business is the fact that as employees they earn significantly less than men. According to study did by Sörensson (2017), many of the businesswomen own and operate their businesses themselves and have done so for a long time, often for more than 10 years. One of the main reasons why they started their own business is independence, as well as a keen interest in what they are doing.

Another opportunity for women to be successfully grounded on their own business activities is to find their place in the public sector, for example in politics, and through this to have a higher and more targeted influence on the formation of the business environment both for men and women and to influence the overall better status of rural women.

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MILK PRODUCTION EFFICIENCY EVALUATION

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Annotation: An aim of the paper was to compare a level of milk production in the Czech Republic and the European Union since 2007. Further also an evaluation of mutual relations between inputs and outputs in dairy cow breeding with use of selective groups of agricultural enterprises within the EU and the CR. The CR is represented by a set of selected plants from the region Vysočina, Pardubice and Hradec Králové which constitutes 35 % of nation-wide milk production.

For comparability of input, data for calculations regardless of the size of enterprises in the production of milk were obtained, absolute data are converted to a common base of 100 days of feeding cows. Panel data were evaluated by Statistics program. As a variable was considered in the calculation of milk production, as well as significant cost items such as feed costs and interdependencies between variables are expressed as means of production and cost functions.

A development of milk production in the CR and the EU since 2007 is almost identical according to a calculated growth rate from a view-point of comparability of results. Also after cancellation of milk quotas in 2015 there is a slight production increase within the EU.

In the framework of the set of enterprises in the EU, the decisive part of producers is distributed with milk yields 7 - 10 thousands kg with expenses for feeds 5-15 cents per kg of milk production. In the CR for the mentioned level of expenses for feeds the reached production moves in a range 6-10 thousand kg with a wider dispersion of values.

On base of testing within all regression functions, a close dependence has been proved among the monitored parameters.

From the carried analysis of relations between expenses for feeds and milk production can be supposed an effort of agricultural enterprises to reduce significant cost items including to expenses for feeds for reaching of favourable competitiveness of the own production because purchase mil prices within the EU will further converge.

Key words: cow, milk production, feed cost, Czech Republic, European Union

JEL classification: Q12

1. Introduction

Ongoing production improvement is essential for all business enterprises in competitive markets. The competitiveness of the European agriculture is strong. The number of dairy cows has been significantly reduced after the EU accession (Špička and Machek, 2015).

Specialized farms are technologically demanding. Farms with the specialized milk production do not have the same significance across the EU (Špička and Machek, 2015). During the first years, it has been especially due to the increasing milk yields under the applied quota system. During last three years, it has been influenced by the decreasing profitability, particularly in 2009 during an extreme decline of the FGP of milk (Doucha, Foltýn and Humpál, 2012). High costs of the compliance with the acquis determined to a large extent the development of the dairy sector at all levels of the market chain. Consequently, new development opportunities appeared with joining the EU common market (Ratinge and Boušková, 2013).

The monitoring of the production economy is an essential part of the farm management of dairy cows and the condition of achieving the maximum income from inputs (Lawson et al., 2004). Improving the economic results requires knowledge of current production and economic indicators (Kvapilík, 2006). The negative relation to the competitiveness was observed for the feed costs, labour costs, repairs and service costs, depreciation, other direct costs (Michaličkova et al., 2015). The value of the individual costs items should be reasonably drawn with respect to the production and other economic indicators to reach the rational consumption of inputs (Michaličkova et al., 2014). Functional traits of cattle (such as health, reproduction, and survival traits) and feed efficiency traits generally have substantial effect on profitability because they influence utilization of inputs in the production process (Solkner et al., 2000; Krupová et al., 2015).

Thus, producers should monitor profit margins rather than milk income or feed costs to predict profitability. Milk production is often monitored because a higher milk production equates to a higher milk income. However, monitoring of the gross milk income per cow alone does not provide a good estimate of cash flow or profitability, especially when feed costs are high (Buza et al., 2014).

The economic efficiency of dairy farms can be improved substantially by adopting optimal nutritional grouping strategies for lactating cows. These strategies promote more precise feeding with increased productivity and lowered feed costs (Cabrera and Kalantari, 2015). The aim of the economic assessment of feed is to stimulate the production of only high-quality feed and thus to increase the production capacity of the animals (Zeman, 2006), as feed is the largest cost item of milking cows. Their amount, apart from the costs per hectare, mainly affects the yields and the quality of the crops, the harvest and storage losses etc. (Kvapilík, 2010).

The management of cattle is a decisive tool for the achievement of full production and the greatest efficiency of the breed due to the impact of the environment on the resulting performance and animal health (Bouška, Sedmíková and Jílek, 2006). Minimizing the health care needs of dairy cows is important from both economic and animal welfare points of view. Diseases such as mastitis, displaced abomasum, ketosis, cystic, ovaries, metritis, and lameness severely affect the profitability of dairying through increased veterinary treatments, additional labor, lost milk sales, and involuntary culling (Zwald et al., 2004, Becker, Heins and Hansen, 2012).

2. Materials and Methods

Data from the Czech Statistical Office (CzSO), Czech-Moravian Breeders Association (CMBA), European Statistics (EUROSTAT) and European Dairy Farmers (EDF) are used as a source of data for the overall assessment of cattle breeding in the Czech Republic and the EU.

Own costs of dairy cows were surveyed for calendar years 2009-2014 through questionnaire surveys. The methodology was used for comparison with the values of Research Institute of Animal Production (RIAP) (according to Kvapilík (2010)) and Institute of Agricultural Economics and Information (IAEI). The cost of the EU was used in the EDF questionnaire. The number of data evaluated in the regression analysis in the Czech Republic was 525 data and the EU was 1,803 data. The conversion of the data to the euro used a rate of CZK 27 per euro.

Basic indices describe the development of the indicator relative to the fixed base period.

Chain indexes (growth factors) reflect changes in the indicator relative to the previous period.

The average growth coefficient is then expressed as the geometric mean of each growth temp.

It is therefore possible to compare the development of selected indicators with the coefficient of growth.

Regression analysis can be used to examine the dependence of quantitative characters on variables. This is a summary of statistical methods and procedures used to estimate values or mean values of variables that correspond to given values of other variables based on sample survey data. Through the regression we can characterize the influence of changes of the independent variables on the theoretical level of the dependent variable.

3. Results and Discussion

Analysis of the dairy cow development in the EU and the Czech Republic

The European Union has a share of 8.7% of world dairy cows. Compared to other countries, the European Union achieved a growth rate of 98.87% over the projection horizon by 2012. This downward trend continued**,** and by 2015 the rate of growth has declined to 97.32%, with conditions declining between 2007 and 2015 and dairy cows by 692 thousand pieces. The decrease was caused by the introduction of quotas for milk production and increasing cow yields. For 2007, the performance was 6,931kg/head, and by 2015 it was 962 kg more to 7,893kg/head which represents a growth rate of 101.6%.

Within the monitored period, the growth rate for the European Union 15 was 100.4% which was due to the regulation of milk production through milk quotas. On the other hand, for the European Union 13, the growth rate decreased to 97.3%.

In the Czech Republic, since 2007, the number of the dairy cows had been decreasing until 2012 when they experienced a reduction of 40.2 thousand units during this period, a 10% decrease compared to 2007. Only in 2013 there was a slight increase in dairy cows. It was an increase of 8.2 thousand units. Compared to 2012, the increase was 2.2% when compared to 2012. Since 2014, the number of states has fallen to 369 thousand. Within the monitored period 2007 - 2015, the growth rate was 98.8%. The Czech Republic ranks 13th place in the number of dairy cows within the EU.

The yield of dairy cows in the monitored period showed a significant increase as in 2007 milk production on dairy cows was 6,548 kg/head and in 2015 the yield of dairy cows was 8,001 kg/head. The yield of dairy cows in the Czech Republic experienced a growth rate of 102.5% which was 0.9% higher in the Czech Republic compared to the EU growth rate for dairy yields.

Analysis of milk production in the EU and the CZ

Table 1 shows that milk of dairy cattle production fluctuates in the monitored period. The largest milk production was achieved in 2014 in the volume of 159.1 million tons. Since 2007, therefore, production had increased by 11.3 million tons of milk, an increase of 6.9% in 2014 compared to 2007.

Table 1. Milk production in the EU

	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
EU (mil.tons)	148.849	149.284	147.649	148.273	150.516	150.940	152.301	159.136
Base index (2007=1)	1.000	1.003	0.992	0.996	1.011	1.014	1.023	1.069
Chain index		1.003	0.989	1.004	1.015	1.003	1.009	1.045
Growth rate								1.010

Source: EUROSTAT

Small fluctuations in milk production due to the introduction of milk quotas regulate milk production. This regulatory instrument was introduced in 1984 and ended in 2015. Quotas and penalties linked to overproduction of milk have resulted in milk production without major fluctuations. Therefore, the growth rate was 101% in the monitored period. This 1% was due to an annual moderate increase in milk quotas. According to the Table 2, it is clear that the Czech Republic ranks among the smaller milk producers within the European Union. The Czech Republic ranks on 15th place in the EU 28 dairy production.

Table 2. Milk production in the Czech Republic

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Milk production (mil.t)	2.756	2.802	2.781	2.683	2.736	2.815	2.850	2.933	3.026
Base index (2007=1)	1	1.016	1.009	0.973	0.993	1.021	1.034	1.064	1.098
Chain index		1.016	0.993	0.965	1.02	1.029	1.012	1.029	1.032
Growth rate									1.012

Source: CzSO, CMBA

Production of cow's milk in the Czech Republic has fluctuated over the monitored period. The lowest milk production during this period was by 3.5% lower in 2010 than in the previous year.

Since 2011 there has been a turnover and 2% increase in production year by year. The highest milk production was achieved in 2015 with a volume of 2.946 million liters of milk. Compared to 2007, 262 million liters of cow's milk were produced in 2015, an increase of 9.8% the reporting period. The average growth rate of cows' milk production in the Czech Republic was 101.2%.

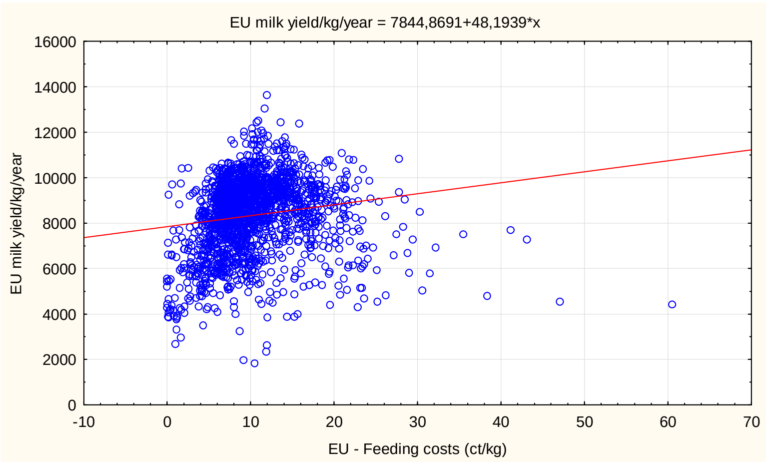
Analysis of milk production economy in the EU and the CR

Analysis of milk production economy is based on the evaluation of the mutual relations between inputs and outputs of the production process of dairy cows. One possibility of expressing this relationship is the production function where the independent variable is the consumption of feed and the dependent variable of the milk production on the cow. The analytical and graphical form is represented by the EU file in the Figure 1 and for the Czech Republic in the Table 3.

Production function of the EU

From the Figure 1, an accumulation of producers can be found within the feed cost range of between 5-15 cent per kg of production and an annual productivity of 7-10 thousand liters.

Figure 1. Production function of the EU



Source: Own research

On base of testing within a regression function a uniform dependence has been proved among the monitored parameters with 100% reliability and a correlation coefficient R = 0.15437.

Production function of the Czech Republic

Table 3. Production function of the Czech Republic

N=525	Regression results with dependent variable: EU milk yield/kg/year R= ,08927338 R^2 = ,00796974 Adjusted R^2 = ,00607293 F(1,523) = 4,2017 p					
	b*	**St. error from b***	**b**	**St. error from b**	**t(1803)**	**b***
Absolute member			6655.406	373.2689	17.83005	0.000000
Feeding costs (ct/kg)	0.089273	0.043552	54.591	26.6325	2.04979	0.040883

Source: Own research

For producers in the Czech Republic production functions also have a slightly increasing trend. Compared to the EU producer group, the distribution of present values is not so concentrated in a range but is more dispersed across the whole quadrant. In both cases, the performance-related dependency ratio is shown to increase feed costs. To achieve higher yields, besides high-quality bulk feeds, an increased share of more expensive cereals and various necessary supplements such as vitamins and minerals are used. These results are in line with the conclusions of Zeman et al. (2006) and Kvapilík (2010).

Cost function of the EU

Table 4. Cost of feed for dairy production in the EU

EU N=1805	Regression results with dependent variable: Feeding costs (ct/kg) R= ,08927338 R^2 = ,00796974 Adjusted R^2 = ,00607293 F(1,523) = 4,2017 p					
	b*	**St. error from b***	**b**	**St. error from b**	**t(1803)**	**b***
Absolute member			6.175304	0.633648	9.745643	0.000000
EU milk yield / kg / year	0.154368	0.023268	0.000494	0.000075	6.634265	0.000000

Source: Own research

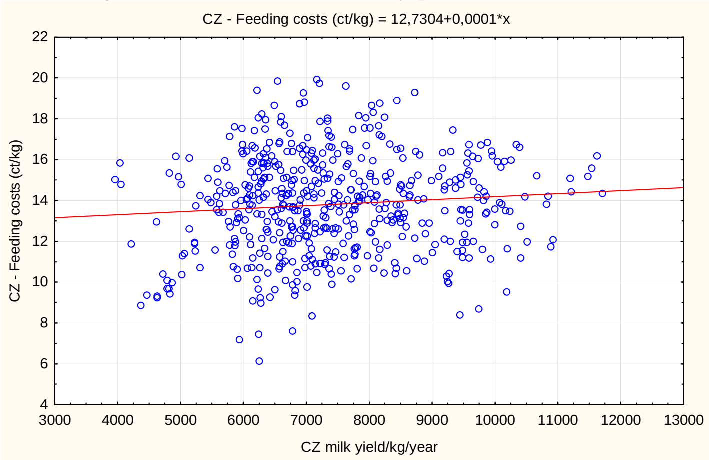
Even the cost function confirms that in the EU, with a yield of 6-10 thousand litres per cow, the cost of feed ranges between 5 and 15 cents per litre of milk, and this is true of the majority of producers. With rising yields, the cost of feed per litre of milk produced is also increased.

Cost function of the Czech Republic

The observed set of Czech producers shows a significantly higher dispersion of the cost of feed per litre of milk produced, according to the achieved yield from 5 to 10 thousand litres. With increasing productivity, the increase in these costs is more modest than in the EU.

In line with Lawson et al. (2004), it is confirmed that proper management in dairy cows where the significant production factor is nutrition is also the basis for the favourable overall economic performance of milk producers.

Figure 2. Cost of feed for dairy production in the CZ



Source: Own research

The graph 2 points out a dependence between milk yields and expenses for feeds in the CR when a dependence with 96% reliability and the correlation coefficient R = 0.0893 has been proved.

In line with Lawson et al. (2004), it is confirmed that proper management in dairy cows where the significant production factor is nutrition is also the basis for the favourable overall economic performance of milk producers.

4. Conclusion

From a comparison of milk production development in the CR and the EU since 2007 it results that according to the growth rate indicator the increase of production was the same in both the cases. After cancellation of milk quotas in 2015 it is supposed a further slight growth of milk production.

The aim of the study was to evaluate a relationship between inputs and outputs of milk production based on the field survey at the agricultural companies.

For comparability of input data for calculations regardless of the size of enterprises in the production of milk was obtained absolute data is converted to a common base of 100 days of feeding cows. Panel data were evaluated by Statistics program. As a variable was considered in the calculation of milk production, as well as significant cost items such as feed costs and interdependencies between variables are expressed as means of production and cost functions.

From the carried out calculations close dependencies among the chosen variables results, i.e. expenses for feeds in relation to reached milk yields. An expression of mutual relations between inputs and outputs in milk production implies an effort of agricultural producers to increase yields by means of upgrading of feed ration with an addition of high-quality grain feeds. A decrease of particular costs with growing yields is not unambiguous.

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STATE AID AND ITS LEGAL DEFINITION IN THE EU LAW

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Annotation: The purpose of the present paper is to examine the policy considerations that may be supportive for the explanation of the current concept of State aid as perceived within the EU law. The working hypothesis is that the current definition of State aid does not reflect only „economic“ or „legal“ considerations, and therefore, that it may not be fully explained by taking exclusively those factors into account. Instead, we may imply that it is influenced by objectives and priorities set by the EU Commission in relation to the State aid rules, together with the problems that the Commission had faced in enforcing those rules.

In order to analyze the notion of State aid we turn our attention to policy issues in addition to economic and purely legal ones. The tests devised to define the different criteria of State aid are constantly departing from the original conception of aid as any subsidy that distorts the "natural" functioning of the market. In the same vein, the tests developed later depart more and more from an economic explanation and from the „effects“ doctrine.

Due to the large discretion granted to the Commission when specifying the rules for interpretation and application of EU State aid law we are faced with different approach of the Commission to State aid rules in individual sectors of the EU Internal Market. The latter reflects mainly the economic specific of these sectors. As one of the most apparent examples we may quote the priorities set by the Commission for granting of State aids in the agrarian sector. The recent development of the State aid concept in agriculture is reflected by the new Agricultural Block Exemption Regulation (ABER) and Community Guidelines for State aid in the agriculture and forestry sector applied from 1 July 2014

Key words: State aid, Competition law, Action Plan for State Aids, Agricultural Block Exemption Regulation

JEL classification: P45

1. Introduction

The starting point for the regulation of State aid s granted by the EU Member States represents today the Art. 107 e.a. TFEU. When comparing the current wording of the Treaty with its previous versions it is obvious at first sight that the TFEU, as derived from the Lisbon (Revision) Treaty, almost literally takes over the concept that was from 1957 on contained in the TEEC, from 1992 called as the TEC. Indeed, the provisions on the State aids granted by the Member States belong among the few provisions of the Founding Treaties that have not changed since the formation of the EEC and in their basic features remained unchanged. They provide evidence of the strong continuity of the European integration entities from the early 1950s.

This continuity means that the TFEU provides for the conditions under which the granting of State aids by Member States shall be prohibited (article 107, paragraph 1, TFEU). It defines the conditions under which the Member States may, by the way of exception from the general prohibition, grant State aids (Art.107 (2) and (3) TFEU). Further on, it establishes rules relating to the supervision of compliance with the provisions on the State aid restriction (Art. 108 of the TFEU) and, finally, provide for the adoption of implementing rules (Art. 109 TFEU). To the extent to that the central concept of the rule of Art. 107 depends on the notion of the state (public) aid, however, the TFEU – as well as in the case of the EEC Founding Treaty and, actually, even the ECSC Founding Treaty – do not give to this term a specific legal definition. It is interesting to notice that, unlike the provisions relating to the competition protection from the conduct of primarily private undertakings, included today in the Art. 101 et seq. TFEU, the rules on State aid s do not contain even a non-exhaustive list of the most important benefits, the selective provision to the undertakings of which by the Member States is prohibited. In this respect The Treaty of Paris (1951) was – even if only slightly – different in that it included to the broader framework of State aid explicitly subsidies as a prototype of State aid s. In this context i tis worth mentioning the clarification of the notion of aid given by one of the early European Court of Justice (ECJ) judgements in 1959 as follows: "A subsidy is normally defined as a payment in cash or in kind made in support of an undertaking other than the payment by the purchaser or consumer for the goods or services which it produces. An aid is a very similar concept, which, however, places emphasis on its purpose and seems especially devised for a particular objective which cannot normally be achieved without outside help. The concept of aid is nevertheless wider than that of a subsidy because it embraces not only positive benefits, such as subsidies themselves, but also interventions which, in various forms, mitigate the charges which are normally included in the budget of an undertaking and which, without, therefore, being subsidies in the strict meaning of the word, are similar in character and have the same effect (ECJ, Case 30/59, De Gezamenlijke Steenkolenmijnen v High Authority).

2. Materials and Methods

The purpose of the present paper is to examine the policy considerations that may be important for the explanation of the legal concept of State aid as perceived within the EU law. The working hypothesis is that the present definition of State aid does not reflect only purely „economic" or „legal" considerations, and therefore, that it can´t be explained in full by taking into account exclusively those factors. Instead, we may imply that it is influenced by objectives and priorities set by the EU Commission in relation to the State aid rules, together with the problems that the Commission had faced in enforcing those rules. Also the evolution of the internal market and/or enlargement considerations have played an important role in shaping the current perception of the concept of State aid under Article 107(1) TFEU and can be helpful in explain its evolution.

In order to analyze the notion of State aid we will therefore turn our attention to the policy priorities of the European Commission which change in the course of time coupled with the difficulties that the Commission has encountered in context with the promotion of its competition policy towards Member States. The various tests devised by the Commission in order to define particular criteria of State aid are constantly departing from the original concept of aid, however, in the course of time incline more and more from purely legal arguments to economic explanations as well as to the „effects" doctrine. According to this doctrine, domestic competition laws are applicable to foreign firms - but also to domestic firms located outside the state's territory, when their behavior or transactions produce an "effect" within the domestic territory. The "nationality" of firms is irrelevant for the purposes of antitrust enforcement and the effects doctrine covers all firms irrespective of their nationality. The "effects doctrine" was embraced by the Court of First Instance in Gencor when stating that the application of the Merger Regulation to a merger between companies located outside EU territory "is justified under public international law when it is foreseeable that a proposed concentration will have an immediate and substantial effect in the Union."(Case T-102/96, Gencor Ltd v Commission, 1999, paras. 89-92)

Further on, we analyze how is the concept of aid specified under the influence of the Commission in individual sectors of the Internal Market, reflecting the approach of the Commission towards the development of the policy issues of the granting of aid by states. In this context we take a brief look on one of the most significant examples - the secondary legislation for granting of aids in the agrarian sector under the 2014 Agricultural Block Exemption Regulation (ABER) as applied from 1 July 2014.

3. Results and Discussion

It may be surprising at first glance that the basic concept, on that depends the application of the provisions of the Founding Treaties directly affecting the discretion of the Member States in the economic field, is not defined by these Treaties.

However, it is certainly not random nor manifestation of some negligence of the creators of the Founding Treaties, that Treaties did not attempted to define the concept of State aid, if only demonstratively. The reason for this was, and still is, to ensure that the concept of State aid can be interpreted and applied so as to include all interventions through that the States may affect competition in the common market in the broadest sense of the word. The latter is even more important when we take into account the extreme variability that characterizes these interventions. Moreover, the range of these interventions can change over the time, so as the economic reality does. The fact that the EEC Treaty resigns in the effort to specify the scope of the State aid can be interpreted as a sign of the intention to allow the interpretation of State aid in an extensive way, as well as to guarantee that the provisions on the regulation of State aid granted by the Member States will be flexible enough as to catch up with its dynamic evolution over the time.

Situations like this are in no way unusual in the context of the EU Founding Treaties. We can find a conscious absence of legal definitions of basic concepts in the Treaties in a number of other legal rules. For example, the EU material law lacks the legal definition of the basic concepts of the free movement of goods or we surely miss a definition of conditions for the non-contractual liability of the EU in the EU institutional law. This circumstances devolve from one part from the effort of the Treaties to give sufficient momentum and prevent undue failure to the interpretation of their provisions, from the other they correspond with the overall trend of European integration being generally conceptualized as an international treaty, providing for a basic legal framework being further developed by the secondary legislation (Simon, 2005).

The lack of a legal definition of the concept of State aid in the Founding Treaties was not unusual at the time when the Treaty of Paris and Treaty of Rome were created when comparing with the law of public aids or subsidies in the international trade law. At the time when EC Treaties were signed, even the universal world trade rules in the GATT have not explicitly defined what is meant by public aid/ subsidy. Only later– in the context of the efforts to strengthen the effectiveness of the regulation of public aid at the international level by the adoption the Code on Subsidies negotiated within the Uruguay Round and becoming part of the 1995 concept of WTO – the definitions of characteristic features public subsidies were added to the legal framework of the world trade law.

The fact that the EC Treaties resigned on the definition of the notion of State aid and continuously refuse to do so implies, on the other side, that the competence to define what are the benefits provided by Member States through State aid s and what benefits the Member States shall not provide, has been delegated to EU institutions. The latter are conferred upon by the EC/EU Treaties the power to supervise the interpretation and compliance with the provisions on State aid and their implementation. These institutions are, first of all, the EU Commission, that is given by Art. 107(3) TFEU and Art. 108 TFEU extensive powers to allow for exemptions from the prohibition of providing State aids and for the supervision of compliance with the prohibition of granting of the aids by Member States. Further on, it is formally also the Council of the EU that is, according to the Articles 107(3) (e) TFEU, 108(2) TFEU and 109 TFEU, entitled in particular to adopt measures to implement the provisions of the EU Treaties on State aids and, under certain circumstances, to permit by itself exemptions from the prohibition of granting if State aids.

The last resort in determining the content of State aid s and its features within the EU´s institutional architecture remains is, however, the Court of Justice of the European Union (EUCJ, as a comprehensive designation for the Court of Justice and the General Court acc. to Art. 19 TEU). With regard to its task to supervise the compliance with the EU law in the process of interpretation and application of the EU Treaties, as laid down by the Art. 19(1) TEU, it has the authoritative power to interpret the Treaties and the EU secondary legislation adopted on their basis. Naturally, this power applies also to the provisions of the Treaties relating the granting of State aids by the Member States. However, while the interpretation and application of certain provisions on the State aid carried out by the political EU institutions – in particular as regards the granting of exemptions from the general prohibition of State aids – is done by the EUCJ, due legal and technical reasons, only to a limited extent, with regard to the notion of the State aid itself the EUCJ keeps in the long term a firm position. The Court´s reasoning for this is that since „ the aid ….is a legal concept and must be interpreted on the basis of objective factors, therefore the Community judicature must, as a general rule and with regard both to the specific features of the case before them and to the technical or complex nature of the Commission's assessments, carry out a comprehensive review as to whether a measure falls within the scope of Article 87(after the renumbering by the Lisbon Treaty Art. 107 (1) TFEU – amended by MJ" (case T‑196/04 Ryanair Ltd. V. Commission, 2008, para. 40). In this conception, it is the EUCJ who keeps the symbolic "last word" in deciding which measures of Member States shall be regarded as State aids and which of them shall constitute aids prohibited according to Art. 107(1) TFEU.

The interpretation of the legal concept of State aid is provided by the General Court, as a rule, in connection with the judicial review of the decisions adopted by the EU Commission or the EU Council within the framework of implementation of their powers to supervise and implement the provisions on State aid (Art. 263 – 264 TFEU). Another possibility offers the power of the Court of Justice to review the Commission's failure to act (Art. 265 – 266 TFEU). Some decisions are also adopted when deciding whether Member States have violated the obligations imposed to them by the Treaties in the area of State aids, i.e. in the framework of infringement proceedings (Art. 108 (2) TFEU), or in preliminary ruling proceedings initiated by national courts of Member States in connection with request for interpretation of the provisions of the Treaties on the State aid (Art. 267 TFEU). Thus, it is the EUCJ who provides the decisive contribution to how both the EU political institutions and Member States should understand the notion of the State aid and how to apply it in specific cases.

The definition of the legal concept of State aid and the scope of the restrictions that membership in the EU imposes to Member States in the field of interventions in their economy, would appear to be, under these circumstances, by far not only as result of the written law. It is influenced, for a considerable part, also by the decision-making activities of the Commission, whose positions - corrected by the case-law of the EUCJ - we can characterize as the unwritten (de facto) EU law.

To the extent to that the legal concept of the State aid, including the restrictions following for Member States thereof, is influenced by the decision-making activities of the Commission and the EUCJ, it is also obvious that the notion of State aid is not a term that should be understood as a purely economic one. Its concept is inevitably influenced by political considerations that play role in the decision-making of the Commission as a collegiate body that shall take in account the European interest, and, further on, by legal arguments, advocated by the EUCJ (Azoulai, 2009). The concept of the State aid has thus not only economic, but also political and legal dimensions. This has led to the situation where the approach to State aids doesn´t have to be in all the cases under decision completely consistent. Indeed, the accent on the individual elements of this concept may vary from case to case in the course of time. As noted by Biondi (Biondi, 2010) in this context, while the rules on State aids form, in principle, an unchanged part of the Treaties since 1957, "we still discuss about what is the exact shape of the State aid." Even this is not a feature that would be reserved only for the EU State aid law (in principle, a similar situation exists for example. in connection with the application of the provisions on competition rules addressed to undertakings). In spite of the effects of State aid law on the discretion of the Member States in the economic field, however, this circumstance seems to be especially apparent.

However, it would be wrong to say that what is held for State aid within the EU law - and therefore also the scope of the prohibition of granting State aid by the Member States pursuant to Art. 107(1) TFEU – results exclusively from the Commission's discretion as corrected by the EUCJ. As a matter of fact, the TFEU limits the latter in its Art. 107 by indicating certain starting points from which the concept of State aid and the prohibition of its granting shall depart.

Moreover, it should be noted in this context that particularly the Commission stressed in the last 10 years that the application of the State aid law occurs on the basis of objective criteria based primarily on an economic analysis. The Commission has brought this intention forward for the first time significantly in the Action Plan for State Aids (COM /2005/17 of 7. June 2005). The Plan was published in 2005 and is based on the arguments of the Commission´s leading economists (Friederiszick, Röller and Verouden, 2008). In order to reach the state where "less" and "more focused" aids shall be granted, the Commission expressed its intention to apply a "more economic approach" to the State aids and to assess aids in the light of the effects and effectiveness based on the Pareto concepts. These intentions that are still kept in mind by the Commission (Idot, 2012) are more and more subject to criticism. First of all, it is noted, that the change of the opinion on the State aid and the methods used for its assessment proposed by the Commission are not ideologically neutral ones, but mean in fact the endorsement of one school of political economy at the expense of others (Kaupa, 2009). From the legal point of view, it is equally strongly opposed that the change in methodology that would cause the State aids to be perceived as a major tool unifying the setting of parameters of the Member States´ economic systems and the competition between them and backed away as a tool for the removal of barriers to the trade between Member States, has no support in the Treaties themselves (Biondi, 2011). Although both lines of this criticism may be probably right, it is, on the other hand, desirable that at least some generalization and stabilization of the interpretation of the State aids characteristic features occurs, as it is currently very often necessary to deduce them from the sometimes very casuistic interpretation by the Commission and the EUCJ.

Application of State Aid rules in the agrarian sector

Due to the large discretion granted to the Commission when specifying the rules for interpretation and application of EU State aid law we are faced with different approach of the Commission to State aid rules in individual sectors of the EU Internal Market. The latter reflects mainly the economic specific of these sectors. As one of the most apparent examples we may quote the priorities set by the Commission for granting of State aids in the agrarian sector. Application of State aid rules in the agriculture is increasingly under the influence of political decisions of the Commission. Under Article 42 TFEU the entire Treaty rules on competition – including rules on State aid - apply to production and trade in agricultural products only to the extent determined by the Council. In the case of State aids, the determination has been made that, as a general rule, Art. 108/1 and the first sentence of Article 108/3 of the TFEU shall apply to aid granted for production or trade in the products listed in Annex I to the Treaty (Council Regulation (EC) 1184/2006).That means that the Commission keeps under constant review the systems of aid operating in Member States and can propose appropriate measures required by the progressive development or by the functioning of the Internal Market.

State aid rules in the agrarian sector bring thus together two different perspectives given by:

a) general principles of competition policy and
b) coherence with the EU's common agricultural and rural development policies (CAP).

Based on this concept, the State Aid rules for the agrarian sector provide a slightly more generous criteria for exceptions to the prohibition of State aid within the EU Internal Market. If, on the one hand, the states modify the rules of the competition in the agricultural sector in the framework of free competition by the public interest and overall needs of the society - and the CAP tolerates this as a right of the States to set restrictions for farmers as elements of the EU Internal Market, then, on the other hand, it logically must allow that the compensation to farmers for these restrictions, represented by State aids in its various forms as direct or indirect support, enjoys in this case, an exception from the general State aid prohibition.

As a consequence of this specificity, primary production the agricultural sector is still governed by separate rules, although here too there is an increasing tendency to align them as far as possible with the horizontal rules. Most aid for undertakings active in the production of agricultural products is governed by a specific secondary legal act - the 2014 Agriculture Block Exemption Regulation (ABER). Specific forms for State aid in the agrarian sector are contained also in the Regulation on notification forms of 2014. All these instruments together create tools for a specific approach of the Union towards one of the most sensitive areas of the economy of all Member States. They represent a compromise between the efforts of Member States to protect their farmers´ interests and the aims of the EU Commission to minimize the state influence and intrusion to the competition on the Internal Market (for more details see Janků (2014)). And the rather loose legal concept of the State aid provided for by the EU primary law allows for this flexibility.

4. Conclusion

It is difficult to imagine a more vague, less inclusive definition of State aid that than we currently find in the TFEU, embracing such wide range of categories of subsidies that includes direct subsidies, tax exemptions, preferential interest rates, guarantees or loans especially those on favorable terms, sale of land or building on favorable terms, indemnities against losses, preferential ordering, preferential discount rates, dividend guarantees, deferral collection of fiscal and state guarantees, whether direct or indirect, to credit operators, not to mention any other means having equivalent effect.

On the other side this loose terms has allowed for in some way adequate space for the EU Commission and EUCJ when interpreting and developing the concept of State aid. Evidently, the viewpoint of EU Commission on the “adequacy” of such definition will thus differ from the viewpoint of member States. Finally, a different opinion represents the standpoint of undertakings. The Commission is in no sense concerned with economic optimality, in the pursuit of which a precise definition and quantification methodology would be of interest for states. Commission´s prime focus is to work towards achievement of the goals or the TFEU, in which case a vague definition of State aid allowing to prohibit any measure which may damage the wide political aims is actually more adequate. In fact, maintaining its discretion in the area of State aid is probably particularly important for the Commission, since it grants a degree of influence over Member States´ fiscal policies, with which it generally has very little to do. While the definition of State Aid in the TFEU is rather inadequate for the national authorities, recipients of aid and other interested in increasing the transparency of EU political and legal structures, it is quite comfortable for the Commission which - because of it - enjoys maximum leverage over Member States in this area.

In light of the foregoing, it is recommended that in order to make the notion of aid more precise we should turn our attention to policy and enforcement considerations rather than to economic or purely legal ones (when trying to devise a fully satisfying „ultimate test or definition“).

The tests devised to define the different criteria of State aid are constantly departing from the original conception of aid as any subsidy that distorts the “natural” functioning of the market (as perceived already by the ECSC Treaty). In the same vein, the tests developed later depart more and more from an economic explanation and from the „effects“ doctrine. This is true for concept of *de minimis* aid but also for the selectivity requirement as part of the discrimination test.

Similarly, enlargement considerations have been used by the Commission to emphasize the need for a stricter enforcement of the rules, and to highlight the convenience of the new tests that the Commission was devising. For example, the Market Economy Investor Principle test in the 1980s applied at the time of the accession of Greece, Portugal and Spain, because in these states the public sector had a very important presence in the economy. From the great enlargement of 2004 the Commission profited in prompting procedural and even substantive changes in the interpretation of State aid, particularly with respect to the notion of effect on trade and competition. It this relation the Commission proposed a significant impact test in parallel to doubling the *de minimis* ceiling in order to reduce the workload that the new enlargement was going to bring about.

In sum, in the State aid field, we should look at the forest in order to better see the trees. In other words, we should look at the context to understand the substance. The study of the evolution of the legal concept of State aid in the light of the two frameworks underlined above (evolution of EU Commission policy and case law of ECJ) provides not only a holistic knowledge of this concept but it is also useful when analyzing future developments. It is so because an approximation of the policy objectives and interests present before the Court when it laid down a particular formula concerning the legal concept of State aid does more than help to understand the reasons that may have underpinned that particular formula. It also gives guidance to the way how to understand the concept of aid in the accordance with those reasons. It emphasizes that the formulas are means to an end, not the ends themselves.

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MANAGERIAL ACCOUNTING AND AGRICULTURAL EFFICIENCY CONTROL IN RUSSIA

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Annotation: A management system in Russian agricultural holdings is quite poorly established. The aim of the paper is to suggest a system for making managerial decisions and control. Suggested system is based on calculation of coefficients identifying economical (gross production, workforce productivity, material return, amortization return and others), environmental (amortization capacity, materials output ratio, labor intensity) and social efficiency (average salary, rates of growth and productivity of labor and others) by types of products and totally for a agricultural holding. Production efficiency is estimated by the system of assessment criteria and factors. Factors in the suggested system are divided into 3 groups: factors of economical efficiency, factors of environmental efficiency, factors of social efficiency. Control and evaluation of agricultural production efficiency upon presented factors is made in special tables where each actual value and each type of product has coefficient of efficiency for current year in relation to basic value or average value for the last 3 years. Paper includes an example of calculation of coefficients based on the data from accounting reports and management accounting reports of "Instructional farm Iyulskoye"

Key words: managerial decision, internal control, economic analysis, strategic management, methodology

JEL classification: Q12, Q14, M11, M42

1. Introduction

After collapse of Soviet Union agriculture experienced great decay. Now agriculture is getting better due to the process of recovery and especially the massive state support (Svatos et al., 2014). However, government support does not solve main problems of efficient management. Problem of efficient management of agricultural production was studied by some authors (Smutka et al., 2014; Spicka, 2015; Ostaev, 2014).

Modernization and intensification of agricultural production is a strategic basis of both development of agriculture and significant improvement of efficient utilization of labour, biological, land, financial and material resources in this branch of industry. In each company efficient agricultural production may be achieved to a certain extent by strict consideration of natural, climate and other simple technological factors of production from time and technological points. However, in accordance with economic law of decreased income growth rates and marginal utility theory, industrial expansion is limited in time and in getting normal efficiency (Sigidov, 2015).

Promptness and quality of managerial decisions concerning improvement of agricultural production is influenced by an extent of completeness, versatility and specification of data about management accounting of production process (Alborov and Gazaeva, 2010). It means that a manager, who takes decision, should have specific information about an issue of the decision being taken. Such information may be taken from different management accounting reports containing some specific aspects of company's activity. This approach provides significant results and temporal evaluation of quality and source of information.

The aim of the research is to suggest a system for making managerial decisions and control.

The tasks of the research are:

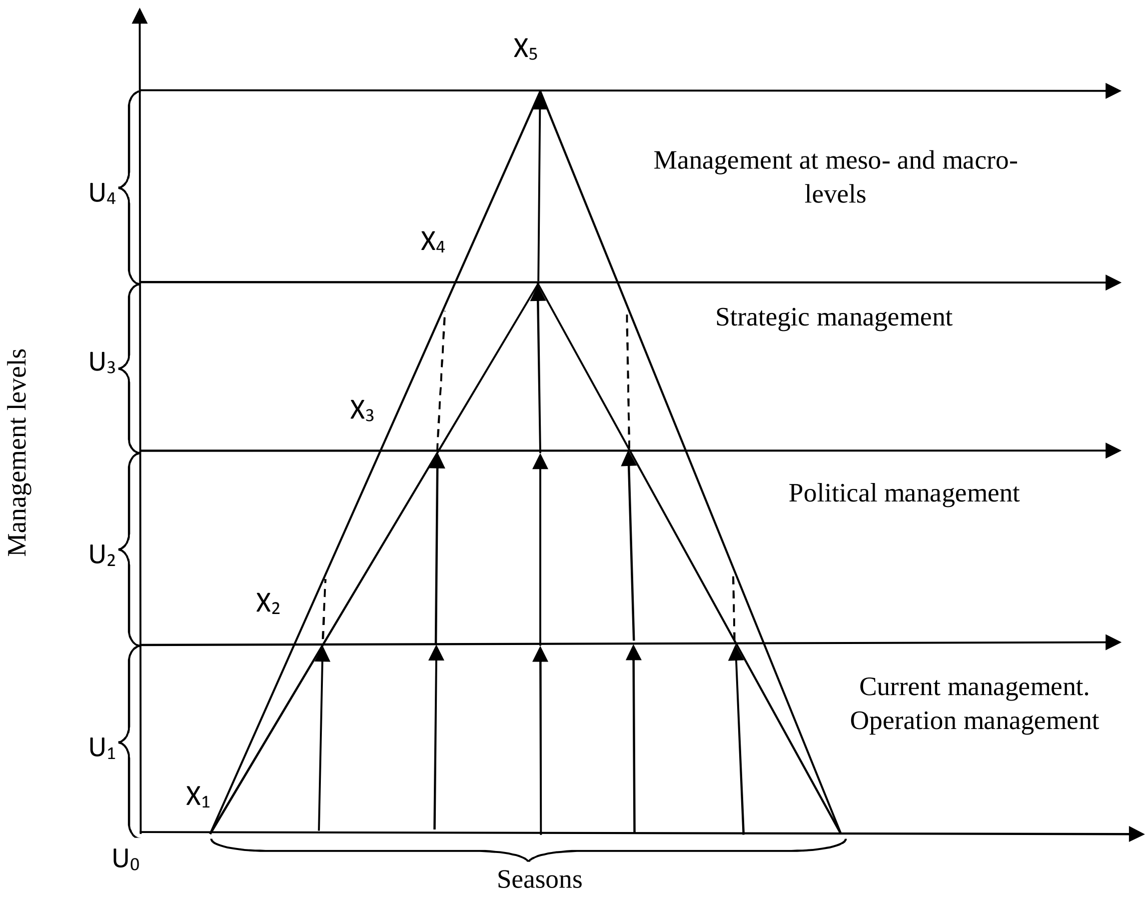
- Research of information levels of management and production efficiency factors at these levels;
- Suggest methodology of calculation which based on calculation of coefficients identifying economical, environmental and social efficiency by types of products and totally for a agricultural holding;
- Calculation of efficiency using JSC «Instructional farm Iyulskoye» as an example.

2. Materials and Methods

Some managerial factors, having big importance, may be defined from specific accounting (financial) reports. These factors may be used for control, analysis and evaluation of efficiency of agricultural companies not only at the company's level but at meso- and macro-levels as well (Figure 1).

In Figure 1 horizontal arrows differentiate management levels in agriculture, and vertical arrows identify communication and averaging of information about management accounting in order to define factors of control, analysis and evaluation of agricultural production efficiency in operation, current, political and strategic management at meso- and macro-levels.

Figure 1. Hierarchy of formation of information about management accounting and factors of agricultural production efficiency distributed by management levels and seasons



Source: Author's construction

As it is shown in Figure 1 information needed to define factors of control, analysis and efficiency evaluation of some works and production of particular kinds of crops and animals is expected to be formed at the lowest level (U0 = X1).

The first level (U1 = X1 + X2) contains factors of efficiency of production (works and services) by departments (responsibility centers). The second level (U2 = X2 + X3) contains factors of efficiency of production (works and services) by branches (sections) of crop growing, animal breeding and others. The third level (U3 = X3 + X4) contains overall factors of agricultural production efficiency in the company. At the fourth level (U4 = X4 + X5) there are factors of agricultural production efficiency of all companies in particular district, province, region and the whole country. Information needed for control, analysis and evaluation of factors from the first three levels can be found in management accounting reports, and information from the fourth level is provided in special annual closing accountig (financial) reports of agricultural companies and in their compilation.

Efficiency evaluation of such complicated branches as crop growing and animal breeding, which contain a lot of subbordinate branches and kinds of production, is the most important. Therefore system of efficiency factors should become integral part of total economic mechanism and efficient management. This system should direct managers of all levels and work collectives of companies to decrease production costs when the quantity and quality of agricultural products is increasing. In this context factors and groups of factors for control and evaluation of agricultural production effciency were defined. Efficiency was presented in some aspects such as economic (gross production, workforce productivity, material, amortization return and others), environmental (amortization capacity , materials output ratio, labor intensity and others) and social (average salary, rates of growth and productivity of labor and others).

Control and evaluation of agricultural production efficiency by abovementioned factors was offered to perform in special tables (Kontsevoy, 2016), where each factor had coefficient of efficiency (K) in accounting period related to basic period, plan or average value of this factor for the last three years. Product of obtained coefficients from the first group of factors generates coefficient of economic production efficiency (KEK), by the same procedure coefficient of environmental production efficiency (KEL) and coefficient of social production efficiency (KSL) are calculated (Table 1,2,3,4). Product of calculated coefficients of production efficiency provides integrated coefficient of production efficiency (IKE) for particular kind of agricultural product presented in the equation 1.

$$\mathrm{IKE} = \mathrm{KEK} \times \mathrm{KEL} \times \mathrm{KSL} \tag{1}$$

Practical implementation of this equation is discussed in the section Results and Discussion. Production and accounting reports of JSC «Instructional farm Iyulskoye IzhSAA» was a basis of calculations and analysis.

3. Results and Discussion

The factors of economic, environmental and socio-economic efficiency were calculated in dairy production.

Table 1. Economic efficiency control in dairy production in JSC «Instructional farm Iyulskoye IzhSAA» situated in Zavyalovsky district, Udmurt Republic (beginning)

Year	Milk yield per cow per year		Production cost Per 1 hwt		Gross product		Workforce productivity		Material return	
	hwt	K	RUB	K	Thou. RUB	K	RUB	K	RUB	K
2013	70	1.02	1,273	1.26	78,038	0.79	491	0.73	2.1	0.95
2014	68	0.99	1,578	1.02	98,310	0.99	696	1.04	2.4	1.09
2015	68	0.99	1,982	0.81	12,1611	1.22	826	1.23	2.1	0.95
Total	68.7	1.00	1,611	1.00	99,320	1.00	671	1.00	2.2	1.00

Source: Author's calculations

Factors strongly influencing production efficiency evaluation were taken to calculate economic production efficiency.

Table 2. Control of economic production efficiency of milk production in JSC «Instructional farm Iyulskoye IzhSAA» situated in Zavyalovsky district, Udmurt Republic (end)

Year	Amortization return		Gross margin		Return on sales		KEK
	RUB	К	Thou. RUB	К	%	К	
2013	10.3	1.16	2,904	0.5	4.4	0.64	0.26
2014	9.0	1.01	7,839	1.36	9.9	1.43	2.23
2015	7.4	0.83	6,561	1.14	6.5	0.94	1.02
Total	8.9	1.00	5,768	1.00	6.9	1.00	1.17

Source: Author's calculations

Environmental production efficiency involves such factors as amortization capacity - an amount of amortization expenses per 1 hwt of milk, materials output ratio – an amount of tangible costs per 1 hwt of milk, labor intensity – number of man hours per 1 hwt of milk and feed capacity – weight (hwt) of fodder units per 1 hwt of milk.

Table 3. Control of environmental production efficiency of milk production in JSC «Instructional farm Iyulskoye IzhSAA» situated in Zavyalovsky district, Udmurt Republic

Year	Amortization capacity		Materials output ratio		Labor intensity		Feed capacity (fodder units)		Feed capacity per one cow		KEL
	RUB	К	RU B	К	Man-hours	К	Hwt of fodder units	К	Hwt of fodder units	К	
2013	0.10	1.2	0.48	0.96	0.002	1.00	0.64	0.80	59.5	0.98	0.90
2014	0.11	1.09	0.42	1,10	0.002	1.00	0.47	1.09	55.1	1.06	1.38
2015	0.14	0.86	0.48	0.96	0.001	2.00	0.42	1.21	60.5	0.97	1.94
Total	0.12	1.00	0.46	1.00	0.002	1.00	0.51	1.00	58.4	1.00	1.40

Source: Author's calculations

Factors of social efficiency involve remuneration and productivity of labor.

Table 4. Control of social production efficiency of milk production in JSC «Instructional farm Iyulskoye IzhSAA» situated in Zavyalovsky district, Udmurt Republic

Year	Annual average salary of 1 worker		Salary budget per 1 RUB Gross production		Rates of salary growth		Rates of growth of workforce productivity		KSE
	Thou. RUB	К	руб.	К	rate	К	rate	К	
2013	148	0.84	0.17	1.02	0.99	0.88	1.01	0.83	0.63
2014	177	1.01	0.17	1.02	1.20	1.07	1.42	1.17	1.29
2015	203	1.15	0.16	0.96	1.16	1.04	1.19	0.98	1.13
Total	176	1.00	0.166	1.00	1.12	1.00	1.21	1.00	1.02

Source: Author's calculations

Having average coefficients of economic (KEK), environmental (KEL) and social (KSE) efficiency it is possible to calculate integrated coefficient of production efficiency (IKE) of milk production in JSC «Instructional farm Iyulskoye IzhSAA».
IKE 2013г. = 0.26 × 0.90 × 0.63 = 0.15;
IKE 2014г. = 2.23 × 1.38 × 1.29 = 3.96;
IKE 2015г. = 1.02 × 1.94 × 1.13 = 2.24.

Hence, it appears that the highest coefficient of efficiency of milk production was in 2014 and the lowest one was in 2013. Increased material return and amortization return and, consequently, decreased materials output ratio and amortization capacity may become reserves for increasing efficiency of milk production in this company. Information presented in these tables 1,2,3,4 is generated in management accounting and factors for definite kinds of production, crop growing, animal breeding and the whole company as well may be calculated by responsibility centers (departments).

Hence, it appears that summarized information about these factors is also mentioned in specialized accounting (financial) reports and it proves availability of a link between management and financial accounting. It should be realized that economic efficiency is a form of final utilization of all recourses. It provides a trend for development of business activity of agricultural companies by means of analysis, control and evaluation of factors presented in Table 1-3. It also provides efficient management of modernization, intensification, environment, volume and quality of production in full accordance with strategy of development of agriculture.

Proceeding from the abovementioned facts, modern conditions of functioning of agricultural company and needs in information imply formation of the following reports in management accounting:

a) Production and management report of department (responsibility center) and consolidated production and management report by departments (responsibility centers);
b) Operation report on monitoring of formation of production costs and market prices of agricultural products;
c) Reports involving tables of factor analysis of utilization of material, labor, biological, land and other resources;

However, an ability of implementation of such reports in agricultural companies is an issue of concern. Russian legislation specifies making heap of formal documents (Budovich, 2017), which strongly loads administration and management. Making additional reports will hardly cause an excitement. In this context abovementioned documents might be formal and useless. Possible solution in this case may be special software for making needed reports.

Similar method to estimate labor productivity by means of coefficients was offered in this paper (Alborov et al., 2014). Bondin (2016) suggests estimation of agricultural production efficiency for managerial needs by means of liquidity ratio and solvency ratio taking into account changes of these factors due to specificity of production. Data for this analysis is taken from publicly available accounting reports. This method has one disadvantage based on mispresented accounting reports as their content is misrepresented in order to reduce tax basis. Method suggested in this paper is based on internal accounting reports which are not misrepresented so often, hence, the factors calculated by means of these reports are more consistent.

4. Conclusion

The paper suggests efficiency evaluation system of agricultural production (milk production is uses as an example) by means of evaluation criteria and factors which are subdivided in three groups.

- Factors of economical efficiency (gross production, workforce productivity, material return, amortization return and others)
- Factors of environmental efficiency (amortization capacity, materials output ratio, labor intensity)
- Factors of social efficiency (average salary, rates of growth and productivity of labor and others)

Control and evaluation of agricultural production efficiency upon presented factors is made in special tables where each actual value and each type of product has coefficient of efficiency for current year in relation to basic value or average value for the last 3 years. In other words, it is calculation of economical, environmental and social efficiency of production coefficients. Integral coefficient of production efficiency for the whole holding is calculated in the same way.

The investigation includes an example of calculation of coefficients based on the data from accounting reports and management accounting reports of “Instructional farm Iyulskoye”.

Increased material return and amortization return and, consequently, decreased materials output ratio and amortization capacity may become reserves for increasing efficiency of milk production in JSC «Instructional farm Iyulskoye IzhSAA».

Suggested system of production efficiency estimation provides comparison evaluation by years and helps reveal untapped resources such as increase of material return and depreciation capacity and decrease of material output ratio and amortization capacity. This information might be used for current, day-to-day and strategic management and as a database at meso- and macro-level. In order to realize abovementioned system of coefficients the following reports should be made: production and management report of a department, operational report of monitoring of generation of production costs and fair market values of agricultural products and reports in view of factor analysis tables of used material, labor, biological, land and other resources.

Further study will be devoted to development of efficiency evaluation system of agricultural production not only at micro-level but at meso- and macro-level as well.

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AGRICULTURAL TRADE BETWEEN RUSSIA AND EU. IS IT POSSIBLE TO PREDICT A SITUATION?

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Annotation: Russia is a significant trade partner for EU countries and agricultural trade is very important part of this partnership. Agricultural trade is influenced by some economical and political factors. This paper presents gravity model identifying dependence of volume of 24 imported/exported products from GDP EU, GDP RU with regard to distance between capitals of EU countries and Russia, common border, related language, common history, and availability of sea ports. The research includes the dataset with data about export and import of agricultural products (24 types of products) with each of 28 countries of EU for 16 years. Data source is UnComtrade database. Researched period is 2000-2015. Linear regression analysis was used to make predictions. Analysis of export trade flow from EU countries to Russia revealed 3 groups of products proved to be the most consistent by linear regression models: dairy products, eggs, honey, edible animal products; beverages, spirits and vinegar; meat and edible meat offal. These three groups take 34% of total volume of export into Russia. Linear regression model explains only 50% of results and the rest is explained by other factors out of the model. Analysis of import trade flows between EU countries and Russia proved inconsistency of used linear regression models. Chosen four groups of products: animal, vegetable fats and oils; beverages, spirits and vinegar; cereals; fish make 73% of imported agricultural products from Russia. These groups are hardly explained by models (R square less than 0.3). This fact might be explained by factors which are out of the model and it is quite difficult to estimate their influence. One of such factors is political decisions of the government. It should be concluded that suggested gravity model can be used to predict agricultural trade flow to Russia but not from Russia.

Key words: gravity model, foreign trade, agri-food

JEL classification: Q1, J10, J11

1. Introduction

All countries in the world take active part in international trade. However, economic crisis shows that economic risk transfers to other countries by good chain (Aiello et al., 2010). In other words, if a key player of the market has problems, it sends them wave-like to another country. In this case, to provide good economic policy it is important to understand the mechanism of international trade, investigate factor influence with regard to volume and route of trade flow. One of the most popular methods of investigation is gravity model of international trade (Stack et al., 2011; Tinbergen, 1962). However, most of gravity models have some shortcoming (Anderson et al., 2003). They do not take into account geographical size of the country and a route of received goods etc. For the most of countries this oversimplified method does not give too many mistakes in estimation of gravity model parameters (Fidrmuc, 2009). However, in case of big country like Russia, which has big area and long state boundary, it is very important to take into account these factors. These important factors influencing intensity of international trade are common border, similar language, long history relationships and availability of cheap delivery of goods (Carrére, 2006).

The main idea of gravity model states that external trade flow is in correlation with economic size and distance between countries. The economic size of the country is the main factor and depends on demand and supply. The factor of distance is important for reducing transportation costs. (Troekurova et al., 2014).

A lot of authors made similar research. For instance, in the paper (Paas, 2008) gravity model was used to analyze trade between USSR, Yugoslavia and Czechoslovakia. The paper (Djankov and Freund, 2002) was devoted to research of influence of barriers to trade. Consistency of data about regional concentration of export in OECD countries with gravity model was checked in this paper (Hejazi, 2007). Research of trade in New Zealand was presented in the paper (Winchester, 2009).

Gravity model is suitable for investigation of particular groups of goods but not for the whole trade flow.

The aim of the article is to compare agricultural trade flow between Russia and European Union for the period of 2000-2015 and find some regularity.

The research covers the period of 16 years and allows finding regularity. The research did not take into account influence of Russian import ban due to insufficient length of its period covering 2 years of 16 years researched.

The tasks of the article were set in order to achieve the aim:

1. Estimation of current conditions of agricultural industry in Russia and European Union;
2. Making scientifically based statistical selection and relevant dataset;
3. Making linear regression models for the most consistent groups of the products.

The hypothesis of the research: null hypothesis states that there is no regularity in trade flows between EU countries and Russia. In other words, it is possible to estimate all factors influencing trade flows. Alternative hypothesis states that there is regularity in trade flows between EU countries and Russia (factors influencing trade flow cannot be estimated or they are unknown).

2. Materials and Methods

The research involves the dataset with data about export and import of agricultural products (24 types of products) with each of 28 countries of EU for 16 years. Data source is UnComtrade, Faostat, Worldbank database for the period of 2000-2015.

The data was under cleaning process and check normality. In order to eliminate inflation's influence the data was transformed into the form of constant price. Software STATA 13 was used for calculations.

Gravity model was made for econometric analysis of trade flows. This method is quite popular because its results can be easily compared with intuitive results. The first suggested model (Tinbergen, 1962) was very simple and bound trade import and export with variables GDPimort, GDPexport and distance.

$$E_{ij} = a_0 \, Y_j^{a1} Y_j^{a2} D_{ij}^{a3} \qquad \textbf{(1)}$$

Where: E_{ij} — Export from the country i to the country j, Y_i — GDP of the country i, Y_j — GDP of the country j, D_{ij} — distance between countries i and j, αi — elasticity coefficient.

Here the suggested model shows dependence between distance, import, export, GDP RU, GDP EU, distance and dummy variables (boarder, language, history, availability of sea ports)

$$F(\text{agri trade flow}) = Imp_i \times Expi \times GDP_i \times GDP_{ru} \times D_i \times B_i \times L_i \times H_i \times S_i \quad \textbf{(2)}$$

Where:
i – Each country of 28 EU countries
Imp_i – import from Russia to each of EU countries in US dollars
Exp_i - export into Russia from each of EU countries, US dollars
D_i - distance between capitals of each of EU countries and Russia (Moscow or Sankt-Petersburg), km
B_i - availability of common border
L_i - related language,
H_i - common history,
S_i - availability of sea ports.

Variable Distance is a distance between capital of European country and Moscow and St. Petersburg. In case the distance between chosen capital and St. Petersburg (the second capital of Russia having status of cultural capital) was shorter than the distance between the capital and Moscow the first one was taken into account.

Variable Border is availability of common marine or land border.

Variable Sea port is availability of sea ports. This variable was taken into account due to significant difference in logistic costs for transportation by sea.

Variable Language. This variable was taken due the paper (Blažek and Novotná, 2005) which helped select Slavonic languages similar in understanding. In addition historical facts about the country was taken into account too, for instance, the vast majority of population in Latvia understands Russian though its native language is completely different.

Variable Common history is availability of close historical relations between countries for the last century. It covers both friendly relations and wars.

Gravity model, made in terms of research, presented dependence of volume of each of 24 imported/exported products from GDP EU, GDP RU, distance between capitals, availability of common border, related language, common history, and availability of sea ports. Used dataset included more than 24,000 obs.

Number of variables is optimal therefore incorporation of additional variables or reduction of utilized variables causes decreasing of R-squared adj.

Result of test Shapiro-Wilk was used for checking normal distribution. Data has not normal distribution, so method for linear regression model with Robust method is suitable.

3. Results and Discussion

Analysis involved condition of export (to Russia) and import (from Russia) of agricultural products. Data was taken from unicomtradebase (2000-2015). Mean value for 16 years per year was calculated. Export of agricultural products from EU exceeded import from Russia more than 2.6 times. AgroExport to Russia from World (EU excluded) + EU = 15.5 bln US doll+11.2 bln US doll. AgroImport from Russia from to World (EU excluded) + EU = 9.1 bln US doll+1.7 bln US doll. So export into Russia exceeds import from Russia 6.5 time.

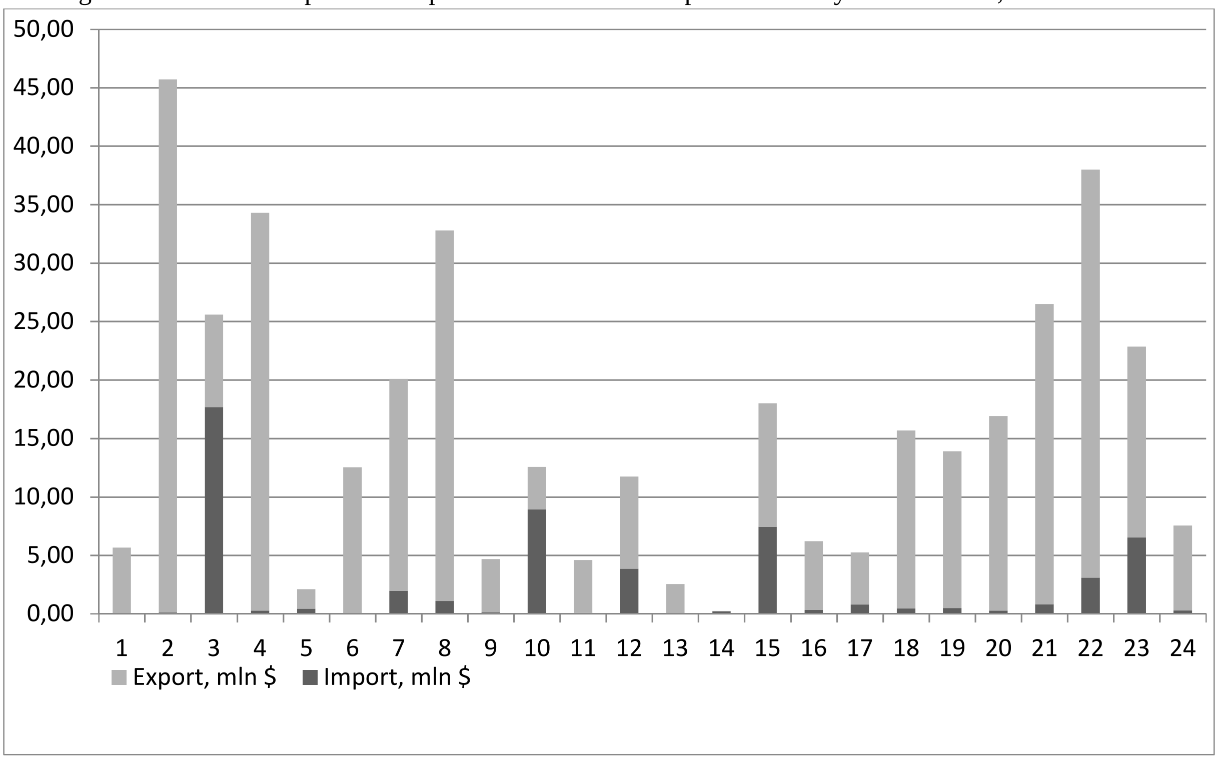
European countries are the biggest trade partners in terms of agricultural products for Russia. The main countries, exporting products to Russia, are Brazil, Belarus, Ukraine, the USA and China. The total amount of import and export per commodity for 16 years was analyzed in unicomtrade base. Data base was presented in constant prices to smooth over inflation’s influence. The results of analysis demonstrated that the main commodities exported to Russia were meat and edible meat offal (21.55%), dairy products (11.91%) and edible fruits (8.83%). The main commodities imported from Russia were fish (39.26%), cereals (16.57%) and animal and vegetable fats and oils (8.11%).

The main import trade partners for Russia are Kazakhstan, Turkey, China, Egypt and Japan. However, in 2015 Russia announced food ban for Egypt and Turkey therefore main partner got prohibited.

In EU the main trade partners for Russia were Germany and Netherlands. Germany had export amount of 1,625.74 mln. US Dollars to Russia and 232.19 mln. US Dollars of import from Russia per year and Netherlands had 1,339.59 mln. US Dollars and 81.36 mln.US Dollars consequently. Comparison of mean export and import in EU countries for 16 years identified that export to Russia from EU exceeded import 6 times. At the same time mean import and mean export between EU countries was relatively equal. Only 2.33% of global export from EU belongs to Russia, and share of Russian products in global import to EU countries is 0.38%. It is proved in the paper (Smutka et al., 2016) that Russian import ban is intended to stimulate internal agricultural production.

The research involved agricultural trade flow for each of 24 commodities.

Figure 1. The Mean Export and Import to Russia from EU per commodity in 2000-2015, mln. US Doll.



Source: Uncomtradedatabase, own calculation

Where: 1-Live animals; 2-Meat and edible meat offal; 3-Fish, crustaceans, molluscs, aquatic invertebrates etc; 4-Dairy products, eggs, honey, edible animal product etc; 5-Products of animal origin; 6-Live trees, plants, bulbs, roots, cut flowers etc; 7-Edible vegetables and certain roots and tubers; 8-Edible fruit, nuts, peel of citrus fruit, melons; 9-Coffee, tea, mate and spices; 10-Cereals; 11-Milling products, malt, starches, inulin, wheat gluten; 12-Oil seed, oleaginous fruits, grain, seed, fruit, etc; 13-Lac, gums, resins, vegetable saps and extracts; 14-Vegetable plaiting materials, vegetable products; 15-Animal,vegetable fats and oils, cleavage products, etc; 16-Meat, fish and seafood and food preparations; 17-Sugars and sugar confectionery; 18-Cocoa and cocoa preparations; 19-Cereal, flour, starch, milk preparations and products; 20-Vegetable, fruit, nut, other food preparations; 21-Miscellaneous edible preparations; 22-Beverages, spirits and vinegar;

23-Residues, wastes of food industry, animal fodder; 24-Tobacco and manufactured tobacco substitutes.

The Table 2 presents that the main exported commodities from EU to Russia are meat and edible meat offal which amount is 45.61 million US Dollars. The main imported commodities are fish, crustaceans, mollusks, aquatic invertebrates etc. Their amount is 17.67 million US Dollars. As it was mentioned earlier import of agricultural products into Russia significantly exceeds export from Russia excluding cereals.

Linear regression model was constructed for each of 24 exported and imported commodities. The dataset was check by Shapiro- Wilk test; data had not normal distribution. So robust method was used in order to prepare linear regression model. It was used t-test for significance checking. Models for each commodity were significant, P-value was less than 0.05. Except for Vegetable plaiting materials, vegetable products etc (P-value was more than 0.5). All models were based on current prices, robust standard errors in parentheses were *** p<0.01, ** p<0.05, * p<0.1.

Among all models the commodity with the biggest P-value and the biggest amount of trade flow was selected (Table 1 and Table 2).

Table 1. Linear Regression model of Export to Russia from EU

Variables	**Dairy products, eggs, honey, edible animal product etc**	**Meat and edible meat offal**	**Beverages, spirits and vinegar**
GDP EU, mln $	0.0208***	0.0391***	0.0402***
GDP RU, mln $	0.0225***	0.0153***	0.0268***
Distance, km	-18.57***	-18.93***	-0.369
Boarder	-3.423	-54.604***	53.068***
Language	-33.200***	-53.022***	16.241***
History	69.624***	75.754***	-24.834***
Sea Port	33.178***	46.847***	-8.447**
Constant	-44.206***	-19.198	-71.342***
R-squared	0.488	0.477	0.465

Source: Uncomtrade database, own calculation

*Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1*

Analysis of export trade flow from EU countries to Russia revealed 3 groups of products, which linear regression models proved to be the most consistent. Linear regression model explains only 50% of results and the rest is explained by outside factors. As it is shown in Table 1 export of beverages, spirits and vinegar is not influenced by distance and export of dairy products does not depend on availability of common border. Opposite situation in case of variables language, border and history for meats and wine can be explained by the fact that for the last 16 years more than ¼ of meat volume (in constant prices) is for Germany which does not have common borders and language but it has active historical cooperation with Russia. As for wine situation is completely opposite; France and Italy take ¼ of the whole volume (all dummy variables equal 0, except sea port) and Latvia, Lithuania and Estonia cover ¼ of the whole volume of wine too (all dummy variables equal 1).

Table 2. Linear Regression model of import from Russia to EU

Variables	Animal, vegetable fats and oils, cleavage products, etc	Beverages, spirits and vinegar	Cereals	Fish, crustaceans, mollusks, aquatic invertebrates etc
GDP EU, mln $	0.00613***	0.00173***	0.00534**	0.0200***
GDP RU, mln $	0.00562***	0.000596	-0.00240	-0.0181***
Distance, km	1.752***	-1.272***	2.731**	6.393**
Boarder	7.038***	617.5	4.137	6.292
Language	1.029	-1.586***	-2.823	-8.050**
History	-4.476***	2.774***	-4.440	14.565**
Sea Port	-244.4	1.785***	3.898**	9.653***
Constant	-18.382***	150.9	3.827	33.394***
R-squared	0.287	0.286	0.092	0.374

Source: Uncomtrade database, own calculation

*Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1*

In Table 2, chosen four groups of import trade flows between EU countries and Russia products are Animal, vegetable fats and oils; Beverages, spirits and vinegar; Cereals; Fish. They make 73% of imported agricultural products from Russia and are hardly explained by models (R square less than 0.3). This fact might be explained by factors which are out of the model and it is quite difficult to estimate their influence. One of such factors is political decisions of the government.

It should be concluded that suggested gravity model can be used to predict agricultural trade flow to Russia but not from Russia.

In other words, initial hypothesis should not be rejected for import from Russia as well as for export to Russia.

The subject for discussion might be linear regression model which does not take into account specificity of each country (Stock and Watson, 2010) that may result in errors.

4. Conclusion

Russia is a significant trade partner for EU countries and agricultural trade is very important part of this partnership. Export of agricultural products to Russia from EU is 37% from the whole export. Therefore there is an actual problem of prediction of situation in future.

The aim of the article is to compare agricultural trade flow between Russia and European Union in the period of 2000-2015 and find some regularity.

The research included the dataset with data about export and import of agricultural products (24 types of products) with each of 28 countries of EU for 16 years. Data source is UnComtrade database. The research covers the period of 2000-2015 The data was under cleaning process and check normality by S-Wilk test. In order to eliminate inflation's influence the data was transformed into the form of constant price. Software STATA 13 was used for calculations.

The gravity model made in terms of research presented dependence of volume of every of 24 imported/exported product from GDP EU, GDP RU, distance between capitals of each of EU countries and Russia, common border, related language, common history, and availability of sea ports. Linear regression model was constructed for each of 24 imported/exported commodities, using robust methods. Analysis of export trade flow from EU countries to Russia revealed 3 groups of products which linear regression models proved to be the most consistent. These products are dairy products, eggs, honey, edible animal product; beverages, spirits and vinegar; meat and edible meat offal. These three groups take 34% of total volume of export into Russia. Linear regression model explains only 50% of results and the rest is explained by outside factors. Export of meat and dairy products corresponds to general hypothesis of gravity model stating that the less distance between countries, the more intensive trade flow between them.

Analysis of import trade flows between EU countries and Russia proved inconsistency of used linear regression models. Chosen four groups of import trade flows between EU countries and Russia products are Animal, vegetable fats and oils; Beverages, spirits and vinegar; Cereals; Fish. They make 73% of imported agricultural products from Russia and are hardly explained by models (R square less than 0.3). This fact might be explained by factors which are out of the model and it is quite difficult to estimate their influence. One of such factors is political decisions of the government. In case of import the hypothesis that the less distance, the more intensive trade flow is true for beverages only.

It should be concluded that suggested gravity model can be used to predict agricultural trade flow to Russia but not from Russia.

Further researches will be devoted to alternative statistic methods such as maximum likelihood. It provides reliable results in case of big number of dummy variables in model.

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GOVERNMENT SUPPORT EFFICIENCY IN AGRICULTURE. EXPERIENCE OF THE RUSSIAN FEDERATION

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Annotation: The paper is intended to estimate current status of government support by subsidies in Russian agriculture and estimate efficiency of these subsidies in different regions of Russia. An investigation involves 85 regions of the Russian Federation. A data source is the web site Statistics of Russia and the web site of Ministry of Agriculture of the Russian Federation. Data was subjected to cleaning process and its relevance was proved. The statistical software NCSS and k-medoids clusters methods were used. Government support of agriculture in the Russian Federation is lower than in Europe. In 2015 the total amount of support was 3,264 mln. EURO. Agricultural production is marginal in Russia. Profitability of the vast majority of regions is zero or negative without subsidies. According to results of cluster analysis there are 3 groups of regions depending on subsidies utilization efficiency. Results of the investigation proved that increased amount of subsidies did not improve production efficiency in agriculture. The linear regression model was constructed in order to reveal dependence of agricultural production volume from amount of subsidies, GNP and share of subsidies in the whole volume of GNP. This model helps predict the results of changes in government support. Efficiency of subsidies is decreased by its improper use and for this reason some measures such as different types of control (preliminary, current and follow-up) are suggested to control utilization of subsidies.

Key words: subsidies, cluster analysis, government control of subsidies

JEL classification: G38, Q12, Q14

1. Introduction

Efficient agriculture is a foundation of country’s food security and health of entire nation. However, agriculture needs government support due to some specific traces. The vast majority of agricultural lands in the Russian Federation belong to so-called risk agriculture area where government support is vitally needed (Alborov, 2012).

A lot of studies, which suggest different approaches and methods, are devoted to government support (Rezbova and Skubna, 2013; Spicka, 2015). In the beginning of 90-s acute decline of agriculture was observed in Russia but in the last decade the Russian agrarian sector is under the process of recovery especially because of the massive state support - market protection and subsidies coming into agriculture (Svatos et al., 2014; Smutka et al., 2015).

The Russian Federation is situated in 4 climate zones (from arctic to tropical) and consequently it is quite difficult to compare efficiency of utilization of one and the same amount of support in different weather and economic conditions. Therefore, in this paper it is offered to use cluster analysis. This analysis involves 85 regions of the Russian Federation which are grouped into clusters. Estimation of government support was done inside the clusters.

Government regulation of agroindustrial business is a complicated mechanism simultaneously influencing benefits of manufacturers of agricultural products, social structure of village, market and support of environment (Kolosova, 2016). The support is direct when government increases incomes of manufacturers of agricultural products and does not influence prices of products. This support may be presented by subsidies, deficiency payments, financing of social sector of rural area. Indirect support is provided by means of internal price regulation, credits by preferential rates, quota for import and export of imported products and customs duties. Indirect support is linked to profitable price policy, preferential taxation and credits by preferential rates (Borniakov, 2011).

Getting subsidies is very complicated process. Small companies usually apply only once whereas the bigger companies usually apply repeatedly (Spicka and Naglova, 2016). Sometimes government support becomes quite exotic, for instance, Russian import ban is intended to support agricultural production within the country (Smutka et al., 2016).

The aim of the article is to estimate government support efficiency in agriculture.

The objectives of the article are:
- Estimation of modern condition of agriculture and volume of government support in the Russian Federation
- Subdivision of 85 regions of the Russian Federation into 3 clusters
- Estimation of efficiency of subsidies by means of correlation regression analysis

2. Materials and Methods

The analysis was based in data from Russian government statistical regional report (Rosstat) and Russian ministry of agriculture report. Cluster analysis included the following variables: total subsidies per 1 ha of agricultural land, ratio of subsidies to agricultural gross value product, agricultural gross value product per 1 ha gross regional product per inhabitant, share of arable lands in total amount of agricultural lands, ratio rural population share in the total population. In order to get complete vision of each cluster the following additional variables were calculated as well: profitability of agricultural companies and its intensity. Missing values were approximated.

The 2015 year was investigated. The research involved 85 regions of the Russian Federation and the data was under cleaning and checking normality by Shapiro-Wilk test (Shapiro and Wilk, 1965). Calculations were made in NSCC and STATA software.

Medoid partitioning algorithms were utilized in order to make cluster analysis. It is used attempt to accomplish this by finding a set of representative objects called medoids. The medoid of a cluster is defined as that object for which the average dissimilarity to all other objects in the cluster is minimal. The medoid algorithm by Kaufman and Rousseeuw (2008) is applied. Two of the most difficult tasks in cluster analysis are deciding on the appropriate number of clusters and deciding how to tell a bad cluster from a good one. Kaufman and Rousseeuw define a set of values called silhouettes (s) that provide key information about both of these tasks. The silhouette measures how well an object has been classified by comparing its dissimilarity within its cluster to its dissimilarity with its nearest neighbour. When s is close to one, the object is well classified. When s is near zero, the object was just between clusters A and B. When s is close to negative one, the object is poorly classified. Kaufman and Rousseeuw interpret the average silhouette SC. When SC exceeds 0.5, a reasonable structure has been found. Otherwise the structure is weak and could be artificial. The Manhattan distance method for place similar objects in one cluster is applied (Strauss and Maltitz, 2017). The Manhattan distance d_{jk} between rows j and k is computed using

$$d_{ik} = \frac{\sum_{i=1}^{P} \delta_{ijk}}{P} \qquad \textbf{(1)}$$

where $\delta_{ijk} = z_{ij}\text{-}z_{jk}$ for interval variables. P denotes a number of variables. In order to remove distortions due to the differences in scales, the data are transformed to a common scales zij and zik using standard deviation.

The cluster analysis uses 5 structural variables (ratio of subsidies to agricultural gross value product, agricultural gross value product per 1 ha., gross regional product per inhabitant, share of arable lands in total amount of agricultural lands, ratio rural population share in the total population) and one key income indicator (total subsidies per 1 ha of agricultural land) to classify the Russian regions. Variables for cluster analysis were checked on correlation. It did not exceed 0.8. Correlation more than 0.8 misrepresents cluster analysis (Kaufman and Rousseeu, 2008). Linear regression model was constructed by robust method as the database has not normal distribution.

3. Results and Discussion

Variables characterizing agriculture in the Russian Federation are presented in the Table 1. Area of lands available for agricultural activity is only 11.17% from the total country square. Agriculture is extensive and does not require significant investments but provides low output. Cropping capacity of grain is 2 times less than average one in EU. In spite of this fact the Russian Federation is a key exporter of grain to other countries. As a comparison in Poland (this country has intensive agriculture) an amount of government support was 3.56 bln. EURO in 2015 (Statistical yearbook Agriculture and Food Economy in Poland, 2015) but in Russia it was 3.26 bln. EURO though Polish square of agricultural land is 10 times less than in the Russian Federation.

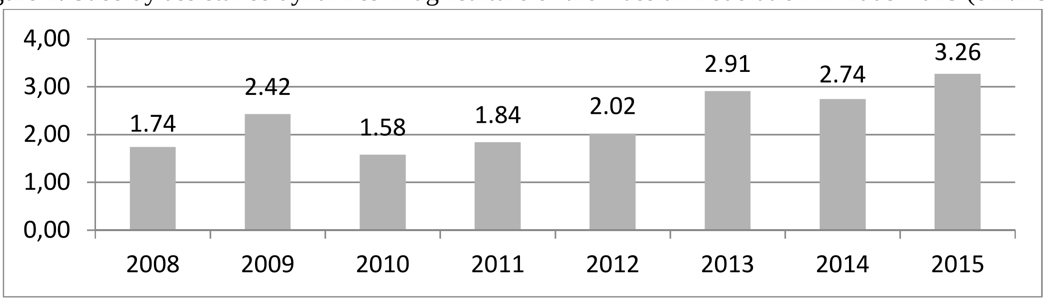
Table 1. Estimation of current condition of agriculture in the Russian Federation

№	Definitions	Amount
1	Total country square , thou. km2	17,125.19
2	Square of agricultural land, thou. km2	1,912.69
3	% of agricultural land in total country square	11.17
4	Cattle, thou. head	18,992
5	Milk whole fresh cow, thou. t	30,797
6	Cow milk yield, kg	5,140
7	Wheat, thou. t	61,786
8	Wheat yield, (1 dt from 1 ha)	23.9
9	Total amount of subsidies in the agricultural sector, bln.EUR	3.26

Source: Rosstat, Ministry of agriculture report, authors' calculation

There is the only one program of government support of agriculture in the Russian Federation. «Government program of agriculture development and regulation of markets of agricultural products, raw materials and food». Volumes of government support are presented in Figure 1. Actual amount of government support in 2015 was decreased by 1.3 times due to weakening ruble and strong inflation.

Figure 1. Subsidy assistance dynamics in agriculture of the Russian Federation in 2008-2015 (bln.EUR)



Source: Ministry of agriculture report, authors' calculation

Structure of government support in 2015 is presented in details in the Table 2. Such industries as plant cultivation and animal breeding make 60% of the total volume.

Regulation of agricultural products and food and raw material markets provides regulation of food products market including results of import phase out.

Investment interest rate of subsidies makes 1/3 of the whole amount. It means that 1/3 of the amount is intended for modernization and intensification of agricultural production. Banks provide special credits to private farmers and agricultural companies and interest rate of these credits is partly financed by government.

Table 2. Content of agriculture development program in 2015

№	Definitions	Total amount of subsidies	
	Total , mln EUR	3,264.65	100%
1	Plant cultivation development	1,042.18	31.92
2	Cattle breeding development	983.33	30.12
3	Steady development of rural area	246.63	7.55
4	Land improvement	115.08	3.52
5	Technical and technological modernization	77.33	2.37
6	Minor business forms support	173.42	5.31
7	Regulation of agricultural products and food and raw material markets	450.43	13.80
8	Development of finance and credit system in agroindustrial complex	176.25	5.40

Source: Ministry of agriculture report, authors' calculation

Number of companies involved into «Government program of agriculture development and regulation of markets of agricultural products, raw materials and food» is relatively small. According to the report of Ministry of Agriculture (2015) the only 3.55% of the total number of companies joined this program in 2015. This program is not popular for quite complicated reason. To join this program it is necessary to fill big number of documents. Agricultural companies are poorly informed about this program. Banks provide high interest rates for using investment credits. High inflation is one of the reasons, too. Agricultural companies are not sure in future government policy.

Regions divided into 3 clusters are presented in the Table 3. Amount of subsidies per 1 ha of agricultural land is 7.89 EURO in the first cluster. Amount of subsidies of the second cluster is 5.51 times more than in the first cluster. The third cluster has 12.48 EURO per 1 ha.

Table 3 - Variables for clusters analysis

№	Definitions	1 cluster	2 cluster	3 cluster
1	Total subsidies per 1 ha of agricultural land, EUR.	7.89	43.48	12.49
2	Ratio of subsidies to agricultural gross value product, %	3.30	4.08	3.03
3	Agricultural gross value product thou. EUR. per 1 ha.	0.74	0.56	0.35
4	Gross regional product per inhabitant, thou. EUR.	4.74	4.69	4.26
5	Share of arable lands in total amount of agricultural lands	51.12	65.14	69.28
6	Rural population share in the total population, %	32.84	30.74	27.25
7	Number of regions in the cluster	23	24	35

Source: authors' calculation

The vast majority of regions in the second cluster have poor weather conditions (Siberia and Northern part of the Russian Federation) and amount of subsidies is relatively big as the region has big area and share of agricultural lands is relatively small.

Additional variables characterizing each cluster are presented in the Table 4.

Table 4 - Additional variables of regions divided into clusters

№	Definitions	1 cluster	2 cluster	3 cluster
1	Wheat (1 dt from 1 ha of harvested acreage)	25.47	23.38	19.56
2	Milk yield per 1 cattle unit, kg	4,567.44	5,041.45	4,894.89
3	Mineral fertilizer amount (equivalent to 100% of plant-food basis), kg per 1 ha of crop of agricultural plants	48.84	53.62	23.16
4	Organic manuring, t per 1 ha of crop of agricultural plants	2.44	1.42	1.0
5	Profit margin of plant cultivation products (with subsidies from state budget), %	11.28	14.28	20.4
6	Profit margin of cattle breeding products (with subsidies from state budget),%	2.99	14.59	11.53
7	Feeds consumption per 1 cattle unit, (dt feed units)	28.52	27.58	29.5
8	Salary per 1 month, EUR	438.08	408.51	389.04
9	Profit margin of agricultural organizations without subsidies from state budget %	-3.12	4.67	8.95
10	Profit margin of agricultural organizations with subsidies from state budget %	14.19	17.78	17.85

Source: authors' calculation

Variables of production intensification are relatively at the same level in all clusters. At the same time profit margin is different. In spite of the fact that plant cultivation and animal breeding has relatively the same share of subsidies 30% of the total amount, their profitability is equal in the second cluster only but in the first and in the third cluster it differs by several fold. Line 8 and line 9 (profit margin of agricultural organizations) present efficiency of utilization of subsidies. For instance, in the first cluster profit margin was increased from -3.12% to 14.19% i.e. profit margin was 5.5 times increased when the amount of subsidies was 7.89 EURO per 1 ha. In the second cluster profit margin was increased only 3.5 times though the amount of subsidies was 43.48 EURO per 1 ha. As a result there is paradox that the first cluster has the least amount of subsidies but uses them the most efficiently.

However, taking into account the fact that unofficial inflation was more than 20% in 2015, condition of profitability and efficiency of agricultural companies is uninspiring.

According to cluster analysis it is impossible to make reliable conclusion about efficient utilization of subsidies. Pairwise correlation for cluster analysis and further linear regression analysis is presented in the Table 5.

Table 5. Pairwise correlation

Definitions	GdpAg	Subs	SubGDPAg	GDP	Field	People
Agricultural gross value product thou. EUR. per 1 ha. (GDPAg)	1.0000					
Total subsidies per 1 ha of agricultural land, EUR. (Subs)	0.4373*	1.0000				
Ratio of subsidies to agricultural gross value product, % (SubGDPAg)	0.2147*	0.8362*	1.0000			
Gross regional product per inhabitant, thou. EUR. (GDP)	0.2557*	0.5244*	0.8284*	1.0000		
Share of arable lands in total amount of agricultural lands,% (Field)	0.0593	-0.3739*	-0.4667*	-0.4432*	1.0000	
Rural population share in the total population, % (People)	-0.2535*	-0.1020	-0.1382	-0.2744*	-0.1803	1.0000
Profit margin of agricultural organizations with subsidies from state budget % (Profit)	-0.0144	0.2652*	0.3807*	0.4066*	-0.0582	0.0534

Source: authors' calculation

Linear regression model is presented in the Table 6. P-value for all indicators is less than 0.05. Model is significant. R-squared is equal 0.49. It may be stated that 49% of variables influencing efficient utilization of subsidies can be explained by means of model. Optimum number of coefficients and check of their significance was selected for model by means of tests and comparison of R-squared adj.

Table 6. Linear regression results

					Number of obs	84
					F(3, 80)	11.58
					Prob > F	0.0000
					R-squared	0.4916
GdpAg	**Coef.**	**Robust Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
Subs	0.00526120	0.0009755	5.39	0.000	.0033198	.0072026
SubsGdpAg	-6.532334	1.790588	-3.65	0.000	-10.09572	-2.96895
GDP	0.0670437	0.0238418	2.81	0.006	.0195969	.1144905
Cons	34.91366	3.320957	10.51	0.000	28.30474	41.52257

Source: authors' calculation

Increasing agricultural gross value product in 1 thou. EUR per 1 ha. leads to increasing subsidies in 0.005 EUR per 1 ha, decreasing ratio of subsidies to agricultural gross value product to 6.53% and increasing gross regional product per inhabitant to 67 EUR.

This model proves the fact that increasing of production volume in agriculture leads to increasing of subsidies. It was chosen 17 indicators for estimation by cluster analysis. These indicators characterize the production of agricultural products from different sides - natural and financial.

It is possible to see positive relationship between total amount subsidies per 1 ha of agricultural land and profit margin of agricultural organizations with subsidies from state budget.

Inappropriate use of subsidies is an actual problem in the Russian Federation. Many follow-up mechanisms intended to control appropriate issue of funds operate formally or do not operate at all. Subsidies should be followed up at each stage. Preliminary stage should realize check of applications. Current stage is intended to control whether final user gets needed money. Follow-up stage should control appropriate utilization of money.

It may be concluded that government support of agricultural companies is of great importance for the whole population of the country. However, issue of government support is still subject for discussion. In the research (Webb and Block, 2010) an opposite point of view was discussed. Developed countries such as the USA, Canada and Germany support agriculture very well but manufacturers of agricultural products are focused at production of cheap products, for instance, corn syrup instead of fruits, in order to get more profit. It brings negative results to health of population.

4. Conclusion

The aim of the paper is to estimate agriculture and efficient utilization of subsidies by means of cluster analysis and correlation regression analysis.

- Modern agriculture in the Russian Federation belongs to extensive type.
- In 2015 amount of government support was 3.26 bln. EURO, and 1/3 of it was intended to cover investment interest rate of subsidies. In other words, subsidies were spent on modernization and intensification of agricultural production.
- K-medoid was used for cluster analysis. To make analysis 85 regions of the Russian Federation were divided into 3 clusters depending on amount of subsidies per 1 ha and efficient utilization of subsidies.
- Regions with the least amount of subsidies use it the most efficiently. Having 7.89 EURO per 1 ha, profitability of agricultural companies has increased 5.5 times.

- Subsidies mainly influenced financial variables such as profit margin. Variables of production intensity were constant.
- Model obtained by linear regression analysis provides 49% of explanation of revealed dependence of agricultural production volume from amount of subsidies, GNP and share of subsidies in the whole volume of GNP. This model allows prediction the results of changes in government support
- In order to stop inappropriate utilization of subsidies it is suggested to implement stage-by stage control. Applications are controlled at preliminary stage. Current stage controls if final user gets needed money and appropriate utilization of money is controlled at follow-up stage.

Further researches will be devoted to comparison analysis of regions from Vishegrad group and the Russian Federation and analysis of efficient utilization of subsidies.

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SOCIAL FARMING IN THE LEGAL AND ECONOMIC ENVIRONMENT OF THE CZECH REPUBLIC

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Annotation: The aim of this article is to specify the economic and legal aspects of social farming (also referred to as social agricultural, green care farming, green care etc.) in general terms, and in relation to seniors in the Czech Republic, Central Europe, primarily with regard to rural areas in the South Bohemian Region. Social farming is a method of real integration of socially or physically disadvantaged persons into society through various mechanisms such as social services, employment, leisure activities, education, etc., all in the direct context of agriculture and rural communities. Rural areas have traditionally been conceived as settlements outside cities which usually have a lower population density and are frequently associated with the agricultural sector. The concept of agriculture includes many functions, e.g. production function, cultural function or social function. Social farming is a current topic that relates, inter alia, to the social exclusion of seniors, and to which attention is paid mainly due to its potential for the whole of society and rural areas. Social exclusion of seniors can be understood as a lack of participation of a person in the age of 65+ in the life of the society, accompanied by a higher degree of dependence on the care of another person. This article also reflects the results of research conducted via a focus group in the second half of 2015.

Key words: Social Agriculture, Social Farming, Green Care, Rural Areas, Senior, Social Services, Czech Republic

JEL classification: K10; Q10

5. Introduction

Social farming, also referred to as Green Care Farming, Social Agriculture or Farming Therapy, has been implemented in the Czech Republic for several years primarily on agricultural farms, usually in direct or indirect collaboration with NGOs. Currently, an indispensable part of the institute of social farming is the mechanism of financial and non-financial support of the agricultural sector. Social farming includes two concepts: multifunctional agriculture and social services. The multifunctional concept of agriculture includes the production function, the landscape, environmental, recreational, cultural, social, settlement-generating functions, and others. Social farming particularly develops the social function of agriculture, particularly via the employment and social inclusion of disadvantaged people, and by social services and other activities in rural areas. These activities are focused on rural areas due to the expectation of their worse availability compared to the offers in cities.

6. Materials and Methods

Agricultural social policy is an important pillar of nearly every national agricultural policy. Competitive agriculture is the main achievement of active farmers who “have to rely on their ability to provide adequately for themselves and their dependents in their old age and in the event of accidents, sickness, death and the need for nursing care” (Act No. 108/2006 Coll.). The agricultural social policy “helps to avoid social hardship as a result of the structural changes in agriculture”. (Act No. 108/2006 Coll.)

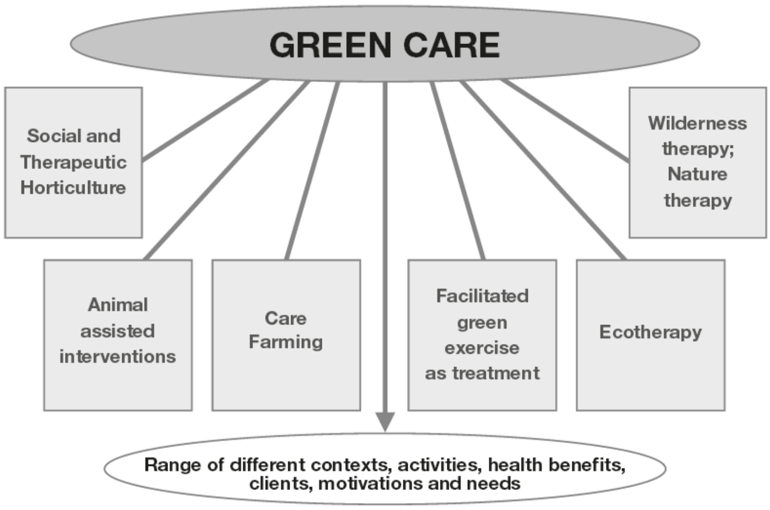
The data presented in this article was obtained and subsequently processed mainly through an analysis of professional literature and related legal regulations. Primarily Czech, but also foreign literature was worked with. The aim of this article is to define social farming and its importance, in particular in relation to social exclusion. Another method described and used for the purposes of this article is a focus group, which was used to determine the subjective opinions of seniors in selected territories of the Czech Republic regarding their position in society and the issue of social farming. The focus group method provides a certain form of compromise between the advantages of direct observation and individual interviews (Act No. 435/2004 Coll.).

7. Results and Discussion

Green Care and Social Agriculture:

Social farming is a relatively new concept that is primarily based on the concept of “Green Care”, i.e. a “broad spectrum of almost any activities that are structured, planned or documented, and are based on the interaction between man and nature to achieve human welfare” (Chovanec, 2015). Green Care includes many activities of various kinds, e.g. teaching, educational, socially-inclusive, working, therapeutic and others, whose main principle is direct “human contact with the natural elements and their positive effects on the quality of human life” (Chovanec, 2015). „Being a Green Care service provider means that the farmer's function is extended, that is, by shaping a therapeutic environment and being a role model, which takes a genuine interest and belief in the idea of Green Care, and ability to think creatively and innovatively“ (De Bruin, 2012). The individual activities covered by the concept of Green Care are shown in the following picture.

Figure 1. Scheme Green Care umbrella – the diversity of green care



Source: Sempik (2010)

Social farming has a specific position amongst the Green Care tools, as it includes an entire complex of different activities ranging from rehabilitation and therapy in terms of providing social services, to the inclusion of people with special needs into society, to education, improvement of rural culture and employment aspects. This complex of activities also represents the objectives of social farming. An indispensable role of social farming is the possibility of social inclusion of disabled and socially disadvantaged people in rural areas. Social farming can be used when working with a number of specific persons, e.g. for community-living of the elderly with dementia (Erasmus+, 2016) or other health or social problems.

In general, the emergence of social farming can be linked to the emergence of society, wherein living and working in rural areas meant not only the necessity for subsistence, but were also important for their beneficial effects. For example, in the past, parks and gardens were created as part of facilities for the institutional care for the sick. One example is the so-called Camphill Movement with its specific attitude to persons with special needs, and the so-called holistic approach to conceptualizing care as a healing, socialization and educational process, and everyday life in the community of an agricultural farm. “The philosophy of the Camphill Movement is an agricultural farm which creates conditions for life, work and socialization of people with mental disabilities (approximately hundreds of units in 20 countries)" (Federal Ministry of Food, 2009). The first social farming institution was in the early 19th century in Germany. However, the institutions began being more developed in various countries in the late 20th century. Currently, the countries where the social farming is at a high level are "Great Britain (about 200 social farms), Finland (about 500 social farms) and Norway (about 800 social farms)" (Chovanec, 2015). Social farming is in its infancy in the Czech Republic.

From a legal perspective, there is no legal definition in the Czech Republic that could define and construe the concept of social farming. Social farming can be perceived as a set of agricultural activities that are oriented on supporting socially and physically disadvantaged people, social inclusion, labour market integration, services associated with rural areas with the aim of the development thereof. For completeness, it is necessary to mention the definition set out in the opinion of the European Economic and Social Committee of 12 December 2012, which favours the term Social Farming and states that "social farming is an innovative approach that brings together two concepts: multifunctional agriculture and social services / healthcare at the local level. Within the production of agricultural goods, it contributes to the welfare and social integration of persons who have specific needs." (Lund, Granerud and Eriksson 2015). In article 3.3 of this opinion, a possible definition of social farming is presented – „Social farming could thus be provisionally defined as a cluster of activities that use agricultural resources – both animal and plant – to generate social services in rural or semi rural areas, such as rehabilitation, therapy, sheltered jobs, lifelong learning and other activities contributing to social integration (according to the definition used in COST (European Cooperation in Science and Technology) Action 866 – Green Care). In this sense, it is about – among other things – making farms places where people with particular needs can take part in daily farming routines as a way of furthering their development, making progress and improving their well-being" (Lund, Granerud and Eriksson 2015).

The following table shows the main benefits of social farming that are beneficial not only for individuals, but also for society, the area of agriculture and rural areas.

Table 1. Social farming benefits

Availability of social services in rural areas	Greater efficiency of social care and social aid
Creation and maintaining of jobs in rural areas	Specific benefits for individuals
Strengthening mutual responsibility and improving relations	Improving the environment
The possibility of new sources of income for small businesses	Establishment of links between rural areas and educational institutions

Source: Own processing according to Chovanec (2015)

Social farming is focused on three main areas: production, services and education. The production is directly related to employment, i.e. to creating jobs and subsequent employment of persons with normal or protected jobs using financial contributions and support. Services aim to integrate people into normal life of society. Education refers to activities of an activation and educational nature linked to the rural environment and agricultural activity.

The following picture shows social farms operating in the Czech Republic. As mentioned above, social farming in the Czech Republic is still in its infancy.

Figure 2. Map of social farms in the Czech Republic

Source: Social farming portal, 2016

So-called examples of good practice include "Sdružení NERATOV, z.s., which operates in the evacuated village of Neratov on the Czech-Polish border and has been trying to restore this area and offers homes and work for physically and socially disadvantaged people." (Federal Ministry of Food, 2009). Another example is Farma Dvůr Čihovice, which "is part of the premises of non-profit organizations Pomoc Týn nad Vltavou, z.s. and Domov sv. Anežky, o.p.s. Both organizations provide services to people with disabilities - protected workshops, social services, rehabilitation centre, whose purpose is to assist these people in incorporating them into normal society." (Federal Ministry of Food, 2009).

In the Czech Republic, there are several forms of economic securing of operation of activities related to social farming. These are regional grants and subsidies, operational programmes, national programmes and other support options. Among other things, the action or development plans of individual regions contain subsidy programmes focused on environmental, social or agricultural areas. For example, in the South Bohemian Region, these are Support Services programmes not defined in Act No. 108/2006 Coll., on Social Services, as well as Support of Direct Sales of South Bohemia Agricultural and Food Products, or the EVVO Programme - Environmental Education, Training and Awareness.

In terms of national programmes, the activities of joint-stock company Podpůrný a garanční rolnický a lesnický fond, a.s (hereinafter "PGRLF") are essential. The sole shareholder of this company is the Ministry of Agriculture of the Czech Republic. Its main activity is "subsidizing a part of interest on loans of business entities in the area of agriculture, forestry, water management and industries dealing with processing of production from agricultural production, and financial support of insurance" (Federal Ministry of Food, 2009). In 2015, a "completely new social farming programme was launched, from which it is possible to provide investment and operating loans with the possibility of reducing the loan principal up to the limit of the relevant de minimis regulation, even repeatedly. The loans are intended to support primary agricultural producers, who employ or will employ persons with disabilities on their farms. The amount of 50 million CZK is intended for social farming." (Federal Ministry of Food, 2009). In addition, once or twice a year the Ministry of Agriculture announces a tender for support of projects of non-governmental organizations (NGOs) – i.e. institutions, associations, public service societies, foundations, specialized facilities of registered churches and religious groups and other legal entities, whose main "subject of activity is providing mainly health, cultural, educational and social services, and to provide social and legal child protection, as well as to individuals who provide such services or social and legal child protection if the central authority decides as such. The target groups of the project are particularly children under 18 years of age, youths under the age of 26, risk groups of children and youths, seniors, people with disabilities, people in social need, ethnic minorities, the Roma community (specific problems), people at risk of drugs or addicted to drugs, refugees, foreigners, fellow countrymen and residents of rural areas" (Federal Ministry of Food, 2009). Other national programmes include the State Programme of Environmental Education and Awareness (Ministry of the Environment) or General Educational Programmes (Ministry of Education, Youth and Sports).

Operational programmes from which social farming can also be funded are, for example, the Operational Programme for Employment, the Rural Development Programme or the Integrated Regional Operational Programme (IROP).

Another example of support possibilities is the Erasmus+ educational programme of the European Union for the period from 2014 to 2020, which focuses on mobility in different areas of education. "Erasmus+ aims to increase the quality and adequacy of qualifications and skills. Two thirds of the funds from this programme are intended for scholarships for more than 4 million persons for study, training, work or volunteering abroad from 2014 to 2020 (compared to 2.7 million from 2007 to 2013)" (Morgan, 1997).

Main participants and target groups of social farming

The main participants in the field of social farming are all those (individuals, legal entities, public administration) who apply the procedures and rules of social farming in practice. These are municipalities and regions, social enterprises, NGOs, ESIF project implementers, farmers, registered providers of social services and social workers.

The target groups are primarily people who are disadvantaged in the job market, social services users, the target groups of related projects (in particular ESIF) and the general public. Czech legal regulations that deal with this area are particularly Act No. 89/2012 Coll., Civil Code, Act No. 90/2012 Coll., on Commercial Corporations, and others.

The institutions dealing with social farming are implementers of policies and support programmes. In the Czech Republic this is primarily the Ministry of Agriculture, which defines rules for farmers through Act No. 252/1997 Coll., on Agriculture. One of the fundamental pillars of the grant policy of the Ministry of Agriculture is PGRLF. "The offer of PGRLF support programmes currently includes fifteen programmes intended for primary agricultural producers, processors of agricultural production and entrepreneurs in the wood processing and forestry industries" (PGRLF, 2016). The Ministry for Regional Development negotiates and coordinates conditions for the programmes of the so-called Common Strategic Framework for the programming period of 2014 to 2020. Another public authority is the Ministry of Labour and Social Affairs, which is the creator of social policies, and, in relation to the objectives of social farming, it primarily proceeds from Act No. 435/2004 Coll., on Employment, Act No. 108/2006 Coll., on Social Services, and Decree No. 505/2006 Coll., which implements certain provisions of the Act on Social Services. Ministry of Education, Youth and Sports also operates herein in direct relation to education. Legal regulations in this field are particularly Act No. 561/2004 Coll., Education Act, Act No. 563/2004 Coll., on Pedagogical Staff and on Amendments to Certain Other Acts, and others.

Support of socially and physically disadvantaged groups

Socially-disadvantaged people, or those who are socially excluded or at risk of social exclusion particularly include the unemployed, disabled persons, persons receiving a pension, mainly a retirement pension, persons from families with more than three children, those from incomplete households, etc.

Social exclusion, otherwise also social disqualification and segregation, is largely an involuntary process wherein not only individuals, but also groups of persons are directly or indirectly deprived of access to resources that are necessary, at any given time and at any given location, for integration into the social, economic and political activities of society as a whole. Social exclusion can happen for many reasons, such as low income, poor education, discrimination, spatial isolation, poor living conditions, bad health condition, etc. Socially-excluded persons are "severed" from various resources, offices and services, including medical facilities and educational institutions.

In the Czech Republic, assistance and support to socially disadvantaged people is primarily introduced in the legal regulation of Act No. 108/2006 Coll., on Social Services, which should enable social integration for such persons, or prevent eventual social exclusion through the so-called social services. This Act (section 1, paragraph 1) regulates the "conditions for providing assistance and support to individuals in unfavourable social situations... through social services and care allowances, conditions for authorizing the provision of social services, public administration in the area of social services, inspection of the provision of social services and the prerequisites for carrying out social services activities" (Sempik, Hine and Wilcox, 2010). The Act on Social Services came into force on 1 January 2007 after almost 16 years of legislative preparations. This Act (section 67, paragraph 3) considers a physically disabled person as an individual "who has the ability to perform a systematic job or other gainful activity, but his or her ability to be or remain employed, carry out an existing occupation or use existing skills or acquired qualifications are significantly limited due to his or her long-term poor health" (Social farming portal, 2016).

In 2015, a research survey using a focus group method was carried out that was focused on seniors in the Czech Republic, specifically the South Bohemian Region. In terms of constitutional definition, the Czech Republic is divided into basic local governments – municipalities and higher territorial self-governing units - regions. There were two focus groups with a total of 31 seniors. The first group consisted of 15 seniors, and the second of 16 seniors. The average age in the first group was 69.31 years and 70.53 years in the second group. Each of the seniors had to fulfil four conditions. The first condition was a direct relationship to a rural area, which was assessed according to permanent residence in a municipality with a population of up to 2,000). The second condition was permanent residence in South Bohemia. The third condition was that this had to be a person without a legal capacity restriction. The last condition was that there was to be no family or similar relationship with another focus group respondent. Four topics were discussed in both focus groups - namely housing, leisure activities, social exclusion and poverty. In relation to social farming, the seniors were asked whether they had encountered this concept. Surprisingly, none of the seniors had ever apparently heard of this concept. The concept was subsequently explained and a wide debate took place in both groups about social farming. In both groups, the seniors liked the idea of social farming. An interesting finding was that in the first group of seniors, the individuals preferred to be in the role of organizers who would like to actively contribute to the implementation of projects and assistance to individuals in need, at least in terms of voluntary activities which would constitute a way for them to spend their leisure time. Adversely, in the second group, from the very beginning the seniors considered themselves individuals in need for whom such projects would be suitable, primarily due to their solitude in rural areas.

8. Conclusion

Social farming is an expanding area distinguished by participation in working life, social inclusion, retraining and therapeutic activities, educational activities, social services and personal assistance services. Given the importance of social farming for both individuals and society, it would be appropriate for social farming to be recognized on the level of the European Union, beyond the state definition, and in particular beyond its legal definition. In relation to the seniors who were respondents of the research, it would be desirable to ensure greater awareness, particularly in relation to persons who are socially excluded or at risk of social exclusion. An indisputable advantage of social farming is connection between individual aspects and functions of agriculture with so-called individuals in need.

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THE INFLUENCE OF LOANS DEVELOPMENT ON COMPETITIVENESS OF AGRICULTURAL COMPANIES IN THE SLOVAK REPUBLIC

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Annotation: In a medium-term conception of economic and social development of the Slovak Republic the task of strengthening effectiveness and competitiveness of agro food sector was determined in order to acquire the adequate utilization of domestic production factors but as well as the advantage of international trade respecting environmental and social functions of agriculture in a society. Loan products of commercial banks are becoming the crucial sources of financing in the subjects of agricultural primary production. In the past banks considered the sector of agriculture as non-perspective mainly from the reason for insolvency. Loan availability for agricultural companies improved after the entrance of the SR to the EU for the eligibility of direct payments. Commercial banks became the inseparable financial stimulus of agricultural companies and provide farmers with bridging loans for pre-financing of subsidies which have a possibility to acquire them in the form of direct payments from the funds of the European Union and the State Budget of the Slovak Republic. The article focuses on the assessment of development and actual state in the structure of loans provided to subjects of agricultural primary production by means of subsidies and offered loan products of commercial banks.

Key words: agriculture, Common agricultural policy (CAP), commercial banks, short-term loans, medium-term loans, long-term loans

JEL classification: M21, Q14, Q18

1. Introduction

Entrepreneurship on the agricultural land belongs among the oldest economic sectors of every country. Slovakia and its countryside was a typical agrarian country for many centuries (Rovný et al., 2015). The agricultural sector in Slovakia was transformed after 1989 when the centralized economy ceased to exist (Tóth et al., 2015). After the accession to the European Union, the Slovak agriculture entered the large European market which involves well-established businesses of advanced countries which stand for a severe competition (Szabo and Grznár, 2015). In the current era of globalization the position of agriculture is changing especially in the trend of EU Common agricultural policy (CAP) reforms (Horská et al., 2013). Integration into the EU single market provided opportunities to the Slovak Republic for better exploitation of its comparative advantages (Bartová and Kónyová, 2015). The European Union and its policy distinctly support agriculture in the individual member states (Svatoš and Smutka, 2012). Principles and forms of realization of the CAP have developed and gradually changed throughout its existence. The aid system applied by the CAP of EU influences in a significant way the economic situation of agricultural enterprises (Homolka and Švecová, 2012). During the 50 year existence of the CAP, many financial instruments have been implemented. Many reform steps have been done and many analyses have been provided to contribute to an improvement of farmers´ situation and maintaining agricultural activities across the EU (Řezbová and Tomšík, 2012). In a conception of economic and social development of the SR the task of strengthening effectiveness and competitiveness of agro food sector was determined in order to acquire the adequate utilization of domestic production factors but as well as the advantage of international trade respecting environmental and social functions of agriculture in a society. Therefore the effective and systematic financial support is indispensable as a lack of financial sources is considered to be the biggest barrier of development of entrepreneurs in agriculture. Financial sources are acquired mainly from bank sector which offers various schemes and models of financing by means of loans. The next possibility of available sources is represented by a huge amount of external long-term financial sources from the EU funds, several subsidies and grants which are arising from the membership of the SR in the EU.

A new financial frame will be hold in the EU member states in a new budget period 2014-2020. It is supposed that the fundamental changes will touch financing of agriculture and the country and will influence significantly incomes of agricultural producers in the EU member states (Boháčková and Hrabánková, 2011). The article focuses on the assessment of development and actual state in the structure of loans provided to subjects of agricultural primary production by means of subsidies and offered loan products of commercial banks.

2. Materials and Methods

It is indispensable to create suitable competitive, financial and business environment in order to secure a sustainable development of the SR in the context of global economic changes. The need for securing of financial means required for operation, investments or renewal of techniques and technologies is ongoing in the agriculture while financial flows are often unstable. Therefore the financial institutions adapt their products to its clients as well as to the sector of agriculture. Database for solving of the mentioned issue is presented by data included in the financial statements of central database of the Ministry of Agriculture and Rural Development in the SR for all legal persons farming on agricultural land in the Slovak Republic within the years 2008 -2015, data from information letters of Statistical Office of the Slovak Republic and selected banks. Inductive – deductive, analytical – synthetic logical scientific methods and methods of comparison by means of chain indexes are used for understanding and explanation of issue. The data were processed using Microsoft Excel spreadsheet. The results obtained are interpreted by basic descriptions statistical characteristics of the development index and percentage structure.

3. Results and Discussion

The Slovak agriculture has been influenced by various factors of external and internal character after the entrance to the EU. The crucial influence has had the CAP of the EU. The CAP of the EU, its adoption to new requirements of rural population and environment determines the status and development of the Slovak agriculture. Its changes and content expressed in the philosophy of applied tools and total amount of subsidies influence the utilization of agricultural potential and its total performance. Pursuant to Chrastinová et al. (2013) the meaning of subsidies from the EU sources as well as national sources is irreplaceable for the Slovak agriculture. Subsidies stimulate not only the economics of a given sector and particular commodities but as well as the investment process that retroactively influences the cost decrease through the labour productivity. The subsidy policy in the SR agriculture is more transparent and direct payments from the EU significantly contribute to the increase in financial sources of companies.

As regards the character of seasonal production the entrepreneurship in agriculture requires the capital achieved from own (sales, interest income) respectively external financial sources. While costs related to inputs are allocated in the beginning of season, the sale of crop and animals is realized with a time delay and after the settlement of income from own products and services companies have own financial means at disposal. As company profits are low and altogether with depreciation and amortization they are sufficient for a renewal of material-technical base, the crucial task is presented by subsidies and loans when financing those companies. The most essential meaning from subsidies is represented mainly by legally claimable direct payments from the EU that are the guarantees of short-term bridging operating loans from commercial banks. Agricultural companies settle the loans through subsidies so they keep their solvency in the loan market what is presented by a simultaneous increase in loans to this sector for financing of operating cycle of agricultural produce from soil preparation to realization of produce. The ratio development of profitable and loss companies as well as achieved results of profits or losses expresses that almost more than 50% of agricultural companies is dependent on external financial sources mainly loans from commercial banks. In the last years agricultural cooperatives internally changed to capital businesses with the majority interest of several members. The huge part of agricultural business companies was established by the transfer of creditworthy part of cooperative assets and their business activities without the transfer of liabilities towards banks and other business partners and as well as without a suitable settlement of interests of their members and shareholders. Higher indebtedness of business companies derives from the fact that they are more creditworthy as regards profit and return on loans and therefore loans are more accessible to them. Banks provide them with loans at a higher level than cooperatives.

Table 1. Basic economic data of agricultural enterprises – legal persons (in €. ha-1 of agricultural land, in %)

Year	**Indebtedness of property in %,**		**Share of profit making enterprises in %**	
	agricultural cooperatives	business companies	agricultural cooperatives	business companies
2010	31.0	53.5	55	73
2011	31.9	53.8	69	80
2012	30.5	54.8	61	79
2013	34.8	54.4	50	71
2014	34.4	54.3	66	75
2015	35.8	55.0	53	74

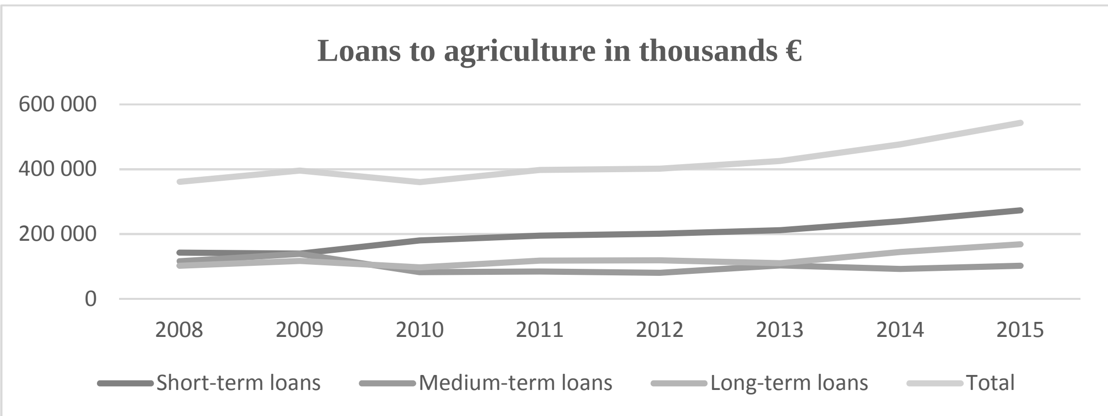
Source: NBS, own processing. Note: Data including loans to hunting and fishing

Table 2. Loans to agriculture in thousands €

Year	**Short-term loans**	**Medium-term loans** from 1 – 5 years	**Long-term loans** over 5 years	**Total**
2008	142,785	115,862	102,243	360,890
2009	139,780	138,961	116,646	395,387
2010	180,492	82,762	97,044	360,298
2011	195,615	84,899	117,772	398,286
2012	201,501	80,764	119,205	401,470
2013	212,435	103,273	110,226	425,934
2014	239,946	92,232	144,904	477,082
2015	272,931	102,025	168,306	543,262

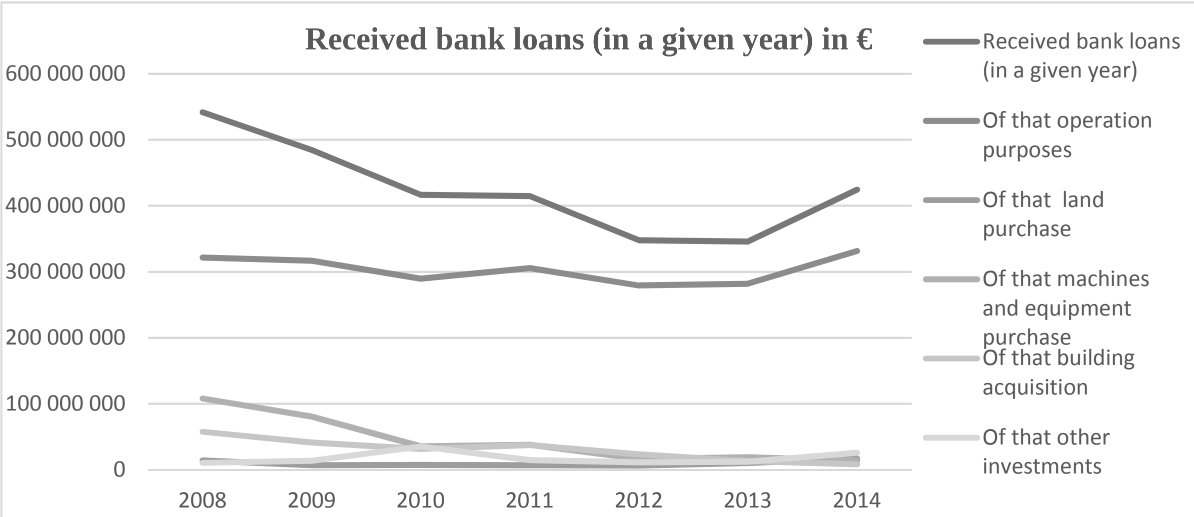
Source: NBS, own processing. Note: Data including loans to hunting and fishing

Figure 1. Loans to agriculture in thousands €



Source: NBS, own processing. Note: Data including loans to hunting and fishing

Figure 2. Received bank loans (in a given year) in €



Source: The selected indicators from the Statement of selected indicators of individual data of legal persons farming in the land in the Slovak Republic derive from central database of the Ministry of Agriculture and Rural Development in the SR, own processing.

Agriculture as a whole has annually maintained a profitability trend since the entrance of Slovakia to the EU but the competitiveness of its produce has been significantly differentiated and without subsidies the majority has reported losses. Agricultural companies maintained its creditworthiness through subsidies and their position in the loan market. Loans from commercial banks helped them to secure the continuance of operating cycle of agricultural produce. With the flow of financial means from the EU funds the amount of loans needed for a project co-financing increased while the total status of loans annually increased by 25.8%. Short-term bridging loans prevailed (43%). From the point of investment activities medium-term and long-term loans were crucial which formed more that 50% of total loans. The assets indebtedness arose in total as well as in loan and also the ratio of loans to external sources presented the fact that the providing of loans did not slow down. Government guarantees attributed to it, namely those of Slovak Guarantee and Development Bank.

The results of agro food sector in the year 2009 were influenced by various factors, among others the impact of global financial and economic crisis. The year 2009 was the first one from the entrance of the Slovak Republic to the EU when agriculture reported losses. The significant interest in income of agricultural companies obtained subsidies from the EU sources. Direct payments and other subsidies presented the indispensable element of production cost settlement and securing of their income on a socially acceptable level at a low level of sale prices of agricultural goods and higher prices for industrial inputs and prices of services for agriculture. The crucial significance from subsidies was presented by legally claimable direct payments from the EU presenting the guarantee of short-term bridging operating loans from commercial banks. Agricultural producers repaid loans by means of subsidies and so they maintained the creditworthiness in a loan market what is presented by the increase in loans in this sector for pre-financing of operating cycle of agricultural produce from soil preparation till the produce realization. The total amount of loans in agriculture, hunting and services related to them increased by 4.4% in 2009 that was caused not only by the allocation of new loans but as well as the slower loan repayments from prior years due to slow financial flows. In the structure of total loans short-term bridging loans (34.3%) prevailed needed for the financing of agricultural companies operation. Their amount was lower as in 2008 (9.5%). As regards the investment activities medium and long-term loans were crucial; they exceeded more than 50% of total loans, annually their amount increased by 13%. Commercial banks verified the agricultural clientele in relation to creditworthiness of loan repayments. The amount of newly provided loans decreased in 2009.

In 2010 the significant increase in short-term indebtedness was reported in the majority of companies while banks required the guarantees of loan instalments. Repeatedly by means of subsidies the agricultural companies guaranteed and repaid loans, so they managed to maintain the economic creditworthiness in the loan market. It is presented by the increase in short-term loans (45.3%) to this sector used for pre-financing of operating cycle of agricultural produce. This is supported by the increasing interest of banks in subsidies. Medium and long-term loans were more problematic in relation to their accessibility; they annually decreased. Total loans to agricultural sector slightly went down. Business companies were more indebted than cooperatives.

Total loans to this sector increased in 2011 (10.6%) mainly because of better profits so the creditworthiness of agricultural companies was higher. The crucial significance in subsidy policy presented namely claimable direct payments from the EU which guaranteed short-term bridging operating loans. By means of subsidies agricultural companies repaid loans and interests so they maintained the economic creditworthiness in the loan market. In comparison with prior years when medium and mainly long-term loans were problematic in relation to their accessibility, the situation partially changed in 2011 and long-term loans significantly increased (21.4%). It can be attributed, in addition to withdrawal of financial means from the EU funds and so requested financial complicity from own – company resp. loan sources as well as fixing of interest rates when providing loans for investment projects. Except for that several banks offered companies a flexi loan for land for the period of 7–10 years. Agricultural land is currently less utilized collateral of loans due to its fragmentation and unsettled ownership relationships. Short-term bridging loans prevailed in the structure of total loans (49.1%) with a maturity up to one year. Short-term loans were provided for bridging the time discrepancy between the need to finance business activities and real payment of subsidies from Agricultural Paying Agency (hereinafter referred to as "PPA").

In 2012 loans slightly accelerated (0.8%), mainly in profitable agricultural companies. Direct payments from the EU were essential from loan guarantees in the year 2012 which presented the guarantee of short-term bridging operating loans. Companies decreased their risk of loan repayments and maintained the economic creditworthiness in the loan market as presented by the increase in short-term loans to this sector (3%). Commercial banks required furthermore the guarantees of loans instalments from direct payments without adequate interest rate advantage. Interest rate advantages of loans would decrease loan costs and improve a financial situation of companies as in 2012 even prosperous companies with diversified business activities were characterized by insufficient cash liquidity. In 2012 a situation partially change and long-term loans increased (1.2%). Except for the withdrawal of financial means from the EU funds this trend was associated by a financial complicity from own – company resp. loan sources as well as fixing of interest rates when providing loans for investments projects.

The year 2013 was the year of "cheap money" from the long-term perspective. This fact was expressed in decreasing loan costs i.e. in the level of interest rates and increased farmers demand for loans. Totally loans increased by 6.1% in agriculture and in the structure of total loans short-term loans prevailed in the structure of total loans with the highest ratio 49.9%; they were crucial for financing of agricultural companies operation and guaranteed by free of problem guarantees from subsidies – the EU direct payments. The lowest ratio in loan structure had medium-term loans. Long-term loans significantly decreased due to the withdrawal of financial means from Programme of rural development 2007-2013 and thereby the decrease in co-financing participation was reported.

Commercial banks, similarly as in the year 2012, offered companies a flexi loans so called investment loan for the purchase of agricultural land with a pledge to purchased land.

Also the year 2014 was the year of “cheap money” from long-term perspective as it was expressed in decreasing loan costs, i.e. at the level of interest rates and increasing farmers demand for loans. Loan indebtedness of assets obtained 13.7%. Totally loans to agriculture increased by 12% in 2014. Short-term loans with the highest level 50.3% prevailed in the structure of total loans. Short-term loans were crucial mainly as regards the operation of agricultural companies and free of problem guarantees realized by means of subsidies – the EU direct payments. Medium-term loans had the lowest ratio (19.3%) in the loan structure. The highest annual change was reported by long-term loans, they increased by 31.5% due to investments to fixed assets. In addition several commercial banks like in prior years offered companies a flexi loan so called investment loans to a purchase of agricultural land. Nevertheless in 2014 loans to a purchase of agricultural land increased.

In 2015 total loans to agriculture annually increased by 13.9% to 543.3 mil. €, thereof short-term ones presented 272.9 mil. €, medium-term 102.0 mil. € and long-term 168.3 mil. €. Short-term loans with the highest ratio 50.2% prevailed in the loan structure while their amount annually increased by 13.7%. It presented mainly fluent financing in time of indispensable expenses due to seasonal character of agricultural activities particularly in the period of crop basement and harvesting. Medium-term loans had the lowest ratio (18.8%) in the structure of loans; their status annually increased by 10.6%. Long-term loans increased mostly (16.2%), attributable to investments in fixed assets. Commercial banks like in prior years offered investments loans to companies for a purchase of agricultural land with a long-term maturity and a pledge to purchase land, respectively other land in unified parcels or other form of collateral. The higher importance is determined by the loan product called “My land” by means of which it is possible to finance the purchase of agricultural land. Based on the agreement of the Ministry of Agriculture and Rural Development of the Slovak Republic with the Slovak Guarantee and Development Bank (SZRB) farmers shall buy land more advantageously since the year 2013. Since 2016 the loan product “My land” has been at disposal also for young farmers who do not have enough capital for loan guarantee.

4. Conclusion

Loan products of commercial banks are becoming the crucial sources of financing in the subjects of agricultural primary production. Loan availability for agricultural companies improved after the entrance of the SR to the EU for the eligibility of direct payments. Indebtedness of assets was higher in business companies than in agricultural cooperatives. This indicates their higher economic solvency towards commercial banks as regards cash flow and therefore mainly the repayment of long-term loans which are not covered by subsidies from the EU, in contrary for investments subsidies it is required the own co-financing. Total amount of loans to agriculture increased annually. Short-term loans prevailed, they were decisive mainly for operations of agricultural companies and free of problem guarantees, realized by means of subsidies – direct payments from the EU. Medium-term subsidies presented the lowest ratio in the loan structure. Mostly the long-term loans with the maturity longer than 5 years increased because of investments to fixed assets. Agricultural companies used the subsidies from the EU realized by the Agricultural Paying Agency as collateral for loans. The higher importance is determined by the loan product called “My land” by means of which it is possible to finance the purchase of agricultural land. Based on the agreement of the Ministry of Agriculture and Rural Development of the Slovak Republic with the Slovak Guarantee and Development Bank (SZRB) farmers shall buy land more advantageously since the year 2013.

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BIOFUEL PRODUCTION VERSUS FOOD – COMMODITY PRICES: USING CASE OF ETHANOL AGAINST SUGAR, CORN AND WHEAT

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Annotation:

The major problem of preferred feedstocks for the current 1st generation biofuels production is that these feedstocks are also used for food and feed production. Moreover, there is persistent concern that biofuels compete with food production and that increasing biofuels prices lead to an increase of the agricultural commodity prices. Therefore, the main goal of the paper is to assess the links between biofuel production and food-commodity prices in Brazilian market. Brazil is the world's largest sugarcane ethanol producer and a pioneer in using ethanol as a motor fuel. In particular, we focus on assessing the links between ethanol and selected food-commodity prices (sugar, corn, wheat) serving as ethanol feedstock. Methodological approach, based on co-integration analysis and estimation of a vector error correction model, is applied in order to analyse the relationship between the time series. Our results suggest that corn and wheat prices drive ethanol prices not vice versa; however, there is an evidence of simultaneous relationship between ethanol and sugar prices.

Key words: biofuel, Brazil, ethanol, price, sugar

JEL classification: Q11, Q16

1. Introduction

Currently, the fossil resources are questionable from the economic, ecology and environmental point of views and not regarded as sustainable due to the fact that the burning of fossil fuels is a big contributor to increasing the level of CO2 in the atmosphere which is directly associated with global warming observed in recent decades. Therefore, together with declining petroleum reserves, the demand for sustainable and environmentally benign sources of energy for our industrial economies and consumer societies has become acute in recent years (Naik et al., 2010). Biofuels are considered as an attractive solution to reducing the carbon intensity of the transport sector and addressing energy security concerns (International Energy Agency, 2008). However, biofuels have received criticism as a result of: (1) rising food prices; (2) relatively low greenhouse gas reduction, or even net increases for some biofuels; (3) high marginal carbon reduction costs; (4) the continuing need for relevant government support and subsidies ensuring economic viability of the biofuels and (4) direct and indirect impacts on land use change and the related greenhouse gas emissions. Further, Kristoufek et al. (2016) state that as biofuels are produced from agricultural crops, there is a persistent concern that biofuels compete with food production and that increasing biofuels prices lead to an increase of the agricultural commodity prices.

In general, biofuels refer to liquid, solid, or gaseous fuels derived from renewable biological sources, including ethanol, various other alcohol-based fuels, pyrolysis oils, gasification fuels, and biodiesel (Baier et al., 2009). Biofuels are generally called as the first (ethanol, biodiesel, biogas), second and third generation biofuels depending on the origin and production technology of biofuels, while the fourth generation biofuels make use of novel synthetic biology tools and are just emerging at the basic research level (Aro, 2016). Elbehri et al. (2013) mention that biofuels tend to be led by few dominant crops targeted through an active policy support program that also accounts for domestic biofuel consumption patterns (e.g. ethanol in the USA and Brazil and biodiesel in the EU). Ethanol is currently produced using a variety of agricultural feedstocks such as maize, sugarcane, wheat, sugar beet, molasses, cassava as well as cellulosic biomass (Muñoz, 2013). On the other hand, Bakhat and Würzburg (2013) note that palm, rapeseed, sunflower, soy and other vegetable oils or animal fats can be transformed into biodiesel. The U.S and Brazil are the main producers of ethanol, while biodiesel is predominantly produced in the European Union.

Several studies have focused on food-fuel linkages on the US ethanol and Brazilian sugarcane market, while others have investigated the EU biodiesel sector. Methodological approaches, based on co-integration analysis and/or estimation of a vector error correction model (VECM), or one of its generalised non-linear versions, are applied in order to analyse the relationship between food-commodity and biofuel prices (Bentivoglio et al., 2016). Balcombe and Rapsomanikis (2008) conclude that biofuels do not seem to have any significant impact on commodity prices and point out the causality from sugar prices on domestic ethanol prices in Brazilian biofuel market. Kristoufek et al. (2016) also determine that the long-run relationship between prices of ethanol and sugar in Brazil is positive, strong and stable in time and the prices of feedstock determine the ethanol prices and not the other way around. Additionally, the outputs of a structural vector error correction model, applied by Capitani (2014), show that the agricultural commodities prices do not seem to be largely affected by biofuels production in Brazil.

The major problem of preferred feedstocks for the current 1st generation biofuels production is that these feedstocks are also used for food and feed production. Moreover, the growing demand for land to grow energy feedstock leads to competition between food and biofuel production. Therefore, the main goal of the paper is to assess the links between bioenergy production and food-commodity prices. In particular, the paper focuses on the links between ethanol and selected food-commodity prices (sugar, corn, wheat) serving as ethanol feedstock in the Brazilian market. The results of our research can contribute to the better understanding of food-commodity price relationship with biofuels.

2. Materials and Methods

The empirical analysis in our study has used monthly prices of ethanol and selected food-commodity prices (sugar, corn, wheat) that were collected over the period from February 2004 to December 2016. Data are taken from CEPEA - Center for Advanced Studies on Applied Economics. Prices are expressed in USD per litre of ethanol, USD per metric ton of wheat, USD per 50-kg bag of sugar and USD per 60-kg bag of corn. The main objective will be achieved through the quantitative assessment using approach such as time-series technique. The paper also outlines government policies and the production patterns of the ethanol and its feedstock in Brazil.

Times series models are appropriate instruments to study the temporal characteristics of price behaviour. The biofuels-related price transmission literature has focused much attention on studying price level connections using co-integration analysis and VECM-type of models (Bentivoglio, 2016).

Firstly, the augmented Dickey-Fuller unit root test (ADF), testing nonstationarity for each individual variable, is generated from the following regression:

$$\Delta \mathbf{y_t} = \boldsymbol{\alpha} + \boldsymbol{\beta_t} + \boldsymbol{\eta} \mathbf{y_{t-1}} + \sum_{\mathbf{i=1}}^{\mathbf{p-1}} \boldsymbol{\varphi} \mathbf{i} \Delta \mathbf{y_{t-1}} + \mathbf{e_t} \qquad \textbf{(1)}$$

Where y_t is the variable assessed; α is a constant; β is the coefficient on a time trend; p is the lag order of the autoregressive process; and e_t refers to white noise (Capitani, 2014).

Johansen's method is used to estimate ∏ (coefficient) matrix from an unrestricted VAR and to test whether we can reject the restrictions implied by the reduced rank of ∏ (Burakov, 2017). Mukhtar and Rasheed (2010) explain that Johansen co-integration test is based on two likelihood ratio tests: Trace test and maximum eigenvalue test.

A convenient framework that allows to evaluate both long-run and short-run relationships between different prices is the vector error correction model (VECM):

$$\Delta \boldsymbol{y_t} = \boldsymbol{\mu} + \boldsymbol{\alpha z_{t-1}} + \sum_{i=1}^{q} \boldsymbol{\Gamma_i} \Delta \boldsymbol{y_{t-1}} + \boldsymbol{\varepsilon_t} \tag{2}$$

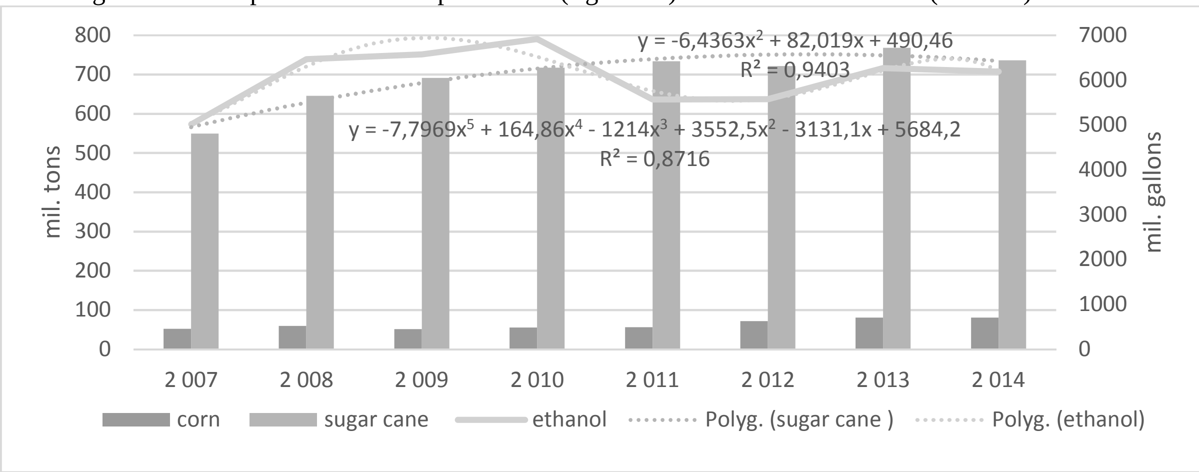
where $z_{t-1} = \beta' y_{t-1}$ refers to the (r x 1) vector of lagged equilibrium errors from $r \leq n - 1$ unique co-integrating relationships between prices in the system; β contains the co-integrating vectors representing long-run equilibrium parameters characterizing long-run equilibrium relationships between prices; the μ , α , and 's Γ_i are unknown parameters to be estimated, q is the lag order for the dynamics; and the VEC errors ε_t are serially uncorrelated but may be contemporaneously correlated (Myers et al., 2015)

3. Results and Discussion

More than half of Brazil's harvested sugarcane has been used for bioethanol since 1990, thus bioethanol and sugar production are competing by allocating sugarcane production (Koizumi, 2014). According to Bentivoglio et al. (2015), Brazil is the world's biggest sugar producer and exporter as well as the world's largest producer and consumer of sugarcane ethanol as a transportation fuel. A combination of government policies and technical change, both in the sugarcane processing into ethanol and in the manufacturing of flex-fuel vehicles have led to the growth of this market. Basso et al. (2011) say that the ethanol production from sugarcane began to be developed in colonial period, when farmers used to produce the Brazilian sugarcane distilled spirit, the "cachaça". Then, since the beginning of the 20th century, Brazil has been using ethanol for energetic purposes and the first tests of using ethanol as fuel for vehicles engines were performed in 1905. These tests gave rise to official attention and resulted in a law published in 1931, which determined that ethanol should be mixed to the gasoline at a rate of 5 % (v/v). Lopes et al. (2016) add that the Brazilian government launched the "Proalcool" program in 1975 due to oil crisis in order to reduce the country´s dependence on oil imports. In the first phase of the program, ethanol was added to gasoline and later on, the automobile industry started to produce the first car to run on ethanol only for the Brazilian market after the second oil crisis in 1979. Koizumi (2014) informs, that over the past three decades, the government of Brazil has implemented powerful intervention programs in its sugar market through its bioethanol program, but changed its role in the late 1990s. With the deregulation of its bioethanol program, implemented during 1998–1999, the government no longer exercises direct control over sugar production and exports and it can only set the bioethanol-to-fuel blend ratio. According to the legislation, the ethanol blend can vary from 18 to 27.5 percent and it is currently set at 27 percent (E27) (Barros, 2016).

Figure 1 shows the development patterns of ethanol production and its feedstocks in Brazil. In 2014, ethanol production increased to 6,190 million gallons from 5,019 million gallons recorded in 2007. Brazilian sugarcane production also recorded an increase of 133% (+186.401 million tons) in comparison to the 2007 (549.707 million tons). Moreover, there has not been any drop experienced (except 2012) over the examined period. In the last 20 years, the volume of sugarcane harvested and processed in Brazil has almost tripled to meet rising demand for sugarcane ethanol and bioelectricity. Corn production reached a value of 79.882 million tons and wheat production was 6.262 million tons in 2014. The production of both food commodities and ethanol has increased significantly in Brazil.

Figure 1. Development of ethanol production (right axis) and food commodities (left axis) in Brazil



	2 007	2 008	2 009	2 010	2 011	2 012	2 013	2 014
wheat /t	4114060	6027131	5055525	6171250	5690043	4418388	5738473	6261895

Source: own proceedings based on US. Department of Energy and FAOSTAT

Positive correlation is revealed between ethanol prices and corn prices (0.6830) as well as between ethanol prices and wheat prices (0.4449) according to the results obtained by the correlation analysis (Table 1). The null hypothesis that the two variables are linearly independent or uncorrelated is rejected for all tested pairs.

Table 1. Correlation Matrix

Variable	**Ethanol**	**Corn**	**Wheat**	**Sugar**
Ethanol	1.0000	0.6830	0.4449	0.653722
Corn	-	1.0000	0.7026	
Wheat	-	-	1.0000	
Sugar	-	-	-	1.0000

Source: own proceedings

The hypothesis "The time series have a unit root and are not stationary" is accepted for all selected variables. ADF test confirms all levels of variables to be non-stationary and integrated of the first order I (1) at 1% significance level. On the other hand, ADF test of the first differences rejects the null hypothesis of unit root test, thus the variables are stationary in the first differences (Table 2). The optimum number of lags is applied according to Akaike criterion, Schwarz Bayesian criterion and Hannan-Quinn criterion as a result of VAR modelling. Then, Johansen co-integration test is performed for identifying long-term relationship. Based on the results provided in Table 3, Johansen co-integration test reveals the relationship between the pairs of considered series in the long-run.

Table 2. ADF test results for prices of ethanol and agricultural commodities

Price	**Test without constant**		**Test with constant**		**Test with constant and trend**	
	Level	**FD**	**Level**	**FD**	**Level**	**FD**
Ethanol	-0.642658	-14.7456***	-3.31405	-14.4922***	-3.58043	-14.4892***
Corn	-0.422215	-14.2829***	-2.40136	-13.3558***	-2.33042	-13.3639***
Wheat	-0.321505	-12.0983***	-1.68999	-11.6527***	-0.00518	-11.6743***
Sugar	0.225184	-6.31978***	-1.24747	-6.31858***	-1.41124	-6.41007***

Source: own proceedings
*Note: FD: First difference; *** significant at 1% level*

Table 3. Results of Johansen co-integration test for prices of biodiesel and agricultural commodities; and prices of crude oil and agricultural commodities

Variables	**L- max test**		**Trace test**	
	r = 0	**r = 1**	**r = 0**	**r = 1**
Ethanol – Corn	26.313	5.6545***	31.968	5.6545***
Ethanol – Wheat	19.804	4.2731***	24.077	4.2731***
Ethanol – Sugar	11.054	2.9010***	13.955	2.9010***

Source: own proceedings

*Note: r = 0 – no co-integration relationship; r = 1 – at most one co-integration relationship; ***significance at 1% level*

The vector error correction model reveals expected signs for explanatory variables in the long-run period. The beta transported vector shows the nature of the long term relationship between the variables and the coefficients refer to the long-run elasticities. Co-integration vector expressing the long-term relationship has a following form in case of ethanol-corn: (1.000; -0.98186), meaning that a 1% increase in corn prices leads to 0.98186% rise in ethanol prices. Additionally, the co-integration relationship suggests that when wheat prices change by 1%, ethanol prices change by 0.63758%. The positive relationship is also revealed in case of ethanol-sugar, a 1% increase in sugar price leads to 0.60476% increase in ethanol price. Corn and wheat price appear to be weakly exogenous indicating that corn and wheat prices drive ethanol and the relationship between the pairs of considered series is not simultaneous – only one way relationship with the impact of food-commodity prices on the ethanol. Similarly, Filip et al. (2016) show that feedstocks lead Brazilian ethanol prices, and not vice versa. Our findings are also in line with the results of Bentivoglio et al. (2016) who suggest that ethanol prices are affected by both food and fuel prices, but that there is no strong evidence that changes in ethanol prices have an impact on food prices. The adjustment coefficient alfa implies that the adaption to price changes happens relatively slow (the closer to one the adjustment speed the faster is the adaption process).The estimated coefficient indicates that about 1.8% of this disequilibrium is corrected within 1 month in case of ethanol-corn and ethanol-wheat equation. However, there is an evidence of simultaneous relationship between ethanol and sugar prices; the error correction coefficient of ethanol is also negative indicating that about 4.5% of the disequilibrium is corrected within 1 month. Additionally, the ethanol has shown negative sign of ECT in the models – indicating a move back towards equilibrium. On the other hand, if it has a positive sign of error correction term, it indicates that the systems in the model are moving away from equilibrium (Bekhet and Yusop, 2009). Diagnostic tests show that the null hypothesis of no autocorrelation is not rejected and the ARCH test indicates that the null hypothesis of homoscedasticity is accepted in all equations as well. The regression models account approximately for 30 - 40% of the variance. We considered the VECM with the optimal number of lags checked by Durbin-Watson statistic.

Table 4. VECM estimation

	l_corn	l_wheat	l_sugar
Constant	-0.0560563 ***	-0.0749772***	-0.111595*
Cointegration vector β	-0.98186	-0.63758	-0.60476
Adjustment coefficient α	l_corn 0.00830385 l_ethanol -0.0186198***	l_wheat -0.00511623 l_ethanol -0.0181246***	l_sugar -0.0615301*** l_ethanol -0.0453773*
Unadjusted R-squared	0.305836	0.296307	0.402954
ARCH	p-value 0.11523	p-value 0.159083	p-value 0.998119
Durbin – Watson statistic	1.99476	1.99456	1.98742
Autocorrelation	p-value 0.493	p-value 0.948	p-value 0.987

Source: own proceedings

*Notes: ***significance at 1% level, ** significance at 5% level, * significance at 10% level*

4. Conclusion

The aim of the paper was to assess price links between ethanol and selected food-commodity prices (corn, wheat, sugar) in Brazilian market. Brazil is the world's largest sugarcane ethanol producer and a pioneer in using ethanol as a motor fuel. In the last 20 years, the volume of sugarcane harvested and processed in Brazil has almost tripled to meet rising demand for sugarcane ethanol and bioelectricity. Thus, the biofuel and food price debate is a long-standing issue with wide-ranging views. The major problem of preferred feedstocks for the current 1st generation biofuels production is that these feedstocks are also used for food and feed production. Hence, there is concern that biofuel industry causes food shortages and consequently drives up food prices.

Price transmission analysis (co-integration analysis and vector error correction model) was performed in order to investigate the relationship between ethanol and selected agri-food commodity prices serving as ethanol feedstock in the Brazilian market. Johansen co-integration test found long-term relationship between variables. Vector error correction model revealed that relationship of ethanol-corn and ethanol-wheat was not simultaneous and the model provided the evidence of the one way positive relation with the impact of food commodities on the ethanol. On the other hand, there is an evidence of simultaneous relationship between ethanol and sugar prices. According to Bentivoglio et al. (2016), the positive relationship between ethanol and sugar prices is not surprising, given the influence of feedstock costs within the total costs of producing ethanol (60%). The production of biofuels from lignocellulose instead of food crops could help reduce competition between food and biofuel production as well as reduce direct land-use change effects.

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PROBLEMATIC ASPECTS OF THE FUNCTIONING OF AGRICULTURAL PRODUCER GROUPS AND ORGANIZATIONS IN THE LIGHT OF ECONOMIC THEORIES. THE EVOLUTION OF GROUP ACTIVITIES IN POLISH AGRICULTURE.

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Annotation: The main aim of this article is to present group action in agriculture in the light of various economic theories. The detailed objectives are: to present the state of organising farmers into producer groups (PGs) and organizations (POs), to show the dynamic creation of groups and producer organizations, to present the benefits of collaboration in groups and to discuss the current legal status of these organisations and efforts. To achieve these ends, economic theories were reviewed with a view to justifying integration activities undertaken by agricultural producers. That justification can indeed be found in a variety of theories. The status of organising farmers into groups and producer organizations was also discussed. For this purpose, data from the Ministry of Agriculture, the Agricultural Market Agency, the Agency for Restructuring and Modernisation of Agriculture and the Central Statistical Office were used. The data show that there is only a low level of integration among producers in Polish agriculture, due mainly to a reluctance among farmers to join the groups. Nonetheless, participation holds numerous benefits that are difficult to come by for farmers operating alone.

Key words: agricultural producer groups, fruit and vegetables producer groups and organisations, horizontal integration, agriculture, economic theories, Poland

JEL classification: B20, Q13

1. Introduction

For many years Polish agriculture has been undergoing transformation. The changes were the result, first, of political transformation, then of EU accession preparations and, finally, integration with the Community. The structure of farms in Poland makes it difficult for individual farmers to compete in the market: more than half (51%) are small farms with an area up to 5 ha (Statistical Yearbook of Agriculture, 2015). This forces the owners of small farms to integrate and create producer groups and organisations, a process which began in the late 1990s and gained steam after Poland joined the EU. A means for agri-producers to overcome both cost and sales barriers is to horizontally integrate. The poor negotiation position of individual farms compared to entities further down the distribution chain could be improved by implementing horizontal integration activities. Horizontal functional integration entails creating agri-producer groups and producer organisations, which can benefit farmers in ways that their unincorporated counterparts would struggle to match. These include providing a more competitive market position, more economically efficient agri-production, better opportunities to create a base for storage, trade and processing, all thanks to pool together their capital. Producers who engage in marketing also improve their prospects (Adamowicz and Lemanowicz, 2004).

2. Materials and Methods

To achieve the objective of this paper, economic theories are reviewed with a view to justifying integration activities undertaken by agricultural producers. The status of creating and organising farmers into groups and producer organisations is also discussed. The data used come from Poland's

Ministry of Agriculture, the Agricultural Market Agency, the Agency for Restructuring and Modernisation of Agriculture and the Central Statistical Office.

3. Results and Discussion

Establishing integration activities in agriculture in the light of economic theory

Creating agricultural producer groups and organisations is economically justified. In neoclassical economics, an essential premise for integrating producers is the flawed structure of the market, which can be seen in its asymmetry and pronounced differences in market strength possessed by those competing on the food chain. Agricultural production is characterised by a field crowded by producers, homegenous products, a weak market position, low barriers to entry, and, on the part of producers, an inability to influence prices. Other entities, such as those operating on the market of the means of production or the agro-food processing or trade chains, function most often amidst oligopolies. According to neoclassical economy, a way to reduce market imbalance between agricultural producers and other market participants is to promote horizontal integration, which improves economies of scale by concentrating supply and the ability to adapt it to demand.

Demand for agricultural products does not only occur after harvest but throughout the year, and ensuring continuity of supplies in the right quantity and quality is a prerequisite for cooperation—for example, with retail chains, among others. Cooperation in groups enables producers to share warehouses, cold stores and stock management and hence to supply product throughout the year. The creation of producer groups is also justified in the new institutional economy, particularly for the optimisation of transaction costs. Neoclassical economics assumes there are no costs associated with conducting market transactions, but the market realities for the most part do not bear this out. The concept of transaction costs was first described in Ronald Coase's The Nature of the Firm.

According to Coase, every transaction, regardless of its organisation, entails transactional costs (Coase, 1993). Williamson contributed significantly to the development of transaction cost theory, which distinguishes ex ante transaction costs—that is, pre-contractual ones—and ex post costs that are the result of the transaction (Williamson, 1998). This division complements the theory put forth by North and Wallis (1986), which distinguished between measurable and non-measurable costs. Not all transaction expenses can be presented by monetary value, so they are not included in measurable costs. The time it takes to prepare a transaction is almost always difficult to determine, but it is undoubtedly a transaction cost. Williamson’s (1998) and North and Wallis’ (1986) theories are complementary, not substitutive.

Based on Coase’s (1993) work, Hobbs (1997) classified transaction costs into three types: information, negotiation, and monitoring or enforcement. Information costs may arise before an exchange has taken place. Negotiation costs are those which attend physically carrying out a transaction, while monitoring costs occur following a transaction and include the costs of ensuring that the terms of the transaction (quality standards and payment arrangements) are adhered to by the other parties involved. Others have joined North and Wallis in distinguishing transaction costs between tangible (transportation costs, communication costs, legal costs, etc.) and intangible (uncertainty, moral hazard, etc.) costs (Cuevas and Graham 1986; Birthal, Joshi and Gulati 2005).

In the theory of transaction costs, the basic research unit is the contract. In the cooperation between farmers, contracts are always accompanied by different costs, which can be included in transaction costs. These are incurred at multiple stages, including searching for opportunities to enter into a contract, searching for partners, completing the contract itself, realising the contract and, possibly, the costs of solving problems after concluding the contract (Hardt, 2009; Gorynia and Mroczek, 2013). Some of these costs are measurable, while others cannot be expressed in monetary units.

Undoubtedly, farmers acting collectiveluy set themselves up for greater cost reductions than do farmers who act individually. In addition, many contracts could never be realised as individual farmers are not able to provide deliveries of adequate quality and quantity.

Group cooperation in agriculture also finds justification in the sharing economy, a concept that has appeared on the market relatively recently, though the sharing of resources has a long tradition in Polish agriculture. A review of the literature reveals a multitude of approaches to the economics of sharing, allowing its scope to be approached from a variety of angles. In the literature, answers are sought to the questions of whether, to what extent and under what conditions groups of individuals are willing to work together and strive for mutually beneficial outcomes instead of individual benefits (Ostrom, 2013; Olson 1965; Botsman and Rogers, 2011). There are two main dimensions of this concept: consumer-oriented approaches and community-oriented ones. Consumption is understood as the sharing of goods to improve the quality of life of individuals and to meet the needs of groups.

As in Poland, farmers throughout the world have long been cooperating, most frequently with informal agreements for mutual assistance without money changing hands (though machines may be exchanged and work done). If, on the other hand, collaboration requires specific commitments, then a formal organisation is formed, which can take various legal forms: cooperatives, companies, associations, and the like. Unquestionably, agricultural producers functioning in producer groups or producer organisations fits squarely within the shared economy, since such an approach is leveraged in order to use common resources. These resources are very often a variety of machinery, equipment, means of transport, warehouses or refrigerators. Shared use of resources helps keep costs in check and reduces the need for all farmers to invest. In the sharing economy, access to resources is important, not ownership by each individual. Krzyzanowska (2016) also looks to the theory of social economy to explain the incentive to form groups. Social economy constitutes a distinctive approach of particular people and institutions to the social reality. This concerns both the attitude towards own problems (rather active than demanding), the manner of solving them (rather collectively than individually), as well as the set goals (rather common good than narrow group interests). Therefore these actions base heavily on solidarity and cooperation. The following are regarded as constituting the basic features of social economy entities:

1 their main goal is not to achieve profits from the invested capital but to satisfy the needs of the people forming them
2 they base on the voluntary character of participation, which bases on membership and only in special cases employment
3 the basic form of management is the democratic formula “one person, one vote” (Izdebski, 2012).

The cooperatives which has a very long tradition in Poland, constitutes one of the forms of social economy. The definition of a cooperative, in light of the applicable law, states that a cooperative is a voluntary association of an unlimited number of people, with changeable members and changing members’ funds, which operates a common business activity in favor of its members. It can also operate a social and education-cultural activity in favor of its members (Journal of Laws of 2003, No. 188, item 1848, as amended). As stated before, producer organizations and groups do not constitute any specific legal form and may be registered as cooperatives, partnerships, private limited companies, or associations. However, it has to be stated that the most popular legal form selected by Polish farmers is the private limited company.

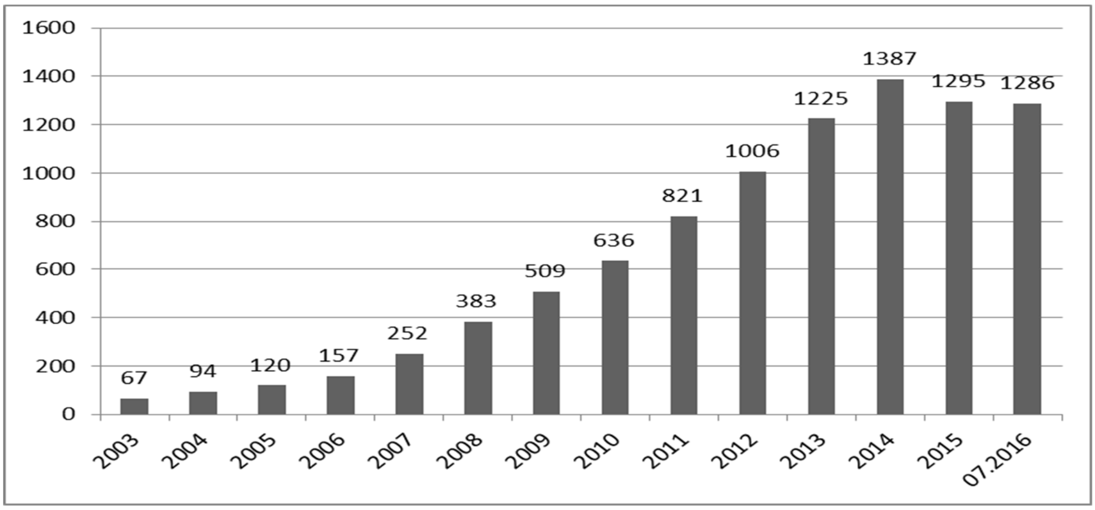
The functioning of organizations and groups of producers may also be discussed from an interdisciplinary point. That is because cooperation is a term of an interdisciplinary character, combining in its theoretical bases social, organizational, and economic aspects.

Organising farmers in Poland into producer groups and organisations

Entities which describe themselves using the terms "group" or "producer organisation" do not imply a specific legal form and may therefore be registered as cooperatives, limited liability companies or associations. These terms describe an organisation whose primary purpose is to market products produced on its members' farms. Groups or producer organisations operate on the market among other business entities. They are therefore subject to the same economic rules, competing with both domestic and foreign entities for markets.

The adoption of the Agricultural Producer Groups Act on 15 September 2000 brought the opportunity for farmers to begin to organise systematically. The law's entry into force has ensured that the emerging groups use national public aid. However, only Poland's accession to the European Union and the support of Community support groups have succeeded in raising interest among producers in creating groups. The terms of financial assistance for emerging agricultural producer groups have improved significantly. Figure 1 shows the number of producer groups in Poland in 2001-2016. At present, there are about 1,300 entities operating on the market, which bring together about 25,000 farmers. The majority of agricultural producer groups deal in live pigs and pork, cereal grains and live poultry (about 300 entities in each category).

Figure 1. The number of agricultural producer groups in Poland in the years 2001-2016



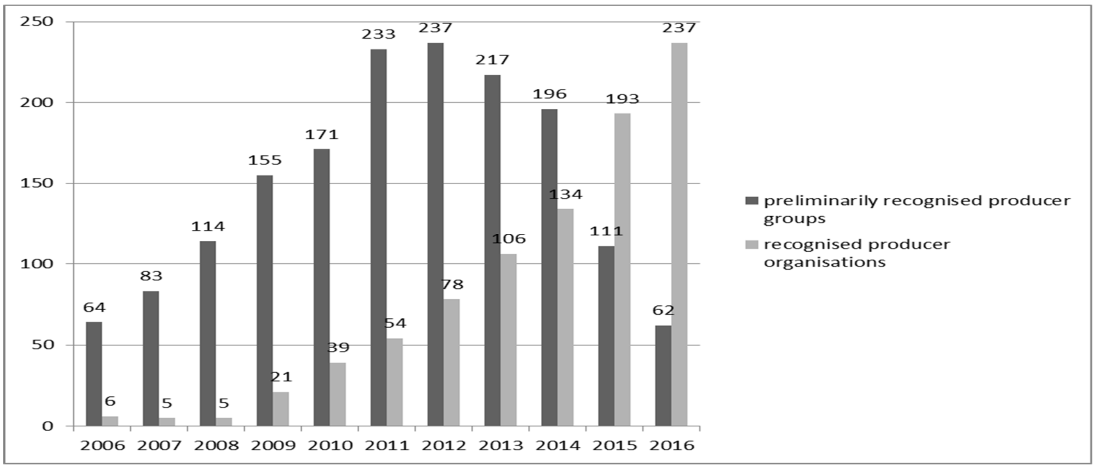
Source: the author's own study based on data from the Agency for Restructuring and Modernisation of Agriculture, the Ministry of Agriculture and Rural Development and the Agricultural Market Agency.

In addition to agricultural producer groups, there are also groups and producer organisations that operate on the fruit and vegetable market. They are subject to different legal regulations than agricultural producer groups. Poland is an important producer of temperate climate fruits in the world, ranking behind only Italy, Spain and France in the EU. Poland is the EU's single largest producer of apples, and fourth globally only to China, the US and Turkey. It also harvests more cherries, raspberries, currants and blueberries than any other EU country. Making up 15% of the value of commodity crops, fruit production is an important component of overall agricultural production (Lemanowicz, 2016). Given Poland's status as one of the world's foremost fruit producers, the extent to which the market is organised is of crucial importance. A key issue is producer cooperation in group activities, as it improves the producers' negotiating position in the supply chain and provides the opportunity to prepare appropriately standardised, large-batch deliveries.

The main law governing their activities is that of 19 December 2003 on the organisation of the fruit and vegetable markets, the hops market, the tobacco market, the dried fodder market and the markets for flax and hemp grown for fiber (Journal of Laws of 2011, No. 145, Item 868 as amended).

By the end of 2013, recognised producer organizations and pre-recognised fruit and vegetable producers could be established in the fruit and vegetable market. In accordance with the provisions of Regulation (EC) No 1308/2013 of the European Parliament and of the Council, which have been in force in Poland since 1 January 2014, there is no legal basis for the creation of pre-approved fruit and vegetable producers. The aim of existing groups should be to implement a plan to be recognised and, as a result, to registered producer organisation. By analysing data on the number of these entities, we clearly see that the number of pre-approved groups has fallen since 2014, while the number of recognised organisations is increasing (Figure 2).

Fig. 2 The number of provisionally acknowledged groups of fruit and vegetable producers and official producer groups in the years 2004-2016



Source: the author's own study based on data from the Agency for Restructuring and Modernisation of Agriculture, the Ministry of Agriculture and Rural Development and the Agricultural Market Agency

This proves that the group is successively gaining the status of a producer organisation. In 2016, there were 62 provisionally recognised groups in Poland and 237 recognised producer organisations. There were about 65,000 producers in these affiliated entities. Bear in mind that there are roughly 1.4 million individual farms greater than 1 hectare in Poland (Statistical Yearbook of Agriculture, 2015), while only 31,500 farmers – 2.3% of agricultural producers are involved in organisations.

Following Poland's accession to the EU, the terms of financial assistance for the emerging groups and organisations improved considerably. Action 142 „Agricultural Producer Groups" in the Rural Development Program for 2007-2013 (RDP 2007-2013) layed down the terms of support for groups of agricultural producers. To facilitate the formation of groups and administrative and investment activities, financial aid was provided to groups in their first five years of operation. From July 16th 2007 to December 31st, 2015, producer groups were paid 805.5 million PLN (approximately 200 million EUR). These financial resources have helped them with administrative activities and further supported their development by enabling the purchase of agricultural machinery or investment in buildings and businesses. For the next programming period 2014-2020, the European Commission favoured further supporting the creation and functioning of producer groups and organisations. These issues are addressed in Regulation (EU) No 1305/2013 of the European Parliament and of the Council (Article 27). In Poland, support for establishing groups and producer organisations is laid down in the RDP 2014-2020 within the framework of the section „Creating groups and producer organisations". Beneficiaries of this action may be new agricultural producer groups and new producer organisations that have been established since 1 January 2014 (Trajer and Krzyżanowska 2016).

For fruit and vegetable market operators, pre-approval fruit and vegetable producer groups and recognised fruit and vegetable producers' organizations could apply for EU financial aid. Assistance for provisionally recognised groups included covering the costs of setting up a producer group and conducting administrative activities and covering some of the eligible investment costs included in the approved recognition plan. Assistance for recognised producer organisations, onthe other hand, covered funding for setting up the operational fund. Within the framework of the common organisation of the fruit and vegetable market, financial aid of more than PLN 7.6 billion (EUR 1.9 billion) had been paid to groups and organisations of fruit and vegetable growers through 31 December 2015. The largest support was directed to the pre-approval groups of fruit and vegetable producers.

As regards the common organisation of agricultural markets, in line with EU agricultural policy in the financial perspective 2014-2020, aid in the fruit and vegetable sector may only be implemented for recognised producer organisations to finance the operational fund. There is no financial support for pre-approval groups and hence the process for creating them will be severely limited.

4. Conclusion

The review of the literature conducted for this paper clearly shows that numerous economic theories justify farmers forming producer groups and organisations. These include neoclassical theory through to economic trends today. In Polish agriculture, the large share of small farms (up to 5 hectares) is a particularly important issue. Earlier known as cooperative activity, group action in agriculture has a long tradition. Cooperatives in Poland came to a halt when system transformation began in 1989. Today, some group activity among farmers is being revoked under new rules, based on new legal acts.

An important element that accelerated the process of organising farmers was financial support for agricultural producer groups and for producer groups and organisations under the common organisation of the fruit and vegetable markets. As part of the support for integration processes in agriculture, by the end of 2015, producers conducting joint business activities generated revenue of 8.4 billion zloty (about 2.2 billion euros), of which more than 90% was received by groups and organisations under the common organisation of the fruit and vegetable market. I believe the further development of groups and producer organisations and their successes will be determined by the scope of financial support from national and EU funds, as well as the appropriate state policy, supporting large players capable of competing in global markets. It will also be important to promote the success of groups already active in the market, take action to build trust in others, and shape and promote the right leaders.

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REDUCING REVENUES VARIABILITY IN AGRICULTURE AND FOOD SECTORS BY SETTINGS OF 4C MARKETING MIX FACTORS

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Annotation: The development and retention of possible profitable customer relationships are crucial factors for the economics performance of today European agriculture. Companies from food and agriculture sectors very often need to be concerned with the future revenue, and also profit flows associated with the continuing satisfaction retention of their key customers. The agriculture businesses that do not recognize the empirical rules overspend in marketing to hold very low profitable (or unprofitable) clients and do not invest enough effort to keeping high-profitable clients. The objective is to find dynamic operating conditions for the best possible settings of the 4C agriculture marketing mix. The 4C concept is an alternative to the marketing mix 4P. While the 4P marketing mix regarding business mix, then 4C is from a customer perspective.

Key words: positioning, pricing, robust design steepest ascent, experimental space

JEL classification: M11; M31

9. Introduction

The development and retention of latent profitable customer relationships is a crucial factor to the health of today business. Companies very often need to be concerned with the future revenue, and also profit flows associated with the continuing satisfaction retention of their key customers (Werner at al., 2000). The companies that do not recognize this empirical law overspend in marketing to retain unprofitable clients and do not spend sufficiently on keeping high paying customers (Haenlein at al. 2009). This paper deals with finding the best possible setting of the 4C agriculture marketing mix using a slightly modified method of steepest ascent, herein marked as dynamic factors setting. One possible way to avoid an inefficient keeping the unprofitable customers is the correct price setting and positioning. This paper deals with finding the best possible setting of the significant factors for keeping only high profitable customers using a modified method of steepest Ascent herein referred to as Robust settings of product price and also its position. It indicates the nature of used method: experimental design space is moved to search for the best adjustment factors influencing a value creation process. The practical experiment was conducted on the Agro-farm Krasna products.

Customers 'oriented approaches associated with solving the business and marketing problems of organizations have increased popularity recently. Customers who have become more careful and informed influence the procedures of enterprise significantly. Thus business strategies are transformed into customer-oriented plans. Customer-oriented conversion of the customer-oriented strategies (focus on product, price, place, and promotion) has brought to cover 4C marketing mix (focus on customer value, the cost to the customer, convenience for the buyer, customer communication). The development and retention of potentially profitable customer relationships are crucial determinants of the health of today business. Companies very often need to be concerned with the future revenue, and also profit flows associated with the continuing satisfaction retention of their key customers. The organizations that do not recognize this practical law overspend in marketing to preserve less profitable (or even unprofitable) clients and do not spend enough on keeping high paying customers.

Cost (often impress by product price), is considered as one of the strongest marketing tools, has a significant impact on consumers' buying behaviors, which cause a direct impact on sales and profitability of the business organizations (Han et al., 2001). Price can directly affect market share, positioning, segmentation, and marketing program of the business groups. Also, it is a criterion that consumer use to evaluate product and brand and it also has an impact on the judgment of the consumers (Yükselen, 2008). Price is perceived not just a negative factor, which consumes clients' resources but recognized as a decisive factor, which gives them a clue about the product quality (Lichtenstein et al., 1993).

Cost related to a product has been the most important factor affecting consumers' preferences historically. This reality is still valid among the customers with low income and in low-earn countries. Although the price is the most important factor that affects consumers' preference, especially nowadays the factors such as quality, promotion, and distribution, etc. have been becoming more important (Kotler et al., 1999). A business organization should consider consumers' standard of judgment, consumers' demand within different price levels and the reasons of price sensitivity (Saxena, 2006). Price sensitivity can be defined as customer's reaction to the price of products or services (Clausen, 2004). There are different factors affecting price sensitivity (or other words sensitivity to marginal costs) (East, Wright and Van Hulse, 2008). One of the important factors is the value perceived by consumers. Price is the easiest factor to be changed in the marketing mix. Determining the rate does not require any investment as it is in advertising, product development and establishing a distribution channel. Price change can be done more quickly than product and distribution channel change. The elasticity of demand is higher than the elasticity of advertising. Due to these reasons, pricing decision is one of the most crucial decisions of the marketing managers. In practice, managers state price by using three basic strategies such as cost-based, value-based and competition-based pricing (Kotler et al., 1999).

10. Materials and Methods

A Taguchi design is a planned operation that lets you prefer a product or process that performs more consistently in the performing situation. Taguchi designs notice that not all factors that produce dispersion can be checked (Taguchi at al., 2005). These uncontrollable determinants are termed noise factors. Taguchi designs work to recognize controllable factors that reduce the effect of the noise factors. During an experiment, we can manipulate noise factors to reduce variability and then determine optimal settings of control factor that make the process robust, or immune to contrast from the noise factors. A process designed with this objective is producing more constant output. A product designed for this purpose will deliver more consistent performance despite the environment in which was used.

The objective of a robust design is regularly to define factor settings that could minimize the dispersion of the response nearly to a fitting target value (Taguchi at al., 2005). Taguchi design does this process by two-steps of optimization. The first step is focused on variability minimization, and the second step focuses on catching the target value.

- First, set all factors that have a strong effect on the signal-to-noise ratio at the level where the signal-to-noise is maximum.

- Then, set the level of one (or more factor), that mainly affect the mean value (but not the signal-to-noise) to place the response on the spot.

One possible way to avoid an inefficient keeping the unprofitable customers is the correct price setting and positioning. This paper deals with finding the best possible setting of the significant factors for keeping only high profitable customers using a modified method of steepest Ascent, herein referred to as Robust settings of product price and also its position. It indicates the nature of used method: experimental design space is moved in order to search for the best adjustment factors influencing a value creation process.The practical experiment was conducted on the Agro-farm Krasna products.

The objectives of the experiment were:
(1) to identify the key process parameters which influence the revenue from product sales in time in relation to the product price and position;
(2) to identify the key process parameters (noise factor) which influence the variability in sales of products; and
(3) to determine the optimal settings of the sales process parameters which can meet the objectives (1) and (2).

After the initial screening, three factors were selected for factor design. This is the A: Costs expressed by the price of organic feed, B: Customer Solution / (expressed by investment in product creation for its position on the market and C: Communication expressed by distribution channel.

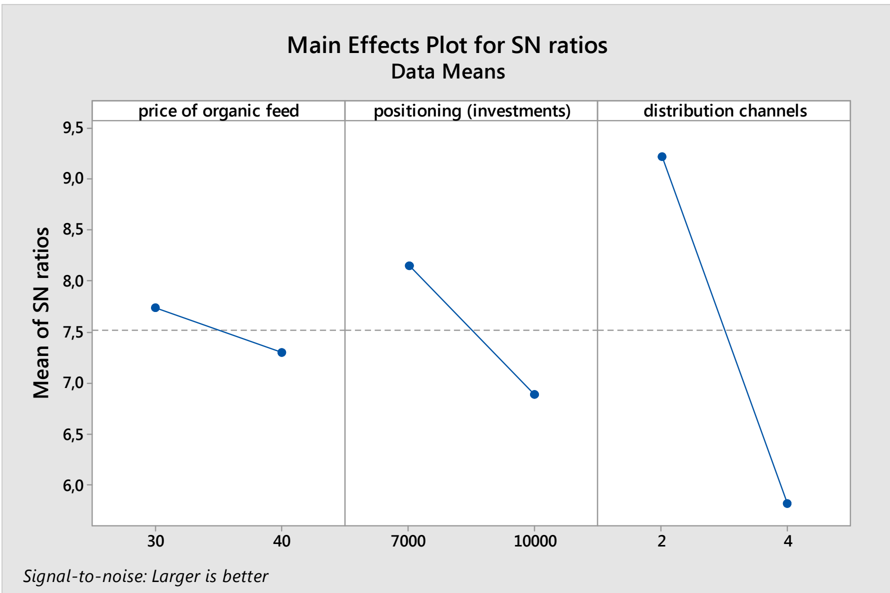
Tab 1 List of process parameters for the experiment

Process parameter	**Units**	**Low level setting**	**High level setting**	**Lower level setting (coded units)**	**High level setting (coded units)**
A: Cost (price of organic feed)	Util/price	30	40	-1	+1
B: Customer solution (investments)	CZK ×10	7000	10000	-1	+1
C:Communication (distribution channel)	Pcs	2	4	-1	+1

Source: Own experiment settings

The main purpose of this analysis is to find factor settings that maximize both the mean and the signal-to-noise ratio. Regarding energy optimization, we have chosen the S / N ratio “larger is better” see Figures 1 and the formula (1).

Figure 1. Main effects for Signal to noise when larger is better



Source: Own graphical analysis of the experiment

From the viewpoint of robustness and stability of the solution we have chosen "nominal is best" see Figures 2, and Formula 3.

Taguchi (2005) states that "The larger-the-better characteristic should be nonnegative, and its most desirable value is infinity." Joglekar (2003) argued "Characteristics such as bond strength also do not have negative values, but larger values are preferred.

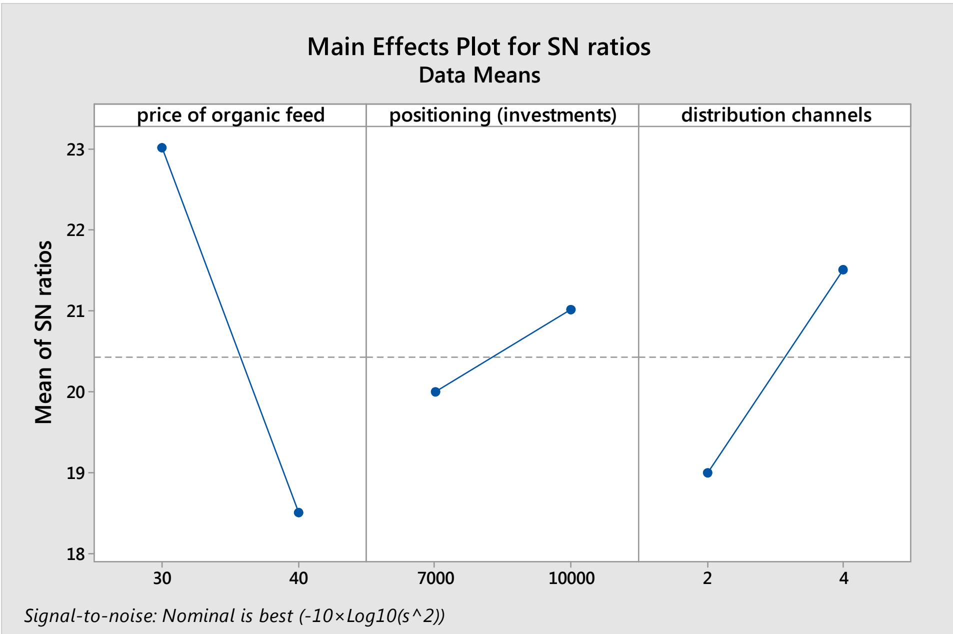
$$\frac{S}{N} = -10log_{10}(MSD) = 10log_{10}\left(\frac{1}{n}\sum_{i=1}^{n}\frac{1}{y_i^2}\right) \qquad \textbf{(1)}$$

Mean squared deviation (MSD) is used in the formulation of the quality loss function. The term ((yi –m)2)is the mean squared deviation, for a group of n products given the performance readings of y i = y1, y2, y3,… , yn and a target of m.

$$\text{MSD} = \frac{1}{\text{n}}\sum_{\text{i}=1}^{\text{n}}(\text{y}_\text{i}\text{-m})^2 \qquad \textbf{(2)}$$

$$\frac{S}{N} = -10log_{10}(MSD) \qquad \textbf{(3)}$$

Figure 2 Main Main effects for Signal to noise when nominal is the best.



Source: Own graphical analysis of the experiment

Response R (revenue) was measured using experiments with two replications and includes two independent variables: the price of organic feed and position (investment into the distribution centers). The response R is then determined by the relationship (4).

$$\text{R} = \frac{\text{Ra}_{\text{MAX}}\text{-Ra}}{\text{P}}\left[\frac{\text{CZK}}{\text{year}}\right] \qquad \textbf{(4)}$$

Where: R_{aMAX} is maximum revenues (sales), which are determined by the number of distribution channels and by the market potential of customers. The optimum response *R* provided by the response optimiser and correctly expressed by the formula (4) is very close to what was defined by visual inspection of the Figures 1 and 2. Table 3 shows that responses from the optimiser have the limitations when it comes to seeking the best possible result.

Table 2 Results from the optimiser of Response R (rate of Revenues and P)
Response Table for Signal to Noise Ratios
Nominal is best (-10×Log10(s^2))

Level	Price of organic feed	Positioning (investments)	Distribution channels
1	23.01	2.,00	19.00
2	18.49	21.00	21.51
Delta	4.52	1.00	2.51
Rank	1	3	2

Source: Own calculation

Table 3 Response Table for Means

Level	Price of organic feed	Positioning (investments)	Distribution channels
1	2.513	2.625	2.913
2	2.362	2.250	1.962
Delta	0.150	0.375	0.950
Rank	3	2	1

Source: Own calculation

11. Results and Discussion

We used specific design which can be used to identify control factors that reduce variability and increase the mean of sales by optimization of the controllable factors setting (in this case the 4C agriculture marketing mix factors). Process parameters, in this case, customer solution, cost, convenience, and communication, are those that can be checked. Noise factor flow of revenues cannot be controlled during production and sales but can be controlled during experimentation. The main event of this study is the identification optimal control factor settings that make the sales process resistant to variation from the noise factors from the financial point of view. Higher values of the signal-to-noise ratio (S/N) indicate control factor settings that minimize the effects of the noise factors.

Compared with other works (factor analysis, multicriteria decision making, linear programming, etc.), this approach allows analyzing the effect of interactions between factors. And furthermore, it allows to optimize the response of mean level and also minimize the variability of the process.

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CHANGES AT THE EU DAIRY MARKET AFTER MILK QUOTA ABOLITION

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Annotation: The results of time series analysis show that Germany and Italy play a decisive role in the volume of milk imports in the intra-European market. Although the volume of milk imports fell after the abolition of quotas in March 2015, due to ensuing domestic production increases, they still remain important. Following the quota abolition, the level of milk imports increased in both volume and value in Austria, the Czech Republic, the U.K., Ireland, Luxembourg, Poland, Romania, and in Croatia. Bulgaria imports increased only in terms of volume. On other hand, the same countries which milk imported, also milk exported. The Netherlands are major exporters of butter on intra-EU markets where the export value of butter almost doubled between the pre-2009 and post-2015 periods. For exports of butter outside the EU the Netherlands together with France and Ireland have the highest shares. Butter exports from the Netherlands, France and Ireland all increased after the lifting of quotas. Among all EU countries, only Latvia experienced a decline in post-2015 imports.

Key words: milk, dairy products, foreign trade, cluster analysis, EU, Import, export

JEL classification: Q17, F14

1. Introduction

European dairy producers view the rapid increase in milk production since the abolition of milk quotas in March 2015 coupled with reduced dairy product demand as a real threat. This scenario provides incentives to increase exports abroad as well as promote the sale of dairy products on domestic European Union (EU) markets. The expansion of EU milk production after the March 2015 quota lifting increased the EU's reliance on the world market for dairy products because much of the added production must be exported outside the EU. However, increased participation in world dairy trade comes with a greater vulnerability to shocks in world dairy markets. Likewise, changes in EU milk supplies will have repercussions on world dairy market prices (Chatellier, 2016).

For the Czech Republic (CR) this excess supply situation can have important impacts on its neighbours and regional trading partners (Visegrad countries – V4). According to Zdráhal (2015) the increased volumes of milk and milk products are exported or imported is mainly connected with the accession of V4 countries. He further observes increased foreign trade with major producing EU-15 countries (Germany, France, Italy …). The development of mutual foreign trade among the Visegrad countries is not reciprocal; Poland has become to be a major exporter to the CR, Slovakia and Hungary. With the exception of Poland, the other V4 countries export little outside the European Union. In addition, following the Ukraine conflict and subsequent to the economic sanctions imposed by the EU, in August 2014 the Russian Federation decided to ban the importation of food and agricultural products from the EU. Russia has been the second biggest destination of EU agri-food products. In case of dairy products 10 percent of exports went to Russia (Bližkovský, 2016). The Russians a ban on EU food imports extend through the end of 2017.

Russia also attempted to increase the self-sufficiency in agricultural commodities and food products. Analysis by Špička and Kontsevaya (2016) revealed significantly higher profitability of Russian milk processors in comparison with Central European countries (V4). The big gap in ROCE was a consequence of different capital structure of the Russian and the Central European milk processors. Russian milk processors use significantly higher share of long-term debt and loans to shareholder funds. The main reason was that the financial crisis did not appear in the Russian Federation to such an extent as in Central Europe. So, the Russian milk processors had continuously increased the bank loans in period 2008 – 2013. The question remains whether, once the embargo will be lifted, European producers will be able to export a significant amount of milk products to Russia again as before.

The dairy market lacks flexibility. Neither producers nor processing companies are able to quickly respond to market changes. To some extent this inflexibility is due to the relatively strong bargaining position of processing companies over producers (Rozsa, 2014). According to findings of Čechura et al. (2015), the mark-up power of milk processors was influenced by milk quotas. Specifically, the mark-up increased in the years of strong release of the quota. This suggests that the abolition of milk quotas may have a negative effect on competitive behaviour in the milk-processing sector.

The main objectives of this paper are to investigate: (i) whether the dairy trade, both inside and outside the EU, has changed after quota abolition, (ii) changes in the directional flows of dairy product exports and imports, and (iii) which countries contribute most to changes in dairy foreign trade.

2. Materials and Methods

This paper analyses monthly data on trade in dairy products, concentrating on exports and imports among the EU states (intra-EU) and all countries outside of the EU (extra-EU) from January 2004 to January 2017. The database of Eurostat by Standard International Trade Classification (SITC) was used. Main 3 groups of dairy products were:
Group 022 – Milk and cream and milk products other than butter or cheese,
Group 023 – Butter and other fats and oils derived from milk,
Group 024 – Cheese and curd.

To examine the changes in trade after quota abolition the data were divided into 3 periods: Period 1, January 2004 to December 2009; Period 2, January 2010 – December 2014, and; Period 3, January 2015 – January 2017. Differences between the groups were assessed statistically using analysis of variance procedures.

To assess the impact of several factors multi-factor models of analysis of variance were used (Seger and Hindls, 1995). The null hypothesis of equality of Period means was tested: H_0: $\mu_1 = \mu_2 = \mu_3$. The alternative hypothesis states there is at least one pair of means which are not equal. The test procedure is written into a table that shows the decomposition of the total variance. The total variance, in the case of simple sorting analysis, is decomposed into two parts, on the variance between classes (it characterizes the effect of factor on the given character) and the residual variance (it characterizes just effect of random causes). The test F statistic is:

$$F = \frac{\text{variance between classes}}{\text{residual variance}}. \qquad (1)$$

With validity of the null hypothesis this statistic follows an F-distribution with degrees of freedom (k - 1) and (n - k). If the value F exceeds the critical value of F-distribution, the null hypothesis of the conformity of means is rejected.

Cluster analysis was used to locate groups of countries with the biggest changes in dairy trade. This procedure divides the units by measuring of their similarity in homogeneous sub-sets (clusters). One cluster includes statistical units that are similar to each other, while units contained in other clusters are different from these of the first or other clusters. The statistical program “SAS” was used for data analysis. In this program, the Tukey grouping was used to divide particular countries into the clusters. The same letter (i.e. A, B, C …) represents means which are not significantly different from each other.

3. Results and Discussion

The empirical results show that Germany and Italy play a decisive role in imports of milk on the internal market of the EU (intra-EU) in terms of volume. Although both reduced the volume of milk imports in Period 3 (post quota abolition), they still remain a key importers. Together with Belgium and Netherlands they represent about 50 percent of all intra-EU imports of milk, cream and milk products (Group 022) as shown in Table 1. One can also see the trends in import values in € - the Italy imported relatively cheap milk and milk products as SMP in the last period (0.62 €/kg), Germany likely imported more processed products (cream, yoghurts) at an average price of imports of 0.79 €/kg in Period 3.

Table 1. Monthly averages of intra-EU imports of milk (group 022)

		1st period	**2nd period**	**3rd period**
BE	mil. kg	106.2	124.2	156.7
	mil. €	86.1	112.2	110.7
DE	mil. kg	204.4	253.0	197.8
	mil. €	118.5	152.2	156.7
IT	mil. kg	222.1	241.3	208.1
	mil. €	123.6	151.4	129.2
NL	mil. kg	139.6	149.9	140.3
	mil. €	119.8	131.1	116.0

Source: own calculation using Eurostat data

The level of milk imports increased in Period 3 (in both kg and €) in Austria, the Czech Republic, the U.K., Ireland, Luxembourg, Poland, Romania and in Croatia. Bulgaria increased imports in volume but not in value.

The same countries which imported milk also exported it. Only Italy is not among major exporters (just 42 mil. kg monthly in Period 3) and in Table 2 was overrun by France. The four countries in Table 2 represent more than 50 percent of total milk exports inside the EU. The average decrease of milk exports in Period 3 among these countries was lower (-4.5% in volume) than milk imports (-14%). The exception is Belgium, where both imports and exports increased (although imports in volume only) about 26% and 1%, respectively. Also the price of imports is lower (0.71€/kg) than of exports (0.91€/kg) which indicates the possibility of higher value added in exports. The same situation is observed in the Netherlands, where the average price of imports was in 3rd Period 0.83 €/kg and of exports 1.15 €/kg. There is an increase in exports of other processed dairy commodities (cheeses and butter), as will be mentioned below. According to Vöneki et al. (2015), in the period around 2012 the most competitive exporters of liquid milk were Germany and Poland, of cheese the Netherlands, Germany, Poland, Denmark and France, and of butter the Netherlands, Ireland, Belgium and Denmark.

Table 2. Monthly averages of intra-EU exports of milk (group 022)

		1st period	2nd period	3rd period
BE	mil. kg	112.9	130.1	131.3
	mil. €	93.7	115.5	119.2
DE	mil. kg	353.6	343.9	336.4
	mil. €	248.5	282.9	259.9
FR	mil. kg	154.8	178.5	164.4
	mil. €	137	172.1	147.8
NL	mil. kg	76.3	81.5	78.7
	mil. €	60.9	85.6	90.4

Source: own calculation using Eurostat data

In case of butter (Group 023), which can be stored in the periods of overproduction, changes in Period 3 exports are shown in Table 3. The Netherlands is the major butter exporter in the intra-EU market in both Periods 1 and 3. The export volume of butter almost doubled between periods in the Netherlands. In the first period the Netherlands and Ireland led butter exports followed closely by Belgium. In the last period the first two countries separated into two specific clusters (A and B), while in cluster C was Germany and Belgium and cluster D was France and Great Britain.

Table 3. Clusters of main intra-EU butter (023) exporters (monthly averages in 100 kg)

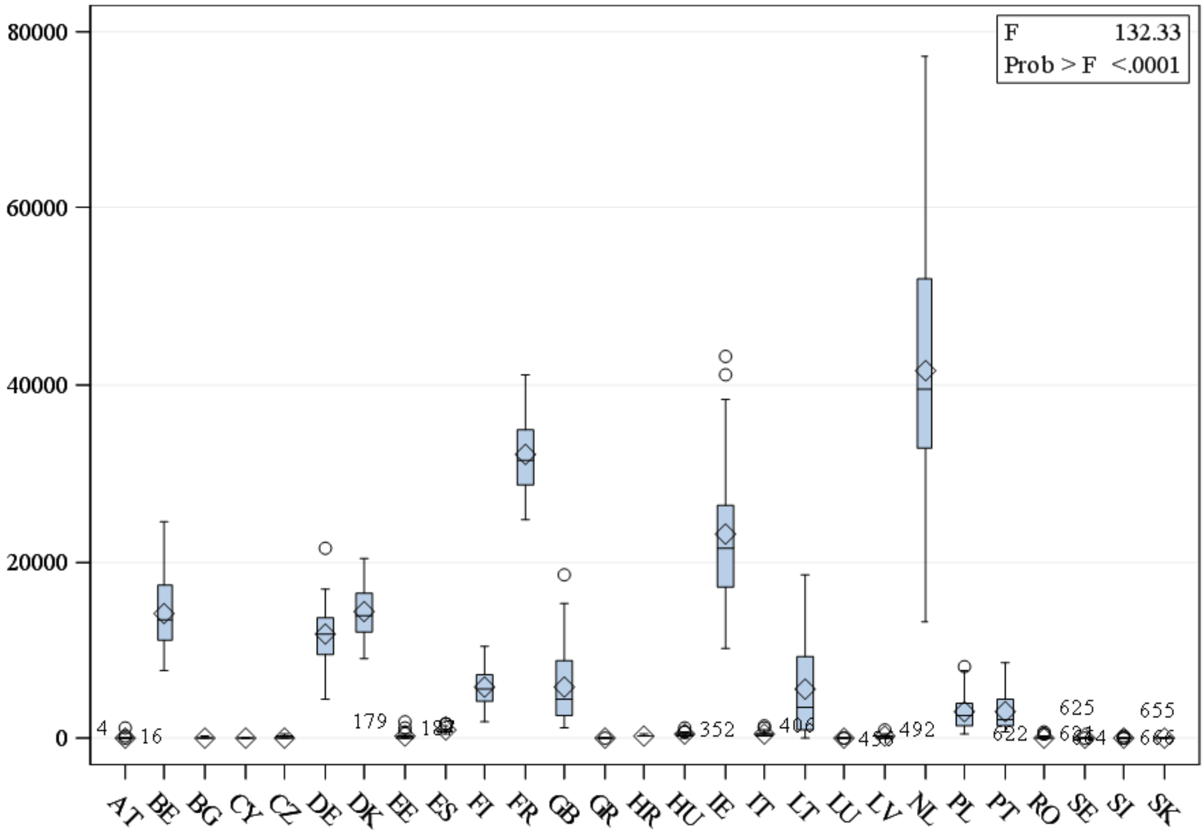
1st period						3rd period				
Tukey grouping			**Mean (in 100 kg)**	**N**	**Country**	**Tukey grouping**		**Mean (in 100 kg)**	**N**	**Country**
	A		99522	72	NL	A		186137	25	NL
	A									
B	A		93548	72	IE	B		138954	25	IE
B										
B			85455	72	BE	C		114949	25	DE
						C				
	C		59934	72	DE	C		105305	25	BE
	D		40558	72	DK	D		51377	25	FR
	D					D				
	D		37836	72	FR	D		41769	25	GB

Source: own calculation using Eurostat data

Note: Means with the same letter are not significantly different

The highest shares of butter exports outside the EU were also found in the Netherlands followed by France and Ireland. While exports from the Netherlands and Ireland first decreased in Period 2 and then increased in Period 3, there has been a continual increase in France (2.1, 2.6 and 3.2 mil. kg of butter in each period). As is shown in figure 1, in Period 3 exports were also important for Denmark, Belgium and Germany with more than 1 mil. kg of butter exported monthly for each country, which formed one shared cluster.

Figure 1. Clusters of main extra-EU butter (023) exporters (monthly averages in 100 kg; 3rd period)



Source: own calculation using Eurostat data

In general, EU butter prices are subject to the large changes. According to models of Chantreuil et al. (2008), by 2020, butter prices can be expected to decline by 9 to 14 percent under various scenarios, relative to the 2020 baseline. Fat is relatively abundant on the world markets compared to protein, thus making it more difficult to find export opportunities for butter.

Another alternative for use of overproduction of milk is to process it into exportable cheese. During Period 3 the exports of cheeses and curds (Group 024) increased for nearly all major producers (see Table 4). In only France did the intra-EU decline in Period 3, but this decline was compensated by an increase in extra-EU exports. The countries shown in Table 4 represent 84 percent of total intra-EU exports and 80 percent of total extra-EU exports of cheeses and curds.

Table 4. Cheese and curd (024) exports (main exporters; in mil. kg)

		1st period	**2nd period**	**3rd period**
DE	intra-EU	62.6	82.2	88.9
	extra-EU	8.6	9.9	8.7
NL	intra-EU	42.3	45.9	56.5
	extra-EU	6.7	9.9	11.3
FR	intra-EU	42.1	47.6	47.0
	extra-EU	6.7	8.3	9.2
DK	intra-EU	16.8	19.8	24.2
	extra-EU	4.4	4.2	5.0
IT	intra-EU	14.3	18.5	23.5
	extra-EU	5.7	6.6	7.6
BE	intra-EU	10.9	13.8	16.6
	extra-EU	0.3	0.4	1.1
IE	intra-EU	10.2	13.1	13.6
	extra-EU	1.6	2.4	3.7
PL	intra-EU	8.2	10.7	14.9
	extra-EU	2.1	4.2	3.9

Source: own calculation using Eurostat data

Among the countries which were affected by increasing exports of butter and cheese are mainly countries accessing to the EU after 2004 (so-called EU-12; see Table 5).

Table 5. Intra-EU imports of butter and cheese in selected countries lately accessing the EU (monthly averages in mil. kg)

		1st period	**2nd period**	**3rd period**
CZ	butter (023)	1.0	1.6	1.9
	cheese (024)	4.7	6.9	7.6
SK	butter (023)	0.4	0.9	1.3
	cheese (024)	1.5	2.9	4.1
RO	butter (023)	0.4	0.5	0.9
	cheese (024)	1.2	2.9	4.7
HU	butter (023)	0.3	0.5	0.6
	cheese (024)	2.4	3.3	4.3
BG	butter (023)	0.2	0.4	0.7
	cheese (024)	0.3	1.1	1.9
EE	butter (023)	0.05	0.08	0.1
	cheese (024)	0.2	0.4	0.6
LT	butter (023)	0.04	0.1	0.2
	cheese (024)	0.3	0.8	0.9
LV	butter (023)	0.08	0.2	0.1
	cheese (024)	0.7	1.3	1.2
PL	butter (023)	0.4	1.1	1.3
	cheese (024)	1.9	4.6	6.6

Source: own calculation using Eurostat data

Almost all countries from the late accessing group increased their imports of dairy products in the Period 3. The exception is Latvia (LV) where the imports of both value added dairy products in last period decreased. This corresponds to findings of Vöneki et al. (2015) who divided member states into groups according to trade balance and quota utilization. All countries mentioned in Table 5 (with exception of Poland) underutilized milk quotas; some of them had a negative dairy product trade balance (Romania, Bulgaria, Hungary and Slovakia) between 2010 and 2013. On other hand, the findings of Smutka et al. (2016) confirm the total positive balance of foreign trade for the Czech Republic (commodity aggregation HS04 – dairy products) between 2005 and 2013. This confirm also findings of authors of this paper, who calculated the total dairy trade balance between the CR and the EU countries (intra-EU) from 2014 to 2016. The positive balance decreased notably in 2016, when it was about € 31 mil. (comparing to 2015 and 2016 – both years about € 69 mil.). The main reason was milk and dairy products price drop in 2016. The positive balance of trade in total volume of dairy products stayed almost unchanged (2014: 61.5 ths. t; 2015: 71.2 ths. t; 2016: 70.3 ths. t).

12. Conclusions

According to the objectives mentioned above we can summarize our findings into 3 parts: (i) The trend of trade in milk and milk products imports from extra-EU are generally fairly flat, while exports to extra-EU are steadily growing, despite reduced export prices and the Russian embargo. The increases in production of fresh products are predominantly produced for domestic EU consumption. As this increased production must be absorbed on the EU market, product prices are depressed, which in turn limits further expansion of production. This explains much of the increase in volume of intra-EU imports and exports. Following the quota abolition, the level of milk imports increased in both volume and value in Austria, the Czech Republic, the U.K., Ireland, Luxembourg, Poland, Romania, and in Croatia. (ii) Of the countries which increased intra-EU imports of milk after quota abolition only Belgium increased import volumes alone. Since each main importer (DE, NL, IT and also BE) can import cheaper milk during the period after quota abolition, they are enabled to export processed products on both the extra- and intra-EU markets. Especially countries of EU-12 increased imports of the dairy products with higher added value (butter and cheeses). (iii) Germany and Italy play a decisive role in the volume of milk imports in the intra-EU market. The EU's continuing structural surplus in milk fat is partially addressed through increased cheese production which depresses cheese prices. Among the main cheese producers, the Netherlands is a major exporter out of the EU but together with Germany play also an important role in intra-EU exports.

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LIFE STRATEGIES OF RURAL INHABITANTS OF UNFIXED ECONOMIC FUNCTION

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Annotation: The aim of the paper was to analyse the occupational attitudes and life strategies of rural residents living in areas that were not in direct impact of urban agglomerations in the context of competitiveness of agricultural sector. The study allowed to define problems of local communities which lived in areas with unstable occupational structure, vague prospects of development, characterized by duration rather than development. To collect the empirical data there were conducted twenty-eight in-depth and narrative interviews with farmers from the Cekcyn municipality with diverse profiles of farming. The study was supplemented with overt participant observation. Farming transformation in the Cekcyn municipality is progressing slowly. Farmers are tentatively developing their activities, being afraid of overinvestment. Some of them are planning to change their line of production. The respondents admitted that apart from the economic one they also need mental support. New information and alternative technologies are in high demand, especially in the areas of poor soil quality, and with scattered farms which lack investment.

Key words: rural areas, occupational strategies, changes in rural areas, problem areas

JEL classification: D12, J0, R20, R22, R23

1. Introduction

The aim of the research was to pinpoint the direction, source and scale of the changes in Polish farming, which have been taking place after the country's political transformation and joining the European Union. It was not by accident that the researchers chose to examine *Iwiec* village and, consequently, the whole *Cekcyn* municipality. This area lies in the heart of the *Tuchola Forest*, and although it has a poor quality land, farming is still the main occupation of the residents. Since the villages are located far from bigger cities, it was interesting to investigate the residents' occupational strategies. They have a choice between working on a farm, which generates scarce income, or being employed in a faraway city. Bearing the above in mind, it is evident that the area requires special programmes, which promote equal development of rural municipalities. In other words, Cekcyn municipality suffers from typical problems such as social exclusion (Jakubowska and Rosa, 2016), unemployment (Markov et al., 2016), poverty (Hubeni et al., 2016), an others.

It is also important to recognize the fact that the changes which are taking place in Poland have significant influence on the country's rural areas. According to Lucjan Kocik, the traditional, autarkic, self-sufficient way of living and values - based on the union between the family, farm and environment - have been steadily disappearing (Kocik, 2000). He argues that one of the consequences of Poland's integration with the EU structures is the need to adapt its countryside to the West European model, in which farm production is more dense - rather than scattered – and more intense. Western Europe has seen a dynamic increase of urban societies since the middle of the twentieth century. Many rural dwellers have migrated to cities, causing the countryside to lose its cultural distinctiveness (Kocik, 2000). In spite of this, according to Krzysztof Gorlach, the countryside is undergoing fundamental changes. First of all, numerous new inhabitants, with non-farming income, are moving into villages. Land, rural space and landscape are no longer used solely for farming purposes as village dwellers have come to realize their aesthetic values and tourist attraction potential (Gorlach, 2004). By using the direct interview and the narrative interview quality methods in the study, its authors were able to establish the factors responsible for local commune activation without the respondents' realizing. The same method was adopted by Lucjan Adamczuk in his study of *Lipce Reymontowskie* village (Adamczuk, 2003).

2. Materials and Methods

It can be said that no perfect field research model has been offered so far. Having said that, according to Michael Angrosino, only by long-term and diligent immersion can researchers document the social structures which build and define the foundations of a society (Angrosino, 2010). We learn from the specialist literature that sociology puts the man and his social behaviour in the centre of its attention. What is more, it also studies social organizations and interactions taking place between people within them (Babbie, 2007; Turner, 1998; Giddens, 2006). Therefore, selecting the appropriate method of study, defining its aim, and theoretical inspiration are the decisive factors for sociologists. To quote Stanisław Ossowski, "the works of 'pre-sociology' writers can, in fact, provide more insight than those written by more contemporary authors." According to him, the works of Émile Durkheim are a good source of such inspiration (Ossowski, 2001). Émile Durkheim who, at the beginning of the twentieth century, suggested broadening the focus of sociology, and shifting it from ideas to objects (understood by him as *social facts*). Contrary to another Frenchman, Auguste Comte, he believed that "the most primary rule is to analyse social facts as if they were real things" (Durkheim, 2000). He considered social facts to be beliefs, penchants and practices of different social groups etc.

Definitions notwithstanding, how are sociological methods different from those used by naturalists? Not surprisingly, they are entirely different, in the sense that for the latter, objects and facts exist independently from human interaction. For the former, however, "things and objects adopt certain values depending on human interaction as they evaluate, depending on who and when interacts with them" (Znaniecki, 2001). Znaniecki explains that "the general and most crucial characteristic of things and facts studied by a humanist is the fact that they belong – or are embedded – in people’s actions and their experiences. Consequently, they possess the characteristics assigned to them through the agent's actions and sensations" (Znaniecki, 2001). This idea was called the *human factor* of things and facts, which are the subject of study of a humanist (Znaniecki, 2001).

In order to collect the empirical data, twenty-eight in-depth and narrative interviews were conducted. The data was obtained between 2011 and 2014 from farmers with diverse profiles of farming from the *Cekcyn* municipality (*Kujawsko-Pomorskie* voivodship, northern Poland). The study was supplemented with overt participant observation.

3. Results and Discussion

Polish rural areas have changed considerably during the last 25 years. The changes were initially difficult to foresee, however they provide extensive knowledgebase for sociologists studying rural development in Poland. We are now observing the positive results of farming production rationalization, namely, the widespread knowledge of farming production and produce distribution. On the other hand, there is an increased demand for land and the competition between farming and urban areas. In conclusion, numerous irresponsible decisions regarding farm development were made in the first stage in the development of rural areas in Poland during the transformation period. In the mid- nineties the situation started to improved, and it peaked in the first years of Poland's membership in the European Union (Pilichowski, 2014). Sudden changes, however, exposed the ineffective structure of the Polish farming, suffering mainly from overemployment. Losing farmland due to its scattering or unsuitable location for farming purposes was another dilemma. 1.4m ha was lost between 2002 and 2010 alone. Today, the biggest problem is the high land purchase cost, which makes it neither feasible to start production nor to combine areas and plots with a view of intensive farming.

With the dawn of the new millennium, Polish farmers were very optimistic about joining the European Union. They expected that the value of their land would soar and so would the government subsidies. Although land concentration figures have increased slightly after the merger, the land spread factor remains a serious problem, with Poland occupying the 24th place in the EU on the Farmland Concentration list (Wilkin, 2014). The total number of farms in Poland in 2013 was 2 172. Due to difficult farming conditions and high unemployment figures, farmers have been reluctant to sell or hire land. Undoubtedly, the EU subsidies have improved the situations of Polish farmers, even though considerable differences in direct payments were observed between different provinces. What is more, the economic situation in the farming sector had become more consistent, even in the *Podlaskie* i *Lubelskie* provinces, with country dwellers no longer feeling excluded or deprived.

Although 25 years have passed since the political transformation in Poland, we are still being told that the transition has not ended, and fundamental changes, whose results can be seen in the sphere of agribusiness (Drelichowski et al., 2014), are still taking place. Not surprisingly, one can ask whether there is a finish line, and - more to the point - where is it? Will we ever get to the point where one can say "At last, this is normal life!" What does "normal" even mean? Is it the West European model or, possibly, the US one? A number of generalizations relating to farmers, farm modernization, and adaptation to the EU laws was made by meticulous scientists. For example, farmers were classified as being innovative or conservative, as having the traditional or modern approach, characterized by individual or collective approach to work, etc. (Bukraba-Rylska, 2005). However, these dichotomies seem to ignore many significant aspects. For example, they do not acknowledge for farmers' happiness, job satisfaction, or whether they still feel as if they own the land, etc. In her works, Izabela Bukraba-Rylska is criticizing sociologists for utterly ignoring the fact that strong bonds exist between farmers and their land. She concludes - not without irony – that "apparently, Polish farmers have never read about their inevitable doomsday“ (Bukraba-Rylska, 2005). Farming researchers in Poland frequently begin presenting their study results with the following introduction: "Polish countryside remains far behind its European counterparts. What is more, there are considerable discrepancies as far as the development between rural and urban areas within the country is concerned" (Śpiewak, 2007). It must be said that comparing Polish farms to their Western European counterparts does not seem reasonable. Common development indicators should not be used as they do not recognize the characteristics of Polish farming. What certain people might perceive as old-fashioned farming methods, others might see in different light, namely as challenging operations performed in an unfavourable environment, which should be viewed as an asset - not handicap (Fedyszak-Radziejowska, 2011).

In the *Cekcyn* municipality, the majority of farms either live on their production (14%) or have no production whatsoever (25%). This section of the *Tuchola Forest*, the *Cekcyn* municipality in particular, has land of the lowest grade. Farmers who benefit from direct subsidies are reluctant to sell their land though. At the same time, the number of potential heirs is diminishing as young people from *Cekcyn* have more attractive employment opportunities in nearby *Bydgoszcz* or *Toruń*. As a result, instead of being passed from generation to generation, land ownership changes. In the light of the above, the current situation could potentially lead to more land concentration, thus making farms more economically viable – was it not for the government subsidies, which render the whole process unfeasible (Rosner and Stanny, 2014). Currently farmers have land but they do not use it for farming production. It should be turned into forests, which would boost tourism in the area but this is not happening as farmers show little interest in changing the existing situation. Special meetings are organized by the municipality but they are attended by a mere several dozen farmers and a handful of regular guesthouse owners.

6,727 residents are registered in the *Cekcyn* municipality, with as many as 2,445 own land owners, out of which 1,018 have an area larger than 1 ha. According to the Inland Revenue, only one farm is larger than 50 ha. The vast majority of all farms in the area are either small or very small. The farming is characterized by very low farming production indicators - 30 percent below the country's average. Soil valuation indicators are also low; more than 65 percent of land is 5th, 6th or 7th grade (Borta, 2014). According to one of the respondents, was it not for the EU and OWN subsidies, the land would be either turned into forests or abandoned altogether. Thus, as such, the subsidies seem to serve their purpose well.

The area is also characterized by considerable land scattering. Land which officially has one owner, may in fact have several of them. According to one respondent, a plot of 20 ha or 30 ha may be "split up into several pieces". As a result, production costs increase, the scale of production remains limited, and as such the produce hardly ever reaches shelves in shops. Eventually, the farming production generates scarce income and it is not seen as worthwhile by the farmers themselves who often resolve to alternative means of income. What is more, farming in the *Tuchola Forest* is noticeably weather-dependant. As one respondent puts it "Farmers' life can be tough here. Any drought or ground frost is all it takes to lose your crops. The shape of land does not make it any easier." The vicinity of the Area of Exceptional Natural Beauty is another drawback as far as farming concentration is concerned. However, farmers do not feel oppressed by the park, on the contrary, they understand the need to protect the natural beauty of the area and the habitats of numerous fauna. They embrace the land and working conditions with all their shortcomings. Some farmers succeed in developing their farms and making profit, while others cannot manage that. Interestingly, few would like to sell their land. Also, there is little interest in managing ecological farms - there are barely five farms of this type in the whole municipality. Cranes, which can damage maize crops are yet another trouble for farmers in the *Cekcyn* area.

It is important to realize that farmers - similarly to other professional groups - need time to learn and accept novelty, innovation and prepare for a change. This claim can be supported by the following example. A company attempted to sell animal feed to acquainted farmers only that is farmers, who the animal feed company owner knew well personally. Surprisingly, the sales were disappointing. The reason was not the lack of trust on the customers' part but the fact that the product had not been properly tested. After several years, the company became a renowned animal feed provider on foreign - not domestic - markets. According to the farmers from *Cekcyn*, "we were afraid of trying something new. You know, until a digger has been tried by someone for the first time, others will continue to use a spade." There is hardly any competition between farmers who must sow on poor soil. Their main competitor is the nature itself, which provides meagre crops despite the farmers' endeavours. In the past, farmers used to sow crops and plant vegetables in soil of different grades. Today, sadly, they adjust their production to the width of the harvester. It is especially apparent in the first weeks after cereal has grown. In one part of the field the cereal will be yellow, which is a tell-tale sign of very poor soil, or sand, and it will grow with difficulty. In the other part it will be green because the grain fell on more fertile soil.

Farmers may adopt different strategies for the future. The smallest group is determined to invest by leasing more land and trying out new plants such as soy or spelt. Others see little prospects for improvement of their situation and hope for modest crops. Apart from the plant production, they usually keep pigs and cattle. However, animal purchase prices tend to fluctuate, so some farmers may eventually decide to stop breeding animals altogether. Due to unstable weather conditions and poor soil, many farmers deem any investment too risky. They prefer to benefit from the area subsidies offered by the government rather than invest in new machinery. Other farmers claim that they have overinvested. They argue that the sums they had to provide to be eligible to use the subsidies for buying new machinery were inappropriate with regards to the outcome. However, they also claim that had it not been for the new machinery, they would be in an even more difficult position today. According to one farmer, "if you invest in land and the machinery today, the benefits will be for generations to come". Unfortunately, there are no generations to come as the farming career opportunities present little or no interest to younger people. Even those people who decide to run a farm, reconsider after certain amount of time, expecting bigger income in return for less demanding occupation. These days it is difficult to predict whether an heir will take over the farm after his father. The fact that a farmer's children study in agricultural colleges does not mean that they will choose this line of work in the future.

Entering the EU markets remains a taboo subject among farmers from the area. When asked to evaluate the accession, older farmers will first relate to the past. They will reminisce about the 70s and 80s when shops were empty, devoid of most basic foods, and they really felt like food producers. Their relatives living in cities – and also strangers – would travel to the country to buy food from them. Farmers would breed animals to meet the growing demand. Farming was a profitable business then. However, the worst period for Polish farmers was between 1989 and 2004, when Poland joined the EU. Food from Western Europe flooded the Polish market. Competition was just an illusion. Consumers were not aware that choosing the sorted and carefully selected produce from European producers was not, in fact, fair competition. Polish farmers stood no chance in fight for the customer as their production – as opposed to the European producers – was not subsidized. Many farmers were not able to compete with the growing production standards, and their situation was particularly difficult if farming was their sole source of income. Only those farmers who managed to diversify their production, or had alternative sources of income, survived. Farmers believed that after joining the EU structures they will be given equal opportunities to compete on the common market, so they voted to join the EU. Today, they are still not receiving the same subsidies as their European counterparts, but the direct payments are enough to plan for profits and make regular loan payments. Although livestock purchase prices remain unstable, breeding pigs and cattle for fattening is financially viable. Almost all cereal is used as animal feed, and there is not enough land to secure crops. While farmers who specialize in cereal production only are entitled to compensation in the case of drought, farmers who have mixed production are not eligible, even though they are also severely affected by drought as they have to supply their animals with extra feed.

As mentioned before, the lack of heirs poses a serious problems for the farming industry. Having children does not necessarily mean that they will manage the farm in the future. Young people, despite having agricultural education are either reluctant to embrace hard physical work on a farm and choose other jobs, or they have no calling to become a farmer. Young people possess extensive knowledge about farming and agriculture. Even children are aware how demanding the work can be, how pests (wild boars, cranes, foxes) can damage crops, or how detrimental drought or hail storm can be. Farmers estimate that only one in ten farms has an heir, which does not mean that he or she will choose to run the farm. Still able-bodied, farmers do not tend to think about the future ownership of the farm. At the same time, the farm has a special place in their hearts as they have managed it the last three or four generations.

4. Conclusion

Agriculture in the *Cekcyn* Municipality has been slowly undergoing transformation. Farmers moderately develop their operations, unwilling to fall into the trap of overinvestment. A few of them are planning to introduce changes in the plant production. Some farmers cautiously consider growing soy. The farmers from the *Cekcyn* area lack economic and mental support. A farmer from *Zamarte* provides the example of a conference which he attended, where the problems of contemporary farmers were discussed. To his dismay, his area was quoted as a "heritage park", where foods are sold but not produced. Such irresponsible comments undermine farmers' self-esteem and may stop them from looking for alternative sources of income. Despite poor soil and high unemployment rate, it is possible to find labourers, which means that there is some hidden potential in this area. The exceptional natural beauty remains a serious asset of the area. Unfortunately, we were not able to find a single farmer (that is not to say they do not exist) who would seek help or advice in an institute or a university. It is safe to think though that many institutes would be pleased to assist farmers with their enquiries. It is evident that there is a considerable demand for new information and alternative farming methods, especially in the areas with impoverished soil, and scattered farms which lack investment.

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INTENSIVE DAIRY FARMING IN NORTHERN GERMANY: DEVELOPMENT AND IMPACT OF THE NEW FERTILIZER ACT

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Annotation: Germany, the largest milk producer in the European Union, increased milk production by 15.1% from 2007 to 2015. In 2015 intensive production regions with a milk production of more than 2,000 kg/ha contributed 59.8% to the German milk production whereby they represented 69.9% of the growth in German milk production from 2010 to 2015. The area of grassland and area of maize silage have a high positive and significant correlation with milk production. The regression model (R^2: 0.832) indicates the strong influence of these variables on milk production. Indeed data of twelve farms from an intensive production region show that fast grown farms get to limits due to the greening regulations on crop rotation and the nitrates limit of 170 kg/ha from manure of animal origin of the New Fertilizer Act. This will lead to increasing demand for land and the need of exporting nutrients to less intensive regions which will increase the costs of milk production.

Key words: Milk Production, Dairy Farming, Fertilizer Act, Germany, Grassland, Limiting Factor, Maize Silage

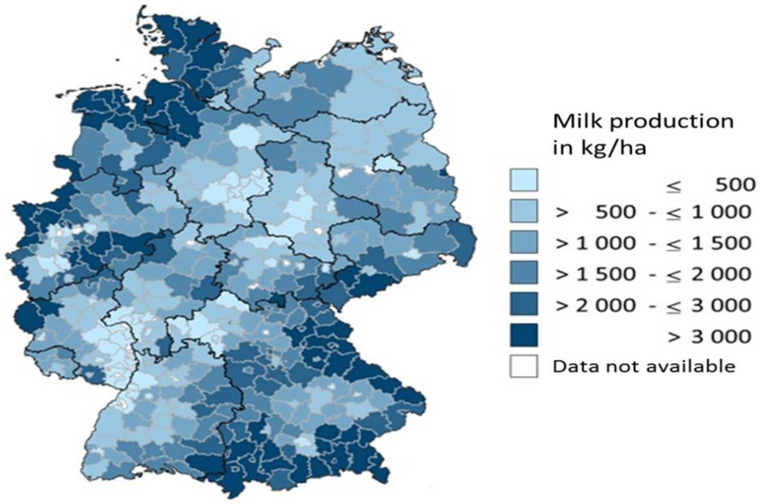
JEL classification: Q12, Q18

1. Introduction

The European Union is the largest milk producer in the world. In 2015, European milk production amounted to 162.6 m tons, which is 24.4% of world milk production. Germany is the largest milk producer in the European Union with a production of 32.7 m tons in 2015, or 20.1% of European milk production (ZMB, 2016). German milk production decreased very slightly by 12.232 tons in 2016. That corresponds to a decrease of 0.04% (BLE, 2017a). This was the first time in more than 10 years that German milk production did not increase over the preceding year (ZMB, 2011; ZMB 2016; BLE 2017). Overall, Germany's milk production grew by 15.1% between 2007 and 2015, which is above the EU-27 average of 9.5% (ZMB, 2011; ZMB, 2016). It should be noted, however, that milk production is not homogeneously distributed throughout Germany, as can be seen in the annual milk production on county level in Figure 1.

Milk production is especially located where natural site conditions allow no or just a few types of land use beside grassland. This results in low opportunity costs for land, compared to regions where more numerous and more profitable opportunities for arable farming exist (Gömann et al., 2006). Thus, the main milk production areas are located in regions with high shares of grassland. These can be found along the North Sea coast, in the upland regions in the middle of Germany, in the alpine uplands and along the Czech border. Further regions where intensive dairy farming takes place but where good conditions for arable farming also exist are the region bordering the Netherlands and the Lower Rhine region (Lassen et al., 2009). During the last decade, Germany's intensive dairy farming regions have attracted additional production volumes, whereas milk production has been shrinking in many less intensive areas (BLE, 2011-2016).

Figure 1. Intensity of milk production in Germany at county level in 2015



Source: Thünen-Institute 2016

Intensive dairy farming regions are characterized by large quantities of manure. Similar effects occur in regions with intensive pig and poultry production, were large amounts of manure are also produced (Chamber of Agriculture, 2017). Due to the resulting nutrient surpluses, intensive livestock farming is held responsible for a substantial impact on nitrate contamination of groundwater (Taube et al., 2013). Next to nitrate, phosphate is also an important water and environmental pollutant because it has the highest eutrophication potential (BMELV, 2013).

The European Union's Nitrates Directive is one of its main efforts to reduce nitrate leaching from agriculture and sets forth a number of measures (Velthof et al., 2013). The Nitrates Directive helps to fulfil the goals of the European Union's Water Framework Directive, which was implemented in 2000 (BMU, 2013). The Directive of Utilization of Fertilizers, Soil Excipients, Culture Substrates and Plant Aids—known as the Düngeverordnung (DüV), or Fertilizer Act—regulates the utilization of fertilizers, including technical aspects of utilization and amounts. The act is the main instrument for implementing the European Union's Nitrates Directive in Germany (BMELV, 2013). The new regulations of the Fertilizer Act were passed by the German Federal Parliament on 31 March 2017 (BMEL, 2017). The new regulation will come into force in the next planting season, starting after the 2017 harvest, and will affect dairy farms, among others. It regulates the balance of nitrates and phosphates as follows: nitrate use is limited to 60 kg/ha for a three year period, decreasing to 50 kg/ha in 2020, and phosphate use is limited to 20 kg/ha for a three year period, decreasing to 10 kg/ha in 2023. Furthermore, it introduces a lengthened blocking period for manure application, thus increasing the need for storage capacity to nine months for farms with more than three grazing livestock units per ha until 2020 and limiting the use of nitrogen from manure of animal origin to 170 kg/ha (BMEL, 2015). In Lower Saxony, the N accumulation per ha will increase from 99.3 kg/ha to 123kg/ha of farmland due to the act's new regulations. This will lead to N accumulation close to the 170 kg N/ha limit or above in intensive livestock regions (Chamber of Agriculture, 2017). In the Netherlands, one of the most intensively farmed countries in the world, the European requirements are estimated to cut the dairy herd by about 160,000 animals, or 6.6% of the Dutch dairy herd, in the short run. In the long run, it is estimated that a further expansion of dairy herd and milk production will occur due to improved efficiency within the sector (USDA, 2017).

Against the background described above, the main objectives of this study are (1) to analyze the development of German milk production and its concentration in the time period 2010 to 2015, (2) to illustrate the coherence and strength of influence of the area of grassland and the area of silage maize production on milk production in Germany and (3) to examine the impact of the New Fertilizer Act on the production costs of dairy farms in an intensive region.

2. Materials and Methods

The study is based on official data from the Federal Office for Agriculture and Food (BLE) on milk production at the county level from 2010 to 2015. Data for 2016 at the county level are not yet available. Additional data on the area of grassland and of silage maize production, disaggregated to county level, based on the agricultural structure survey of 2010 are provided by the KWS SAAT SE, a seed company based in Einbeck, Germany.

To analyse the concentration and development of milk production in Germany, descriptive statistics were used on county-level data. Concentration was measured as the share of milk production in intensive production regions relative to overall milk production in the respective state and in the country as a whole. Intensive production regions were divided into regions with moderate intensity, or milk production of 2,000 to 3,000 kg/ha, and with high intensity, or production of more than 3,000 kg/ha.

To do correlation and regression analysis, the data were analysed on a normal distribution using the Kolmogorov-Smirnov test. The coherence of variables without normal distributions—milk production (tons), area of grassland (ha) and area of silage maize production (ha)—was evaluated with a correlation analysis, using the Spearman correlation coefficient.

The influence of grassland and silage maize on milk production was analysed with an ordinary least squares model (OLS) using the software SPSS 23. Here, the area of grassland (A) and the area of silage maize (B) are the independent variables, influencing the dependent variable milk production in tons (Y). The correlation coefficients β1 and β2 estimate the influence of the independent variables. The residue item (U) shows the influence of other factors on the dependent variable.

$$Y = \beta_0 + \beta_1 * A + \beta_2 * B + Ui \quad (1)$$

To analyse the impact of the New Fertilizer Act on the production costs of dairy farms, data from 12 dairy farms in Northern Germany were collected with the help of a specialized consulting company in autumn 2016. The data refer to the financial year 2014/2015. This means that they show the economic situation from 1 July 2014 to 30 June 2015. Production costs were calculated with reference to the full cost accounting method. Therefore, opportunity costs were scheduled for production factors such as unpaid family workers and land. Depreciations were adjusted to the actual operating life expectancy.

3. Results and Discussion

In 2010 moderately intensive dairy farming regions accounted for 15.5% of German milk production, whereas highly intensive production regions were responsible for 43.3%. Thus, intensive production regions contributed 58.8% to German milk production in 2010. By 2015 the share of German milk production in intensive production regions had increased slightly to 59.8% including a slightly increased share in the highly intensive regions of 44.3% and a constant share in the moderately intensive regions of 15.5%. Although the share of the intensive regions in total milk production increased only by 1 percentage point, they play a very important role in the development of German milk production overall. In 2010 the intensive production regions were responsible for 76.2% of the surplus in milk production; the highly intensive regions alone contributed 62.4%. In 2015 the highly intensive regions were responsible for 67.8% of the increase in production, whereas the moderately intensive regions contributed only 10.7%. From 2010 to 2015 intensive production regions represented 69.9% of the growth in Germany's milk production, of which 54.9% was observed in highly intensive and 14.9% in moderately intensive regions.

The German states of Bavaria (24.9%), Lower Saxony (21%), North Rhine-Westphalia (10.2%) and Schleswig-Holstein (9.1%) represented 65.1% of German milk production in 2015. Milk production of more than 2,000kg/ha also occurs in Hesse, Rhineland Palatinate, Baden Wuerttemberg, Saxony, Brandenburg and Thuringia.

Table 1. Contribution of intensive dairy regions to total milk production in different states (%)

State	2010	2011	2012	2013	2014	2015	Average
Schleswig-Holstein	92.4	92.7	92.2	92.3	92.5	92.3	92.4
Lower Saxony	77.0	77.9	77.8	77.8	77.9	78.3	77.8
North Rhine-Westphalia	67.1	67.5	67.5	67.8	68.2	68.0	67.7
Hesse	18.2	18.4	18.9	18.8	*	18.6	18.6
Rhineland Palatinate	51.5	51.5	51.2	51.7	51.7	51.4	51.5
Baden Wuerttemberg	41.4	41.3	41.0	41.0	41.1	41.3	41.2
Bavaria	75.3	75.5	75.9	75.7	76.3	76.6	75.9
Brandenburg	1.4	1.5	1.4	0.0	1.5	1.5	1.2
Saxony	58.0	58.0	58.1	57.9	58.2	59.0	58.2
Thuringia	23.7	23.9	24.2	24.5	24.9	25.3	24.4

Source: Authors' calculations after BLE 2011- 2016

*Note: *data missing*

As can be seen in Table 1, there are great differences regarding the role of intensive production regions in the various German states. Milk production is most concentrated in Schleswig-Holstein, where 92.3% of milk production came from intensive production regions in 2015. Schleswig-Holstein is followed by Lower Saxony (78.3%), Bavaria (76.6%) and North Rhine-Westphalia (68%). The lowest concentration of milk production can be seen in Thuringia (24.4%), Hesse (18.6%) and Brandenburg (1.5%). In all German states, the highly intensive regions represent higher shares of total milk production than the moderately intensive regions. In Schleswig-Holstein the highly intensive regions contributed 70.3% to the state's total milk production in 2015. The highly intensive regions' share of total milk production was 67.6% in Lower Saxony, 55.5% in Bavaria and 51.8% in North Rhine-Westphalia. The growing concentration of milk production can also be seen when examining production growth in intensive regions. In Lower Saxony, for example, the intensive production regions were responsible for 91.1% of production growth in 2015, with 78% deriving from highly intensive regions. In some states, intensive regions contribute more than 100% to production growth. This is because production grew in these regions, while the states' overall milk production decreased. This is the case in Rhineland Palatinate (198.5%) and Saxony (136.4%).

Available grassland is an important factor for milk production. The weighted average share of grassland on total farming land in highly intensive regions is 49.2%. Moderately intensive regions have a weighted average share of 27.3%, and non-intensive regions 22%. The area of silage maize production is also higher in intensive dairy farming regions. In highly intensive regions, the weighted average share of arable land dedicated to silage maize is 37.6%, and the weighted average share in moderately intensive regions is 22.2%. In other regions silage maize accounts for a share of 15.2% of arable land. The share of arable land dedicated to silage maize production is an important determinant of further growth in milk production because due to the greening regulations, the share arable land dedicated to the main crop is limited to 75% (Chamber of Agriculture, 2016). In a few German counties, the share dedicated to silage maize is already up to 75%. Though at county level that share may average 37.6% in highly intensive regions, at the individual farm level it can be much higher, as is the case on the farms we analysed in the Northern German intensive region, where it is already nearly 75%. The close relationship between milk production (tons) and the areas of grassland (ha) and silage maize production (ha) can be seen when analysing the correlation. Both factors have a very strongly positive and highly significant correlation with milk production, as can be seen in Table 2.

Table 2. Correlation matrix with Spearman correlation coefficient

	Milk production	**Area of grassland**	**Area of silage maize**
Milk production	1.000	0.889**	0.887**
Area of grassland	0.889**	1,000	0.766**
Area of silage maize	0.887**	0.766**	1.000

Source: Own calculations after BLE 2016, KWS 2017
*Note: **significance level 0,01*

The regression model analysed the influence of grassland area and the area of silage maize on German milk production. As can be seen in equation 2, both factors have a highly positive and significant influence.

$$Y = -9{,}448{,}894^{1} + 4{,}935^{1} * A + 5{,}647^{1} * B + Ui \qquad (2)$$

Note: ¹ significance level 0.01

The coefficient of determination, R^2, is 0.832; this means that 83.2% of the estimated residues can be explained by the independent variables “area of grassland” and “area of silage maize”, both of which are essential for milk production. The result confirms the theory that milk production is allocated where natural resources allow no or just a few types of land use other than grassland. Furthermore, it indicates the strong influence of silage maize production on milk production in the prevailing production systems in Germany.

Another point that will influence the development of milk production is the new Fertilizer Act. The data from German dairy farms in intensive regions show that the farms which have grown strongly over the last years will not fulfil the tighter regulations of the new Fertilizer Act because their nitrate levels from animal manure are above the now more strictly defined 170 kg/ha limit. The share of total farm land dedicated to grassland on these farms is 45.9% Therefore, the farms will be impacted by the abolishment of the derogation option, which allowed them to put 230 kg/ha of nitrates from animal manure on grassland. The farms in our study have a surplus of 19.9 kg N/ha (Niemann, 2016). As a result, they will be forced to rent additional land, export the nitrate surpluses to regions with lower livestock densities, reduce their herd size or reorganize their farms by, for instance, outsourcing of the rearing of calves. Export opportunities are restricted due to competition from pig and poultry farmers in intensive livestock production regions, who are also affected by the new legislation. These farms are further affected by the stricter phosphate limit because of the higher amounts of phosphates produced, especially in pig manure (Chamber of Agriculture, 2017). This situation will lead to an increased demand for land even though land prices are already high in the intensive regions we studied. The opportunity costs for land are currently about €600/ha p.a. for arable land (Niemann, 2016). How land prices will develop is not completely clear. In general, prices increase when demand increases, as seen in the past. While rental prices for land are much higher even than €600/ha p.a. in other intensive livestock regions, they have stayed constant or even decreased in some intensive dairy regions because of farm failures due to the low milk prices in recent years. Nevertheless, recent increases in land prices have led to an increase in production costs of 0.7 ct/kg energy corrected milk (ECM). The costs for the export of manure within the blocking period will result in additional costs of 0.4 ct./kg ECM. Here cost of storage of €5/m³ were calculated and an average transport distance of 30 km is assumed (Niemann, 2016). Indeed, these costs may increase in future due to the fact that the legally stipulated nitrate balance of 60 kg/ha will decrease to 50 kg/ha in 2020. Furthermore, export distances are also likely to increase due to competition with livestock farms and substrate from biogas plants because the new Fertilizer Act also limits the application of substrate to 170 kg N/ha (BMEL, 2015). Last but not least, the low prices for mineral fertilizers could decrease the willingness of arable farmers to use manure.

4. Conclusion

From 2010 to 2015, German milk production grew more strongly than the European average, whereby the growth was mainly concentrated in intensive dairy farming regions. From 2010 to 2015, intensive production regions were responsible for 69.9% of production growth in Germany, whereby the highly intensive regions accounted for 54.9%. The result of this analysis confirms the theory that milk production is heavily based on grassland due to its low opportunity costs. Furthermore, the study confirms the strong influence of area of grassland and area of silage maize on milk production. Especially on farms which have strongly increased their herd sizes, EU greening regulations will further limit the growth of milk production. The new Fertilizer Act will increase the production costs of dairy farms, especially those of farms which grew quickly in the past. Affected dairy farms will have to develop strategies to solve this problem. Cost analyses show that strategies such as the outsourcing of the breeding of calves can decrease the surplus of nitrates to below the 170 kg/ha limit at the farm level (Niemann, 2016).

Nevertheless, in most cases this will end up in increasing production costs on affected dairy farms, which will reduce their competitiveness against foreign competitors, especially those farms in less intensive areas with low opportunity costs. Indeed, there are competitors such as farms in the Netherlands which are more heavily impacted by the implementation of the European regulations. Policymakers should deal with the problem of nutrient surpluses by supporting the development of solutions, for example, economically more attractive export systems for nutrients into less intensive regions or more nutrient-efficient ratios for animals (Kröger, 2016). These measures will help remedy the impact of the Fertilizer Act on dairy farming in Germany and preserve its competitiveness since, in the end, there are many good reasons besides site conditions, such as farmers' knowledge and presence of necessary infrastructure, why dairy farming is located in these areas and has been further concentrated there.

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SUSTAINABLE DEVELOPMENT OF RURAL AREAS IN POLAND

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Annotation: The concept of sustainable development is to create a state of balance, both in the economic and social sphere as well as in terms of the natural environment. The local aspect of the issues related to sustainable development is crucial to ensure the sustainability at the national level. The objective of the article is to determine and evaluate the level of sustainable development in its three aspects at the local level in Poland in the year 2015. The analysis was made for rural and urban-rural communes in Poland. The statistical data from the Local Data Bank of the Central Statistical Office were applied. A set of indicators of sustainable development was defined. Using methods of multidimensional comparative analysis the synthetic indicators of economic, social and environmental development were determined. The measure of cohesion was used to assess the sustainability level of communes. It enabled dividing communes into five groups: very low, low, medium, high and very high level of sustainability. The results show that there are pronounced differences in Polish rural and semi-urban communes regarding their level of sustainable development. The largest number of municipalities was in the low level sustainable development class. It was found that the economic aspect may be a barrier in shaping of sustainable development of communes.

Key words: sustainable development, local level

JEL classification: Q01, R11

1. Introduction

The concept of sustainable development emerged in the 1970s and since then its significance in the development theory and policy has been increasing. The key objective of this concept is to harmonise three main spheres: environmental, economic and social (Hopwood, Mellor and O'Brien, 2005). This means such social and economic development, wherein the needs of the present generation are met without compromising the ability of future generations to meet their own needs (Our Common Future, 1987).

Sustainable development is the primary goal of the European Union. The first Earth Summit held in Rio de Janeiro in 1992 finally resulted in developing a Europe-wide sustainable development strategy adopted by the European Council in Goteborg in June 2001.

The major role in implementing sustainable development in practice is played by local and regional authorities. In 1992 the Local Agenda 21 programme delineated a way of developing and implementing sustainable development programmes at a local level. This programme envisaged that national governments should be primarily responsible for implementing the policy enhancing and encouraging business entities to make choices in compliance with the principles of sustainable development. It was emphasised, however, that local actions would constitute a key element in achieving the principles of sustainable development. The Local Agenda 21 that was developed until 1996 additionally underlined the significance of local actions taken to achieve the principles of sustainable development (Lafferty and Eckerberg, 1998). At the World Summit on Sustainable Development held in Johannesburg in 2002 the Local Agenda 21 was introduced by leaders and representatives of local self-government authorities. The need to analyze phenomena at the local level is also due to the large intraregional diversity in Poland (Mikuła, 2016).

Rural areas cover a great part of Poland and of the European Union. Those areas that comprise 90% of the territory of Poland are inhabited by around 40% of its entire population. Of particular importance is to follow the principles of sustainable development with respect to agriculture and rural areas. Agriculture and forestry are essential for the use of land and for the management of natural resources in rural areas. Attention must also be paid to the multi-functionality of agriculture (Wilkin, 2011). It generates a vast range of positive external aspects, some of which are public goods (Hálová et al., 2015).

The objective of the article is to determine and evaluate the level of sustainable development in its three aspects at the local level in Poland in the year 2015. The local aspect of the issues related to sustainable development is crucial to ensure the sustainability at the national level. Local level (LAU-2) in Poland means the communal level (referred to in the literature variously as gminas, communes, communities, municipalities).

2. Materials and Methods

The analysis was conducted for rural and urban-rural communes in Poland. It covered 2,174 communes, including 1,563 rural and 611 urban-rural ones.

The concept of sustainable development of rural areas requires relevant measures and measurement methods to be applied. In both Poland and abroad it has not been possible to develop a comprehensive set of features employed to evaluate the level of sustainable development. The starting point for consideration was to determine a set of indicators that evaluate the level of sustainable development on a local basis. For this purpose, there was applied the so-called long list of indicators based on three spheres: environmental with elements of spatial order, economic, and social with elements of institutional and political order. The selection of the applied indicators was limited by the availability of statistical data at a local level.

The statistical data derived from the 2015 Local Data Bank of the Central Statistical Office. The detailed list of selected measures is set forth in Table 1.

The preliminary statistical analysis of empirical data eliminated quasi-stable variables. For this purpose, the coefficient of variation was calculated for each *i-th* variable. From the set of variables there are removed features consistent with the inequality: $Vi < V^*$, where V^* means a critical value of the coefficient of variation. The critical value is $V^* = 0.10$. For all the selected features the coefficient of variation exceeded 10%.

The procedure for qualifying features for a set of diagnostic variables omits the correlation analysis. This analysis is essential for the process of selecting response variables for the econometric model but it seems to be unnecessary when making the ranking of objects with respect to the level of the phenomena analysed (Kukuła, 2014).

At the next stage one-feature variables were normalised. The basis for standardisation was a standard deviation and standardised values of variables were calculated (z_{ij}) according to the following formula:

- for stimulating factors and positive features:

$$z_{ij} = \frac{x_{ij} - min_i x_{ij}}{max_i x_{ij} - min_i x_{ij}}, \quad \mathbf{(1)}$$

- for destimulating factors:

$$z_{ij} = \frac{max_i\, x_{ij} - x_{ij}}{max_i x_{ij} - min_i x_{ij}}, \quad \textbf{(2)}$$

where z_{ij} is a standardised value x_{ij}, and x_{ij} means a value of *j-th* feature for *i-th* object, $min_i\ x_{ij}$ is a minimal value of *j-th* feature, and $max_i\ x_{ij}$ is a maximum value.

Table 1. List of variables employed to evaluate the level of sustainable development of rural and urban-rural communes in Poland

Symbol	Variable name and dimension	Character of variable
Economic dimension		
x_1	Proportion of registered unemployed in the working-age population (in %)	De-stimulant
x_2	Proportion of commune's investment expenditures in total expenditures (in %)	Stimulant
x_3	Employed persons per 1000 inhabitants	Stimulant
x_4	Entities registered in REGON per 1000 population in working age	Stimulant
x_5	Own commune budget revenues per capita (in PLN)	Stimulant
x_6	Total commune budget revenues per capita (in PLN)	Stimulant
x_7	Total commune budget expenditures per capita (in PLN)	Stimulant
x_8	Natural persons conducting economic activity per 1000 inhabitants	Stimulant
Environmental dimension		
x_9	Proportion of population connected to wastewater treatment plants (in %)	Stimulant
x_{10}	Forest cover (in %)	Stimulant
x_{11}	Proportion of legal protected area (in %)	Stimulant
x_{12}	Proportion of commune's municipal economy and environmental protection expenditures in total expenditures (in %)	Stimulant
x_{13}	Consumption of water in households per 1000 inhabitants (in m^3 per year)	De-stimulant
x_{14}	Proportion of population with a water supply connection (in %)	Stimulant
x_{15}	Proportion of population with a waste water disposal connection (in %)	Stimulant
x_{16}	Waste management commune budget expenditures per capita (in PLN)	Stimulant
Social dimension		
x_{17}	Physical education commune budget expenditures per capita (in PLN)	Stimulant
x_{18}	Foundations, associations and social organizations per 1,000 inhabitants	Stimulant
x_{19}	Social assistance commune budget expenditures per capita (in PLN)	Stimulant
x_{20}	Dwellings per 10,000 inhabitants	Stimulant
x_{21}	Proportion of commune's education expenditures in total expenditures (in %)	Stimulant
x_{22}	Average useful floor area per 1 person (in m2)	Stimulant
x_{23}	Proportion of dwellings with a bathroom (in % of the total of inhabited dwellings)	Stimulant
x_{24}	Health care commune budget expenditures per capita (in PLN)	Stimulant

Source: own study on the basis of Borys (2005).

The synthetic factor was calculated according to the following formula:

$$Q_i = \frac{1}{m}\sum_{j=1}^{m} z_{ij}, \quad \textbf{(3)}$$

where Q_i is a synthetic value for *i-th* object and m is a number of features. The taxonomic measure of development (Q_i) ranges from 0 to 1. An increase in the value of the analysed commune causes an increase in the level of development the analysed unit. The values of the discussed factor for three elements of sustainable development allowed classifying the analysed communes into five groups:
1st group, very high level: $Q_i \geq \bar{Q} + 0.9 s_Q$,
2nd group, high level: $\bar{Q} + 0.9 s_Q > Q_i \geq \bar{Q} + 0.3\ s_Q$,
3rd group, medium level: $\bar{Q} + 0.3\ s_Q > Q_i \geq \bar{Q} - 0.3\ s_Q$,
4th group, low level: $\bar{Q} - 0.3\ s_Q > Q_i \geq \bar{Q} - 0.9\ s_Q$,
5th group, very low level: $Q_i < \bar{Q} - 0.9\ s_Q$.

The synthetic indicators were applied to rank each commune in each aspect and to determine spatial similarities that may be observed in those rankings. The comparison of two order arrangements marked with p and q comprising n number of objects enables using the measure m_{pg} (Kukuła 1986).

$$m_{pq} = 1 - \frac{2\sum_{i=1}^{n}|d_{i(pq)}|}{n^2}, \qquad (4)$$

where $d_{i(pg)}$ is a difference in ranking positions for the *i-th* commune. This measure is valued from 0 to 1, where is 0 for identical order arrangements and 1 for completely dissimilar rankings.

The synthetic indicators allowed determining the level of sustainability of three spheres of sustainable development of urban and urban-rural communes in Poland. For this purpose, there was applied the standard deviation of ranks for three indicators according to the following formula:

$$SD_i \sqrt{\frac{1}{2}\sum_{j=1}^{3}\left(R_{ij} - \overline{R}_{ij}\right)^2}, \qquad (5)$$

where SD_i is a measure of the commune's sustainability level, R_{i1} is a rank of economic indicator in test, R_{i2} is a rank of environmental indicator in test, R_{i3} is a rank of social indicator in test, and R_{ij} is an average rank for the *i-th* the commune. A decrease in the value of this indicator makes the level of sustainability more favourable.

There was also specified which of three spheres most considerably affect the lack of sustainable development. This sphere was determined on the basis of the largest distance from the average of the *i-th* commune.

3. Results and Discussion

In consideration of the synthetic measure for each analysed aspect of sustainable development, it may be said that in each aspect the medium development level group contained the largest number of communes. Almost 27% of the total number of the analysed communes were at the medium level of economic development, 21% were at the medium level of environmental development, and 30% were at the medium level of social development. The lower development level in all aspects is clearly visible in rural communes compared to urban-rural ones. 43% of rural communes were classified into two groups with lower level of economic development, whereas those groups contained 10% fewer urban - rural communes. As for the environmental aspect every second rural commune was characterised by a low or very low level of development, whereas such development was characteristic for every fifth urban-rural commune. For the social aspect there occurred disproportions but differences were clear (Table 2). This may mean that the level of economic, social and environmental development requires massive support in rural areas. It is worth mentioning that in case of economic development the indicator value of over 50% of urban-rural communes was above average, whereas such indicator value was characteristic for 43% of rural communes. As for the environmental aspect the value of the synthetic indicator of 75% of urban-rural communes and of 40% of rural ones was above average. For the social aspect 68% of urban and rural communes and 45% of rural communes had the indicator above average.

Table 2. Structure of communes as per their development level in three aspects in 2015 (%)

Development level	The interest of the analysed communes in individual groups of development level (%)		
	total	rural	urban-rural
	Economic aspect		
very low	15.5	17.3	10.8
low	25.1	26.2	22.3
medium	26.6	26.5	27.0
high	18.5	17.5	21.1
very high	14.3	12.5	18.8
	Environmental aspect		
very low	20.2	25.7	6.1
low	19.6	22.3	12.8
medium	20.8	20.5	21.8
high	19.6	16.3	28.2
very high	19.7	15.2	31.3
	Social aspect		
very low	17.0	20.7	7.4
low	16.2	18.3	10.8
medium	30.3	29.7	31.9
high	22.4	19.2	30.4
very high	14.2	12.1	19.5

Source: Own study

It is noteworthy that the communes characterised by a very high level of economic development were mainly located in south-western Poland (Dolnośląskie and Śląskie Provinces), in the western region (Wielkopolskie Province) and in the central region (Mazowieckie Province).

Whereas, as for the environmental aspect the group with the highest development level was dominated by the communes located in south-western Poland (Podkarpackie Province), and in the north-western and northern regions of Poland (Zachodniopomorskie and Pomorskie Provinces). The communes located in those provinces were not present in large number in the 1st group of economic development. This underscores the difficulties involved in ensuring the high level of economic development without interfering with the environment.

As for the social aspect the largest number of the communes classified in the first group are those located in the Wielkopolskie Province (western Poland) which also has a high level of economic development.

To determine the similarity of the developed rankings there were fixed similarity measures for order arrangements, creating the M matrix.

$$M = [m_{pq}]\begin{bmatrix} 1 & 0.432 & 0.474 \\ & 1 & 0.491 \\ & & 1 \end{bmatrix}, \text{(p,q = 1,...,3).}$$

The data of the M matrix show that the highest similarity is between a pair of the following rankings: environmental development and social development. Whereas, the least similar is a pair of the rankings: economic development and environmental development. It is also noteworthy that none of the ranking pairs are highly similar to each other, which proves the weak sustainability of three spheres of development in the analysed communes.

Only 5% of the analysed communes, mostly rural ones, showed a compatible level of development in all three aspects (i.e. they were in the same group of environmental, social and economic development). It is worth mentioning that to the greatest extent this compatibility referred to the communes included in the group with the medium level of economic development. 11 analysed communes (0.5%), of which 7 were rural ones, were contained in the 1st group in each of the aspect of the sustainable development.

This compatibility between the economic and environmental aspects equalled to 20%, between the economic and social aspects it amounted to 21.5%, whereas the greatest compatibility (27.5%) was between the environmental and social aspects.

The level of sustainable development of three aspects was calculated in particular communes. The value of the synthetic indicator SD ranged from 7.57 in the rural commune of Kłodawa to 2,518 in the rural commune of Rudnik, whereas the average value of the analysed communes was 1,352. The calculated value allowed conducting the classification to keep a group of communes with a similar sustainability level. Two parameters: an arithmetical mean and a standard deviation were employed to establish five groups of sustainability: The 1st group has a very high level of sustainability, whereas the 5th one has a very low one. A decrease in the value of this indicator makes the level of sustainability more favourable.

The higher level of sustainability was achieved by urban-rural communes (1,102) compared to rural ones (1,449). The group with the highest level of sustainability comprised 449 communes, which is 21% of the total analysed communes. This group included 16% of all the rural communes and 33% of urban-rural communes (Table 3). By analysing this phenomenon in the spatial arrangement it may be concluded that the most communes with the highest level of sustainability were in the Lubuskie Province (52%) and the fewest were in the Łódzkie Province (5%), Podlaskie Province (5.7%) and Podkarpackie Province (7%).

Table 3. Level of sustainability of rural and urban-rural communes in Poland in 2015

Sustainability level	Number of communes		
	total	**rural**	**urban-rural**
Very high	449	248	201
High	372	223	149
Medium	451	311	140
Low	436	357	79
Very low	466	424	42

Source: Own study

In the group with the highest level of sustainability 42% of communes were in the group with the highest level of economic development, 16% were classified in the group with the highest level of environmental development and 12% were included in the group with the highest level of social development.

The group with the lowest level of sustainable development comprised 466 communes, *id est* every fourth rural commune and every fourteenth urban-rural commune. The communes contained in this group were not located in the Opolskie Province and above a half of the communes from the Lubelskie Province had a low level of sustainability.

In the group of the communes with the lowest level of sustainability 41% of them belonged to the group with the lowest level of economic development, 15% were contained in the group with the lowest level of environmental development, and 17% were included in the group with the lowest level of social development.

This analysis allowed identifying the aspect that hinders the sustainability to the greatest extent. For 33% of communes it was the social aspect, for 32% of communes it was the environmental aspect and for 35% of communes it was the economic aspect.

4. Conclusion

The concept of the sustainable development envisages the sustainability among the economic, social and environmental development. In Poland the level of sustainability of rural areas is considered as unsatisfactory. In 2015 only every fifth rural or urban-rural commune showed the high level of sustainability of three development aspects.

Rural communes have the lower level of sustainable development compared to urban-rural ones. This may result from the fact that the economic aspect is the one that hinders the sustainability of communes to the greatest extent. The absence of a urban centre in the commune may adversely affect economic results. A significant factor that differentiates the level of the commune's sustainable development is its location in the region. Therefore, it is important to consider the territorial aspect in the cohesion policy.

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COMPETITIVENESS OF SOUTH ASIAN AGRICULTURE: A CRITICAL ASSESSMENT

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Annotation: Agricultural sector has historically been the backbone of South Asian economy, providing employment for more than half of sub-continent's work force. Although its share has progressively declined due to growing industrial and service sectors, it remains pivotal for almost three quarters of population living in rural areas. Agricultural productivity, as the ratio of agricultural output to agricultural input, is an important driver of growth, income, and human welfare in rural areas, and a major determinant of competitiveness. The aim of the paper is to understand the factors affecting agricultural productivity, as their interaction is key to improving competitiveness of South Asian economies. Indicators such as total agricultural production, arable land, rural population growth, fertilizer and pesticide application, and use of agricultural equipment and credit, were assessed using simple linear regression and modified total factor productivity analyses. While regression analysis highlighted arable land and fertilizer application as the best predictors of agricultural production, the modified total factor productivity analysis pointed out to relatively higher competitiveness of agricultural sectors of India and Bangladesh, and lower competitiveness of agricultural sector of Pakistan.

Key words: agricultural competitiveness, total factor productivity, South Asia

JEL classification: Q01, Q15, Q18, J11

1. Introduction

The Global Competitiveness Report (2016-17), which ranks countries according to Global Competitiveness Index, highlights India's advance to 39th position, an improvement of 16 spots from the previous year (World Economic Forum, 2016). The boost, attributable to better infrastructure and strong economic growth (Deep Singh, 2016), however, was not characteristic of all South Asian nations. Neighboring Bangladesh ranked 106th, while Pakistan occupied a distant 122nd position.

The widely used index compiled by the World Economic Forum, accounts for overall economic landscape and looks into the soundness of country's institutions, policies, and factors driving economy's productivity, as represented by some 114 indicators. Although there is a strong connection between the overall and agricultural competitiveness, the latter requires a more specialized approach, as encapsulated by OECD's Policy Framework for Investment in Agriculture program (PFIA) (2014) or World Bank's Enabling the Business of Agriculture project (2017).

While PFIA considers ten policy areas that determine agricultural competitiveness, including investment policy, infrastructure development, and sustainable use of natural resources, there is no single set of strategies for improving agricultural competitiveness (Jambor and Babu, 2016). The multitude of approaches to measuring agricultural productivity and competitiveness as described in USDA's (1999) and CGIAR's (2015) manuals, among other sources, thus encourage the use of alternative methodologies.

The paper employs simple linear regression and modified total factor productivity analyses to estimate total agricultural output growth relative to growth in traditional agricultural inputs, such as arable land, rural population growth, fertilizer and pesticide application, and use of agricultural equipment and credit. The standard weighting applied in total factor productivity analysis is replaced with adjusted R-squared values of each respective component, with alternative equal weighting scenario added for comparison. Although productivity is only a component of competitiveness (Biggeri, 2007), it is nevertheless an important driver of growth, income, and human welfare in rural areas, and its major determinant.

The aim of the paper is to assess productivity and thus competitiveness of agricultural sectors of select South Asian nations, namely Bangladesh, India and Pakistan. It accomplishes that by identifying productivity growth drivers and revealing potential areas for improvement.

2. Materials and Methods

South Asian Association for Regional Cooperation (SAARC, 2017) identifies Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka as South Asian nations. The paper, however, focuses on Bangladesh, India and Pakistan only, as these three giants alone account for roughly 97% of all agricultural production within the region (Afghanistan was not considered due to lack of data).

The analysis uses six primary indicators (Table 1), with two additional ones included in Indian rice production example. Variables were chosen out of approximately 19 plausible indicators available from FAO statistical database, based on data availability and prior literature review. Shortlisted indicators were then put through simple linear regression to identify any significant predictors and their correlations with agricultural production (response variable), resulting in six currently used indicators (not counting agricultural production, which is dependent variable).

Table 1. Assessed variables

Variable	N	Unit of measure	Source
Agricultural production	25	Million current USD (May, 2017)	FAO
Arable land	25	1000 hectares	FAO
Rural population	25	1000 persons	FAO
Agricultural tractors	25	Units	FAO
Fertilizer application	25	1000 tonnes	FAO
Pesticide application	25	Tonnes	FAO
Credit to agriculture	25	Million current USD (May, 2017)	FAO
Area harvested	25	Hectares	FAO
Yield (rice, paddy)	25	Kg/ha	FAO

Source: FAO, 2017

Only statistically significant variables (Pearson correlation, ANOVA, adjusted R-squared and Beta coefficient significance levels at <0.05) were reported. Pearson correlation is used to tracks linear correlation between variables, returning values between +1 (indicating positive correlation) and -1 (negative correlation), with 0 implying no correlation between the two variables (Stigler and Stephen, 1989). ANOVA, on the other hand, assesses whether means of several groups are equal (Rutherford, 2001), while adjusted R-squared is a statistical measure, which explains the variance in dependent variable by measuring how close the data are to the fitted regression line (Frost, 2013). Finally, Beta coefficients are used to compare relative strength of predictors within a model and are considered most valuable output of an analysis.

Simple linear regression results are presented first. In the general regression equation (1), y is the response variable, x is the explanatory variable, β_1 the intercept and β_0 is the slope. The Betas are also called regression coefficients and the slope β_0 can be interpreted as the change in the mean value of y for a unit change in x.

$$y = \beta_0 + \beta_1 x \tag{1}$$

Growth rates are calculated next for each indicator for period 1991-2015. Overview of relative increases in agricultural production and select agricultural inputs across all three countries (Table 6), reveal which categories have grown the fastest over the past 25 years. Indicators with adjusted R-squared greater than 60 percent are marked with an asterisk, thus highlighting indicators with the highest importance in terms of explaining variance in dependent variable.

Productivity index is then calculated for each country by dividing agricultural output growth percentage by agricultural input growth total, weighted by adjusted R-squared (2), where p is productivity index, i_0 is agricultural production growth percentage, i_n is independent variable growth percentage, and r_{sq} is adjusted R-squared for respective independent variable. Alternative equal weighting scenario was added for comparison. Credit to agriculture indicator was not considered due to relatively low adjusted R-squared values and distorting effect it had on India's results.

$$p = \frac{i_0}{i_1 \times \frac{r_{sq1}}{\sum r_{sq}} + i_1 \times \frac{r_{sq1}}{\sum r_{sq}} + \cdots i_n \times \frac{r_{sqn}}{\sum r_{sq}}} \tag{2}$$

Lastly, per capita agricultural production growth, followed by simple linear regression analysis of Indian rice production, is included to validate total factor productivity and simple linear regression outputs. Linear regression analysis was performed in SPSS 22, whereas total productivity analysis was performed in Excel.

3. Results and Discussion

Results are presented starting with simple linear regression output for Bangladesh, highlighting arable land and fertilizer application as most suitable predictors of agricultural production (Table 2). The seemingly unlikely decrease in agricultural production of $7.78 billion with every 1,000-hectare increase in arable land can be explained by long-term decline in arable land area coupled with growing agricultural production. Bangladesh as one of the world's most land-deprived countries is continuously challenged by population growth, land degradation and climate change, which have reduced country's arable land area from about 1,600 m^2 in early 1960s to less than 500 m^2 today. The country has nevertheless managed a 125 percent increase in agricultural production over the past 25 years (FAO, 2017), which helps explain the paradox.

The findings therefore, not surprisingly, point out to rising yields as key growth driver, supported by 2.6 times increase in fertilizer and 14 times increase in pesticide application over the same period. Mechanization, as a compatible productivity driver, could help sustain the growth in the future. More importantly, it could accommodate for the ageing farming population and migration effects. On the other hand, projected population of around 200 million by 2050 and discouraging climate change forecasts, warn of potential obstacles to future growth. Alternatives approaches, including land aggregation and focus on economies of scale, cooperative farming, and turning to overseas farming as Brazil, Japan and China have done (Bloomberg, 2017), should be considered.

Table 2. Simple linear regression output for Bangladesh

Independent variable	N	Pearson corr.	Adjusted R-squared	ANOVA F	B	95% confidence interval for B	
Arable land	25	-0.83	0.67	50.03	-7.78	-10.05	-5.50
Rural population	25	0.70	0.47	21.95	0.48	0.27	0.69
Fertilizer application	25	0.86	0.73	67.37	3.90	2.92	4.89
Pesticide application	25	0.62	0.36	14.71	0.26	0.12	0.40
Credit to agriculture	25	0.79	0.55	29.94	0.00	0.00	0.00

Source: own work

Both arable land and fertilizer application indicators demonstrate high corrections with agricultural production, and along with relatively narrow confidence intervals for Beta, indicate greater degree of certainty. The fact that rural population has not ranked higher reveals an already ongoing labor substitution with mechanized equipment. This may not be obvious from a 59 percent decline in number of tractors during the past three decade but it is supported by the rise of pedestrian controlled tractors (single axle tractors), mainly due to lower price point, cheaper maintenance, and ease of use.

Regression findings for India resemble those of Bangladesh, again, with arable land and fertilizer application coming on top with the highest adjusted R-squared values (Table 3). Arable land indicator, however, predicts somewhat larger drop in agricultural production, reflecting on average 14 times bigger agricultural production of India coupled with higher growth (198% vs. 125%), even though India has undergone a considerably milder land area decline of 4 percent as opposed to Bangladesh’s 20 percent. In India, just as in Bangladesh, it is therefore continuous yield improvements that have allowed the country to cope with growing food demand.

Fertilizer application indicator shows almost identical Beta values for both countries, while pesticide application seems to be negatively correlated and comes with a negative Beta prediction. The explanation is similar as in case of arable land. Whereas pesticide use in Bangladesh has increase 13 times between 1991 and 2015, India has seen a decline of 85 percent, as reflected in regression output. Nevertheless, both countries are overrun with untrained sales personnel distributing pesticides, often resulting in their overuse and host of chronic diseases amongst farmers (Singh, 2008).

Rural population Beta, on the other hand, although aligned with Bangladesh findings, is twice as high, indicating sector’s higher dependency on manual labor. This is yet another surprising result, considering that Bangladesh has experienced a sharp decline in tractor use, while India progressed from about 1.1 million tractors in 1991 to 4 million today. Measured as per capita tractor ownership (rural population only), India appears to have 580 times more pieces of agricultural equipment than Bangladesh (one tractor per 216 farmers in India vs. one tractor per 125,210 farmers in Bangladesh).

Credit to agriculture has played an important role in both countries (IGC, 2010), although the growth has been considerably larger in India (22,783%) than in Bangladesh (328%) (FAO, 2017). Each additional dollar of credit approved to agriculture, forestry and fishery sectors in 2015, however, had equivalent of \$3.18 in agricultural production in Bangladesh compared to \$1.77 in India. The implications of extensive machinery and credit availability in India, as opposed to other South Asian nations, were consequentially reflected in most recent Global Competitiveness Index ranking, placing the country on a firm 39th position.

Table 3. Simple linear regression output for India

Independent variable	N	Pearson corr.	Adjusted R-squared	ANOVA F	B	95% confidence interval for B	
Arable land	25	-0.96	0.91	238.86	-28.14	-31.90	-24.37
Rural population	25	0.89	0.79	90.11	0.95	0.74	1.15
Agricultural tractors	25	0.93	0.85	138.33	0.07	0.05	0.08
Fertilizer application	25	0.94	0.87	164.84	3.86	3.24	4.48
Pesticide application	25	-0.82	0.65	45.85	-3.09	-4.03	-2.15
Credit to agriculture	25	0.77	0.57	33.17	1.07	0.68	1.45

Source: own work

Results for Pakistan point out to agricultural tractors and pesticide application as most notable growth drivers (Table 4). Although arable land area remained virtually unchanged during 1991-2015 period, the number of tractors had increased by 88 percent. The tractors also seem to be utilized with greater efficiency than in neighboring India, as suggested by an expected rise in agricultural production of $70,000 with each additional tractor. Using per capita tractor ownership, however, puts Pakistan slightly behind India, with 226 farmers per tractor. Pesticides seem to be used more efficiently as well, with each additional tonne expected to increase agricultural production by $1.11 million. As such, Pakistan is well positioned to follow India's lead in terms of agriculture.

Rural population prediction appears comparable to that of Bangladesh, as both countries have similar count of rural population. Credit to agriculture, on the other hand, increased by modest 92 percent, and was reflected through inflated predicted increase in production of $12.35 million with each additional million allocated to agricultural sector.

Table 4. Simple linear regression output for Pakistan

Independent variable	N	Pearson corr.	Adjusted R- squared	ANOVA F	B	95% confidence interval for B	
Arable land	25	-0.41	0.13	4.63	-4.44	-8.71	-0.17
Rural population	25	0.89	0.77	83.38	0.49	0.38	0.60
Agricultural tractors	25	0.92	0.84	127.18	0.07	0.06	0.08
Fertilizer application	25	0.88	0.76	77.77	4.99	3.82	6.16
Pesticide application	25	0.91	0.83	117.79	1.11	0.90	1.32
Credit to agriculture	25	0.76	0.56	31.15	12.35	7.77	16.93

Source: own work

Regression analysis highlighted arable land and fertilizer application as best predictors in case of India and Bangladesh, and agricultural tractors and pesticide application, in case of Pakistan. All three countries have nevertheless benefited from yield improvements as a hidden growth driver. Regression output for Indian rice production supports the notion of yield as the single most important predictor, explaining as much as 96 percent of variance in agricultural production (Table 6). Agricultural tractors, fertilizer application and rural population have all scored high as well. The reason Beta for area harvested indicator is not negative in this case is due to slight growth in land dedicated to rice cultivation, as opposed to overall arable land within the country.

Table 6. Simple linear regression output for Indian rice

Independent variable	N	Pearson corr.	Adjusted R-sq.	ANOVA F	B	95% confidence interval for B	
Area harvested	25	0.51	0.23	7.98	7.21	1.93	12.49
Rural population	25	0.87	0.75	72.49	220.66	167.05	274.28
Agricultural tractors	25	0.88	0.77	82.66	15.14	11.69	18.58
Fertilizer application	25	0.88	0.77	82.07	869.08	670.63	1,067.52
Pesticide application	25	-0.84	0.69	54.99	-758.17	-969.67	-546.68
Credit to agriculture	25	0.76	0.55	30.78	250.56	157.14	343.98
Yield	25	0.98	0.96	552.06	46,444	42,355	50,533

Source: own work

Under modified total factor productivity analyses, India emerges as a clear winner, with a score of 76, calculated using Adjusted R squared weights, and a score of 67, using equal weighs (Table 5). Bangladesh occupies a second position with 40 and 16, and Pakistan again a third place with score of 33 and 27, respectively. Not surprisingly, the results correlate with Global Competitiveness Report results, both in absolute and relative terms. Only by applying equal weights in calculating the productivity index, does Pakistan attain the second place.

Alternative way to validate the findings is using per capita agricultural production growth. In this exercise too, India takes the first spot with 128 percent, followed by Bangladesh with 87 percent, and Pakistan with 63 percent per capita growth in agricultural production during 1991-2015 period.

Table 5. Relative increase in agricultural production compared to independent variables (%) (1991-2015)

Variable	Bangladesh	India	Pakistan
Agricultural production	125	198	138
Arable land	-20	-4*	1
Rural population	20	31*	46*
Agricultural tractors	-59	276*	88*
Fertilizer application	158*	983*	61*
Pesticide application	1,713	-85	1,549*
Productivity indexa	40	76	33
Productivity indexb	16	67	27

** Independent variables explaining at least 70 percent of variation within dependent variable.*
a Productivity index calculated using Adjusted R squared weights.
b Productivity index calculated using equal weights.

Source: own work

Low soil quality, inadequate irrigation management, small and shrinking land holdings, inadequate farming knowledge, low access to credit, and outdated technology, are at the hearth of these countries' poor performances. When met with poor access to local and regional markets and inefficient government policies, it becomes clear why progress although notable, is still comparatively slow. Successful land reform followed by land consolidation, for instance, could help achieve economies of scale and expedite mechanization efforts and technology adoption (Rabobank, 2016). The progress, however, has been incremental due to political and social specificities, inadequate laws, and restrictive regulations.

Improving competitiveness of South Asian region will in case require further increase in yields by transforming subsistence into agribusiness farming and having it better integrated in local food value chain and consequently global agriculture (Hitchcock, 2008). Such changes carry particular risks for smallholder farmers, as they struggle to meet agro-industry standards and are forced to works as contractors. Subsidies may be a transitional solution, however, the experience of India shows that such approach can be costly (FAO, 2006).

Although not entirely surprising, the findings highlight the importance of land in developing world, and more importantly, how it is used. Choosing mechanization over manual labor, strategic pesticide and fertilizer application, and free market over government policies, could lead to more efficient production and in case of these three countries, improved food security for rural poor.

4. Conclusion

Agricultural sector remains essential source of income for majority of South Asian population. Sector's productivity and competitiveness has a profound impact on the rural population, with India being the most competitive country within the region, as revealed by modified total factor productivity analysis and supported by per capita agricultural production growth findings. The results indicate that higher productivity is possible with comparatively scarce resource base and focused government intervention. Bangladesh and Pakistan are on the other end of the spectrum, yet still able to leverage on experience of India's farmers and government efforts.

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WINNERS AND LOSERS IN THE SLOVAK TRANSFORMATION OF AGRICULTURE

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Annotation: Transformation of the Slovak agriculture has resulted in new types and dimensions of inequalities between various social categories and groups. The paper deals with dynamic characterizations of winners and losers in agricultural sector following the situation of employees and workers in conjunction with the process of agricultural transformation. The objective is to assess changes in the position and status of agricultural population during the period between 1990 and 2015. The authors use socio-demographic and socio-economic interpretation of the situation of winners and losers. Using document study and content analysis, based on the quantitative data about selected characteristics of the Slovak agriculture (structural indicators - structure of enterprises, labor force, permanent agricultural employees and temporary workers, age, wages and salaries), Green reports, and available sociological/ethnological and economic papers aimed at transformation of agriculture in Slovakia, the situation of agricultural employees and workers is investigated and interpreted in the context of the post-socialist societal and political development. The results show that several milestones within the post-socialist period of development of the Slovak agriculture have resulted in concrete long-term and/or short-term tendencies and trends. The authors characterize them and point out their societal, political and legal reasons, as well as their consequences.

Key words: transformation of agriculture, winners and losers, post-socialist transformation, agrarian structure, the Slovak agriculture

JEL classification: A14, O12, Q10, Z13

1. Introduction

Winner and loser approaches share a number of problems in the central European context. They are overly concerned with economic development at the expense of political development. The phrase of winners and losers is widely used despite little discussion of what is meant by a “win” or “los”. (Gould, 1999) New forms of competition lead to the polarization of population into group of winners and losers. Most commonly, winners and losers are identified based on socio-demographic and socio-economic characteristics. (Teney, Lacewell and Wilde, 2013) Static and dynamic characterization is distinguished in defining the concept. Static characterization reflects current social, economic or political dimensions and dynamic characterization emphasizes identification of winners and losers following an event or in conjunction with long-term processes. Economic interpretation identifies winners and losers in terms of prices and factor returns, in the political-economy perspective winners and losers are considered a rational outcome of ongoing social and political processes. They are not considered to be absolute, definitive, or predetermined; rather, they are the consequences of nature-society interactions. (O'Brien and Leichenko, 2003) This paper deals with dynamic characterizations of winners and losers in agricultural sector following the situation of employees and workers in conjunction with the process of agricultural transformation. The objective is to assess changes in the position and status of agricultural population during the post-socialist period. The authors use socio-demographic and socio-economic interpretation of the situation of winners and losers.

2. Materials and Methods

The paper represent an overview of changes in the Slovak agricultural sector during the period between 1990 and 2015. Interpreted secondary data are collected from different sources. Using document study and content analysis, based on the quantitative data about selected characteristics of the Slovak agriculture (structural indicators - structure of enterprises, labor force, permanent agricultural employees and temporary workers, age, wages and salaries), Green reports, and available sociological/ethnological and economic papers aimed at transformation of agriculture in Slovakia, the situation of agricultural employees and workers is investigated and interpreted in the context of the post-socialist societal and political development.

3. Results and Discussion

3.1 Changes in the Agrarian Structure in a Legal Context

Significant changes in the agriculture occurred in Slovakia during the post-war period. In 1948 new political strategy was adopted and Slovakia began to be strongly industrialized. The Land Reform Act was approved in 1948 (No. 46/1948 Coll.) and the process of collectivization started in 1949 when the Act on Agricultural Cooperatives was approved (No. 69/1949 Coll.). The process was completed in the 70s of the 20th century by creating the socialist agro-complex model based on large-scale forms of production and was followed by the specialization in production in the 80s. (Námerová, 1991) Prior to 1989, it was agricultural cooperatives and state estates that predominantly existed in the agricultural area and farmers were given only small area of the land. This is also proven by the legal regulation of individual forms of agriculture companies that was defined by the Economic Code (No. 109/1964 Coll.), the State Enterprise Act (No. 88/1988 Coll.) and the Act on Agricultural Cooperatives (No. 122/1975 Coll.). In the then Czechoslovakia, more than 200 state-owned estates existed with the acreage around 6,000 ha and more than 1,600 agricultural cooperatives with an average of 2,500 ha acreage. The Economic Code governed the economic activity of state organizations, the economic activity of cooperative organizations and individual commercial companies (public limited company, limited liability company, limited partnership, silent partnership, consortium and joint venture). Cooperative organizations were considered as cooperatives, joint ventures, cooperative associations, and the Central Board of Cooperatives. The Agricultural Cooperative Act defined socialist cooperative as an integral part of the socialist economic system, where the principles of voluntarism, state governance, cooperative democracy, planning method, cooperative property protection, and convergence of forms of socialist ownership in agriculture, were applied. Cooperatives and other agricultural cooperative organizations were governed by the state, and the state provided uniform adjustment of the basic issues of cooperatives and other organizations. Under the State Enterprise Act, state-owned enterprises were considered to be a basic element of the national economy and at the same time they had a decisive influence in developing the economic potential of society and achieving the main goal of social production in socialism, which was to satisfy the material and spiritual needs of all people.

After 1989, there were important as well as significant changes also in the field of agriculture. The main objective of the transformation process in agriculture was the de-collectivization of agriculture and the restoration of private ownership. Agricultural land and other assets became the subject of a transformation of ownership relationships and a source for the emergence of new legal forms of business. After 1989, the agricultural cooperatives were regulated by special legislation such as the Act on Agricultural Cooperatives (No. 162/1990 Coll.), Act on Adjustment of Property Relations and Settlement of Property Claims in Cooperatives (No. 42/1992 Coll.), as well the Act on the Adjustment of Ownership Relations to Land and Other Agricultural Property (No. 229/1991 Coll.), so-called “the first restitution act”. The General Law, which has defined the legal form of a cooperative since 1991, is the Commercial Code. A cooperative (within the meaning of a legal regulation) is a business entity, a community of unincorporated number of persons established for the purpose of doing the business or securing the economic, social or other needs of its members. Cooperative is distinguished from the partnerships by a special arrangement of internal relations between the cooperative and the members as well as between the members themselves. The Commercial Code imposed on cooperatives that were established prior to its entry into force to be converted into companies or cooperatives by a procedure that was modified by so-called transformation act (No. 42/1992 Coll.). Property repositions, transformation and privatization in agriculture were further governed by special legislation such as the Law on the Return of Land Ownership (No. 503/2003 Coll.), the so-called the second restitution act and two amendments to the Transformation Act (No. 264/1995 Coll., No. 3/2005 Coll.) Moreover, the status of a self-employed farmer (SEF) was added and defined by the Act on Private Enterprise of Citizens (No. 105/1990 Coll.). According to the Act, SEF is a natural person carrying out an agricultural activity (agricultural production, treatment or processing of his/her agricultural production, the provision of occasional works and performances related to agricultural production). A self-employed farmer performs agricultural activity on his own behalf, on his own responsibility and on his own account.

The scenario of the post-socialist changes in 1990s was based on the assumption that former landowners would spontaneously return to the family farming on land, which was confirmed only partially. In the initial stage of transformation, social scientists recognized predominant reticence, mistrust and vigilance against privatization, but also groups of people who had been expecting it with hope. A favorable subsidy policy and tax reliefs encouraged an interest in privatization and an increase in the amount of SEFs in particular between 1992 and 1994. However, so called “nostalgic farmers” prevailed. They were older people with a positive relationship to work “on their own property”, coming from the former farming families, who step by step came to the fact that they no longer have enough knowledge and skills to do business on land. After 1989, at the same time two groups of cooperatives were formed in Slovakia – cooperatives, that did not undergo the transformation process (they were established after 1992) and they had better starting conditions for business; and cooperatives that had undergone a transformation process (before 1992), in which persons who are not their members are also given property rights.

During millennium crossing, the structure of agricultural companies was also profiled in two categories:

a) Formally institutionalized structures consisting of legal entities (LEs) and natural persons (NPs), where approximately 98,000 people worked (from which around 88% was in the employment relationship and others were SEFs)
b) Informal types of economic units consisting of approximately 680,000 households reporting agricultural activities (from which around 90% did not meet the conditions of farms).

Corporate farms used the largest part of farming area and both registered and non-registered individual farms jointly with households operated close to one sixth of the total acreage of the country. As a consequence of this, the dual structure of agricultural holdings, which was typical for the feudal land distribution, but also for the period of socialist collectivization, has been preserved. This was due to the still persisting decisive role of successor companies of former socialist collective farms in the overall land use. In 2004, there was still an open unresolved question in Slovakian agriculture dealing with the issue of ownership in a cooperative society sector. Companies operating in this sector were facing particularly the problem of money insufficiency. Their situation was strongly influenced by changes in the system of financial subsidies after the EU accession. Until the May in 2004, the national supplement payment to direct payments was provided to companies and after the accession into the EU, the companies received the rest of payments. (Barát and Moravčíková, 1996; Danglová and Námerová, 1999; Blaas, 2003; Buchta, 2003; Farm structure survey, 2001; Gurčík, Miklovičová and Miklovičová, 2009; Škriniarová, Bandlerová and Ilková, 2012; Green report 2003-2016)

Nowadays, small farmers manage around 10% of agricultural land, although they account for up to 90% of the total number of farms. Small businesses are mainly registered and unregistered natural persons, but also legal entities with small acreage of farms. Non-registered persons are represented mainly by households with a self-supply character, and registered persons are in a decisive measure SEFs in different size categories. In 2010, there were 6,008 small farmers and they managed 16.7% of the total utilized agricultural land in Slovakia. In total, there were 16,179 self-supply households managing 2.6% of the total utilized agricultural land in Slovakia. In the period 2001-2010, the number of farms of natural persons decreased in production areas, while their number increased in less productive areas, what confirms that spatial dispersion of agricultural subjects is still strong, including the growing importance of small family farms in especially less productive areas of Slovakia. Currently, cooperatives as well farm on the largest area of agricultural land among all types of business entities in Slovakia and still maintain a significant position in agriculture. After 1995, however, the share of trading companies began to increase significantly, and since 2010 they have taken the lead in farmland management. (Farm structure survey, 2010; Chrastinová, Stanková and Belešová, 2013; Buchta, 2012; Green report 2003-2016)

3.2 Development of Labor Legislation and Employment in Agriculture

Prior to 1989, agrarian sector in Slovakia was characterized by high agrarian employment of especially marginal social groups (unqualified workers, rural women, retirees, etc.). Key legislation in labor legislation between 1990 and 2015 was the two codes: the Labor Code (No. 65/1965 Coll.) and the Labor Code (No. 311/2001 Coll.). The Labor Code regulated employment relationship on the basis of a fixed-term contract, indefinite contract and on the basis of work agreements beyond employment contracts. The employment was concluded for an indefinite, unless the employment contract did not contain a provision on precise and certain length of employment. The fixed-term employment could be concluded for a maximum of three years. Its renewal was possible only upon exhaustive reasons, such us during seasonal works which requires increased number of employees for a transitional period up to eight months. The Labor Code, effective from 1 April 2002, supplements the new provisions on the establishment and duration of the employment. The employment concluded by an employment contract for an indefinite period is preserved, as the fixed-term employment, with provision of minor changes, addition of employment with shorter working time and a split job post, home work and telework are added. Similarly, the provisions of the Labor Code concerning the contracts performed beyond the employment have been changed, supplemented by provisions on the student's brigade work. An employment concluded by a contract of indefinite duration means there is no fixed term. The employment concluded by a fixed-term contract can be concluded for a maximum of two years, and its renewal is possible only on the basis of the exhaustively specified reasons stated in the Labor Code. One of the reasons for the renewal of the fixed-term employment is also the implementation of seasonal work carried out annually, depending on the rotation of the seasons, and their duration does not exceed eight months in the calendar year. An important milestone that influenced work performance based on work agreements beyond employment contracts was the introduction of levy obligation from this form of employment. Until December 31, 2012, the employer paid only levies for the accident and guarantee insurance for employees working under work agreement outside the employment, and the employee working on one of the forms of the agreement was obliged to tax his/her income from the specific activity. The changes were brought by the amendment to the Act on Social Insurance (No. 413/2012 Coll.). This amendment changed the status of employees working on agreements to the status of employee, and natural persons introduced the obligation to pay sickness, retirement, unemployment and health insurance for employees working under work agreements.

As mentioned above, agrarian sector in Slovakia was characterized by high agrarian employment of especially marginal social groups, i.e. unqualified workers, rural women, retirees, etc. and by the fact that agriculture represented so-called “total institution” that had often carried out so-called “social charity” in rural areas and regions. The status of the employee as well as the status of seasonal worker on the farm ensured a very good standard of living and financial security. The first decade of transformation was characterized by a significant decline in labor force and a significant segmentation of agricultural companies, which was also reflected by the high rate of agrarian unemployment. It was dominated by occupational status with a high prevalence of employment in agricultural cooperatives (79% from the category of organizations with 20 + employees). (Buchta, 2003; Moravčíková, 2010)

In the period 1990-2005, the share of agricultural workers in the total amount of workers fell from 13% to 3.7%. Due to the implementation of the Sectoral Operational Programme Agriculture and Rural Development, the most successful programming document during the shortened programming period of 2004–2006, it is possible to say that the subsidies significantly contributed to the mitigation of the decline in employment and helped to preserve the employment in agriculture. The trend of agricultural employment decline continued until 2014 (2.7%). The situation partly stabilized in 2012, when it grew year-on-year by about 2,700 people. The overwhelming majority of agricultural workers in the next period (2005-2014) was also created by employees and their share dropped from 92.8% to 86.8%. Development of the share of entrepreneurs increased from 7.4% to 12.1%.

By 2011, the number of workers with the status of employee fell to less than one seventh. This decline was related not only to the reduction of agricultural production but also to the extinction of non-agricultural activities (so-called associated productions) that previously employed as much as one fifth of the labor force in agriculture. Employment was again relied mainly on agricultural cooperatives and trading companies with more than 20 employees. Employment in agriculture has been continually decreasing. On the other hand, the intensity of this decline was higher for cooperatives than for trading companies, what to some extent suggests that the period of the higher decline was shifted by the period of relative stability (e.g. for trading companies after 2012). However, it is important to emphasize that the workload expressed in terms of the number of workers in agriculture is very relative, because in the periods of seasonal increase of work there is a considerable number of brigadiers, including the statistically unrecognized black work, or work for natural counter-service. Therefore, the share of workers working under the agreement and the proportion of unpaid work is an important indicator. In the period 2006-2015, the proportion of unpaid labor in agriculture ranged between 20-30% of the total labor force. In Slovakia, this share has been declining in terms of the multi-annual trend mainly due to the fact that the corporate structure is dominated by corporate farms. For paid labor, after a steady year-on-year decline, there was a slight increase in 2015 and also the long-term decline in agricultural labor force. For the near future, development in the number of workers in the agrarian sector indicates the decrease of the share of employment relationships and the increase of flexible contracts in line with the immediate need of work and seasonal fluctuations from the point of view of employment status.

After 1989, there was shortage of young generation and it was possible to notice an increase in the share of older age categories of employees in agriculture. At the end of 1989, the average age of workers in agriculture in the Slovak Republic was 41.1 years, in 2005 it increased to 44.0 years, in 2011 to 45.9 years and in 2014 it reached 46.6 years. The highest proportion of workers was represented by the age group of 50-59 years and the aging of the male population continued throughout the entire period. However, the average age in agriculture is heavily influenced by the most numerous group of employees on farms of legal entities, where it is still around 43 years.

The average age of workers on the farms of SEFs is usually higher by 5.5 years, so it is necessary to perceive these average values also in the context of these significant differences. In agriculture, there is also a still high number persons of low human capital, who also have low wage and are caught in the so-called low-wage trap. Average wages in agriculture are only slightly over 70% of the wage level in the national economy and their overall increase is mainly driven by a more dynamic increase in the wages of managerial and administrative workers. In 1989, the wage in agriculture exceeded the average wage in the national economy by 6.8% and in 1990 it was by 9.4%. However, in 2005, the wage parity achieved only 72.4% compared to the average of the national economy and in 2014, after a year-on-year increase, it was 76.4%. In 2015, the average wage in agriculture again decreased year-on-year by 2.3% to 670 € and the wage gap between the economy of the Slovak Republic and its sub-sectors – agriculture and food industry persists. In comparison with the average wage of the Slovak economy, the wage in agriculture was lower by 24.12% (in the food industry by 10.99%). Education and qualification are more and more influencing wage level. Therefore, low wages in agriculture reflect not only the level of labor productivity, retired people, but also the content of work, which is demonstrated by the corresponding quality of the workforce. (Buchta and Buchta, 2009; Buchta, 2012; Blaas, 2013; Jamborová and Masár, 2015; Buchta, 2016; Green report 2003-2016)

4. Conclusion

Changes in the agrarian structure in the post-socialist period were affected mainly by the processes of privatization and restitution accompanied by the transformation of cooperatives and commercial business entities – cooperatives. Owners or shareholders were on the one hand their employees who did not own the land and, on the other hand, some of the assets of the new agrarian entities (in the form of land, but also of buildings, equipment or techniques) were owned by non-members. Nowadays, it is possible to talk about the existence of so-called dualistic system of the organization of the Slovak agriculture, which is on the one hand created by the persistence of the farming in the large farms and on the other by the fluctuating number of individual farms, which have predominantly self-supply character and are represented by a group of self-employed farmers. Within the reference period, it is possible to recognize several milestones, which meant a change of long-lasting persistent trends and thus also a change of the status of agricultural workers or agricultural subjects, respectively their parts in the category of winners and losers. The first milestone was the year 1992, when a part of the cooperatives found themselves in a privileged position in the context of the legislation framed by the first Restitution and Transformation Act. It led also to the radical (negative) turnover in further development of the ratio between average wage in agriculture and average wage in national economy. The year 1995 can be considered as another milestone, after which the number of individual farmers rapidly decreased as well as their societal status. The trend of declining employment in agriculture has been partly stabilized following the implementation of the tools of shortened programming period 2004-2006 and in 2012. In 2014, this trend stopped and there was a slight increase in 2015. In the year 2010, it was possible to notice a change in favour of trading companies that have taken the lead in farming on agricultural land. That was mainly due to farmland management on the larger area of agricultural land, and partially due to slower decline in the number of employees than in the case of cooperatives. However, given the development of the average wage level in agriculture compared to the average wage in the national economy and the age structure of agricultural workers, it is reasonable to state that they still remain in the position of losers. The losers' position of agricultural workers is also strongly underlined by the fact, that the societal perception of farmers' role and status is underestimated in Slovakia.

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EVALUATION OF THE CONSUMER'S AWARENESS OF FOOD QUALITY LABELLING

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Annotation: The constant growing demand for quality and safe food products require the implementation of certain measures which would simplify the customers' orientation at the food market. Food quality labelling represents one of the options responding to such a trend. The issue has been attracting the growing attention from both the public and professionals. This paper aims to assess the consumer's awareness of food quality labelling on the basis of primary research data analysis. The research was executed in the form of a questionnaire survey launched by a co-operating team comprised of the Department of Trade and Finance, the Czech University of Life Sciences Prague, and the State Agricultural Intervention Fund of the Czech Republic. The research analysed data from 573 respondents, between the ages of 15 to 55. Approximately 60% of the respondents claimed an awareness of some of the quality food product marks. Almost 49% of the total respondents demonstrated a general awareness. About 30% of the respondents noted that they had heard about quality food product marks; however, they were not aware of any specific one. Absolute ignorance of the issue was declared by approximately 10% of the respondents with males' response dominating this category. A high correlation between the specific mark awareness and the respondents' education level was demonstrated for the 'Klasa' mark, in particular. An interrelationship between the specific mark awareness and the respondents' gender and education level was established for the 'Organic Farming Product' mark (Produkt ekologického zemědělství) while no dependence was affirmed for the 'Regional Food Product' mark (Regionální potravina).

Key words: awareness, brand, consumer, quality, label, market

JEL classification: F18, Q13, Q18

1. Introduction

Food products and their quality have been debated frequently. Such discussions have been affected by both current food market product trends and negative experiences regarding quality of certain food products and related risks (Velčovská and Sadílek, 2014). Likewise, as confirmed by Verbeke et. al (2007) *"In recent years, it seems that consumers are generally uncertain about the safety and quality of their food."* Consumers' decision making within the process of food product purchasing is a complex issue (Janssen and Hamm, 2011). During the last 10 years, shopping, consuming, and dietary practices have changed significantly (Regnerová and Šálková, 2014). The rising concerns and knowledge in the sphere of food and health relations, awareness of qualitative attributes, access to information on the latest manufacturing and processing technologies result in a constantly growing demand for better quality food products (Fotopoulos and Krystallis, 2003). Likewise, as confirmed by Brožová and Beranová (2017), the public's demand for higher quality, that includes growing interest in safe food, animals' good living conditions, and natural resources preservation has been increasing significantly in recent years.

Food quality labelling represents one of the options responding to such developments. As stipulated by Grunert (2005), food quality labelling embraces, for example, grade mark and country of origin labels among others. Clear labels inform consumers of the product quality level they can expect. Food quality labelling accounts for an important piece of information which is actively searched for by consumers within the purchase decision making process. According to Verbeke and Roosen (2009), this topic has been attracting the public's growing attention on the grounds of providing information to consumers on actual products and, furthermore, reducing uncertainty in the sphere of food quality. The trend refer to the increasing use of extrinsic cues in quality perception (Grunert, 2006).

Consumers in developed economies have been focusing extensively on food product quality and, in particular, on the quality of food product management and production. *"Food consumers face uncertainty and demand high quality and safe food products, apparently with as much information as possible."*(Verbeke, 2005). According to Zagata (2012), product properties and organic food process characteristics have still been determinative factors for Czech consumers.

This paper aims to assess the consumer's awareness of food quality labelling in the Czech Republic. In the Introduction, a brief theoretical background of the examined issue is provided. The Materials and Methods section of this paper delineates an execution of primary research as well as a description of the respondents' samples. The Results and Discussion section presents the outcomes obtained including a discussion and comparison of the final results with similar studies.

2. Materials and Methods

The theoretical background of this paper was based on an analysis of secondary sources gained from scholarly papers, specialised literature, and official web portals. Primary data was obtained through a survey.

The data was obtained by quantitative research using a questionnaire survey among respondents of the general population (n = 573) of the age from 15 to 55. An age structure of the respondents was selected with regard to previous research in the Czech Republic.

Data was collected in the autumn of 2015. Primary data was gathered through a questionnaire survey launched by a co-operating team comprised of the Department of Trade and Finance, the Czech University of Life Sciences Prague, and the State Agricultural Intervention Fund of the Czech Republic.

Basic sociodemographic factors of the respondent reference group are summarised in the following table:

Table 1. Sociodemographic factors of the respondents in %

Gender	Females	49.9
	Males	50.1
Age	15 – 25 Years	31.2
	26 – 35 Years	24.8
	36 – 45 Years	23.9
	46 – 55 Years	20.1
Highest education level obtained	Elementary	2.8
	Secondary with no graduation exam	17.6
	Secondary with graduation exam	49.7
	University	29.8
Permanent residence	Prague	11.5
	Central Bohemian region	12.0
	Ústí nad Labem region	7.3
	South Bohemian region	6.5
	Hradec Králové region	4.9
	Pardubice region	4.5

	Vysočina region	6.1
	Plzeň region	5.9
	Moravian-Silesian region	10.6
	Karlovy Vary region	3.7
	Liberec region	4.4
	South Moravian region	11.3
	Zlín region	5.4
	Olomouc region	5.8
Population of place of residence	up to 500 inhabitants	10.6
	501 – 1,000 inhabitants	8.4
	1,001 – 10,000 inhabitants	17.6
	10,001 – 50,000 inhabitants	19.5
	50,001 – 100,000 inhabitants	17.3
	Over 100,000 inhabitants	26.5

Source: Authors' research, 2015

To evaluate the various results of the survey, methods of descriptive statistics (absolute and relative frequency, testing of independency between set qualitative characteristics, and power dependency measures), Pearson's chi-square test and Cramer's V were applied. If the p-value calculated by the means of the $\chi 2$ test was lower than the selected level of significance $\alpha = 0.05$, null hypothesis about independency was rejected.

The table provides an overview of the set hypotheses for the purposes of data analysis:

Table 2. Set hypotheses summary

Hypothesis No.	**Hypothesis**
$H0_1$	General awareness of food quality labelling is not dependent on the respondents' gender.
$H0_2$	General awareness of food quality labelling is not dependent on the respondents' age.
$H0_3$	General awareness of food quality labelling is not dependent on the respondents' education.
$H0_4$	Specific awareness of 'Klasa' mark is not dependent on the respondents' gender.
$H0_5$	Specific awareness of 'Klasa' mark is not dependent on the respondents' age.
$H0_6$	Specific awareness of 'Klasa' mark is not dependent on the respondents' education.
$H0_7$	Specific awareness of the 'Organic Farming Product' mark is not dependent on the respondents' gender.
$H0_8$	Specific awareness of the 'Organic Farming Product' mark is not dependent on the respondents' age.
$H0_9$	Specific awareness of the 'Organic Farming Product' mark is not dependent on the respondents' education.
$H0_{10}$	Specific awareness of the 'Regional Food Product' mark is not dependent on the respondents' gender.
$H0_{11}$	Specific awareness of the 'Regional Food Product' mark is not dependent on the respondents' age.
$H0_{12}$	Specific awareness of the 'Regional Food Product' mark is not dependent on the respondents' education.

Source: Authors' research, 2015

3. Results and Discussion

The gender, age, and level of the highest education obtained of the respondents are the attributes of the utmost significance in the research of food quality labelling. This section provides an overview of tests of these variables in relation to selected questions.

Almost 60% of the respondents claimed some awareness of a certain quality food product marks. Very good awareness was stated by 11.2% of the respondents who were predominantly females. General awareness of some quality food product marks was indicated by 49.2% of the total questioned people (n = 573). Just under 30% (29.3%, 168 respondents) noted that they had heard about quality food product marks; however, they were not aware of any specific one. Absolute ignorance of an issue was declared by approximately 10% of the respondents (10.3%, 59 people), and the male gender was the majority of this response category.

Table 3. General awareness of quality food product marks by gender

Gender	Yes, I am very well aware	Yes, I am generally aware	I have heard about; however I am not aware	No, I am neither aware, nor I have heard about	Total
Female	39	148	80	19	286
Male	25	134	88	40	287
Total	64	282	168	59	573

Source: Authors' research, 2015

The calculated chi-square value of 11.61 in Table 3 is higher than the critical value of the distribution by 3 degrees of freedom at level 0.95. Null hypothesis can therefore be rejected. The awareness of one quality food product mark, minimally, is dependent on the respondents' gender. Better awareness was overall demonstrated by females. However, degree of association measured by Cramer V is weak.

Table 4. General awareness of quality food product marks by age

Age category	Yes, I am very well aware	Yes, I am generally aware	I have heard about; however I am not aware	No, I am neither aware, nor I have heard about	Total
15 – 25 years	15	86	59	19	179
26 – 35 years	16	77	35	14	142
36 – 45 years	19	73	36	9	137
46 – 55 years	14	46	38	17	115
Total	64	282	168	59	573

Source: Authors' research, 2015

The calculated chi-square value of 12.44 in Table 4 is lower than the critical value of the distribution by 9 degrees of freedom at level 0.95. Therefore, null hypothesis cannot be rejected. The awareness of one quality food product mark, minimally, is not dependent on the respondents' age.

Table 5. General awareness of quality food product marks by education

Highest education level obtained	Yes, I am very well aware	Yes, I am generally aware	I have heard about; however I am not aware	No, I am neither aware, nor I have heard about	Total
Elementary	0	5	7	4	16
Secondary with no graduation exam	9	33	40	19	101
Secondary with graduation exam	27	139	96	23	285
University	28	105	25	13	171
Total	64	282	168	59	573

Source: Authors' research, 2015

It should be stated that the number of respondents with elementary education was substantially low to implement correct contingency table calculations as the statistics would demonstrate false dependence. Therefore, the category of elementary education was merged with the one of secondary education with no graduation exam. Table 5 demonstrates the data preceding the merge; nevertheless, both the value of statistics and critical value, reflect the results after the merge of the first two categories into a common category of the respondents with secondary education with no graduation exam.

The calculated chi-square value of 49.7 in Table 5 is higher than the critical value of the distribution by 6 degrees of freedom at level 0.95. Null hypothesis can therefore be rejected. The awareness of one quality food product mark, minimally, is dependent on the respondents' education. Not surprisingly, higher awareness corresponds to the rising of higher education of the respondents. However, the degree of association measured by Cramer V is weak or moderate.

Specific awareness of a certain quality food product mark or award was investigated by way of an open question. The respondents submitted their opinions in a written form. Later, the responses were sorted manually and coded for further automatic processing. Unequivocally, paramount awareness was given to the 'Klasa' mark (59.2%, 339 respondents); i.e. 61.5% of the total number of females and 56.8% of the total number of males. The findings are in compliance with Velčovská and Sadílek (2014) who defined the 'Klasa' mark as the most known mark in the Czech market.

Almost a quarter of respondents (23.0%, 132 respondents) claimed the awareness of some form of organic food product labelling. Predominantly, respondents were considerably more aware of the Czech Republic's 'Organic Farming Product' mark, which was recognised by almost half of the individuals within the responding group. Noticeably less knowledge was demonstrated by the respondents with regard to the 'Protected Designation of Origin' mark (PDO) – 13.4% and the 'Protected Geographical Indications' mark (PGI) – 12.7%. Aprile, Caputo and Nayga (2012) advocate, based on their selective experiment, that consumers are willing to pay top prices for PDO labelled products followed by organic farming marked products and PGI products. Furthermore, Jannsen and Hamm (2012) emphasise the importance of appropriate labelling of organic food products with familiar organic farming certification logos that the consumers refer to. Approximately 15.0% (86 respondents) have been familiar with the 'Regional Food Product' mark.

Table 6. Summary values of statistics on the 'Klasa' mark, organic food labelling, and 'Regional Food Product' mark

Category	**Values**	**'Klasa'**	**Organic food labelling**	**'Regional Food Product'**
Gender	Critical value	3.84	3.84	3.84
	$\chi2$	1.33	9.00	0.91
	Cramer's *V*	0.05	0.13	0.04
Age	Critical value	7.81	7.81	7.81
	$\chi2$	1.23	7.53	2.21
	Cramer's *V*	0.05	0.11	0.06
Highest education level obtained	Critical value	7.81	7.81	7.81
	$\chi2$	14.76	18.84	7.44
	Cramer's *V*	0.16	0.18	0.11

Source: Authors' research, 2015

Table 6 provides an overview of the values of statistics focusing on the correlation between an awareness of certain selected marks and selected sociodemographic characteristics of the respondents. No dependence was ascertained between the respondents' age and their awareness of these marks ($H0_5$, $H0_8$, and $H0_{11}$) and/or general awareness of the food quality labelling ($H0_2$). Weak education dependence was demonstrated with regards to the awareness of 'Klasa' and organic food labelling; likewise, the familiarity with organic food labelling is strongly linked with the respondents' gender.

Table 7. Summary results of the tested hypotheses related to the 'Klasa' mark, organic food labelling, and 'Regional Food Product' mark

Hypothesis	Results
$H0_1$	Rejected
$H0_2$	Confirmed
$H0_3$	Rejected
$H0_4$	Confirmed
$H0_5$	Confirmed
$H0_6$	Rejected
$H0_7$	Rejected
$H0_8$	Confirmed
$H0_9$	Rejected
$H0_{10}$	Confirmed
$H0_{11}$	Confirmed
$H0_{12}$	Confirmed

Source: Authors' research, 2015

Table 7 encapsulates the final results of the tested hypotheses which were defined above in Table 2. As stipulated above, the general awareness of marks is primarily related to the respondents' education and, to a lesser extent, to their gender. However, dependencies are defined as low or moderate, at the most. No association with defined variables was observed regarding the 'Regional Food Product' mark.

Efficient promotion in selected media and of locally engaged enterprises represent the basic factor to stimulate the consumers' increasing demand for regional food products (Valenta et al., 2011). Turčínková (2011) observe that the Czech Republic consumers are interested in the country of origin, and thus, they prefer domestic food products.

4. Conclusion

This paper aims to present the current results of primary research in the field of consumers' awareness of food quality labelling in the Czech Republic, which is a very important factor when individuals are deciding on food product purchases in the current competitive food market.

Approximately 60% of the respondents of the total sample size claimed some type of awareness of some quality food product mark. Almost 30% stipulated that they had heard about the quality food product marks; however, they were not aware of any specific one. Absolute ignorance of an issue was declared just by approximately 10% of the respondents, with males comprising the majority of this category. In the sphere of the consumers' general awareness of food quality labelling, the correspondence between the level of awareness and the respondents' gender and education was ascertained. The dependence between the specific mark awareness and the respondents' education level was demonstrated for the 'Klasa' mark, in particular. Furthermore, the correlation between a specific mark awareness and the respondents' gender and education level was established for the organic food labelling. No dependence between a specific mark awareness and the respondents' gender, age, and education level was affirmed for the 'Regional Food Product' mark.

The theoretical contribution of the paper is to highlight the issue of food quality labelling; the practical contribution of the paper is to present the results of consumer´s awareness of food quality labelling with focus on specific mark awareness.

The results prove the public's concern for the issues discussed and, moreover, a solid awareness of selected quality food product marks. The limiting factor of this research could be the fact that the survey was conducted only in the Czech Republic. Nevertheless, future research could be more focused on specific categories of food product labelling and investigate the regional differences at the level of consumers' awareness and preferences in the Czech Republic.

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DO INTERGOVERNMENTAL EQUALIZATION GRANTS HAVE IMPACT ON TAX PREFERENCES IN URBAN-RURAL MUNICIPALITIES IN POLAND?

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Annotation: Among almost 2500 municipalities in Poland we can find over 610 which cover both town and rural areas. Taking into considerations their revenue sources we can notice that over two third of them is supported by equalization grants. The main objective of this paper is to find out how do they use their negative taxing powers to lower tax burden from local taxes while they receive equalization grants. It is important because equalization scheme in Poland should equalize revenues taking into consideration Base Tax Revenues of municipality (potential revenues to collect by the municipality omitting all introduced tax expenditures). All collected data come from local government annual reports Rb-PDP, Ministry of Finance announcements about equalization grants for local governments and Base Tax Revenue per capita indicator also announced by Ministry of Finance. Research cover 2012-2017 period. Basic methods of survey were descriptive statistics - summary statistics as location, spread, shape and dependence (Pearson population correlation coefficient). The main findings of this analysis are as follow: firstly we can observe that in case of urban-rural municipalities revenue loss from tax expenditures of all kinds is between 10 and 50 % of possible revenues from Base Tax Revenues (local government taxes and tax shares in income taxes) but average loss was about 20%. Secondly we can notice that municipalities use mainly possibility to lower tax rates for all local taxpayers instead of discretional administrative decisions eg. about tax reliefs. It should be also noted that lowering tax rates mainly is visible in vehicle meanings tax (almost half of them reaches 70 to 100% loss of possible revenues) than in real estate tax. The third finding points out that there is Pearson population correlation coefficient (-0,37 for 2015 year) between level Base Tax Revenue per capita and coverage of tax expenditures by equalization grant (when tax base drops down coverage rises, when we remove outliers it changes to -0,60). In another words municipalities with poor tax base chose low tax rates because they are aware that equalization grant will cover their revenue loses.

Key words: local government, intergovernmental grants, tax expenditures

JEL classification: H20, H71, H77

1. Introduction

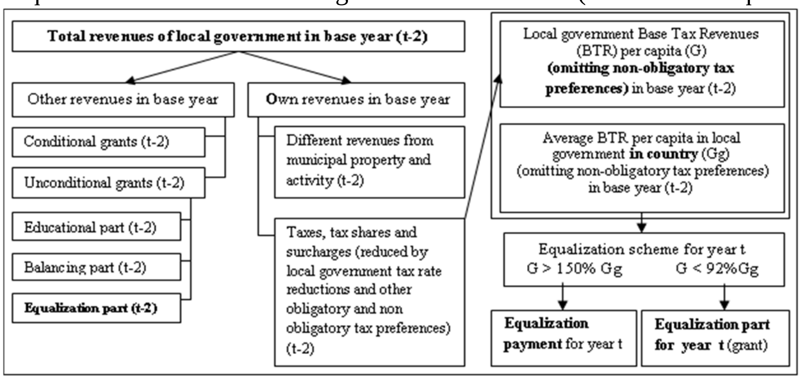
The financing system of local government units is not a uniform system around the world, which results from historical, cultural, economic and political conditions. The basic differences mainly concern the issue of importance of individual types of revenues and method of providing adequate funds for the entrusted tasks (Geys and Revelli, 2011). One of the few points of reference regarding the desired structure and form of financing sources guaranteed to the local governments are regulations of the European Charter of Local Self-Government. However, these provisions indicate only the desired direction of building of the revenue system of local governments. Many scientists focus their attention on providing the local governments with appropriate own revenues in the form of local taxes, as well as on the system of vertical and horizontal equalization of the financial situation of local governments (Langorgen, 2015; Olejniczak, 2015; Shah, 2006; Shunk and Porca, 2005). Also, the issue of impact of the adopted equalization model on the tax policy of local government units is raised here. In the literature on this subject, there has been a long discussion concerning the effects of basing the equalization mechanism on the efficiency of tax base of the given unit of local government. This problem has been described by many researchers, both from theoretical perspective and on empirical examples (Bravo Rodriguez, 2013; Bucovetsky and Smart, 2006; Buettner, 2006; Wrede, 2014). The revenue system of local government units in Poland has been shaped in the last

10-15 years, but it still has certain defects (Poniatowicz and Wyszkowska, 2015). Local governments have been equipped with diverse revenue sources, among which the shares in PIT and CIT play a significant role, as well as local wealth taxes - whose rates and other types of tax preferences can be shaped by municipalities, grants that include horizontal equalization mechanism and subsidies. Adoption of the efficiency of selected taxes constituting revenues of the municipalities as a basis for calculations in the horizontal equalization system raises the question about the impact of such solution on the tax policy implemented by municipalities – i.e. on the use of tax preferences within the above-mentioned part of the taxes. In the Polish scientific literature, the problem of using tax preferences and their impact on finances of local government is discussed rather in terms of the scale of revenue loss and it's not related to the amount of equalization grants received by local governments. A few studies that have been conducted on this subject concern rural municipalities (Olejniczak, 2017). Also, an analysis has been conducted in the recent years concerning the tax competition between municipalities, resulting from the use of tax preferences.

2. Materials and Methods

The analysis of relation between the level of tax preferences used by the studied municipalities and the amount of equalization grants calculated on the basis of Base Tax Revenues (BTR) requires the juxtaposition of grant amount and BTR amount, which constitute the base for its calculation. Figure 1 presents the simplified relation between BTR and calculation of equalization grant. As can be seen, the amount of grants is influenced by the potential BTRs, which may be obtained in the base year – preceding the year of grant payment by two years. This means that by using tax preferences, the local authorities decrease their income in the given year, but these decreases do not affect the amount of future grants.

Figure 1. Simplified equalization scheme for local government in Poland (tax revenues equalization part)



Source: Own work

Therefore, by definition this mechanism is neutral in terms of the scale of redistribution of funds. However, on the other hand, it's necessary to examine how the amount of received grants would in practice compensate local governments for used tax preferences. The analysis will cover all urban-rural municipalities in Poland (approx. 610), which had the status of urban-rural municipality between 2012 and 2017 (due to the availability of data concerning the revenues of these units and the amounts of planned/implemented grants in those years). Data sources will include: firstly, the reports from individual municipalities Rb-PDP from 2012 and 2015 – in order to determine the amount of achieved revenues BTR and amounts of individual tax preferences used by the municipalities; secondly, data from the letters of the Ministry of Finance concerning the final amounts of grants for municipalities in 2012 and 2017; thirdly, data from the letters of the Ministry of Finance concerning the value of BTR indicators in 2012 and 2017 for individual municipalities.

The first stage of the study will consists of determination of the structure and types of tax preferences used by the studied entities in the local taxes (real estate tax, tax on means of transport). The study will include determination of the relations of individual tax preferences to the amounts of potential revenues from these taxes in the studied municipalities and the share of individual types of preferences, as well as their variability over the studied period. This will allow for finding the answer regarding the scale and types of used preferences, as well as the tendency to use them (i.e. the tendency to reduce tax revenues). Secondly, an analysis will be conducted regarding the territorial distribution of results obtained in the first stage, taking into account rural municipalities as a point of reference for the possible existence of tax competition between municipalities in the given area. This stage of the study will allow for identifying the potential differences between individual regions, as well as determining whether there are visible manifestations of tax competition between neighbouring municipalities. The final stage of the study will include determination of the degree of replacement of lost tax revenues with the grants, the correlation between BTR indicators and the amount of tax reliefs used by municipalities in the studied years, as well as calculation of BTR change in municipalities, in the case of its calculation on the basis of actually implemented revenues.

3. Results and Discussion

The analysis of the scope of using tax expenditures by municipalities should be started by indicating, whether they are significant in relation to BTR in individual municipalities (table 1). The obtained results allowed for assigning each municipality to one of 10 groups based on the percentage of lost revenues (where each group represents 10% left half-open interval). As can be seen, by using reliefs the vast majority of municipalities do not lose more than 30% of their potential revenues, while it’s clear that in the case of municipalities with lower revenue potential, there’s a lower tendency to use tax expenditures - more than 80% of these municipalities don’t lose more than 20% of their BTR, whereas for the whole group of studied municipalities, this percentage is lower by 4-6 percentage points. This indicates a cautious tax policy of municipalities with low tax base.

Table 1. Percentage of municipalities in terms of percentage decrease in potential tax revenues (BTR) as a result of using tax preferences (TEX/BTR)

Local governments under 92% of Gg				**All surveyed local governments**				
2015	2014	2013	2012	2015	2014	2013	2012	Year/Loss (%)
36.50%	32.57%	28.07%	27.41%	30.86%	27.66%	22.46%	22.07%	<0.10>
50.74%	52.96%	52.49%	53.16%	53.60%	54.65%	53.19%	54.73%	(10.20>
10.80%	12.34%	15.61%	16.45%	13.06%	14.74%	19.15%	19.82%	(20.30>
1.80%	1.64%	3.49%	2.33%	2.25%	2.27%	4.73%	2.93%	(30.40>
0.16%	0.49%	0.33%	0.67%	0.23%	0.68%	0.47%	0.45%	Over 40.50

Source: Own calculations

Table 2. Percentage of municipalities in terms of percentage share of using tax rates reduction in the total tax expenditures (RATE_LOW/TEX)

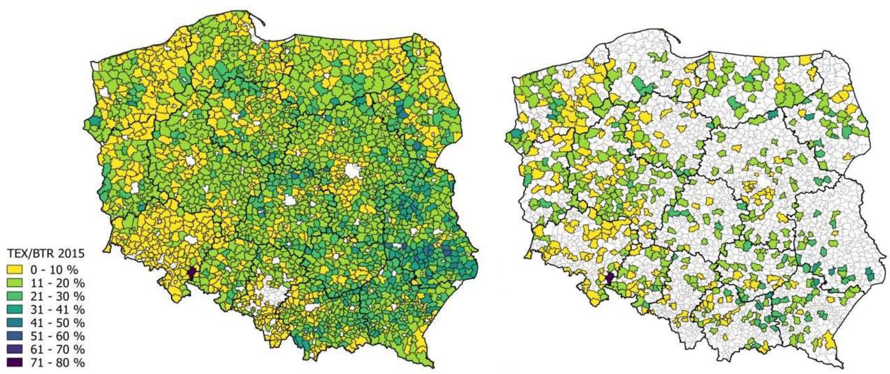
Local governments under 92% of Gg				**All surveyed local governments**				
2015	2014	2013	2012	2015	2014	2013	2012	Year/Loss (%)
0.99%	0.99%	0.83%	0.17%	0.45%	0.46%	0.23%	0.23%	<0.10>
0.82%	0.33%	0.33%	0.67%	0.68%	0.46%	0.45%	0.00%	(10.20>
1.48%	1.98%	1.82%	0.67%	0.90%	1.14%	1.13%	0.23%	(20.30>
1.15%	2.15%	1.65%	2.66%	0.68%	1.82%	1.13%	1.81%	(30.40>
3.78%	2.81%	2.48%	3.49%	3.17%	2.28%	2.04%	2.71%	(40.50>
7.72%	5.94%	6.11%	5.99%	8.14%	6.15%	6.33%	5.20%	(50.60>
11.82%	11.22%	9.90%	9.65%	13.12%	12.30%	10.63%	9.95%	(60.70>
17.08%	18.32%	16.83%	19.13%	18.10%	19.13%	17.65%	19.46%	(70.80>
19.54%	22.28%	19.64%	23.96%	19.91%	23.69%	21.49%	26.02%	(80.90>
35.63%	33.99%	40.43%	33.61%	34.84%	32.57%	38.91%	34.39%	(90. 100>

Source: Own calculations

There's a visible decrease of the share in the effects of tax preferences regarding tax rates reductions – in the case of both studied groups of municipalities, the process of limiting tax reductions occurred, which is visible as a decrease in the percentage of municipalities, where these reductions are between 80 and 100% of tax expenditures, and increase in the percentage of municipalities for which they constitute less than 60% of tax expenditures. For all municipalities in general, it's a decrease by 5 percentage points in the first two intervals and increase from 10 to 14% for the second indicated group (table 2). In the case of those receiving the equalization grant, these changes have the same tendency, but they are smaller. This indicates an increase in the importance of discretionary decisions – particularly deferments of repayment and payment in instalments.

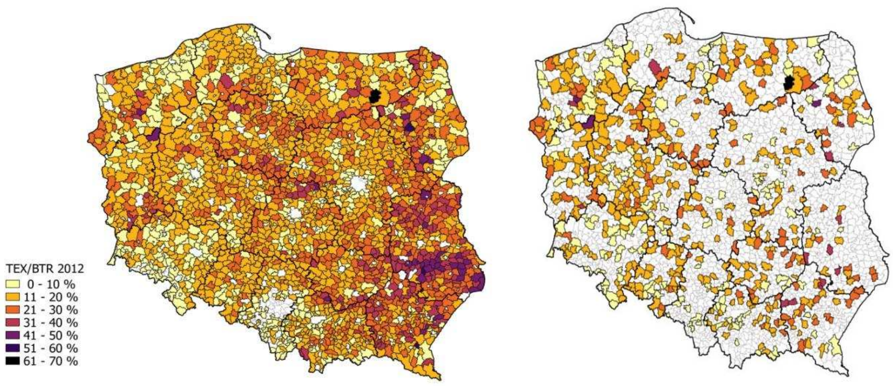
The analysis of spatial distribution of the scale of used tax preferences must be preceded by an indication of the specific situation of urban-rural municipalities in Poland. The occurring division of territorial local government units is mainly based on the criterion of the seat of municipality authorities and the specific characteristics of the territory, which has been assigned to the municipality. The distinction between urban and rural municipalities is simple and the differences occurring between them, in terms of collected revenues, form and conditions of task implementation, are significant. On the other hand, urban-rural municipalities combine both types of municipalities in themselves - however, due to the relatively large share of rural areas in the total area of the municipality, from the viewpoint of the form of implemented tasks, they are closer to the rural municipalities. Furthermore, over the years, the number of urban-rural municipalities has been gradually increasing – along with the granting of urban rights to the subsequent villages, which are the seats of rural municipalities. In connection with the above, it's impossible to imagine the spatial analysis of tax expenditures without comparison with rural municipalities. For the purposes of this analysis, the data about the structure of tax expenditures in rural municipalities in 2015 and 2012 were used (fig. 2 and fig. 3). The left side of the figure shows the TEX/BTR scale in territorial aspect for all municipalities (with the exception of the cities - white fields), the right side shows isolated urban-rural municipalities. As can be seen, there's a certain territorial relation between the scale of tax expenditures in urban-rural municipalities and the scale of used tax expenditures in surrounding rural municipalities. The high level of TEX/BTR relation in rural municipalities of south-eastern Poland (the lower right part of the map) results in both periods in the similarly high level of this relation, in the urban-rural municipalities in the same regions. On the other hand, the lower level of studied relation in rural municipalities in western provinces of Poland coincides with its low level in neighbouring urban-rural municipalities. However, it should be noted that there's a significant asymmetry in the structure of municipalities in particular regions of Poland, which may affect the tax policy implemented by municipalities.

Figure 2. TEX/BTR relation in urban-rural municipalities and rural municipalities, as well as in urban-rural municipalities in 2015.



Source: Own calculation

Figure 3. TEX/BTR relation in urban-rural municipalities and rural municipalities, as well as in urban-rural municipalities in 2012



Source: Own calculation

Table 4. Structure of the share of tax preferences in selected taxes

All local governments												
Vehicle meanings tax				**Agricultural tax**				**Real estate tax**				
2015	2014	2013	2012	2015	2014	2013	2012	2015	2014	2013	2012	/ Year
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04	14.85	13.58	Min
5.19	4.97	4.70	4.34	0.25	1.71	5.40	7.19	74.57	68.66	63.54	59.58	Q1
9.07	8.94	8.24	7.89	3.64	9.17	14.11	17.27	83.75	79.61	74.62	71.84	Med
14.90	14.32	13.28	12.56	10.64	17.74	24.68	28.92	90.93	88.32	85.93	83.65	Q3
90.47	84.89	71.22	69.32	93.42	88.92	74.24	73.19	100.0	100.0	100.0	99.99	Max
Local governments under 92% of Gg												
0.00	0.00	0.00	0.00	-0.02	0.00	0.00	0.00	0.04	0.04	25.66	21.61	Min
5.08	4.67	4.31	4.42	0.35	2.21	6.49	9.32	74.71	67.75	62.36	58.45	Q1
8.67	8.69	7.85	7.80	4.50	10.85	16.77	20.83	83.42	77.84	71.87	69.01	Med
14.29	13.86	12.27	11.94	12.18	20.29	27.64	32.76	90.51	87.11	83.94	81.26	Q3
58.44	72.54	67.49	69.32	93.42	88.92	74.24	73.19	100.0	100.0	100.0	99.99	Max

Source: Own calculations

The analysis of minimum value, maximum value and individual quartiles for three basic (from the viewpoint of possibility of applying tax preferences) taxes shows that similar values are observed for the municipalities in general, as well as for the municipalities covered by the equalization grant mechanism. The share of tax preferences in real estate tax in the total amount of tax preferences for ¾ municipalities increased and amounted from 59.58% in 2012 to 74.57% in 2015 for municipalities in general, and from 58.45% to 7.71% for municipalities receiving the grants. At the same time, there was a decrease in the interquartile range for both groups of municipalities. Consequently, the share of tax preferences concerning the tax on means of transport for ¾ municipalities in both groups constituted approx. 12% in 2012 and 14% in 2015. The increase in the share of preference in two previous groups represented a significant decrease in the share of preference in agricultural tax – by approx. 12 percentage points between 2012 and 2015.

The last stage of the study was to determine the existence of correlation between the BTR level and the level of coverage of the funds lost due to the use of tax expenditures by municipalities (COV_LOST). According to the data contained in table 5, it can be seen that Pearson correlation coefficient in the following years was negative for both groups of municipalities, except for 2012 – in the case of no elimination of outliers. As can be seen, the correlation coefficient for individual years and types of municipalities usually takes the values from -0.3 to -0.4, and this indicates the existence of an average correlation between the BTR and the grant. When applying Spearman's rank correlation coefficient it reaches -0.8.

Table 5. Pearson and Spearman correlation coefficient BTR/COV_LOST

Pearson correlation coefficient				**Spearman rate correlation coefficient**				
2015	2014	2013	2012	2015	2014	2013	2012	Year/ Sample
-0.3477	-0.3713	-0.2711	-0.2796	-0.8434	-0.8482	-0.8638	-0.6466	All municipalities
-0.3724	-0.4030	-0.3839	-0.3850	-0.7129	-0.7201	-0.7236	-0.5488	Under 92%

Source: Own calculations

The obtained results of the study confirm the tendency (previously postulated by other authors) to use greater tax preferences in local governments receiving greater equalization within grants. The study also indicates changes occurring in the structure of tax preferences - increase in the importance of preference regarding real estate tax for most municipalities, as well as decrease in the importance of preference concerning agricultural tax. Such situation may result from favourable shaping of grain prices in the studied period and the inability to use some part of tax preferences. At the same time, it should be indicated that the analysis of territorial distribution of the application of tax preferences urges to undertake further studies on the possible existence of tax competition among municipalities, in the scope of studied taxes eg. similar to research of Sedmihradska and Bakos (2016) . An important limitation of the study was the lack of analysis of changes in tax rates in the studied municipalities (as a factor mainly affecting the size of tax preferences). However, such study is currently not feasible due to the inability to gather relevant data.

4. Conclusion

The conducted analysis of tax preferences used by urban-rural municipalities indicates their large territorial differentiation. Such situation may result from the fact that part of the local governments is under pressure from local governments of rural municipalities - neighbouring the given municipality and using more favourable rates of local taxes in regard to their residents (tax mimicking and yardstick competition). This raises the question about the legitimacy of such hypothesis and it constitutes another area of possible further study, because such study hasn't been yet undertaken in Poland. Another conclusion from the conducted study is that in the case of urban-rural municipalities, there are no significant differences in the scale of used tax preferences, and municipalities with lower revenue potential usually use tax preferences in a more cautious manner. On the other hand, the results of the studies also indicate that there's an average negative correlation between the BTR level and the degree of coverage of the losses resulting from the use of tax preferences by the equalization mechanism. It is also a potential area of future studies - analogous to the studies conducted in this scope in other countries and concerning the attitude of the decision-makers in relation to the use of tax preferences and their justification. The disadvantage of this article is the fact that it did not include the use of more advanced statistical methods for data analysis – e.g. ANOVA models or other methods, such as cluster analysis.

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CHANGES IN THE CHARACTER AND COMPETITIVENESS OF UZBEKISTAN'S AGRARIAN FOREIGN TRADE

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Annotation: Agricultural sector represents an important pillar in Uzbek economy and society. Agricultural trade represents nearly 10% of total merchandise exports and over 10% of total merchandise imports. The character and structure of Uzbek agrarian trade are fast changing. Only in period 1992 – 2015, the value of agrarian trade turnover increased from 140 mill. USD up to 1.7 billion USD. Changes affected not only the structure but also the value, volume, unit prices and competitiveness. The main goal of this paper is to identify the changes in the area of Uzbekistan's agrarian foreign trade structure and competitiveness. Competitiveness is analysed not only in relation to global markets, but it is also analysed in relation to different groups of countries and significant agrarian trade partners. Both agrarian trade competitiveness and territorial and commodity structure changes are analysed from the perspective of the last 15 years (2000-2015). Agrarian trade development (territorial structure) is analysed from two different perspectives: intra-trade (CIS market) and extra-trade (other countries). Competitiveness analyses is done through the application of following methods: Lafay index, Trade balance index and also the product mapping approach is applied. Uzbek agrarian trade territorial structure has become more concentrated, the commodity structure became more diversified. Uzbek trade is quite competitive especially in relation to the Asian countries and CIS countries, the competitiveness in relation to other territories is limited. The significant weakness in Uzbek agrarian trade is its ability to generate added value. The unit values of Uzbek imports are much higher in comparison to exports unit values. The main pillar of Uzbek competitiveness is low price of inputs and cheap volume of unprocessed products.

Key words: Agrarian trade, Uzbekistan, partners, potential, competitiveness, value, structure, changes, Export and import.

JEL classification: Q13, Q17

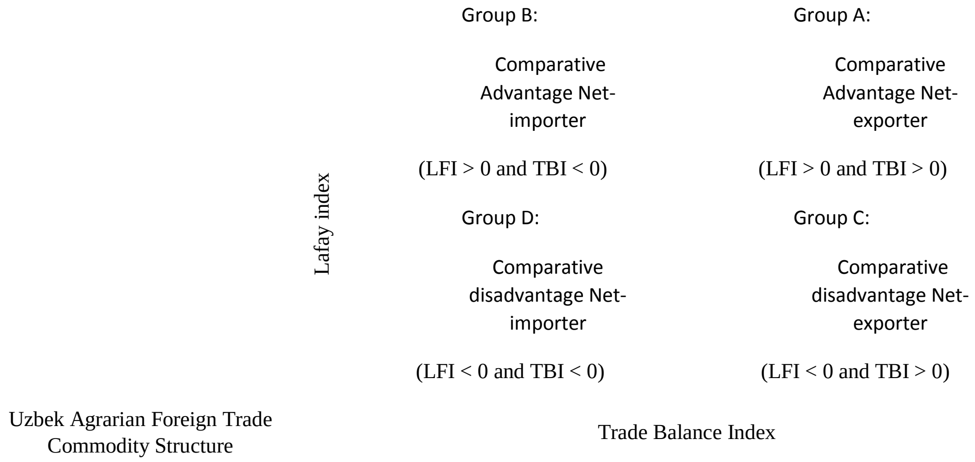
1. Introduction

In Uzbekistan, the performance of export of agricultural products has been increased every year. It is a symbol of efficient use of resources. The paper is focused to highlight the position of the Uzbek agro-food exports on international market (Csaki and Nash, 1999). The export potential of agricultural products is one of the organic parts of the national economy. It involves the possibility of the national economy to produce products that will be competitive in the international market, and export those products in sufficient quantity for world/market prices. The main role of agricultural exports is the ability to foster the current state of the Uzbek agro-industrial complex and to use its competitive prospects. The application of Uzbekistan to join the WTO as a full member was sent in December 1994. In December 1995, WTO working group was formed to consider the issue of Uzbekistan's membership. In the years that followed, no progress was made in the work on accession to the WTO. In May 31, 2013, national government signed a protocol establishing the free trade zone between the Republic of Uzbekistan and Community of Independent States (CIS). The purpose of the Protocol is to encourage mutual cooperation between Uzbekistan and CIS. Another reason why this Protocol was signed is the effort of Uzbekistan to unify the trade regimes in relation to CIS and to foster cooperation existing within the former soviet countries Customs Union (Belorussia, Russia, Kyrgyzstan, Kazakhstan, Armenia, Tajikistan and Uzbekistan) (Smutka et al, 2015a). Uzbek agrarian foreign trade experienced significant changes during the last few years. Only in the period from 2000 through 2015 its export value increased from 249 million USD to 561 million USD. The growth of exports even exceeded the growth of imports (from 270 million USD up to 1 billion 200 million USD). Uzbek agrarian export territorial structure in the period of 2001 to 2015 was heavily concentrated in relation to CIS countries. The dominant positions are kept by Russia, Kazakhstan and Belarus. Tradition role of Russia as the main trade partner is changing. The share of exports to Russia is decreasing, on the other hand Kazakhstan has become the extremely important trade partner for Uzbek agrarian export within the last few years (Ilyina, 2016). This article analyses the basic transformation trends related to Uzbekistan agrarian trade territorial and commodity structure in the period of 2000 to 2015. Within the mentioned time period, the Republic of Uzbekistan and other post-soviet countries significantly changed their trade strategies and policies. The negative feature of Uzbek agrarian trade is much faster growth of import value in comparison to the growth of export value. The result is constantly increasing negative trade balance.

2. Materials and Methods

The processed paper is analyzing the last fifteen years (2000-2015) agrarian trade development in Uzbekistan. The paper is focused on trade competitiveness and trade value distribution in relation to individual territories representing the trade partners of Uzbekistan. Trade performance is analyzed especially in relation to the following territories: Asian countries (without the CIS), European countries (without CIS and EU28), CIS countries and European Union. Agrarian trade commodity structure (we used of HS system dividing agrarian trade into 24 aggregations) is analysed especially in relation to added value development and distribution. The paper indicates the distribution of comparative advantages in relation to CIS countries market and also in relation to the rest of the world (Asian countries, European Union (EU28), other European countries, and developing countries). To achieve the above-mentioned result of the following methods are applied: Lafay index, Trade balance index and Product mapping. LFI and TBI indices provides only limited information about trade competitiveness development. The "Product mapping method" represents more holistic approach. It identifies the entire process of Uzbek agrarian foreign trade commodity structure profiling (Similar approach was already tested by Maitah et al, 2016; Bielik et al., 2013; Rezbova et al., 2014; Svatos et al., 2010a, 2010b, 2012, 2014). The mentioned approach is based on combination of both above mentioned indices. Using the Lafay index (Lafay, 1992) we can analyze bilateral trade relation between countries and regions. Using this index, we consider the difference between each item's normalized trade balance and the overall normalized trade balance. Thereby LFI index is used to eliminate the influence of cyclical factors, which can affect the magnitude of trade flows in the short run and to focus on the bilateral trade relations between the countries and the regions. Positive values of the Lafay index indicate the existence of comparative advantages in a given item; the larger the value the higher the degree of specialization. On the contrary, negative values points to de-specialization (Zaghini, 2003; Smutka et al., 2015b). While LFI index is focused on competitiveness development analysis, TBI index is analyzing trade balance development. A country is referred as a "net-importer" in a specific group of products if the value of TBI is negative, and as a "net-exporter" if the value of TBI is positive. (Widodo, 2009; Ishchukova and Smutka, 2013). Data sources for individual analyses are the following: UN Comtrade and State Committee of the Republic of Uzbekistan on Statistics.

Figure 1. Modified product mapping scheme



Source: own modification and processing (2017)

3. Results and Discussion

Results coming from individual analysis provides the following findings. Agrarian trade of Uzbekistan is concentrated on European and central Asian countries. The most dominant role is represented by CIS members and EU members. CIS countries represents the most dominant trade partners both from export and import perspectives. The CIS share in the Uzbek agricultural export and import reached about 83% respectively 33% in 2000. The share of EU28 in agricultural export and import reached about 7% respectively 52% (in 2000). During the next fifteen years the share of individual trade partners changed by the following way. The CIS share in agricultural export and import reached 67% respectively about 70% (in 2015). The share of EU in total exports and imports reached 6% respectively 14%. Except for traditional partners also Asia significantly increased its importance for Uzbekistan. The share of all Asian countries in agricultural export and import reached about 25% respectively about 11% in 2015. The key aspect of the Uzbek agrarian trade is its competitiveness (especially low-price competitiveness). The Uzbek agrarian sector still does not finish the process of its restructuring and its commodity structure profile is constantly changing. The significant share in total exports is still represented by low added value products. The value of Uzbek agrarian trade is typical especially because of its specific character in relation to individual partners/partner territories. As it was mentioned already before Uzbek agrarian trade is focused on CIS, Europe and Asia. If we compare the period between 2000 and 2015, it is possible to see the significant growth of export and import value performance in relation to all main territories representing the main Uzbek agrarian trade partners (for details see Table 1). The negative feature of Uzbek agrarian trade is much higher inter annual growth rate of import value in comparison to export value. The result is constantly increasing negative trade balance.

The problem of Uzbekistan is rather limited export competitiveness. The comparative advantages analysis based on LFI indicator proved the existence of comparative advantages existing on bilateral level especially in relation to post-soviet countries. The results presented by the product mapping approach provide the more accurate overview of the distribution of comparative advantages of Uzbekistan's agrarian exports. The majority of items representing agrarian trade commodity structure is distributed between two groups A (having comparative advantages) and D (without comparative advantages). On the other hand, within the last fifteen years the significant changes in agrarian trade structure were recorded. Those changes can be considered as an evidence of still running restructuring process. The commodity structure is still looking for the optimal state (for details, see also Tables 2 and 3). The Republic of Uzbekistan is not competitive at the general level, but it has only bilateral comparative advantages as it was mentioned before. Comparative advantages have been existing especially in relation to trade partners applying restrictive trade policies in relation to world market. The mutual trade is not result of the real price competitiveness but it is result of political deal.

Table 1. Uzbek agrarian foreign trade value development between 2000 and 2015 in ths. USD

2000	Asia	Africa	EU 28	Other European countries	CIS	North America	Latin America	Australia and Oceania	World total
Export	18,677,323	0	17,749,020	3,092,804	207,774,843	2,181,042	95	0	249,475,127
Import	35,743,330	0	141,937,313	336,619	91,064,474	1,793,607	57,994	0	270,933,337
Balance	-17,066,007	0	-124,188,293	2,756,185	116,710,369	387,435	-57,899	0	-21,458,210
Balance/Export	-91.37%	0.00%	-699.69%	89.12%	56.17%	17.76%	-60946.32%	0.00%	-8.60%
2015	**Asia**	**Africa**	**EU 28**	**Other European countries**	**CIS**	**North America**	**Latin America**	**Australia and Oceania**	**World total**
Export	140,100,653	1,356,616	32,917,097	3,647,255	376,957,292	6,057,608	527,356	35,196	561,599,073
Import	137,246,993	193,580	175,374,376	8,531,567	830,121,535	2,901,732	53,931,938	2,950,252	1,211,251,973
Balance	2,853,660	1,163,036	-142,457,279	-4,884,312	-453,164,243	3,155,876	-53,404,582	-2,915,056	-649,652,900
Balance/Export	2.04%	85.73%	-432.78%	-133.92%	-120.22%	52.10%	-10126.86%	-8282.35%	-115.68%

Source: COMTRADE database, 2017 and own calculations

Table 2. Uzbek agrarian trade commodity structure in 2000 (traditional product mapping approach) in ths. USD

All trade transactions worldwide 2000									
B-2000	**Export**	**Share in export**	**Import**	**Share in import**	**A-2000**	**Export**	**Share in export**	**Import**	**Share in import**
					HS01	473,396	0.19%	285,088	0.11%
					HS05	4,227,646	1.69%	1,148,989	0.42%
					HS06	5,850,545	2.35%	153,620	0.06%
					HS07	32,139,297	12.88%	6,534,242	2.41%
					HS08	85,853,445	34.41%	1,053,268	0.39%
					HS12	14,509,999	5.82%	2,739,601	1.01%
					HS13	1,193,263	0.48%	296,551	0.11%
					HS14	16,741,308	6.71%	160,607	0.06%
					HS20	27,575,339	11.05%	1,173,581	0.43%
					HS22	4,876,474	1.95%	3,113,466	1.15%
					HS23	13,047,628	5.23%	609,150	0.22%
					HS24	29,672,985	11.89%	9,079,735	3.35%
					Total	236,161,325	94.66%	26,347,898	9.72%
D-2000	**Export**	**Share in export**	**Import**	**Share in import**	**C-2000**	**Export**	**Share in export**	**Import**	**Share in import**
HS02	318,945	0.13%	3,589,988	1.33%					
HS03	2,247	0.00%	211,647	0.08%					
HS04	217,660	0.09%	16,914,352	6.24%					
HS09	763,809	0.31%	14,385,851	5.31%					
HS10	2,446,313	0.98%	64,044,224	23.64%					
HS11	305,017	0.12%	16,295,797	6.01%					
HS15	5,214,505	2.09%	16,986,672	6.27%					
HS16	45,180	0.02%	5,877,851	2.17%					
HS17	2,819,949	1.13%	91,835,500	33.90%					
HS18	115,100	0.05%	3,858,285	1.42%					
HS19	561,099	0.22%	2,868,718	1.06%					
HS21	503,978	0.20%	7,716,554	2.85%					
Total	13,313,802	5.34%	244,585,439	90.28%					

Source: own processing, 2017

Table 3. Uzbek agrarian trade commodity structure in 2015 (traditional product mapping approach) in ths. USD

All trade transactions worldwide 2015									
B-2015	Export	Share in export	Import	Share in import	A-2015	Export	Share in export	Import	Share in import
HS12	26,903,631	4.79%	44,912,528	3.71%	HS05	3,424,405	0.61%	3,108,094	0.26%
HS22	12,697,393	2.26%	19,986,639	1.65%	HS07	170,597,333	30.38%	17,170,850	1.42%
HS24	10,055,967	1.79%	16,827,360	1.39%	HS08	267,541,542	47.64%	3,812,486	0.31%
Total	49,656,991	8.84%	81,726,527	6.75%	HS13	6,509,791	1.16%	3,996,360	0.33%
					HS14	1,518,073	0.27%	59,349	0.00%
					HS20	13,612,764	2.42%	7,192,376	0.59%
					Total	463,203,908	82.48%	35,339,515	2.92%
D-2015	Export	Share in export	Import	Share in import	C-2015	Export	Share in export	Import	Share in import
HS01	3,135,358	0.56%	41,499,305	3.43%					
HS02	31,592	0.01%	52,420,679	4.33%					
HS03			3,778,216	0.31%					
HS04	3,056,285	0.54%	31,403,694	2.59%					
HS06	3,928,133	0.70%	10,064,254	0.83%					
HS09	6,322,794	1.13%	58,153,324	4.80%					
HS10	233,780	0.04%	261,849,919	21.62%					
HS11	24,456,766	4.35%	221,834,762	18.31%					
HS15	155,095	0.03%	192,982,132	15.93%					
HS16	8,240	0.00%	2,973,147	0.25%					
HS17	1,143,176	0.20%	10,082,444	0.83%					
HS18	2,173,528	0.39%	25,733,433	2.12%					
HS19	1,271,887	0.23%	35,518,941	2.93%					
HS21	448,792	0.08%	36,562,704	3.02%					
HS23	2,372,748	0.42%	109,328,977	9.03%					
Total	48,738,174	8.68%	1,094,185,931	90.34%					

Source: own processing, 2017

Distribution of comparative advantages in relation to different groups of countries

The above specified analysis provides interesting results related to the distribution of the comparative advantages of Uzbekistan's agricultural trade in relation to all trading partners. Despite of the fact that the processed analysis seems to be carried out very accurately, it is necessary to mention one very important weakness of the above analysis. The main weakness is the fact that the above-mentioned calculations do not take into consideration the significant differences existing among individual regions or groups of countries in relation to their agrarian trade activities. Some countries apply very strict trade policies, defending their markets, and on the other hand, some countries are very liberal. The Republic of Uzbekistan, as a member of the CIS, carries out its agrarian and trade activities in various regimes and different conditions with respect to certain groups of countries. As a CIS member, Uzbekistan can operate within the CIS market without any restrictions, on the other hand, with respect to some territories, as e.g. EU and other European countries, the agrarian trade of Uzbekistan is influenced by multilateral agreements signed under the WTO rules, as well as signed at the bilateral level between individual members of the EU and the CIS. If we want to understand the real distribution of comparative advantages, we need to analyze them for every single group of countries - Asia (without CIS countries), EU28, other European countries (without members of the EU and CIS) and CIS countries, North American countries and the World. The analysis provides not only a comparison of different commodity structures and individual items competitiveness for individual groups of countries. It also makes possible to compare the state of the commodity structure at the beginning and at the end of analyzed period. The results obtained from individual analyses provide the very interesting overview of current and past time situation. The significant dynamics of commodity structure development can be seen both in relation to the LFI and to the

TBI index. The structure of agrarian trade has not been stabilized yet, and agricultural trade is still looking for the ideal state. Significant changes in the competitiveness of Uzbek agrarian trade in the period from 2000 to 2015 can be observed especially in relation to the EU28 countries and other European countries, Asian countries, Africa and CIS countries. According to the product mapping matrix the share of Group A products in the total volume of agricultural exports increased significantly between 2000 and 2015 (for details, see Tables 4 and 5). On the other hand, the proportion of items located in group D was significantly reduced. Developing countries have not changed their role in Uzbek agrarian trade activities both in the case of exports and imports. TBI and LFI index did not proved any important changes. The Republic of Uzbekistan is largely focused on trade activities carried out in relation to developed and especially Asian countries and the CIS.

Table 4. Uzbek agrarian trade value commodity structure – modified product mapping approach (2000)

2000 (in ths. USD)	A		B		C		D		Total	
	Export	Import	Export	Import	Export	Import	Export	Import	Export	Import
Asia	17,145,252	1,680,468	921,768	1,116,925			610,303	32,945,937	18,677,323	35,743,330
Africa										
EU 28	10,634,005	1,887,068	6,955,544	4,908,159			159,471	135,142,086	17,749,020	141,937,313
Other European countries	3,092,328						476	336,619	3,092,804	336,619
CIS	196,459,224	3,415,916			6,345,786	4,522,781	4,969,833	83,125,777	207,774,843	91,064,474
North America	2,181,042	15,374						1,778,233	2,181,042	1,793,607
Latin America										
Australia and Oceania										
World	229,511,851	6,998,826	7,877,312	6,025,084	6,345,786	4,522,781	5,740,083	253,328,652	249,475,032	270,875,343

Source: own processing, 2017

Table 5. Uzbek agrarian trade value commodity structure – modified product mapping approach (2015)

2015 (in ths. USD)	A		B		C		D		Total	
	Export	Import	Export	Import	Export	Import	Export	Import	Export	Import
Asia	136,400,761	9,125,485					3,699,892	128,121,508	140,100,653	137,246,993
Africa										
EU 28	26,170,655	931,293	5,072,749	21,522,601			1,673,693	152,920,482	32,917,097	175,374,376
Other European countries	3,502,336	187,946	144,616	159,776			303	8,183,845	3,647,255	8,531,567
CIS	361,391,350	24,194,949					15,565,942	805,926,586	376,957,292	830,121,535
North America	6,050,335	606,635					7,273	2,295,097	6,057,608	2,901,732
Latin America										
Australia and Oceania										
World	533,515,437	35,046,308	5,217,365	21,682,377	0	0	20,947,103	1,097,447,518	559,679,905	1,154,176,203

Source: own processing, 2017

During the analyzed time period, the agrarian trade of Uzbekistan changed its structure. The share of agrarian exports realized under the group A increased from 92% to 95.33%. The share of A group in total imports changed from 2.58% to 3.04%. Group B decreased its share in total agrarian export and imports from 3.16% to 0.93% respectively from 2.22% to 1.88%. The share of exports and imports realized under the group C decreased from 2.54% to 0.00% respectively from 1.67% to 0.00%. Exports and imports realized under the group D recorded the following changes. The share of exports in total agrarian exports increased from 2.30% to 3.74% and the share of realized imports increased from 93.52% to 95.8%. The conducted analysis also proved the dominant role of CIS countries as the main trade partners of the Republic of Uzbekistan. Their share in agrarian exports and imports is dominant 67.1% (the share is decreasing) respectively 72% (The share is rapidly increasing. In 2000 the share of CIS in total imports was only 33%).

4. Conclusion

The last fifteen years analysis provides the following results. Agrarian trade of Uzbekistan is constantly increasing its value and changing both commodity and territorial structure character. The values of imports in growing two times faster in comparison to the value of imports. The result is constantly increasing negative trade balance and also constantly decreasing food self-sufficiency. Agrarian trade territorial structure is becoming more and more concentrated. It makes Uzbek agricultural trade extremely vulnerable. The commodity structure development is opposite (diversification trend was proved). The structure of commodity exports is based mainly on the variety of low added value items having comparative advantages - especially at the bilateral level. While Uzbek trade is quite competitive, especially with respect to Asian countries, competitiveness towards other territories (especially developing countries, Other European countries, North and Latin America) is limited. The combination of the TBI, LFI and product mapping approach analyses proved the comparative advantage of the following set of aggregates/trade items: fish, plants, meat products, cereals, live animals, vegetable oils, vegetable juices, dairy products, sugar, juices and weaving materials, products shredding, drinks and alcohol.

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THE IMPORTANCE OF THE US TO THE FOREIGN AGRI-FOOD TRADE IN POLAND UNDER THE TTIP IMPLEMENTATION

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Annotation: In 2013 the EU and the US began talks on the Transatlantic Trade and Investment Partnership (TTIP), which is going to be established as the world's largest free trade area. In view of the fact that the EU and US differ considerably in their economic potentials, the signing of the agreement liberalising bilateral trade may cause a radical change in the conditions of competition both on regional markets and on the global market. Agricultural issues are one of the most difficult areas of the TTIP negotiations. The main aim of this paper is to identify the current role of the US in the foreign agri-food trade in Poland and to consider the strength of trade creation and diversion effects after signing the TTIP Agreement. The research was based on data of the European Statistical Office (Eurostat). A computable general equilibrium model of the Global Trade Analysis Project (GTAP) was used to simulate the impact of the TTIP agreement on agri-food trade between Poland and its major trade partners, including the US. The importance of the US as Poland's trade partner was insignificant. In 2016 the share of the US in the structure of the total export of agri-food products from Poland amounted to 1.7%, whereas the share in the structure of import was as low as 1%. The significance of the US in agri-food trade with third countries was slightly greater. The establishment of the free trade zone between the EU and US may result in the effect of creation of the Polish-American agri-food trade but the impact of the TTIP agreement on Poland's trade with other main partners may be limited. Due to the small share of the US in the total agri-food turnover, no significant change in the dynamics of total export and import of agri-food products from/to Poland should be expected after signing the TTIP Agreement.

Key words: export, import, agri-food trade, agri-food products, the TTIP, the US, Poland

JEL classification: F13, F14, F15, F17, F53, Q17

1. Introduction

In view of difficulties reaching a consensus concerning global trade liberalisation at the WTO forum, the changes which take place in contemporary international trade mostly consist in the tightening of relations within the existing regional groupings or in establishing new trade areas. The Transatlantic Trade and Investment Partnership (TTIP) is one of the most important and topical trade liberalisation initiatives under regional preferential agreements, whose aim is to establish the biggest free trade area in the world. The abolishment of trade barriers would give both the US and the EU an opportunity to increase their market shares and strengthen the international competitive position (among others these issues were considered by Fontagné, Gourdon and Jean, 2013; Francois et al., 2013; Bureau et al., 2014). It is particularly important in view of the increasing significance of some less developed countries on the international arena, such as the BRIC countries, especially China (Wang, 2003; Bosworth and Collins, 2008; Feenstra and Shang-Jin, 2010; Hölscher, Marelli and Signorelli, 2010; Cheptea, 2012; Paul, 2016).

Agriculture is one of the most difficult areas under the TTIP negotiation for historical reasons and due to considerable differences in production potential and asymmetric market protection (Pawlak, 2016). Like at the WTO forum, agriculture appears to be the most protected sector of national economies, the most undisciplined area of international trade and the cause of the most dangerous conflicts in international economic relations (McCalla, 1993). However, as results from the study by Grant and Lambert (2008), so far regional trade agreements have been more effective than the WTO in agricultural trade liberalisation. The researchers analysed six of them (NAFTA, EU, MERCOSUR, the Andean Pact, ASEAN, CER) and proved that the trade in agricultural products in the member-states of these groupings increased by about 72% in comparison with the 27% increase in the trade in industrial goods. Trade impacts of selected free trade agreements on agricultural trade of their members were also the subject of many other analyses. Interesting results were submitted for example by Lambert and McKoy (2009), Svatoš and Smutka (2009), Sun and Reed (2010) or Hndi, Maitah and Mustofa (2016).

For the economies of individual countries and their agricultural sectors the scale of effects of potential trade liberalisation between the EU and the US will be determined by the assumed trade liberalisation scenario and it will vary according to individual countries' engagement in trade with the US. In this context it is necessary to ask the questions about the importance of the US as an agri-food trade partner for Poland and about the perspectives of trade development after signing the TTIP agreement. Therefore, the main aim of this paper is to identify the current role of the US in the foreign agri-food trade in Poland and to consider the strength of trade creation and diversion effects after signing the TTIP Agreement.

2. Materials and Methods

The research was based on data of the European Statistical Office (Eurostat). The methods of meta-analysis, descriptive analysis, analogies and comparisons, and the deductive approach were employed in the research.

In order to determine the significance of the US for the Polish agri-food trade, a ranking of Poland's most important export and import partners was made, and the US was located among them. Next, the values of turnover and trade balance, as well as the commodity structure of bilateral trade between Poland and the US in 2016 were analysed. The share of the US in total trade and in trade with third countries was assessed. The export-import coverage ratio (CR) was also calculated. This indicator let us identify the export specialisation of a particular country and its possible advantage over a trade partner. The commodity structure of bilateral trade between Poland and the US was considered according to the nomenclature of the Harmonised Commodity Description and Coding System (HS) at 2-digit HS product level.

A computable general equilibrium model of the Global Trade Analysis Project (GTAP) was used to simulate the impact of the TTIP agreement on agri-food trade between Poland and the US. On the one hand, the GTAP general equilibrium model is based on a specially adapted Leontief's inter-branch flow (input-output) matrix, and on the other hand, it is based on the assumptions of Walrasian equilibrium and on the neoclassical assumption that the prices of products, services and production factors run freely on the market and balance the demand and supply (Shoven and Whalley, 1984). The results of simulation analyses of two trade liberalisation scenarios prepared by Hagemejer, Michałek and Pawlak (2016) were presented. The first scenario assumed complete abolition of duties on agricultural and non-agricultural products in bilateral trade between the EU and the US (Scenario I). The other scenario assumed the elimination of duties and a removal of 50% of the initial non-tariff barriers to trade (NTB) on all products and services in bilateral trade between the EU and the US (Scenario II). The simulations were performed using GTAP 9 database and a reference year of 2011.

3. Results and Discussion

Between 2004 and 2016 the value of export of agri-food products from Poland to the US increased nearly 2.5 times and reached about €374 million in 2016 (Table 1). The import increased even more dynamically. In 2016 the import of agri-food products from the US to Poland exceeded the value of €153 million and it was nearly three times greater than in 2004. In spite of this fact the significance of the US as a trade partner in the agri-food sector in Poland was relatively low. In 2016 the share of the US in the structure of the total export of agri-food products from Poland amounted to 1.7%, whereas the share in the structure of import was as low as 1%. The significance of the US in Poland's agri-food trade with third countries was slightly greater. The export to the American market amounted to slightly more than 8% of the total value of agri-food export to third countries, whereas the import from the US amounted to nearly 5% of the total value of import from non-EU countries (Table 2).

Table 1. Polish foreign trade in agri-food products by major trade partners in 2016

No.	Country	Export (million euro)	Share in the total export from Poland (%)	No.	Country	Import (million euro)	Share in the total import to Poland (%)
1	Germany	5,447.6	24.2	1	Germany	4,076.9	25.8
2	United Kingdom	2,139.7	9.5	2	Netherlands	1,852.1	11.7
3	Czech Republic	1,604.9	7.1	3	Spain	914.1	5.8
4	Netherlands	1,339.6	6.0	4	Sweden	890.7	5.6
5	Italy	1,321.2	5.9	5	Belgium	831.8	5.3
6	France	1,208.1	5.4	6	Denmark	813.4	5.1
7	Slovakia	704.3	3.1	7	Italy	679.5	4.3
8	Hungary	619.2	2.8	8	France	607.4	3.8
9	Romania	589.1	2.6	9	Czech Republic	600.7	3.8
10	Spain	583.2	2.6	10	United Kingdom	558.1	3.5
11	Lithuania	550.9	2.4	11	Argentina	557.4	3.5
12	Denmark	511.0	2.3	12	Ukraine	435.1	2.8
13	Belgium	507.1	2.3	13	Hungary	365.2	2.3
14	Austria	431.7	1.9	14	Slovakia	329.0	2.1
15	Sweden	399.9	1.8	15	Lithuania	292.8	1.9
16	Russian Federation	375.4	1.7	16	Austria	241.1	1.5
17	United States	373.9	1.7	17	China	223.2	1.4
TOTAL		22,492.4	100.0	18	Norway	207.5	1.3
				19	Ireland	167.4	1.1
				20	Paraguay	163.2	1.0
				21	Turkey	157.9	1.0
				22	United States	153.3	1.0
				TOTAL		15,821.2	100.0

Source: ComExt-Eurostat, 2017; own elaboration

In 2016 the US was Poland's seventeenth largest export partner and the second largest non-EU export partner after Russia (Table 1). The relatively low value of export of agri-food products from Poland to the US was chiefly caused by relatively low complementarity of the Polish and American agriculture and the resulting minimal demand for agricultural products from the temperate zone in the US. These products are made in the US, usually at a lower cost, and they are the export surplus of this country. The US was Poland's twenty-second largest import partner. As far as non-EU countries are concerned, Poland imported more agri-food products from Argentina, Ukraine, China, Norway, Paraguay and Turkey (Table 1). Salvacruz and Reed (1993) indicate that in bilateral trade the value of export from the US to its partners depends on food self-sufficiency in the importing countries and it decreases as the distance to the target market increases, because it causes higher costs of transport.

Table 2. Commodity structure of Poland's trade in agri-food products with the US in 2016

HS code	Export thous. euro	Export %	Export Share in the total export from Poland (%)	Export Share in the export to third countries (%)	Import thous. euro	Import %	Import Share in the total import to Poland (%)	Import Share in the import from third countries (%)	Balance (thous. euro)	CR (%)
1	224.6	0.1	0.1	0.5	71.3	0.0	0.0	6.2	153.3	315.0
2	82,385.4	22.0	2.2	12.9	0.0	x	x	x	x	x
3	13,495.7	3.6	1.2	15.0	38,973.4	25.4	2.3	6.9	-25,477.6	34.6
4	9,214.2	2.5	0.6	2.4	78.8	0.1	0.0	0.2	9,135.4	11,699.2
5	5,524.8	1.5	2.3	8.3	1,130.6	0.7	0.6	3.7	4,394.2	488.7
6	825.8	0.2	0.6	1.7	28.0	0.0	0.0	0.5	797.8	2,952.8
7	14,769.8	4.0	1.6	11.2	401.9	0.3	0.1	0.6	14,367.9	3,675.1
8	2,783.7	0.7	0.3	0.8	10,430.7	6.8	0.8	3.8	-7,647.0	26.7
9	5,144.3	1.4	1.0	7.3	18.3	0.0	0.0	0.0	5,126.0	28,152.2
10	113.8	0.0	0.0	0.0	1,397.6	0.9	0.4	3.0	-1,283.8	8.1
11	19,126.6	5.1	8.3	17.5	63.5	0.0	0.0	1.4	19,063.0	30,104.0
12	1,797.8	0.5	0.7	9.0	4,769.8	3.1	0.9	2.2	-2,972.0	37.7
13	62.8	0.0	0.4	0.5	1,591.4	1.0	1.8	7.5	-1,528.6	3.9
14	1.0	0.0	0.0	0.2	52.9	0.0	0.1	0.1	-51.9	1.9
15	1,005.9	0.3	0.2	4.8	2,779.9	1.8	0.4	2.9	-1,774.0	36.2
16	60,592.8	16.2	5.0	63.1	38.6	0.0	0.0	0.1	60,554.3	157,171.7
17	12,983.6	3.5	2.3	6.9	35.6	0.0	0.0	0.0	12,948.0	36,470.7
18	41,764.9	11.2	3.0	13.1	11.2	0.0	0.0	0.0	41,753.7	372,402.4
19	16,510.3	4.4	0.9	3.9	24.0	0.0	0.0	0.1	16,486.4	68,882.1
20	29,050.6	7.8	2.6	12.4	7,917.2	5.2	1.3	4.9	21,133.4	366.9
21	11,610.9	3.1	0.8	4.1	23,412.6	15.3	2.5	18.7	-11,801.7	49.6
22	43,452.4	11.6	5.9	26.4	29,212.6	19.1	4.2	35.1	14,239.7	148.7
23	1,473.1	0.4	0.2	1.2	12,792.7	8.3	0.9	1.5	-11,319.7	11.5
24	0.0	0.0	0.0	0.0	18,030.5	11.8	2.6	7.8	-18,030.5	0.0
TOTAL	373,914.8	100.0	1.7	8.2	153,263.0	100.0	1.0	4.8	220,651.8	244.0

Source: ComExt-Eurostat, 2017; own calculations

HS codes: 01 – live animals; 02 – meat and edible meat offal; 03 – fish and crustaceans, molluscs and other aquatic invertebrates; 04 – dairy produce; 05 – products of animal origin, not elsewhere specified or included; 06 – live trees and other plants; 07 – edible vegetables and certain roots and tubers; 08 – edible fruit and nuts; 09 – coffee, tea, maté and spices; 10 – cereals; 11 – products of the milling industry; 12 – oil seeds and oleaginous fruits; 13 – lac; gums, resins and other vegetable saps and extracts; 14 – vegetable plaiting materials; vegetable products not elsewhere specified or included; 15 – animal or vegetable fats and oils; 16 – preparations of meat, of fish or of crustaceans, molluscs or other aquatic invertebrates; 17 – sugars and sugar confectionery; 18 – cocoa and cocoa preparations; 19 – preparations of cereals; 20 – preparations of vegetables, fruit, nuts or other parts of plants; 21 – miscellaneous edible preparations; 22 – beverages, spirits and vinegar; 23 – residues and waste from the food industries; prepared animal fodder; 24 – tobacco and manufactured tobacco substitutes

The agri-food trade between Poland and the US was predominated by food preparations, which amounted to nearly 60% of the total turnover in 2016 (Table 2). In this category of products, the following items were the most important in the export structure from the US: preparations of meat or of fish (16.2% of total export in 2016), beverages, spirits and vinegar (11.6%), cocoa and cocoa preparations (11.2%) and preparations of vegetables, fruit or nuts (7.8%). The value of export of these product groups was more than €60 million, €43 million, €41 million and €29 million, respectively and it was from about 1.5 times (beverages, spirits and vinegar) to more than 370 times (cocoa and cocoa preparations) greater than the value of import. Apart from that, meat and edible meat offal amounted to more than 20% of the total value of agri-food export from Poland to the US (€82.4 million). The share of the US in the total export of these commodity groups from Poland was relatively low and ranged from about 2% (meat and edible meat offal) to 6% (beverages, spirits and vinegar). However, it is necessary to note that the American market absorbed more than 63% of the Polish export of preparations of meat or of fish to third countries. As far as export to non-EU countries is concerned, more than a quarter of the Polish export of beverages, spirits and vinegar and about 12-13% of the export of meat and edible meat offal, cocoa and cocoa preparations and preparations of vegetables, fruit or nuts went to the US.

The following items were chiefly imported from the US to Poland: fish and crustaceans, beverages, spirits and vinegar (wines and whiskeys), tobacco and manufactured tobacco substitutes, prepared animal fodder, residues and waste from the food industries (chiefly oilcakes and other solid residues resulting from the extraction of soya-bean oil), as well as fruit and nuts (pistachios and almonds). In 2016 these product groups absorbed more than 71% of the total amount of money spent on the agri-food import from the US (Table 2). Apart from beverages, the trade in abovementioned items was characterised by negative balance (CR<100%). It is noteworthy that nearly 50% of the value of import from the American market resulted from the purchase of by-products of the food industry, animal fodder, tobacco and beverages rather than basic foodstuffs. The import of beverages, spirits and vinegar from the US amounted to more than 35% of the total value of import of this product group from third countries.

Table 3. Possible changes in Poland's agri-food trade with major trade partners after signing the TTIP Agreement (%)

Scenario	Product group	Export					Import				
		US	Germany	Rest of EU-15	EU-12	Total	US	Germany	Rest of EU-15	EU-12	Total
I	Agricultural products	8.9	-0.1	-0.6	0.2	-0.1	37.5	-0.6	-0.5	-0.6	-0.1
	Food preparations	14.6	-3.4	-2.3	-1.0	-1.8	35.2	-0.5	-0.7	-0.7	-0.1
II	Agricultural products	48.7	-0.7	-1.6	-0.2	-0.2	48.8	-1.6	-1.5	-0.3	-0.1
	Food preparations	61.4	-3.8	-2.7	-1.7	-1.0	84.5	-2.5	-2.6	-1.1	-0.3

Source: GTAP simulation made by Hagemejer, Michałek and Pawlak (2016)

As results from the study by Hagemejer, Michałek and Pawlak (2016), the potential trade liberalisation between the EU and the US within the TTIP should not cause considerable changes in the total Polish agri-food trade (Table 3). If tariff barriers are abolished, we can expect a relatively greatest drop (though not greater than 2%) in the export of food preparations from Poland. As was proved, trade with the US is of minimal importance to Poland and even ambitious liberalisation of bilateral trade barriers, including tariff and non-tariff barriers, will not influence the total trade value significantly. The trade creation effect, which will result from the establishment of the free trade area, can be observed in relations between Poland and the US. However, due to the fact that at present there are much higher duties protecting the EU market (Pawlak, 2016), the reduction of barriers in the EU-US trade will stimulate the American economy to increase export more than the EU one. If duties are abolished completely and non-tariff barriers are reduced by 50%, the import of agricultural products from the US to Poland may increase by nearly 50%, whereas the import of food preparations may increase by 85%. The dynamics of increase in the export of agricultural products from Poland to the US may be comparable, whereas the increase in the export of food preparations may be much smaller and amount to about 61.5%. There could be bigger differences in the rate of growth of bilateral export if only tariff barriers are liberalised.

We can see that if tariff barriers in bilateral trade between the EU and the US are abolished, the intra-EU trade may decrease, especially the exchange with major trade partners, such as Germany and the other countries in the EU-15 (Table 3). We can expect that the export of food preparations will be more reduced than the export of agricultural products. According to a more complex liberalisation scenario, which assumes complete abolition of duties and 50% reduction of non-tariff barriers to trade between the EU and the US, the export of food preparations from Poland to Germany may drop by 3.8%, to the other countries of the EU-15 – by 2.7%, and to the EU-12 – by 1.7%. We can expect that the Polish export to the other EU member-states will be reduced due to changes in relative prices and the resulting shift in the EU demand to the US. For the same reason, the import of agricultural products and food preparations from the US to Poland may grow at the expense of lower import from the EU member-states, especially from Germany and the other countries of the EU-15. It is noteworthy that the results of simulation analyses for Poland are in agreement with the results of research conducted within the EU framework. The likelihood of stronger creation of export of agri-food products from the US to the EU markets rather than in the opposite direction and simultaneous reduction of the intensity of intra-EU relations is confirmed by the results of simulations made by Fontagné, Gourdon and Jean (2013), Francois et al. (2013) and Bureau et al. (2014).

4. Conclusion

Although the value of bilateral trade between Poland and the US rose between 2004 and 2016, the importance of the US as Poland's trade partner decreased. In 2016 the export of agri-food products from Poland to the US reached almost €374 million, i.e. slightly more than 1.5% of the total Polish agri-food export. At the same time Poland imported agri-food products worth €153 million from the US (1% of the total agri-food import to Poland), which made a surplus in mutual agri-food trade. The position of the US in the Polish agri-food trade with third countries was a little stronger. In 2016 export to the US market amounted to about 8% of the total Polish agri-food export to non-EU countries, while the share of the US in the non-EU import structure amounted to nearly 5%. The relatively low value of the agri-food trade turnover between Poland and the US results from small complementarity of agriculture in these countries, and consequently, from insignificant demand for agricultural products of the temperate zone, which are successfully, and usually at a lower cost, produced in the US.

We can see that apart from fruit and vegetable preparations, as well as meat and meat preparations Poland did not export any products made by basic branches of the food industry to the US, nor did it export any raw agricultural materials or unprocessed products which are ready to eat. Nearly 50% of the import value resulted from purchasing by-products of the food industry, animal fodder, tobacco and beverages on the American market rather than from the import of basic foodstuffs. However, if we consider the availability of different products on the market, we can say that this import was necessary in a way. Poland imported dried fruit and nuts, which are not offered by domestic producers. It also imported fish and oilcakes from the extraction of soya-bean oil, for which the demand is much greater than the domestic production.

The establishment of the free trade area between the EU and US may result in the effect of creation of the Polish-American agri-food trade. However, due to the fact that at present there are much higher duties protecting the EU market, the reduction of barriers in the EU-US trade will stimulate the American economy to increase export more than the EU one. The more the trade barriers are reduced, the greater dynamics of changes we may observe. Simultaneously, in consequence of changes in relative prices and the resulting shift of the EU demand to the US we can expect a slight decrease in the Polish agri-food trade with the other EU member-states, which will mostly concern Poland's most important trade partners in the EU. Due to the small share of the US in the total agri-food turnover, no significant change in the dynamics of total export and import of agri-food products from/to Poland should be expected.

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HOW INHABITANTS PERCEIVE THE AGRICULTURAL BIOGAS STATIONS?

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Annotation: Building of agricultural biogas stations (BGS) is supported from Rural Development Program as part of diversification measure for agricultural holdings. Despite certain advantages such as production of renewable energy and combating climate change, there are several drawbacks that affect local inhabitants. The aim of the paper is to assess how local inhabitants in the Czech Republic perceive the presence of BGS near their homes. We held quantitative survey that examined how pros and cons of the BGS are perceived by local inhabitants (on a scale from *not perceived as very important positive* – 1 point to *perceived as very important positive* – 4 points and from *not perceive as negative at all* – 1 point to *fully perceive it as negative* – 4 points). How often the negatives bother them (a scale from *never* – 1 point to *permanently/daily* – 5 points). The evaluation of the results was based on methods of descriptive statistics. For each positive or negative is calculated an average mark. We can conclude that the position of the local inhabitants towards the presence of the agricultural BGS can be characterized as neutral, as they do not perceive much advantages or disadvantages of the BGS. They acknowledge that BGS can have certain environmental benefits, but do not consider them strongly important. Mainly local inhabitants notice odour from the transportation of input/output materials or from operation of BGS. However, both drawbacks can be minimized by compliance with prescribed procedures. Hence, the social impact of the diversification measure of RDP on well-being of local inhabitants in the Czech Republic is not that significant. However, for example in Germany, consumers are willing to pay higher prices for renewable heating as they acknowledge features such as extra climate protection or the use of waste as a biogas substrate.

Key words: agricultural biogas station, Czech Republic, externality, public goods

JEL classification: D62, I38

1. Introduction

The concerns about global warming caused by greenhouse gas emissions are raising recently. Hence, the alternative sources of fuel and electric power are searched. “One sustainable energy source that shows considerable promise is biogas produced from organic waste”, (Karlsson et al., 2017). “Energy policies should foster environmentally optimal solutions, especially because social acceptance issues often arise in the case of biogas”, (Patrizio et al., 2017). Hence, number of biogas stations has rapidly increased not only in the Czech Republic. There are currently over 350 agricultural biogas stations (BGS) with the total installed power 365 MW are in operation mainly due to positive policy towards renewable energy resources. (Slaboch and Hálová, 2017). Building of BGS is supported from public funds within Rural Development Program of EU by Ministry of Agriculture as a part of diversification measure for farms.

The advantages such as production of renewable energy and combating climate change are clear. The results or research by Kimming et al. (2011) “show that the biomass-based scenarios reduce greenhouse gas emissions considerably compared to the scenario based on fossil fuel, but have higher acidifying emissions.” Besides, there may appear several drawbacks affecting local inhabitants. There are certain externalities related to biogas production. For example, Britz and Delzeit (1993) named as positive externalities related to production of biomass carbon sequestration (growing crops and forests), waste reduction (if jointly produced and consumed with some other desired output) and as negative externalities possible contamination of water and soil (pesticides and fertilizers used to produce crops), transport and related air pollution, and loss of biodiversity. Especially the last mentioned is significant. The boost in biogas output went along with a significant increase in production of green maize, the dominant feedstock. “Moreover, the increasing production of energy crops has triggered a debate over moral aspects of using fertile land for other purposes than food production”, (Kimming et al., 2011).

When the BGS are fed by crops, the environmental impact of bioenergy production from biomass depends on its type. Kaegi et al. (2007) examined which crops are suitable. They used Swiss Agricultural Life Cycle Assessment methodology and found that the lowest environmental impacts for biogas show extensive grassland. Britz and Delzeit (1993) explored the situation in Germany, where the biogas program is almost entirely based on non-waste feedstocks which is a large problem for biodiversity. “The German biogas production is large enough to have sizeable impacts on global agricultural markets in prices and quantities, causing significant land use change outside of Germany. While profits in the agricultural sector increase, food consumer face higher prices, and subsidies for biogas production are passed on to electricity consumers,” (Britz and Delzeit, 1993) There is difference, when waste is used as a feedstock. Vollebergh (1997) explored two markets for energy produced from biomass: waste-to-energy electricity production in the Netherlands and the blending of biofuels with oil-based fossil fuels in cars in France. He concluded that “waste-to-energy is optimal only if the alternative of landfilling is excluded as an opportunity for waste management”, (Vollebergh, 1997). Patrizio et al. (2017) quantified the environmental impact of airborne emissions associated with biogas-based energy vectors and their corresponding fossil substitutes.

The opinion of population on renewable energy in Shandong, China was examined by Liu, Wang and Mol (2013). Their paper assessed rural social acceptance of renewable energy. “The results show that rural residents are generally supportive renewable energy development given its positive impacts on environment.” (Liu, Wang and Mol, 2013). Respondents’ stated willingness to pay more for renewable electricity increased with household income, individual knowledge level and belief about costs of renewable energy use but decreased with age. Pechrová and Lohr (2016) derived the monetary value of externalities related to the biogas stations from the value of real estate sold nearby. However, the impact was only mild.

The aim of the paper is to assess how local inhabitants in the Czech Republic perceive the presence of BGS near their homes and to compare the results in EU context. The paper is structured as follows. First, the primary survey and obtained data are described by statistical methods. Second, the results are presented. Consequently, they are discussed and compared with the findings of other studies. Last section concludes.

2. Materials and Methods

We held quantitative primary survey that examined how the local inhabitants perceive positives and negatives of the BGS. A questionnaire contained closed or semi-open questions. The scale for positives was from *not perceived as very important positive* (1 point), *not perceived as an important positive* (2 points), *perceive as more important positive* (3 points), to *perceived as very important positive* (4 points). The perception of negatives ranged from *not perceive it at all* (1 point), *rather do not perceive it* (2 points), *rather perceive it* (3 points) to *fully perceive it* (4 points). How often the negatives bother locals was assessed on the scale from *never* (1 point), *few times per year* (2 points), *few times per month* (3 points), *few times per week* (4 points), *permanently / daily* (5 points). The evaluation of the results was based on methods of descriptive statistics. For each positive or negative is calculated an average mark.

The pros and cons of the BGS were identified based on literature review. Among positives belonged: (1) production of renewable energy; (2) contribution to protection of environment; (3) utilization of the materials that would be otherwise left without utility; (4) increasing employment in municipality; (5) benefits for municipality; (6) attracting tourists or visitors; (7) promoting the municipality; (8) other. Negatives included: (1) noise related with the operation of the BGS; (2) odour related with the operation of the BGS; (3) pollution due to transport from import of raw materials or disposal of waste (digestate); (4) noise due to transport from import of raw materials or disposal of waste (digestate); (5) odour due to transport from import of raw materials or disposal of waste (digestate); (6) visual distortion of image and character of the local landscape; (7) discouraging tourists from visiting the site; (8) decline of property prices in the area; (9) monocultural land use for biomass production (e.g. corn field).

We used 860 completed questionnaires from 1001 asked inhabitants. The respondents were chosen based on that they live not far than 1 km from BGS and are older than 18 years. Average age was 43, maximum 72 years. There were 385 females (44.8%) and most of the respondents graduated from middle school without (317, 36.8%) and with leaving exam (305, 35.4%). Almost 12% finished higher specialized education and little less percentage achieved university education. Others had basic school (6.0%) or did not state their education. Majority of respondents lived in the household with 3 or 4 members (28.0%) and 23.5% with 2 members. Average number of members of the household was 3. Mostly, there were 2 people economically active in the household (71.7%). In 19.0% of cases there was only one, and in other 8% three. Otherwise there were even 4 persons economically active in the household. Over 80.0% of respondents were employees and 18.8% self-employed. In majority of cases (826), none of the family members was employed in BGS. Description of the sample is in Table 1.

Table 1. Description of the sample - frequencies

No. of members	**of the household**	**economically active**	**A member of household with the highest income is**		**The highest finished education**	
1	69	163	employee	696	basic	52
2	202	617	self-employed	162	high school without state exam	317
3	241	69	unemployed	0	high school with state exam	305
4	241	11	student	0	higher education	100
5	90	0	other	2	university	81
over 6	17	0			not stated	6

Source: Own elaboration, 2016

3. Results and Discussion

Respondents came from villages up to 1 km far from 10 BGS. Mostly they were from Lhota pod Libčany in region Hradec Králové, the less from Dlouhá Ves in Plzeňský region. Distribution of number of respondents in particular region can be seen at Table 2.

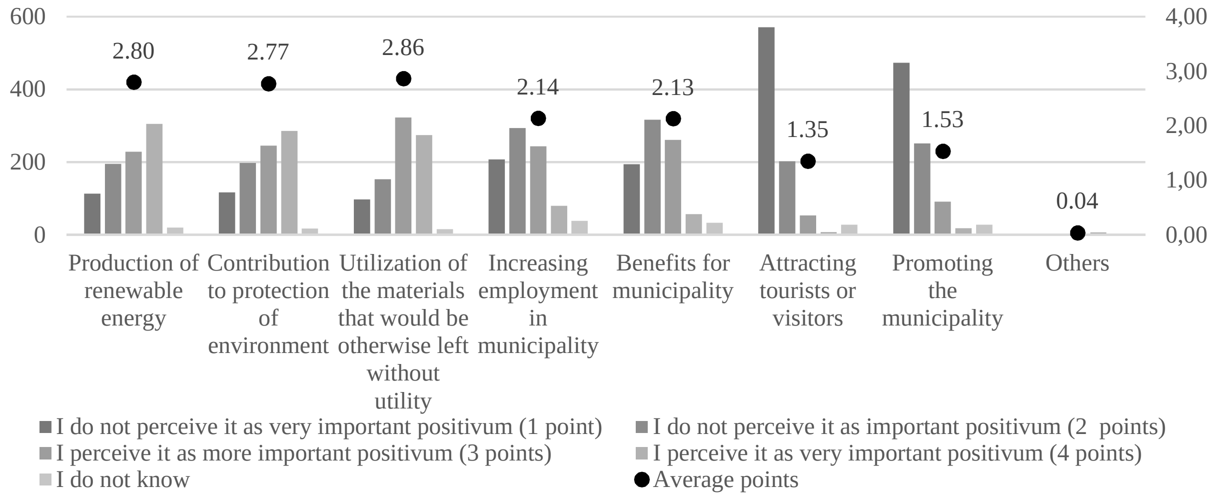
Table 2. Sample of BGS stations with number of respondents

Bělčice	96	Jankov	89	Dlouhá Ves	67	Meclov	79	Ptení	84
Houstoň	91	Kněževes	96	Lhota pod Libčany	97	Mořina	83	Určice	78

Source: Own elaboration, 2016

Local inhabitants were asked about their perception of positives and negatives that are related to BGS near their home. The higher is the average number of points given to the positive, the more intensively the respondents consider the advantage as important. From advantages, they fully acknowledge that BGS produce renewable energy (35.5%) and hence they contribute to the environment protection (33.1%). Also relatively high percentage of respondents notice these benefits mildly (26.5%, 28.5%, resp.). The most acknowledged advantage was the utilization of the materials that would be otherwise left without utility (such as disposal from animal production that would not have been used for fertilization). Then the ecological role is apprehended as important. Particularly respondents perceive as an advantage that the BGS produce renewable energy and hence contribute to the protection of environment. Respondents also perceive as more important positive that the BGS can increase the employment in municipality. Contribution of the BGS to the municipality (e.g. by heating of public houses) is not perceive to be that high. The results are displayed at Figure 1.

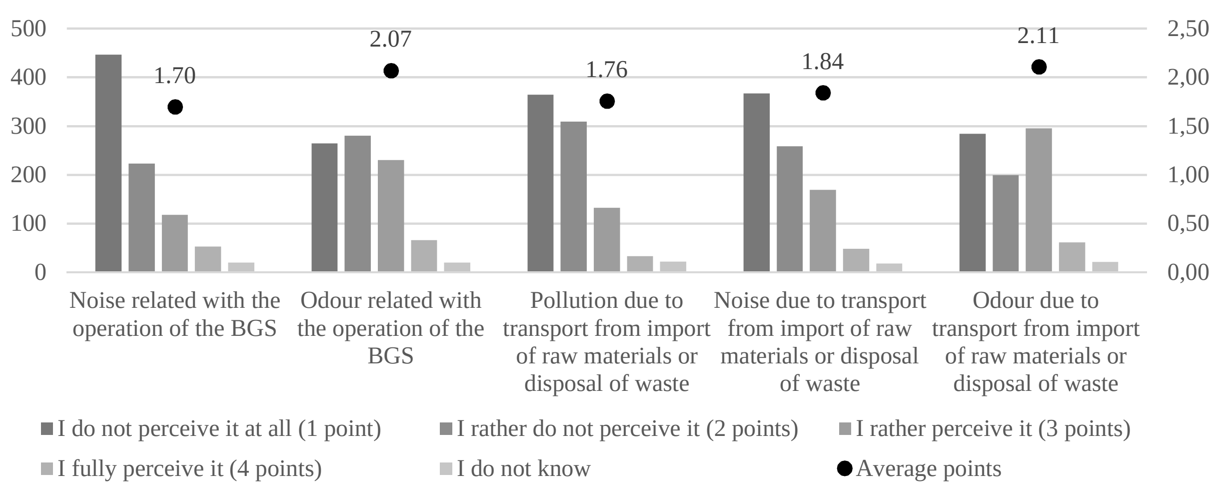
Figure 1. Indicate on the scale from 1 to 4 how you perceive following possible positives of BGS.



Source: Own elaboration, 2016

Negatives were not that significant for local inhabitants. As can be seen from Figures 2 and 3, the average points exceeded only mildly value of 2 (the higher is the number of points, the more is the disadvantage perceived as a problem). Mainly they objected against odour related with the transport of raw materials or disposal of waste (digestate). The average mark was 2.11 and mostly the respondents “rather perceive it” or “do not perceive it at all). Odour from operation of the BGS was on the second place among negatives, but its perception was only mild (26.7% of respondents marked that they rather notice it). Than they objected against noise from transport (average mark was 1.84). Operation of the BGS itself is perceived as relatively quiet. Pollution caused by transportation does not bother the locals much. Only 132 respondents rather perceive it and 33 perceive it.

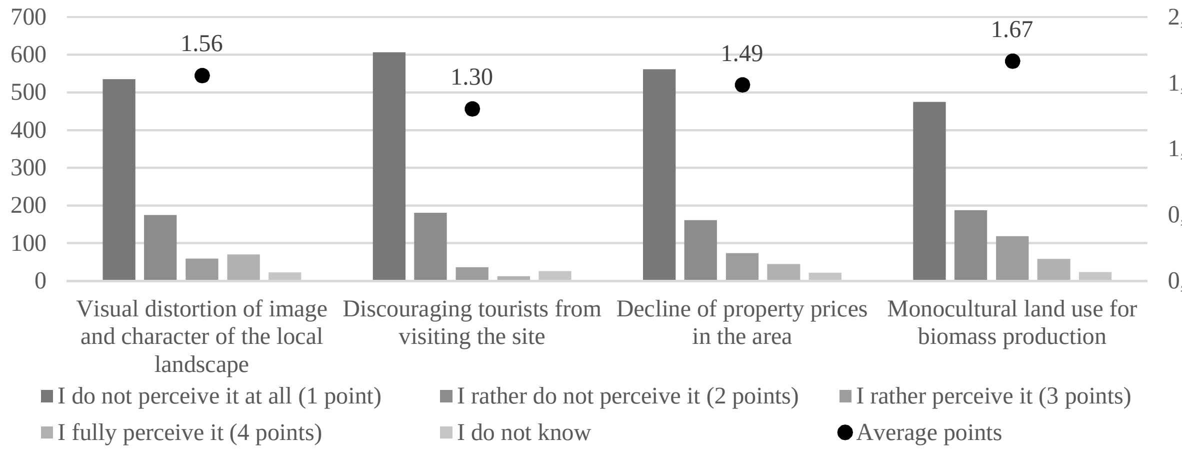
Figure 2. Indicate on the scale from 1 to 4 how you perceive following possible negatives of BGS (part 1)



Source: Own elaboration, 2016

Other disadvantages of the BGS were perceived less. Their average number of points was below 1.70. The most negatively perceived was the fact that the building visually distorts the image or character of the local landscape: in one way by the building of BGS itself (1.56 points) and in the second way caused due to the fact that planting of feed for the BGS causes changes in crop rotations procedures and monocultures of one crop for biomass occurs more often (1.67 points). Inhabitants mostly do not observe any decline of property prices in their area (1.49 points on average). Only 12 people thought that the presence of BGS discourages tourists from visiting the site. Mostly those respondents were from the surrounding of Jankov BGS.

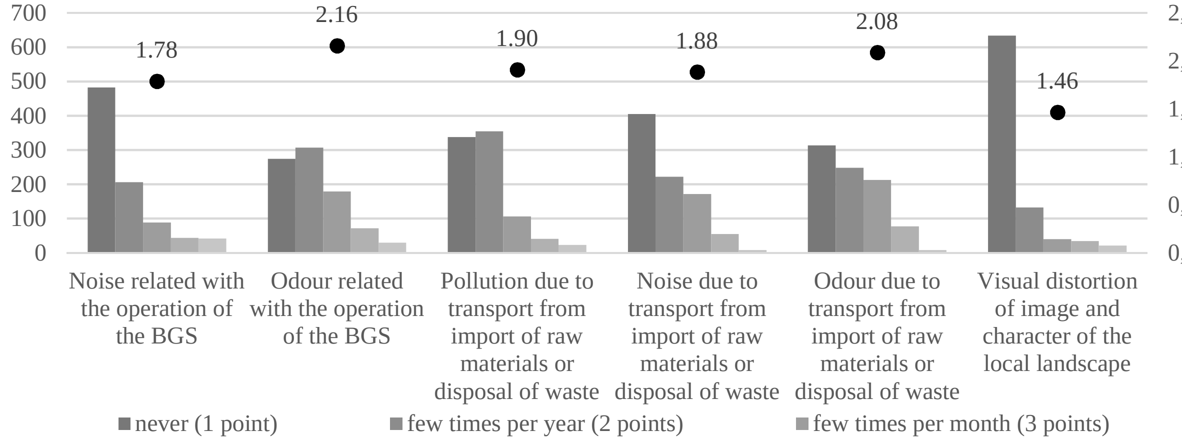
Figure 3. Indicate on the scale from 1 to 4 how you perceive following possible negatives of BGS (part 2)



Source: Own elaboration, 2016

Since mostly local inhabitants do not notice and are not bothered by many negative externalities from agricultural BGS, the discomfort due to the presence of BGS is perceived as low. Results are displayed at Figure 4. Noise related with the operation of the BGS causes permanent discomfort to 41 respondents (4.8%). Otherwise, the influence is not that intense. Few times per week 77 respondents (9.0%) notice odour from transport of raw materials or disposal of waste (digestate). Same problem bothers 24.7% of respondents only few times per month. On the other hand, respondents are mostly never or only few times per year bothered by the visual image of the BGS. Odour related with the operation of the BGS and pollution due to transport from import of raw materials or disposal of waste (digestate) were the only two negatives, when the answers "few times per year" exceeded the answer "never". The highest number of points, the more frequent is the distortion. Odour from operation of the BGS and due to transport were the most inconvenient negatives. It was followed by the pollution and noise from transport.

Figure 4. Discomfort due to the presence of BGS – How often are you disturbed by:



Source: Own elaboration, 2016

In summary, the position of the local inhabitants towards the presence of the BGS can be characterized as neutral, as they do not perceive much advantages or disadvantages of the BGS. Respondents mainly acknowledge that the BGS can utilize the materials that would have been otherwise left without utility (such as disposal from animal production not used for fertilization). Then the ecological role is apprehended as important. Particularly respondents perceive as an advantage that the BGS produce renewable energy and hence contribute to the protection of environment. We may suggest that this aspect shall be stressed during energy policy formulation. “Enhancive knowledge and understanding about renewable energy (for instance, the cost) would be conducive to win public acceptance of renewable energy deployment”, (Liu, Wang and Mol, 2013).

Respondents also perceive as more important positive that the BGS can increase the employment in municipality. However, the potential to create rural employment might not be that high as e.g. in China – see study of Yang and Chen (2014) who stated that “human labour contributes a great proportion to the total input, indicating that the biogas production has great potential to create rural employment opportunities with part of surplus labour being transferred to the biogas production sector.” Similar assumption that BGS can create new work places in the regions of high unemployment was also taken in Poland (Igliński, Buczkowski and Cichosz, 2015). Contribution of the BGS to the municipality (e.g. by heating of public houses) is not perceive to be that strong. This is true for developed countries where the need for alternative sources of heating is not significant. Unlike that, “biogas technology represents a sustainable way to produce energy for household, particularly in developing countries” (Ali el al., 2013).

Negatives were mostly not that significant. Mainly the inhabitants objected against odour related to the operation of the BGS or from transport of input / output materials, but only mildly. Only minority of respondents stated that they are bothered by odour or noise from BGS on daily (permanent) basis. This is a good news suggesting that requirements on the operation of the agricultural BGS given by the producer companies are met. This creates new opportunities for companies. As Herbes, Braun and Rube (2016) found, WTP of German consumers indicates that there are significant opportunities for providers of renewable heating to collect higher prices for products with preferential features such as the climate protection or the use of waste as a biogas substrate. This result can be relevant beyond the German energy market.

4. Conclusion

The aim of the paper was to assess based on primary survey how local inhabitants in the Czech Republic perceive the presence of biogas stations (BGS) near their homes. We can conclude that the position of the locals towards the agricultural BGS can be characterized as neutral, as they do not perceive much advantages or disadvantages of the BGS. They acknowledge that BGS can have certain environmental benefits, but do not consider them strongly important. Mostly local inhabitants notice odour from the transportation of input/output materials or from operation of BGS. However, both drawbacks can be minimized by compliance with prescribed procedures. Hence, the social impact of this diversification measure of RDP is not that significant. The challenge for future research is to monetary value the externalities related to agricultural BGS based on the opinion of the local people – e.g. by certain contingent valuation method as was done e.g. by Herbes, Braun and Rube (2016) in Germany.

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WHY PEOPLE USE HASHTAGS WHEN VISITING FARMERS´ MARKETS

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Annotation: A shorter organic food supply chain is providing environmental and social benefits. To support the continued growth of organics, greater emphasis should be put on farmers' markets and supply chain special projects. This calls for increasing the accuracy of organic market data collection. The analysis of people´s behavior helps us understand social, cultural and environmental issues surrounding customers' activities at farmers' markets. This paper´s objective is to identify motives that lead consumers with smart phones to use hashtags when posting photos related to farmer´s markets on the social network Instagram. Data were obtained using two methods. The first method was a structured interview with 136 users of the social network Instagram who created posts in relation to farmers' markets. The second was an analysis of 1,000 photos on Instagram where four evaluators (each 250 images) created the categories that define the content of hashtags in relation to their contributions to farmers' markets. Based on the semi-structured interviews, it was possible to identify four basic motivations for people's use of hashtags: (1) Expression of feelings, emotions and characteristics of the place and the products actually captured in the photo; (2) Expression of feelings, emotions and characteristics of places and products not captured on the photo; (3) To self-promote (show others where I am and what I am doing) and (4) To be seen as popular (using buzzwords,"cool" hashtags).

Key words: Farmers' Markets, Hashtag, Instagram, Social Network Analysis

JEL classification: Q13, D85, L66

1. Introduction

Food marketing and food consumption issues are very widely discussed in Europe and especially in the EU (Šrédl and Soukup, 2011; Martin and Danielsson, 2016). Farmers' markets can be considered a way of delivering fresh fruit and vegetables to areas that do not have direct access to this commodity (Bader et al, 2010; Foltz et al, 2012). Programs to promote food purchases at the farmers' markets to improve health of customers can be found in big cities such as New York (Payne et al, 2013).

Farmers'markets are very closely linked to organic food (Svoboda and Severová, 2015; Dodds and Holmes, 2017; Dias et al, 2016; Doležalová et al, 2016) that can be understood as a platform for long-term sustainable development of life quality (Dědina et al., 2014). The organic food market is growing rapidly in Europe; 10.3 million hectares is now devoted to organic food production (IFOAM, 2016). Consumers are beginning to realize the impact of food on health (Vukasovič, 2015; Costa, 2017). Research (Gumirakiza, Curtis and Bosworth, 2017) shows that customers are willing to pay more for products with local and organic attributes, which the Farmers Market provides (Pilař et al, 2016a). This is confirmed by the research of Pokorná, Pilař and Balcarová (2015), which shows the sensitivity of customers to quality, freshness, and healthfulness.

In farmers´ markets, customer relations plays a significant role, and it is necessary to understand customers' perception of personal assistance (Balcarová et al., 2016). One way to do this is through analysis the social networks and hashtags generated by customers in connection with farmers´ markets. Furthermore, it is necessary to increase the accuracy of organic market data collection (IFOAM 2016).

Instagram is widely used by farmers' market customers (Pilař et al, 2016a and Pilař et al, 2016b). Instagram is a social network that focuses on sharing photos and describing these photos. Today, (according to statistics), there are over 300 million active Instagram users (people who are logging on every day), and every day, an estimated number of 95 million photographs are uploaded to the site (Omnicoreagency, 2017). There are many motives for using Instagram. Sheldon and Bryant (2016) defined in their research categories as "Surveillance/Knowledge about others," "Documentation," "Coolness," and "Creativity." Users can include hashtags in the photo description -- words beginning with ”#“ are used to explain the photo. A deeper understanding of Instagram usage is very important because it helps us see the social, cultural and environmental issues surrounding farmers' markets from the customers' point of view.

This article followsup on the previous research (Sheldon and Bryant, 2016) with a more specific focus on farmer´s markets and an analysis of only hashtag use. The paper's objective is to identify motives that lead to the use of hashtags related to farmer's markets on the social network Instagram from the customer's point of view.

2. Materials and Methods

Data were obtained through two methods. The first method was a semi-structured interview with users of the social network Instagram who created posts in relation to farmers' markets. This interview was conducted with 136 respondents in three phases at 8 farmers' markets. The profile of a respondent was a customer in the target group that was attending a farmer's market. This respondent was approached with this question: “Are you creating the content on your Instagram account related to the farmers´ market?”. The semi-structured interview was conducted with 92 women (68%) and 44 men (32%). The age structure was divided according the analysis of demographic of social media platforms (Greenwood, Perrin and Duggan, 2017): 12 persons (13-18 years old), 86 persons (19-29 years old), 26 persons (30-49 years old), 12 persons (50-64 years old) and 0 person in the age 65+.

The customer could choose one of his own photos that he shared on the social network Instagram and was related to the farmers' market. The respondent explained the hashtags he used for this specific photo as well as the reasons for creating and sharing these hashtags.

The second research method was the analysis of 1,000 photos on Instagram where four evaluators (each evaluated 250 images) created the categories that defined the content of hashtags in relation to the contributions to farmers' markets.

For the determination of the motives, a modified basic division according to Sheldon and Bryant (2015) was used -- see Table 1.

3. Results and Discussion

Based on the results of semi-structured interviews, the most important reason for using hashtags in relation to farmers' markets can be identified as "Expression of feelings, emotions and characteristics of places and products that are not captured in the photo." This result is a combination of "Knowledge and experience for others" (121 points) and "To share my feelings and emotions which are not expressed on the picture" (82 points). For example, this category covers such hashtags as #happy, #fresh, #local, etc.

The second most important reason for using hashtags was "Expression of feelings, emotions and characteristics of the place and products that are captured on the photo," where the motivation is combination of "Knowledge for others -- characteristics of products (services) which are expressed on the picture " (112 points) and “To share my feelings and emotions which are expressed in the picture " (76 points). For example, they used the hashtags #vegetables, #fruit, #fresh, etc.

During the discussion about hashtags, there was a problem with the sorting of the #fresh, #healthy, etc. Respondents were not able to assign “expressed” or “not expressed” to the keywords.

An example might be a picture of the farmer's product where some of the respondents considered the product to be a fresh and healthy but some respondents consider these features to be unidentifiable from the photo.This could be because the categories associated with the expression of feelings, emotions and characteristics of the location and products is commonly seen as a verbal expression of their given situation that they want to share with others.

The third reason for using hashtags was the category “Satisfaction of the inner feeling associated with narcissism,” which can be identified by the area “to self-promote” (show to others, where I am and what I am doing) (118 points). Here the most commonly used hashtag was #farmersmarket, which was not created to identify the location, but primarily to share the message “I´m attending the premium event” (premium for the participant's point of view). The last category is “To be cool -- to become popular,” characterized by a buzzword or “cool” hashtag, for example, #foodporn (96 points).

Table 1. Motivation to use hashtags

Motivation	Absolute	Relative	Absolute	Relative
Knowledge and experience for others - characteristics of products (services) which are expressed on the picture	112	83.58%	989	98.90%
Knowledge and experience for others - characteristics of products (services) which are not expressed on the picture	121	90.30%	983	98.30%
Clear identification of the place, which is associated with the notification of location	62	46.27%	216	21.60%
To identify special events	36	26.87%	136	13.60%
To share my feelings and emotion which are expressed on the picture	76	56.72%	567	56.70%
To share my feelings and emotion which are not expressed on the picture	82	61.19%	679	67.90%
To document the world around me	36	26.87%		
To remember something important for me	26	19.40%		
To become popular (buzzword) It is cool hashtag	96	71.64%	683	68.30%
To self-promote (show to others, where I’m and what I am doing)	118	88.06%	782	78.20%
Help other people categorize photos for Instagram and for a better search.	16	11.94%		
Sample	134		1,000	

Source: semi-structured interview and picture analysis (2017)

Following the semi-structured interviews, three responses in the photos analysis which could not be evaluated were eliminated: (1) To document the world around me; (2) To remember something important for me and (3) Help other people categorize photos for Instagram and improve searching.

The results show that most users share hashtags for two reasons: 1. Knowledge and experience for others -- Characteristics of products (services) which are expressed on the picture and

2. Knowledge and experience for others - Characteristics of products (services) which are not expressed on the picture.

This finding is supported by the research of Giannoulakis and Tsapatsoulis (2016) and confirms hashtags are used to describe the visual content of an image. For those involved with farmers' markets, this is a very important finding because these hashtags might be used for creating machine learning algorithms or automatic image annotation. (Giannoulakis and Tsapatsoulis, 2015).

Another strong motivation for using hashtags is self-promotion (show others where I am and what I am doing). This supports the results of Moon et al. (2016), which identified a relationship between people with narcissism and the number of shared photos. "To become popular" (buzzword, "cool" hashtag) and "To share my feelings and emotions which are not expressed in the picture" have a similar representation that follows the motive "To share my feelings and emotions which are expressed in the picture."

The objective of this article was identification of the factors, not the exact statistic. This means not determining the exact percentage expression of individual categories or identifying the motives for the use of hashtags statistically, which was impossible with this methodology given the global use of Instagram and cultural differences. However, the important contribution of this article is a greater understanding of farmers' market customers' perceptions based on hashtags analysis in the basic categories of knowledge, experience and characteristics of products (services). These categories were analyzed by Pilař et al. (2016a) and Pilař et al. (2016b), but only as a statistical frequency without motives identification of users.

Due to this limitation, the order of importance of individual motives cannot be precisely determined, which is not critical in the interpretation of results based on the subsequent statistical analysis of the images in the order of millions. It is necessary to understand the basic areas of motivation: Customers are personally sharing their feelings, emotions and evaluation of farmers' markets in terms of product characteristics and self-promotion in an effort to be popular with their peers. These results can be used to capture and analyze Instagram users' perceptions in relation to farmers' markets across the world. Individual regions also can be examined in order to analyze different cultural points of view.

4. Conclusion

The results suggest that the analysis of hashtags related to farmers' markets is an important tool for understanding farmers´ markets customers, because these people are personally sharing their feelings, emotions and evaluation of farmers' markets in terms of product characteristics. Analysis of hashtags is an important complement to other methods of analysis that are based on the analysis of image content. According to the results of this research, it is not possible to adequately interpret all information because customers use hashtags to express feelings, emotions and characteristics of place and product which cannot be captured in the photo.

Based on this research, it is possible to identify four basic areas that define the motivation to use hashtags: (1) Expression of feelings, emotions and characteristics of the place and the products which are expressed on the picture and are actually captured on the photo; (2) Expression of feelings, emotions and characteristics of places and products that are not captured on the photo; (3) To self-promote (show to others, where I am and what I am doing) (4) To become popular (using of buzzword, "cool" hashtags).

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THE SAFETY OF INFORMATION AND COMMUNICATION TECHNOLOGIES IN THE CONTEXT OF EXISTING AGRICULTURE COMPANIES

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Annotation:

The aim of the present paper is to define the basic attributes of the use of ICT and design a procedure for assessing and evaluating efficient and safe use of ICT and the development of agriculture enterprise security policy. Another objective is the processing of data obtained from agriculture businesses that assess how ICT impact on the efficiency of enterprises, especially their impact on economic variables. Information risk analysis, we focus on developing proposals to increase information security companies. In selected agriculture companies with the lowest level of information security elaborate security policy to enhance information security. For the evaluation of the questionnaire survey were used statistical methods to determine the relevance and depending on the data collected to confirm or refuse the hypothesis of statistical indicators. For this purpose, we used MS Excel 2013 and subsequent statistical program Statistical Analysis System (SAS). The statistical methods we used the method further analysis of collected data, methods of synthesis of the results, comparative method and interview. We used descriptive statistics methods to obtain basic statistical characteristics.

Key words: Information and communications technology, agriculture enterprises, information security

JEL classification: Q16, Q19

1. Introduction

The term of information system is well-known and used in our modern period as well. Using of information system has reached all spheres of our existence, economy, production, and so on. It is not surprising that the term of information system is also penetrating into agriculture, where it can also bring quite a big contribution (Hennyeyová et al., 2010). The deficiency in processing of information uses a number of threats. The farms receive daily the quantities of smaller or larger invisible bats which violate great damages. Because of this fact, the field of information security has accrued. It deals with the complex protection of information that includes physical, personnel, object and administrative security. A number of new solutions are accumulating in the field of ICT, but the threats are increasing for secure systems at the same speed. Non-assurance of information may have consequences of irrecoverable loss and violation of the organization credibility (Sodomka, 2006), (Krch, 2005). Paper deals with the issue of the aspects of information security in the field of using information technologies and information systems. The information security is a very essential objective for all users of information technologies and information systems. In this context, the information security is the balance between risks and benefits in the form of performing activities electronically (Hofreiter, 2004). Paper defines the relationship between data and information, controlling and assorting of information assets and mainly the aspects of information security.

Information security is the process of data protection against accidental or deliberate misuse by people within or outside organizations, including employees, or even hackers (Stočes et al., 2016). Security breaches may involve various activities, e.g. web page corruption, computer virus infection, employee failure that inadvertently reveals your password, and so on (Strnád, 2009). Information security, according to the international standard ISO / IEC 27001, protects information against a wide range of threats to ensure continuity of business processes, minimize losses and maximize return on investment (Gurčík, 2004). Information security specifies forms and procedures for securing business information resources and defines it from the organization's security policy.

Frequent inspections of the current status of security measures - security audits are often lacking. The result is incomplete solutions to ICT and IS security. Information security has a multilateral character, it must take into account the interests of the owners of ICT systems, the needs of their users, as well as the rights of natural and legal persons whose data are processed in the systems (Siponen, 2000), (Khouri, 2009). There are a number of factors that can cause the malfunctioning of ICT systems and the degradation of data processed in them. Information security in the state sphere suffers from similar problems as in the private sector. In addition, state institutions do not have enough qualified people and cannot pay experts on information security (Šimek, 2008), (Benda et al., 2016).

Information security is the protection of information against threats and vulnerabilities to ensure a continuous and successful running of the organization's activities, minimize business risk and maximize the use of investment and business opportunities (Hennyeyová et al., 2013). Information security is not a managerial process that generates profits but is currently a prerequisite for running processes that are directly involved in generating profits. According to the definition of International Standard ISO / IEC 27001, information security includes and provides 3 main principles: confidentiality, integrity and availability. Confidentiality - information is not made available to and exposed to unauthorized persons, entities, or processes. Integrity - ensuring the accuracy and completeness of assets. Availability - ability to be available and usable at the request of an authorized entity. For the management of each enterprise, it is necessary to increase the protection of the assets and assets of the company, or to ensure that they are strictly insured against their being stolen (Šilerová et al., 2016)

2. Materials and Methods

In the processing of underlying data (primary and secondary), the available software products, including the rich offer of statistical procedures in the latest versions of Excel spreadsheets, SAS (Statistical Analysis System) used to use common quantitative and qualitative methods, input and output testing values. In addition to the statistical methods used for the creation of the thesis, basic statistical methods were used - method of analysis of acquired data, method of synthesis of obtained results and method of comparison and querying. Existence of dependencies between characters was verified by Chi-quadrate test.

It is an examination of qualitative-nominal (verbal) and ordinal (sequence) statistical characters - association and contingency. The association examines the dependence between alternate characters with two variations. Contingency deals with the investigation of the relationship between possible signs with more variations. Therefore, non-parametric data analysis methods have been applied. The search method is the most common and most commonly used method of collecting primary data in primary research. A questionnaire technique was developed for this purpose, which is the collection of data based on the responses of the companies surveyed.

The term questionnaire can be formulated as an exploratory, developmental and evaluation tool of mass and, in particular, rapid acquisition of information about knowledge, opinions or attitudes to the current issue and potential facts through the written testimony of the subject under review.

The aim of the questionnaire was to confirm or deny the established research hypotheses. The survey was attended by 32 enterprises. The data obtained from the questionnaire survey was processed and used. Their purpose was to analyze and evaluate the current state of information security of the company and to highlight the security issues related to the use of IT and the operation of IS. The respondents surveyed were agro-sector enterprises, where the key facts were the area of business activity, the focus of the SR agro-sector enterprises, the region, the legal form and, last but not least, the size of the enterprise according to the number of employees.

The survey was conducted in 2016 and was geared towards obtaining critical business information, basic information on information security, perceived information security, organizational security, security policy, security solutions, financial security for information security, informing employees about threats, financial losses in virus attack, enterprise security measures, risk analysis, business asset valuation, IT and IS security responsibility, awareness of the problem area, and preparedness to respond to possible security incidents. We assumed that:

The number of agro-sector enterprises that have a defined ICT security policy does not depend on the size of the enterprise by the number of employees.

The security measures applied in agro-sector enterprises do not depend on the existence of a dedicated financial budget for information security.

In the interpretations we proceeded from the following statement:

- p -value >= alpha (0.05) H0 we cannot reject it
- p -value < alpha (0.05) H0 we reject; we accept H1

Determining the theoretical abilities is based on a sentence on the independence of random phenomena A and B: $P(A \cap B) = P(A) . P(B)$, That is, if the characters A and B are independent, then they apply: $P(a_i b_j)=P(a_i) . P(b_j)$.

Estimation based on relative abilities (1):

$$\frac{(a_i b_j)o}{n} = \frac{(a_i)}{n} . \frac{(b_j)}{n} \Rightarrow (a_i b_j)_o = \frac{(a_i) .(b_j)}{n} \tag{1}$$

3. Results and Discussion

On the following lines we present the partial results of our survey. From the analysis of the sample, it can be said that each of the stakeholders is responsible for the safety. In some cases, however, this responsibility is only partial. The fact that 51% (65%) of enterprises have a person in the company responsible for IT and IS for their security and reliability is a clear and unmistakable one. Notable is the high rate of business (27. 65%), which lacks an IT manager.

On the other hand, the survey of survey respondents, in essence, supported the question of the person responsible for ICT, but often only in the milder form. A relatively large number of respondents thought they had an IT manager in the company. It should be noted that for some IT managers, at their discretion, the owner of the enterprise, the head of the economic unit, in a few cases was also surveyed by every worker using the computer, but most often they were mentioned in the surveyed sample as persons responsible for ICT - IT staff who are also responsible for the security of the business. We monitored the dependence between the features of ICT manager in agriculture enterprises and the number of employees according to the results of, we conclude that the number of agriculture enterprises in which IT manager or director of the IT department is independent of enterprise size, there is no dependency amongst the number of agriculture enterprises in which the IT manager or director of the IT department and the size of the enterprise do not exist (Table 1).

Table 1. Percentage of enterprises with the person responsible for ICT

Statistic	DF	Value	Prob
Chi-Square	2	1.43	0.4098
Likelihood Ratio Chi-Square	2	1.27	0.3843
Mantel-Haenszel Chi-Square	1	0.0296	0.8634

Source: according to the authors

Access to information security solutions is influenced, amongst other things, by the business sector or its size as measured by the number of employees in agro-sector enterprises. Agribusinesses, based on their standpoint on IT security issues in their business, should set out their approach to addressing information security. Figure 1 shows the percentage of approaches to the information security solution in agro-enterprises, 19% of the agro-sector enterprises do not deal information security at all, 11% of enterprises deal with information security exclusively by their own forces, 35% of enterprises deal with information security exclusively by the external supply company and the same number of enterprises Solves information security in cooperation with external companies.

Figure 1. Percentage expression of approaches to information security in agriculture businesses

Source: according to the authors

In the observation of the dependence between qualitative features, we find that the area of business influence does not affect the first three ways of solving information security, so there is no dependence between the field of activity and these ways of solution information security (Table 2).

Table 2. Testing the dependence between the first, second and third way of information security and the area of business activity

Information security	DF	Value	Prob
Not at all	5	7.39	0.1949
Supply company	5	9.91	0.0820
An external firm	5	4.70	0.4261

Source: according to the authors

Table 3. Testing for dependence between the fourth way of information security and the area of action

Statistic	DF	Value	Prob
Chi-Square	5	27.4196	<0.0001
Likelihood Ratio Chi-Square	5	21.0357	0.0008
Mantel-Haenszel Chi-Square	1	7.96	0.0062
Phi Coefficient		0.5929	
Contingency Coefficient		0.5100	
Cramer's V		0.5929	

Source: according to the authors

Table 3 shows the results of testing the dependence between the latest way of information security solutions where, as you can see, a business area affects the way IT solves exclusively by its own forces, so there is dependence between the area of activity and thus the information security solution. The Pearson coefficient shows a strong dependence of the 4th way of addressing the safety from the area of action, the values of the Kramer and Phi coefficients, which are also calculated, confirm that there is also a strong dependence between the characters.

A well-designed, formally defined and accepted security policy is the cornerstone of the consistency, efficiency and quality of information security solutions. From the analysis of the sample to 80.77% of the agro-sector enterprises concerned has no security policy in the field of ICT, 19.23% of businesses have an ICT policy in the field of ICT. Only the agricultural enterprises (40.00%), 26.67% of the food businesses, 20.00% of the food businesses and others and 13.33% of the agricultural enterprises and others are represented by the sample analysis. From the point of view of the agro-sector enterprises according to the legal form, only 13.33% of all cooperatives and 37.5% of the limited liability company have this document drawn up in their company. As far as the comparison of enterprises is concerned, the developed security policy has 18.75% of small enterprises and 40.00% of medium-sized enterprises, the sample survey is not the micro-enterprise that would have developed this document.

4. Conclusion

Information technology is presently present in every sector of human activity as it helps us to solve the most diverse tasks. They also affect very sensitive areas such as finances, personal data, and so on. So, you need to deal with security and protection. The need to secure property, to which we undoubtedly advise sensitive data, is as old as trying to get to foreign property against the will of its owners and enriching it in its favor. The development of technologies, on the one hand, improves current security methods and, on the other hand, they are developing new, more efficient, safer but more complicated methods for everyday use. The method used should always be adequate to what is to be ensured. For farms, the most important asset value is the data they have created with whom they work. Everything else can be replaced (computer after malfunction, computer program after reinstalling the computer). In approximately 65% of enterprises, a certain person is named for the reliable and safe operation of IT and IS, and over 42% of these businesses use ICT outsourcing services, ie outsourced services. The same percentage of enterprises has a built-in local computer network, and all agribusinesses are connected to the Internet without restriction, which was a positive finding. More than 52% of businesses have assessed that their level of information security solutions is good or excellent. 19% of enterprises have indicated that they do not do it at all in terms of access to information security solutions, only 12% deal with information security exclusively by their own forces and the remaining enterprises with the same share alone or in cooperation with external firms. Negative attitude has been taken by agro-industry businesses on the question of the existence of a financial information security budget that only 8% of surveyed businesses have set up and in the development of a security policy that only 20% of businesses have. Up to 77% of companies of their employees regularly report on threats from the Internet. The most common security incidents in 86% of the agro-industry are unsolicited mail, and 85% of businesses are power outages. The level of security measures is relatively high in agro-industry enterprises, particularly in the case of antivirus protection, up to 73.08% of enterprises have virus protection software installed on their personal computers and 27% of enterprises use security systems. A knowledge-based economy supports the development of education, science and research in order to make efficient use of available resources. Effective business management in all aspects of its security supports this challenge to a considerable extent, because the economic impact of security incidents of unprotected or poorly protected assets directly or indirectly affects these resources.

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AGRICULTURAL LAND FUND IN MOTION

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Annotation: The aim of the paper is construction of the model for development prediction of the extent and structure of agricultural land fund in the CR. Using the advanced statistical methods from the time series analysis adaptive approaches domain, long-term tendencies of farmland fund structure development have been described over the 1999-2015 years, as considered in the context of historical data from 1920-2015, and future development forecasts have been constructed. Two exponential smoothing methods have been applied in the forecasts for non-seasonal time series with local linear trend (the Holt method) and the double exponential smoothing (the Brown method). The solution starts from identification and analysis of relevant factors causing reduction of area and degradation of farmland, especially the loss of arable land. Primarily these are: area development, changes in the forest land area, water and wind erosion, soil compaction, acidification, dehumification and soil contamination. In most cases the degradation process causes a chain reaction and the degradation factors follow each other. Considering the 80% self-sufficiency in the basic foodstuffs production it is necessary to preserve the soil production capabilities not only by its protection but by the economically tolerable structure, too. Position of the Czech Republic as concerns the farmland fund development has been compared with selected EU Countries regarding the farmland fund structure and the per capita arable land area.

Key words: Agricultural land fund, arable land, exponential smoothing methods, prediction, CR, EU.

JEL classification: C22, Q10, Q15

1. Introduction

Soil and its non-production functions are decisive for the landscape´s state and development, for every society´s needs satisfaction and for the quality of life in every area. (Procházková, Prášilová and Hloušková, 2016) Definition of the CR agricultural land fund and its breakdown is given by the Act No. 334/1992 Coll., on the Protection of Agricultural Land Fund. The agricultural land fund contains all kinds of farmed land, i.e. arable land, hop gardens, vineyards, gardens, orchards, permanent grassland and land that has been and should continue to be farmed, but is not temporarily cultivated. From a pan-European point of view Czech agriculture belongs to the submountainous up to the mountainous type. A larger part of the agricultural land fund, i.e. 60 %, is located on the less fertile down to infertile soils. 40 % of the arable land are above average of fertility. Out of those 60 % of land area there are 53 % below average of fertility and 6 % of arable land is an area quite unsuitable for farming (Report, 2015). The share of farmland on the total area has gradually been reduced in favour of non-agricultural land. Changes in the level and structure of agricultural land fund have been caused by heterogeneous factors. Most often these are the climatic, natural, ecological, economical or socio-political factors. The authors (Nowak and Schneider, 2017) have analysed three types of agricultural soils environmental degradation and they are looking for a way of the assessed risks elimination. These are: erosion, flood and loss of nutrients in the soil. The global demand for farm products is growing but farmland area is dropping. As the authors (Levers et al., 2016) make us aware, this contradiction will require a further intensification of agricultural production, but using new instruments. These should be aimed at gentle handling and maintenance of the existing land fund. Based on the expected expansion of population numbers and the current tendencies in land fund transfers in the area given, authors (Ivan and Chebenova, 2016) offer a model of ecological stability considering changes in the land fund structure.

Agriculture and the landscape of Czech country have changed much over the last 60 years. Mainly the collectivization and consolidation of lands negatively affected the natural balance of ecosystems. Authors (Homoláč and Tomšík, 2016) offer the political connections, leading into the new ownership relationships after 1989. Large plots with small amounts of landscape elements are typical for farmed landscape in CR. Such areas then are excessively endangered by soil erosion. The too long interruption of ownership relations is still unfavourably reflected in some primary producers in the relation to soil and in the neglect of soil protection (Píšková and Touš, 2013). As Doucha (2015) is putting it: „Agricultural land use in the context of soil protection belongs to the most discussed topics in the Czech Republic – especially at present, when the negative consequences of the land ownership changes in the previous generations cause significant problems to the agriculture. The consequences of poor access to land use are reflected in the increasing erosion risks, the decreasing biological activity, the compaction of soil, etc. In the CR, 67 % of the farmland area are potentially threatened by some form of water erosion. About 18 % of farmland in CR are potentially endangered by varying strength of wind erosion. The agrarian structure depends not only on the character of agricultural development, but on the access to different resources, too. Land use structures may vary substantially over time (Strojny and Piecuch, 2017). Gebeltová, Řezbová and Pletichová (2014) point to regional differences in the changes of agricultural and non-agricultural land fund areas in the Czech Republic. They see the main reasons in the soil quality, in the level of subsidies and in the prices of land. The impact of specific subsidies on the land fund and on the economic outcomes within the Czech Republic regions has been assessed by Pletichová and Gebeltová (2015). Featherstone and Baker (1988) warned already in 1988 that, „subsidies increase income from agricultural production and thereby increase demand for input, including land. " Píšková and Touš (2013) call the irreversible loss of land area a serious problem with all the negative impacts. Land seizures are directed mainly on flat areas with fertile soil, along roads and in the vicinity of towns. The protection of land is an essential part of the EU agricultural policy. Currently, soil degradation is under way in most of the EU Member States, threatening sustainable land use (Borská and Kadlecová 2015).

2. Materials and Methods

The aim of the paper is construction of the model for development prediction of the extent and structure of agricultural land fund in the CR. Two exponential smoothing methods have been applied in the forecasts for non-seasonal time series with local linear trend (the Holt method) and the double exponential smoothing (the Brown method). The solution starts from identification and analysis of relevant factors causing reduction of area and degradation of farmland, especially the loss of arable land.

2.1 Data sources

The statistical analysis here is based on the resources of Czech Statistical Office and the Ministry of Agriculture of Czech Republic. Using advanced statistical methods from the domain of time series analysis adaptive approaches, the long-term development tendencies of the agricultural land fund structure over the 1999-2015 period have been described. These are considered in the context of historical data from the 1920-2015 years and future development forecasts are being constructed based on them. For the comparison of agricultural land fund use between the Czech Republic and the EU Countries data from the FAOSTAT database have been applied.

2.2 Analytical smoothing of time series

Besides trend functions, the adaptive models, too, have been applied in the trend description. Models of this type quickly react on the structural changes occurring in time and they are very suitable for prognosticating the future course of the time series loaded by irregularities and breaks in the trend. The adaptive models start from the presumption that, the latest data from a time series are those most valuable for the future development forecast construction (Hindls et al., 2008). In the present study, one adaptive approach has been exploited actually, the exponential smoothing method, that is. The parameter estimates can be obtained using the least squares method in the following format:

$$\sum_{k=0}^{n-1}\left(y_{n-k}-T_{n-k}\right)^2 w_k = min, \tag{1}$$

where y_{n-k} are the empirical values at the (n-k) moment; k = 0, 1, . . . , n-1 is the age of the data at the moment n; T_{n-k} is the trend component at time (n-k); w_k are the weights that are inversely proportional to the „age" of the data, i.e., with the age growing, the weight is decreasing. It is assumed at that time that, the w_k weight is an exponential function of the type

$$w_k = \alpha^k, \quad 0 < \alpha < 1, \quad k = 0, 1, ..., n-1, \tag{2}$$

where the α quantity is the balancing constant. As it is clear from the **(2)** relationship, the weights w_k are an exponential function of the age of the data. Estimates of the trend model component T_{n-k} can be obtained using the minimized expression:

$$\sum_{k=0}^{n-1}\left(y_{n-k}-T_{n-k}\right)^2 \alpha^k ....min. \tag{3}$$

For prediction of the T_{n-k} trend type two exponential smoothing methods have been used. For non-seasonal time series with constant trend in short sections of the series the Brown method has been used, with the α smoothing constant from (0;1) interval. In case, the trend in short sections was approximately linear, the procedure was a double exponential smoothing procedure. In case of the Holt smoothing procedure, two smoothing constants, α and γ are being estimated, from the (0;1) interval:

$$\alpha_{Holt} = \alpha(2-\alpha); \quad \gamma_{Holt} = \frac{\alpha}{2-\alpha} \tag{4}$$

The α parameter adjusts the level of adaptation and it means, the higher is its value, the faster the method reacts on changes in the data. The γ parameter defines the levels of smoothing of the local linear trends (Montgomery, Jennings and Kulahci, 2008). Real economic criteria should form the basis for decision making based on the appropriate trend function type. The paper offers a criterion based on the comparison of sums of squares of deviations of the empirical time series values from the smoothed ones – Mean Absolute Percent Error (MAPE):

$$\mathrm{MAPE} = \frac{100}{n}\sum_{t=1}^{n}\frac{|y_t - y'_t|}{y_t} \tag{5}$$

y_t, y'_t . . . empirical and smoothed t. s. values.

The model with the lowest MAPE criterion values is generally preferred. Statistical computations have been performed in the STATISTICA software, version 13, environment.

3. Results and Discussion

3.1 Loss of the farmland

Total area of the agricultural land fund of the Czech Republic as of Dec 31, 2016 was 4,208,374 hectares, which is 53.4 % of the CR land fund total area (7,886,973 ha). Farmland area is permanently declining. The largest decreases took place in the Fifties till Seventies of the 20th century, following the farmland seizures for construction of buildings, transport networks and establishment of the surface and underground mines. Following the loss of the predominantly most fertile land, agriculture began to spread through the Seventies of the last century to less productive zones. Since

1990 until 2000 the loss of farmland was comparatively small and uniform (approximately by 1 thousand hectares annually). The sudden increase of the agricultural land fund area in 1997-1999 (total increase of four thousand hectares) results from the more accurate land fund record, when the areas formerly recorded as „other land“ were included into the agricultural land category. Since 2000 till 2007 the loss of farmland increased, by about 4 to 5 thousand hectares annually. This loss is due first of all to transfers to the „other“ and „construction“ areas (construction of line structures – motorways, industrial zones etc.) and to the land intended for forest functions (forest land).

Since 1921 the farmland area lost 886 thousand hectares, which is a loss of more than 20 %. The development of changes in the farmland structure since 1995 is shown in the Table 1.

Table 1. Land use in Czech Republic (ha)

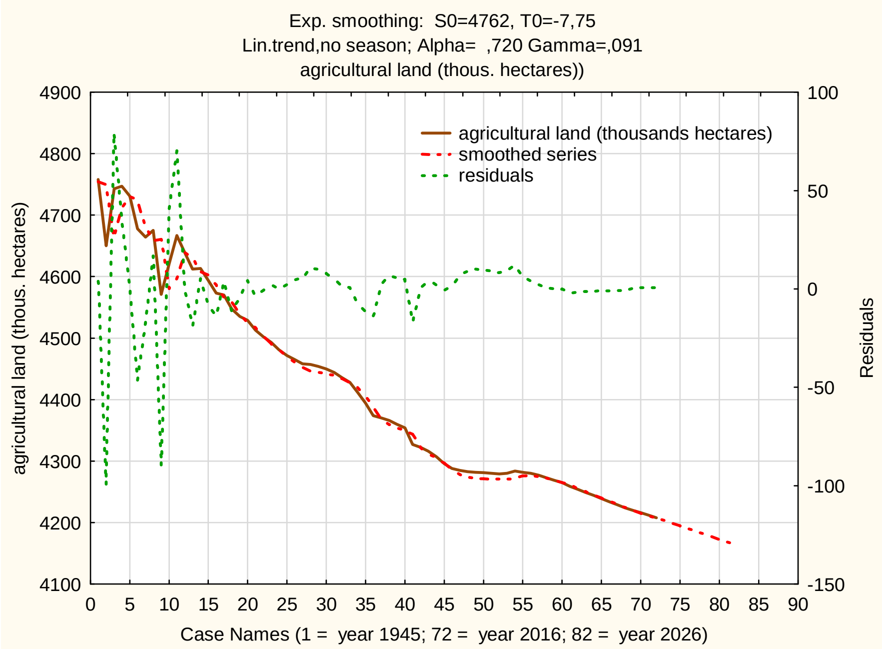
State	**Land area (ha)**			**Change (%)**		**Predictions***	
	1995	**2005**	**2015**	**1995/2005**	**2005/2015**	**2020**	**2025**
Arable land	3,142,642	3,047,250	2,971,957	-3.04	-2.47	2,928,501	2,887,210
Gardens	158,698	161,811	163,785	+1.96	+1.22	165,797	167,152
Orchards	50,091	46,992	45,613	-6.19	-2.93	44,546	43,492
Hop fields	11,425	10,967	10,149	-4.01	-7.5	9,927	9,655
Vineyard	15,632	18,907	19,811	+20.95	+4.78	20,731	21,664
Permanent grassland	901,333	973,791	1,000,620	+8.04	+2.76	1,063,575	1,093,265
Agricultural land total	4,279,823	4,259,481	4,211,935	-0.48	-1.12	4,189,835	4,167,873
Forest land	2,630,129	2,647,417	2,668,392	+0.66	+0.79	2,670,727	2,678,680
Built-up areas	129,294	130,077	132,119	0.61	+1.57	133,408	134,715

Source: authors, using Czech Statistical Office, 2017
**Own estimates based on the Holt exponential smoothing*

Since 2000 to the present, 67,941 hectares of farmland have been lost, i.e., 11.6 hectares daily, at average. Partially (of 55 %) this loss is caused by expansion of the forest areas and water areas. The extent of forest land expanded over the period 1990 till 2000 by 7 thousand hectares. A larger part of the increment follows the more accurate land fund record and the transfer of areas afforested by spontaneous air seed from the original farmland category into the forest land, especially in mountainous regions. Since 2000 till 2010 a significantly larger increase of forest areas appears, namely by 20 thousand hectares. Between 2010 and 2015 expanded the extent of forest land more rapidly, by 11 thousand hectares (mostly this was caused by the afforestation of low productivity areas and enclaves of unused farmland). The development and prediction of farmland acreage in the Czech Republic is presented in Figure 1. and Table 1. The Holt adaptive model applied here showed MAPE = 0.2440 %.

However, the losses of farmland have been caused by housing development, too. In 2006 already, the CR was found above average of the EU Countries as to the extent of covered surface per year (243 m^2 per head). Considering the location of Czech Republic in the middle of Europe, there is a considerable interest of private developer companies in continued surface coverage aimed at construction of transition centres and warehouses. Thanks to the Amendment to the Land Fund Protection Act certain success has been reached so far in slowing down the area coverage growth rate.

Figure 1. Development (1945 - 2016) and prediction (2017 - 2026) of agricultural land area in Czech Republic



Source: authors, using Czech Statistical Office, 2017

3.2 Loss of arable land and decrease of the share of arable land on farmland area

Arable land covered 2,965,606 hectares in CR on Dec 31, 2016 (i.e. 37.6 % of the total farmland area). Since 2000 there has been a considerable loss of arable land (117,000 hectares total). The loss of arable land is presented in Table 1. The Holt adaptive model applied for predictions showes MAPE=0.3889 %. The percentage of arable land on farmland area has been decreasing slowly over the years and it was 70.5 % at Dec. 31, 2016. In comparison with other EU Countries this is one of the highest figures. Higher levels within EU in the year 2014 comparable were recorded in Poland, Latvia, Hungary, Sweden, Malta, Denmark and Finland. As given by Pletichová and Gebeltová (2015), "the common agricultural policy within the EU Countries motivates the farmers to the extension of permanent grassland areas using subsidies." The percentage of arable land on farmland area is decreasing and slowly increasing is the permanent grassland area in the CR what can be seen in the Table 1. Over the Sixties till Seventies of the last century the permanent grassland area decreased, plowing up was taking place. Since the start of the Nineties only, the increase of permanent grassland areas has taken place, on the contrary. The highest year-to-year increase within the period studied was recorded in 1966, 44 thousand hectares namely, what makes it an increase by 5 %. After 2000 the permanent grassland areas go on increasing at a slower rate, at an average of 2.8 thousand hectares annually. While in 1995 the permanent grassland areas covered 21.1 % of farmland area, in 2015 the share was 23.8 %, with an increment of almost 100 thousand hectares.

4. Conclusion

Despite the fact that farmers keep drawing attention to the growth of built-up areas on the farmland by construction of hypermarkets, warehouses by the motorways, houses and roads, over the last 20 years most of their land has been cut off by forests, the area of which has increased since 1995 by more than 38 thousand hectares. According to the Agriculture Minister Jurečka (2017), afforestation should go on, since some land is not suitable for farming (e.g., the erosion-endangered localities in flood areas). According to the Czech Statistical Office data, since 1989 lost the agricultural land fund more than 84 thousand hectares (a loss of 2 %).

The time series adaptive models chosen show a further decrease of agricultural and arable land in the CR and they offer a significant fundament for further aiming of the primary farm production and the Czech agrarian policy. To a degree this decrease is caused by the expansion of forest areas and water areas and partially by development. The built-up land irretrievably loses not only its own production capacity, but it also ceases to fulfil ecological functions. Outcomes of the analyses are in line with conclusions by Borská and Kadlecová (2015). Also Píšková and Touš (2013) warn that, frequently the highest quality plots are being built over. Soil sealing together with uncontrolled expansion of housing estates and with erosion currently create the biggest problem of the agricultural land fund. Among the soil sealing causes there always are, according to Pletichová and Gebeltová (2015) and Píšková and Touš (2013) comparatively low prices of plots, when it better pays to the developers to build on the greenfields, than to exploit the more expensive plots in the built-up area of the town or to regenerate older buildings (the so-called brownfields). Through the loss of farmland also biodiversity in the area decreases, relief of the territory changes as well as the complete face of the landscape. New buildings also bring a potential danger of contamination of the neighbourhood by waste water and the environmental burden by increased traffic volumes.

The percentage of arable land on farmland area in the CR is decreasing and the areas of permanent grassland slowly expand, what is in line with the EU Common Agricultural Policy, motivating farmers to the expansion of permanent grassland areas using subsidies. By the way, according to the analyses by Pletichová, Gebeltová (2015), the relationship between the volume of subsidies paid (SAPS + TNA, AEM, LFA) and the soils production capability change (difference GARE) has not been confirmed.

The Strategic Framework of the Czech Republic until 2030 supports indirectly the total loss of arable land. However, this should concern the low quality land with low yields. The State also should go on, according to the Strategic Framework, supporting transfers of arable land into the ecologic farming regime. Currently, only about 2 % of the Czech arable land area have fallen there. The question of self-sufficiency and efficient exploitation of the agricultural land fund is important for every country. Foodstuffs and feed production are directly connected with the acreage of farmland. The Czech Republic has reported the decrease of farmland fund acreage on a long-term basis and the forecast models chosen have extrapolated this trend.

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CONSUMER PREFERENCES IN THE PURCHASE WINE IN THE CZECH REPUBLIC

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Annotation: Wine as commodity is offered in endless diversity, at prices from low to very high. There are many factors that affect the quality of wine. The popularity of wine and its consumption is increasing in all countries, including the Czech Republic. The wine offer is as varied as wine itself. Wine category is a comprehensive basis used for monitoring consumers´ behavior, when choosing and buying wine. Wine is difficult and confusing product for the consumers, because they cannot predict how wine will taste after purchase. The subject of the article is to evaluate consumer preferences when purchasing wine in a population over 18 years old in the Czech Republic. Data acquired in the framework of quantitative research and questionnaire survey has been selected as a methodological tool. Respondents were persons over 18 years from the general population of the Czech Republic. The questionnaire concerning wine preferences has been answered by 1179 respondents, 40% of men and 60% women. Research shows that almost 90% of the respondents buy wine for personal use. The research was realized through personal questioning in the spring of 2017. A wide range of wine-buying respondents helped to find the dependencies of the monitored characteristics. The contribution of this paper is to present current research in the monitored field.

Key words: wine, consumer, consumption, preferences, market

JEL classification: F18, Q13, Q18

1. Introduction

Wine is a natural product that is the result of many biochemical reactions and its quality can be very different. (Torija et al., 2001). This quality is primarily determined by the interaction between grapes, fungi, yeasts and bacteria that begin their processes in the vineyard and they continue during fermentation until packing (Fleet, 2003). Torija et al. (2001) adds that technology also has a share in wine quality. King et al. (2014), on the basis of their research, concluded that the variety of wine types is related to the altitude in which it was grown. Rainfall by the authors plays a smaller role.

Since the aim of this work is to find out how customers are behaving in the wine market in the Czech Republic, it is necessary first to focus on consumer behavior in general. "In terms of the product category, emphasis, sensitivity to quality, cost, or social effect can be distinguished" (Koudelka, 2005).

The decision-making process for purchasing goods and services is generally influenced by innovation in the production, distribution, purchase and sale of products (Regnerová and Šálková, 2014). The standard bottle content is 0.75 l. This quantity originates in historic shops between Europe, Great Britain and America. Each region used a different measurement system, but three quarters of a liter could be used as a multiple of each of them. The content of barrique barrels - 225 liters - can be spilled into 300 bottles (Stevenson, 2011). Consumers when buying bottled wine, however, is influenced by many other factors. Sales of wine in bottles in stores dominated the final consumer, even though the import of foreign wines are increasingly using large-volume containers (Regnerová and Hes, 2016).

In 2015, wine production in the world amounted to 274 million hl (EU 166 million hl), total vineyard area stabilized at 7.53 million ha and world wine consumption is estimated at 240 million hl of wine (Ministry of Agriculture, 2016). Consumption of wine in the Czech Republic in the years 2007 - 2015 ranged between 18.5 and 19.5 liters per person. In 2015 it was 18.9 liters, which was a slight decrease compared to the previous year (CSO, 2015).

The aim of this paper is to evaluate consumer preferences when purchasing wine in the Czech Republic. A theoretical background of the examined issue is provided in the Introduction. The Materials and Methods section of this paper describes how the primary research was conducted as well as the samples of respondents. Section Results and Discussion presents the obtained results and discussion and comparison of the final results of own research with similar studies in the context of the conducted issue.

2. Materials and Methods

The theoretical basis for this paper was based on secondary sources, which were derived from scientific articles, professional literature and relevant Internet resources. Primary data was obtained through quantitative research conducted in 2017. The questionnaire survey among respondents from the general population over 18 years of age (n = 1179) was used by the data collection technique. The target group was chosen with respect to the age limit from which a citizen of the Czech Republic is allowed to consume and buy alcohol.

Basic identification signs monitored group surveyed consumers can be defined as follows.

Table 1. Absolute and relative sociodemographic factors of respondents

Variable	Category	Absolute	Relative
Gender	Females	708	60.05
	Males	471	39.95
Age	Up to 30 years	454	38.51
	30 – 49 years	438	37.15
	50 – 64 years	215	18.24
	65 years and over	72	6.11
Highest Education Level	Secondary without graduation	165	13.99
	Secondary with graduation	514	43.60
	University	500	42.41
Permanent Residence	Prague	379	32.15
	Central Bohemian Region	184	15.61
	Ústí Region	93	7.89
	South Bohemian	172	14.59
	Hradec Králové Region	47	3.99
	Pardubice Region	40	3.39
	Vysočina Region	32	2.71
	Plzeň Region	67	5.68
	Moravian-Silesian Region	19	1.61
	Karlovy Vary Region	34	2.88
	Liberec Region	48	4.07
	South Moravia Region	38	3.32
	Zlín Region	11	0.93
	Olomouc Region	15	1.27
Size of Place of Residence	up to 500 inhabitants	82	6.96
	501 – 2 000 inhabitants	127	10.77
	2 001 – 10 000 inhabitants	150	12.72
	10 001 – 20 000 inhabitants	187	15.86
	20 001 – 50 000 inhabitants	114	9.67
	Over 50.000 inhatinants	119	44.02

Source: Own research, 2017

Statistical Means for Analysis

The contingency table is used for transparent visualization of mutal relations of two statistical variables. The type of the contingency table is given by the number of rows r and the number of columns s, is means $r \times s$ (Hindls, 2007). Obviously, $\chi^2$is a measurement of the overall dissimilarity of n_{ij} and m_{ij}. The bigger the difference between observed and expected values, the higher is the test statistic χ^2.

$$m_{ij} = \frac{n_i . n_j}{n} \quad \textbf{(1)}$$

$$\chi^2 = \sum \frac{(frequency\ observed - frequency\ expected)^2}{frequency\ expected} \quad \textbf{(2)}$$

$$\chi^2 = \sum_{i=1}^{r} \sum_{j=1}^{s} \left(n_{ij} - m_{ij}\right)^2 / m_{ij} \quad \textbf{(3)}$$

i and *j* are indexes of rows and columns, n_{ij} are observed marginal frequencies, n_i and n_j are marginal totals, *n* is grand total of observations, m_{ij} are expected frequencies. We compare χ^2 to the critical value χ^2 with a chi-square distribution of *(r-1)(s-1)* degrees of freedom at the chosen level of significance. We reject the hypothesis if χ^2 is larger than the table value. This test is valid asymptotically, and thus can only be applied if there is a sufficient number of observations. All expected values ought to be higher than one (Hendl, 2009); at the same time, the table should not contain more than 20% theoretical incidence rates (frequencies) of less than 5. Where zero values occur in any of the fields, we proceed to analyze a derived table, created by merging a small number of categories (Hendl, 2009). Cramér's *V* was used to determine the degree of association between the variables.

The following hypotheses, the summary of which is given in the table, were tested during data analysis.

Table 2. Overview of established hypotheses

Nr. of Hypothesis	Text of Hypothesis
$H0_1$	The fact that a respondent buys bottled wine occasionally does not depend on his gender.
$H0_2$	The fact that the respondent sometimes buys bottled wine does not depend on his age
$H0_3$	The fact that the respondent sometimes buys bottled wine does not depend on his education
$H0_4$	The preference of the color of bottled wine does not depend on buying the wine on the respondent's gender
$H0_5$	The preference of the color of bottled wine does not depend on buying the wine on the respondent's age.
$H0_6$	The preference of the color of bottled wine does not depend on buying the wine on the respondent's education.
$H0_7$	The choice of bottled wine in the purchase in terms of own experience and respondent habit does not depend on his gender.
$H0_8$	The choice of bottled wine in the purchase in terms of own experience and respondent habit does not depend on his age.
$H0_9$	The choice of bottled wine in the purchase in terms of own experience and respondent habit does not depend on his education.
$H0_{10}$	Choosing a bottled wine when purchasing in terms of its quality does not depend on the gender of the respondent.
$H0_{11}$	Choosing a bottled wine when purchasing in terms of its quality does not depend on the age of the respondent
$H0_{12}$	Choosing a bottled wine when purchasing in terms of its quality does not depend on the education of the respondent.
$H0_{13}$	Choosing a bottled wine when buying in terms of its variety does not depend on the gender of the respondent.
$H0_{14}$	Choosing a bottled wine when buying in terms of its variety does not depend on the age of the respondent.

$H0_{15}$	Choosing a bottled wine when buying in terms of its variety does not depend on the education of the respondent
$H0_{16}$	The choice of bottled wine at purchase in terms of its price does not depend on the gender of the respondent
$H0_{17}$	The choice of bottled wine at purchase in terms of its price does not depend on the age of the respondent
$H0_{18}$	The choice of bottled wine at purchase in terms of its price does not depend on the education of the respondent
$H0_{19}$	The choice of bottled wine when purchased from the point of view of its country of origin does not depend on the gender of the respondent.
$H0_{20}$	The choice of bottled wine when purchased from the point of view of its country of origin does not depend on the age of the respondent.
$H0_{21}$	The choice of bottled wine when purchased from the point of view of its country of origin does not depend on the education of the respondent.

Source: Own research, 2017

3. Results and Discussion

Almost 88% (87.9%, 1036 people) reported that the total number (n = 1179) of respondents with alcohol experience sometimes bought bottled wine for their personal use or attention. More than one-tenth (12.1%, 143) responded negatively to this issue.

Table 3. Purchase of bottled wine in relation to the monitored variable

Independent variable	Value types	Resulting value
Gender	Degree of freedom	1
	Critical value	3.84
	$\chi2$	36.95
	Cramer´s *V*	0.18
	Hypothesis $H0_1$	Rejected
Age	Degree of freedom	3
	Critical value	7.81
	$\chi2$	8.37
	Cramer´s *V*	0.08
	Hypothesis $H0_2$	Rejected
Highest Education Level	Degree of freedom	2
	Critical value	5.99
	$\chi2$	56.52
	Cramer´s *V*	0.22
	Hypothesis $H0_3$	Rejected

Source: Own research, 2017

Table 3. summarizes the results of hypothesis testing H01, H02 and H03. In all cases, the zero hypothesis can be rejected. It showed dependence on all three variables examined. Wine is purchased by more women than men (weak to medium dependence), what is agreed by Bruwer, Roediger, Herbst (2017)*“The majority of cluster members are married females, mostly, high school or college educated”*. Wine purchases are declining with age (but this dependence is very weak) and purchases are growing with the education of respondents (weak to medium dependency).

In terms of color, respondents prefer 60.1% (623 people) to the most white wine. 19.0 (19.0%, 197) of respondents prefer red wine and pink wine to 5.8% (60). 15.1% (156) persons have no choice.

Table 4. The preference of choice of bottled wine in terms of color in relation to the monitored variable

Independent variable	Value types	Resulting value
Gender	Degree of freedom	3
	Critical value	7.81
	$\chi 2$	33.89
	Cramer´s *V*	0.18
	Hypothesis $H0_4$	Rejected
Age	Degree of freedom	9
	Critical value	16.92
	$\chi 2$	64.23
	Cramer´s *V*	0.14
	Hypothesis $H0_5$	Rejected
Highest Education Level	Degree of freedom	6
	Critical value	12.59
	$\chi 2$	12.25
	Cramer´s *V*	0.08
	Hypothesis $H0_6$	Confirmed

Source: Own research, 2017

Table 4. summarizes the results of hypothesis testing H04, H05 and H06. It was not possible to reject the H06 null hypothesis, so the dependence of choosing the color of the wine on the education of the respondents was not proven. The remaining two zero hypotheses may be rejected, thus weak to medium dependence on the respondents' age and gender has been demonstrated. In general, respondents prefer the most white wine (623 respondents).

Women preferred white and rose wine more than men, men preferred red or they had no clear opinion. Dependency was weak to medium. Depending on the age of the respondents was manifested mainly in the greater preference of white wine in the group to 30.

Table 5. Wine selection criteria

Variable	Value types	Experience and habit	Quality	Variety	Price	Country of origin
Gender	Degree of freedom	1	1	1	1	1
	Critical value	3.84	3.84	3.84	3.84	3.84
	$\chi 2$	10.28	0.18	5.69	1.26	0.70
	Cramer´s *V*	0.09	0.01	0.07	0.03	0.02
	Hypothesis	$H0_7$ Rejected	$H0_{10}$ Confirmed	$H0_{13}$ Rejected	$H0_{16}$ Confirmed	$H0_{19}$ Confirmed
Age	Degree of freedom	3	3	3	3	3
	Critical value	7.82	7.81	7.81	7.82	7.8
	$\chi 2$	6.18	6.8	10.52	11.36	1.75
	Cramer´s *V*	0.07	0.08	0.10	0.10	0.04
	Hypothesis	$H0_8$ Confirmed	$H0_{11}$ Confirmed	$H0_{14}$ Rejected	$H0_{17}$ Rejected	$H0_{20}$ Confirmed
Highest Education Level	Degree of freedom	2	2	2	3	2
	Critical value	5.99	5.99	5.99	5.99	5.99
	$\chi 2$	4.03	15.05	20.52	4.08	4.59
	Cramer´s *V*	0.06	0.11	0.14	0.06	0.06
	Hypothesis	$H0_9$ Confirmed	$H0_{12}$ Rejected	$H0_{15}$ Rejected	$H0_{18}$ Confirmed	$H0_{21}$ Confirmed

Source: Own research, 2017

Another test question was the criteria that respondents apply when choosing a wine. Respondents could give more choices.

The largest number of respondents 34.52% (407) stated their own experience as a criterion. This is where only a low gender dependence has been demonstrated, with women applying this criterion more. The quality of the wine was mentioned as a criterion for the selection of 33.25% (392) respondents. Here, it has been shown a weak dependence on education - this criterion is more often chosen by college students. 30.20% (356) respondents reported the variety criterion. This has been shown to be a low dependency on all the observed characteristics: From the point of view of gender, women report this criterion more often, according to age, it is more often chosen by people under the age of 50, according to education, then college educated.

The price was listed as 29.77% (351) respondents. The null hypothesis could be rejected by depending on age. A weak dependence on this variable shows that this criterion is more important for respondents outside productive age (up to 30 and over 65). Charters and Pettigrew (2006) mention *"that income and age are causal influences associated with consumers´ involvement levels for wine. It was found that older people with a higher income were more likely to be highly involved with wine"*.

Only 17.30% (204) respondents reported the country of origin. None of the zero hypotheses could be rejected, so it did not prove to depend on any of the monitored characteristics of the respondents. Papadopoulos and Heslop (2002) similarly focused research also turned their attention to the aspect that the positive association (quality, higher price of wine) occur mainly in famous regions. Batt and Dean (2000), on the other hand, have found in their research that when deciding to purchase wine, the place of origin is a crucial feature that decides to purchase.

4. Conclusion

The contribution of the paper is to present the current results of primary research focused on consumer behavior and preferences when buying bottled wines in the Czech Republic, which is a very important factor in the current competitive environment in the food market. The wine market in the Czech Republic is very diverse and dynamic. Domestic production is insufficient to meet the demand for wine, and it gives the room a large amount of wine imported. Research results can help organizations, traders and consumers orient in the domestic wine market. In addition, research results could have a major impact on the decision-making processes of planting and wine production for domestic winemakers and producers. They would then be able to compete in the competitive environment of the wine market in the long run.

The theoretical contribution of the article is to point out the consumer behavior in buying bottled wines in the Czech Republic as a commodity that has an important position on the domestic and international market. The practical contribution of the article is the presentation of the results of a questionnaire survey conducted with consumers (n = 1179) who buy wine in the Czech Republic.

A certain limiting factor of the article is the fact that the research was carried out only within the Czech Republic. Possible direction for further research is the orientation on wine offer within the retail network in the Czech Republic.

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COMPARISON OF BEER PRODUCTION IN EUROPEAN COUNTRIES, DEPENDING ON THE TRANSFORMATION EFFICIENCY OF INPUTS INTO OUTPUT

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Annotation: The aim is to identify the most (the least) efficient country in relation to the performance of other countries analyzed in terms of the production of beer. The first part of the article is devoted to the basic descriptive characteristics of the selected individual indicators of beer industry used to calculate the technical efficiency of the brewing industry in the European countries within and outside the European Union.

Subsequently, all the countries are compared at the basis of the achieved output oriented technical efficiency calculated by the Cobb-Douglass production function. This function was based on panel data for the period 2010-2015.By the constructed stochastic model, we can evaluate the impact of individual input variables on output. Examined is 31 European countries. For input parameters have been selected total consumption of beer in selected European countries, consumption total, on-trade and off-trade, employment in the sector and the number of active breweries. The output is represented by the production of beer.

Key words: Beer, Beer production, Brewery, Effectivity, Production effectivity, Technical efficiency

JEL classification: A1 General economics, A10 General

1. Introduction

Beer is one of the oldest drinks and is in the top three most popular drinks of the world. Leaving aside the first two, which are water and tea, beer is the most popular beverage in the world. In ancient Mesopotamia Sumerians even worshiped the goddess of beer called Ninkasi (Black, 2006).

The brewing process uses malted barley and/or cereals, unmalted grains and/or sugar/corn syrups (adjuncts), hops, water, and yeast to produce beer (Abass, 2012).

Globalization followed upon the opening of several major markets like China, Russia, Eastern Europe and India – has greatly impacted the international beer industry. While in 2000 most breweries were focused on the home market and limited number of neighboring countries, there has been a race among industry leaders for global reach (Gammelgaard and Dörrenbächer, 2013).

The brewing industry has experienced massive changes over the last decades. Industry concentration has increased dramatically, and the leading brewing groups have globalized their operations across virtually all countries (Madsen, Pedersen and Lund-Thomsen, 2016)

Global changes in consumption have been mirrored by changes in beer trade. Form most of the 20th century, beer trade was largely domestic and made up 2% of global beer consumption. International beer markets and trade have fundamentally changed in the 21th century. The volume of beer exported more than doubled over the past two decades – from around 6 billion liters in 1990 to around 15 billion in 2014 (Swinnen, 2017).

At present, China is the largest beer producer in the world and the most popular style of beer is rice lager. Production of China is almost double the production of the world's second-largest beer producer, the US. The beer production in China converted per capita represents less than half of the beer production converted per capita in USA (Rivers, 2017). However, the highest beer consumption is in Europe. In the first 20 countries with the highest consumption of beer, there are 17 European, sovereignly led by the Czech Republic, where the annual consumption of beer per capita is 143 liters. Higher beer consumption in European countries is mainly due to the tradition in production and drinking of this beverage. That is why the European brewing industry grew by 73% between 2008 and 2013. That is why the European brewing industry grew by 73% between 2008 and 2013.In 28 European countries, 7397 breweries are registered, employing 2.3 million people. Tax revenues from beer consumption reached more than € 22.9 billion (The Brewers of Europe, 2016).

Technological change and economic efficiency are tightly linked. As potential sources of economic growth, both technological change and improvements in efficiency are of interest to economists and policy makers (Kerkvliet, 1998).

Because of these facts the article deals with beer brewing, more precisely the technical efficiency of beer brewing in selected European countries.

The aim is to identify the most (the least) efficient country in relation to the performance of other countries analyzed in terms of the production of beer.

2. Materials and Methods

Data for the analyzes are obtained from the Beer statistics 2016 edition, published by The Brewers of Europe in November 2016. This statistic was based on National brewers' association data and Eurostat.

For the calculation is used the model of the production limit expressed by Cobb-Douglas production function, which is constructed on the basis of panel data for the period 2010-2015.

$$\ln Y = \beta_0 + \sum \beta_n \ln x_{ni} + (v_i - u_i) \qquad \textbf{(1)}$$

where:

ln Y_i - Is the logarithm of the output of the production boundary for the i-th country,

x_{mi} - Is (k x 1) a vector of values for known functions of inputs of the i-th country during the reference period,

β_n - It represents the estimated parameters of the model of stochastic frontier production,

v_i - Is a random variable that has a normal distribution N (0,1),

u_i - Is a non-negative random variable that represents a component of technical inefficiency (Aigner, Lovell and Schmidt, 1977).

The maximum likelihood estimates of the production function parameters and the technical efficiencies are computed using LIMDEP, FRONTIER4.1version, and STATA software packages (Coelli, 1995).

There are many authors focusing among other things on technical efficiency. What the technical efficiency really is we discussed with some authors.

Briec, Comes and Kersten (2006) are explaining that the technical efficiency degree measure of a production unit permits to surround if this last one can increase its production without consuming, at the same time, more resources, or reduce the use of at least one input by conserving at the same time, the same level of production.

Production unit is effective technically if, from the inputs it possesses, it produces the maximum of possible outputs or if, to produce outputs given quantity, it uses the smallest possible quantities of outputs (N'Gbo, 1991; Atkinson and Cornwell, 1994).

Firm cannot be 100% efficient economically if it is not 100% efficient technically and simultaneously 100% effective allocative (Farrell, 1951).

The economic efficiency of a production system is made up of two components, technical and allocative efficiency. Crudely defined, technical efficiency is the physical component of the production system which deals with the maximization of output from the physical combination of inputs, and allocative efficiency is the optimization of the production process which takes into consideration input-output price relationships (Makombe et al., 2011).

The product of technical efficiency and allocative efficiency is simply an economic efficiency (Farrell, 1957).

Because of this it is necessary to observe technical efficiency in every production processes not only in production of beer.

3. Results and Discussion

Before the technical efficiency analyzes we analyze selected beer variables by descriptive statistic calculations for the first and last year of panel data (2010, 2015). Use of descriptive statistics (Table 1.) allows us to interpret data more easily. It also allows a better understanding of the presented results.

Table 1. Descriptive statistics for year 2010 and 2015

Variable	Mean	Median	Standard Deviation	Coefficient of variation	Minimum	Maximum
production10	79.840	71.983	42.864	54%	14.166	181.319
production15	78.614	68.868	45.089	57%	12.638	185.324
consumption10	70.618	70.361	26.559	38%	12.700	148.823
consumption15	68.665	68.448	26.762	39%	11.689	149.009
employment10	0.039	0.037	0.026	65%	0.003	0.121
employment15	0.038	0.033	0.024	65%	0.003	0.116
actBeweries10	0.824	0.520	0.906	110%	0.015	4.213
actBeweries15	1.575	1.243	1.466	93%	0.012	7.563
onTrade10	36.258	36.000	18.219	50%	6.000	69.000
onTrade15	34.161	35.000	17.334	51%	8.000	67.000
offTrade10	63.742	64.000	18.219	29%	31.000	94.000
offTrade15	65.839	65.000	17.334	26%	33.000	92.000

Source: own counting, SAS software is used

The average beer production in liters per inhabitant in the selected countries of the EU in time horizon of 2010 – 2015 is falling from 79.89 liters/inhabitant to 78.61 liters/inhabitant. Variability measured by standard deviation is rising from 42.86 liters/inhabitant (54% from the average) to 45.09 liters/inhabitant (57% from the average). The growth of variability proves that disparities in beer production are growing within the selected countries of the EU. In 2010 the value of median of beer production (71.98 liters/inhabitant) proves that more than a half of the analyzed countries has the beer production lower than the average for the countries. In 2015 the value of median exceeds the value of the average in production, thus more than a half of the analyzed countries reaches higher beer production than the average in the given year. In 2010 Ireland reaches maximum beer production (181.32 liters/inhabitant), in 2015 the Czech Republic (185.32 liters/inhabitant). Minimum beer production in both monitored years has Turkey (14.17 liters/inhabitant in 2010 and 12.64 liters/inhabitant in 2015).

The average beer consumption is falling from 70.62 liters/inhabitant in 2010 to 68.66 liters/inhabitant in 2015. Disparities explained by variability among analyzed countries in beer consumption slightly rise (26.56 liters/inhabitant in 2010 and 26.76 liters/inhabitant in 2015). In both analyzed years consumption median is (70.36 liters/inhabitant in 2010 and 68.45 liters/inhabitant in 2015) lower than the average of beer consumption, thus more than a half of the analyzed countries has beer consumption higher than the average for the countries. This means that the average is influenced by existence of extreme values in a negative meaning. The Czech Republic reaches in both years maximum in beer consumption (148.82 liters/inhabitant in 2010 and 149.01 liters/inhabitant in 2015). Minimum value of beer consumption is represented by Turkey (in 2010 12.70 liters/inhabitant and in 2015 11.69 liters/inhabitant).

In 2010 the average value represents direct employment in beer industry 0.039% from the overall population and ranges at ± 0.026% (65% from the average). In 2015 it falls to 0.038% and ranges on the interval 0.024% (65% from the average). The half of the analyzed countries has in both years direct employment in beer industry lower than the overall average value (0.037% in 2010 and 0.033% in 2015). It means that the average is influenced by existence of extreme values in positive meaning. In the monitored years maximal direct employment has Malta (in 2010 0.121%, in 2015 0.116%), minimum Turkey (in 2010 as well as in 2015 0.003%).

In 2010 the average value of active breweries is 0.824 per 100000 inhabitants with variability of 0.906 breweries per 100000 inhabitants (110% from the average). In 2015 it rises to 1.575 per 100000 inhabitants with variability 1.466 breweries per 100000 inhabitants (93% from the average). The growing variability explains deepening disparities among the analyzed countries. 50% of the countries has in 2010 as well as in 2015 lower number of active breweries than the average value of the countries (0.520 per 100000 inhabitants in 2010, 1.243 per 100000 inhabitants in 2015). In both years Switzerland has maximum number of active breweries (4.213 per 100000 inhabitants) as well as in 2015 (7.563 per 100000 inhabitants), minimum number has Turkey (0.015 per 100000 inhabitants in 2010 and 0.012 per 100000 inhabitants in 2015).

The average value of beer consumption on trade is in 2010 36.26% from the overall beer consumption in the country whereas it ranges on the interval ± 18.22% (50% from the average). In 2015 beer consumption on trade falls to 34.161 % from the overall consumption in the country and ranges on the interval ±17.33% (51% from the average). In the first analyzed year 2010 a half of the countries has consumption on trade lower than the average for the countries (36%), in the second analyzed year a half of the countries has consumption on trade higher than the average (35%). Maximum value of beer consumption on trade reaches in 2010 Portugal (69% from the overall beer consumption), in 2015 Ireland (67% from the overall beer consumption). Minimum value of beer consumption on trade reaches Latvia in 2010 (6% from the overall beer consumption), in 2015 Estonia (8% from the overall beer consumption).

The average value of beer consumption off trade is growing from 63.74% from the overall beer consumption in 2010 to 65.84% from the overall beer consumption in 2015. Variability of beer consumption off trade, measured by standard deviation in time horizon of the analyzed years decreases from 18.22% from the overall consumption (29% from the average) to 17.33% from the overall consumption (26% from the average). A half of the analyzed countries has in 2010 beer consumption off trade up to 64% from the overall consumption, in 2015 up to 65% from the overall consumption. In 2010 maximum beer consumption off trade has Latvia (94%), minimum Portugal (31%). In 2015 maximum beer consumption off trade has Estonia (92%), minimum Ireland (33%).

Comparison of the EU countries based on measurements of effectiveness of transformation of selected inputs to the outputs represented by beer production

Position of countries on the beer market is evaluated not only based on the most important indicator, thus beer production, but also depending on how effectively the countries transform their inputs connected with beer market to the final output represented by production. The goal is to find out if the countries with the highest production simultaneously transform their inputs to the final output effectively. We use the model of stochastic frontier function (SFA). The function is classic Cobb-Douglas production function whereas the model is constructed based on the data panel from 2010 to 2015. The given approach is evaluated as an interesting alternative view at the evaluation of effectiveness and position of the EU countries on beer market. As the advantage of the approach we may consider as well gaining supposed parameters of the production frontier model and its adequate interpretation. Provided that it is Cobb-Douglas production frontier, parameters of the model represent coefficients of elasticity of the output considering the given input.

Model of production frontier is as a whole statistically significant (Prob > chi^2) and production function has the following form:

ln Production = 4.305 + 0.78 ln Consumption + 0.013 ln Employment + 0.011 ln ActBreweries + 0.255 ln OnTrade + 0.395 ln OffTrade

Table 2. Stochastic frontier analysis

			Wald $chi^2(5)$ = 78.93			
Log likehood = 180.89448			Prob> chi^2 = 0.0000			
Production	Coef.	Std. Err.	z	P>|z|	95% Conf.	Interval
Cunsumption	0.7802845	0.1015033	7.69	0.000	0.5813417	0.9792273
Employment	0.0127694	0.0393204	0.32	0.745	-0.0642972	0.089836
ActBreweries	0.0107083	0.0172405	0.62	0.535	-0.0230825	0.0444992
OnTrade	0.2548169	0.077806	3.28	0.001	-0.10232	0.4073139
OffTrade	0.3950237	0.1762804	2.24	0.025	-0.0495205	0.7405269
_cons	4.305733	1.072123	4.02	0.000	2.204412	6.407055

Source: own counting, STATA software is used

Values of the coefficients can be interpreted as percentage change of the output caused by percentage increase in the given input (Table 2). If beer consumption increases by 1%, we can suppose increase in beer production by 0.78%, whereas influence of the given variable is statistically highly significant. Significant influence on beer production have indicators like beer consumption on trade and off trade. If beer consumption on trade increases by 1%, we can await increase of the whole production by 0.255%. If beer consumption off trade increases by 1%, we can await the overall increase in production by 0.395%. Influence of the indicators like employment and active breweries on production is statistically insignificant.

Thanks to the model of stochastic frontier border production function we can suppose in the five monitored years from the data panel output oriented technical effectiveness with which the analyzed countries transform the given input indicators to the final output. As the order of the countries, based on reached technical effectiveness, is the same for all the analyzed five years, within interpretation we focus on the last year of the monitored period, year 2015.

Division of multiplicities of supposed technical effectiveness for the analyzed countries is presented in table 3, whereas these are one-level division of multiplicities. The countries are, based on the value of technical effectiveness, divided into eight intervals. The value of technical effectiveness equals one and represents model, most effective country on the beer market.

Table 3. Division of multiplicities of supposed technical effectiveness

Stochastic frontier	
Efficiency score	2015
0.20 - 0.30	5
0.30 - 0.40	11
0.40 - 0.50	8
0.50 - 0.60	3
0.60 - 0.70	1
0.70 - 0.80	1
0.80 - 0.90	1
0.90 - 1	1
Mean	0.439
Minimum	0.247
Maximum	0.952
Standard deviation	0.168

Source: own counting, STATA software is used

On the interval with the lowest technical effectiveness there are five countries: Malta, Italy, Latvia, Cyprus, Switzerland. The most countries are situated on the interval with technical effectiveness from 0.3 to 0.4, where the following 11 countries belong: France, Slovakia, Turkey, Greece, Norway, Finland, Luxemburg, Sweden, Lithuania, Spain. From this interval the number of countries in the following intervals gradually decreases. Technical effectiveness from 0.4 to 0.5 is reached by eight countries: United Kingdom, Poland, Romania, Hungary, Austria, Croatia, Germany and Estonia. In interval with technical effectiveness from 0.5 to 0.6 there are three countries: Slovenia, Portugal and the Czech Republic. In the last four intervals there is only one country with multiplicity. Technical effectiveness belonging to the interval from 0.6 to 0.7, is reached only by Denmark (0.681). On the interval from 0.7 to 0.8 there is Ireland (TE=0.732). In the interval with technical effectiveness from 0.8 to 0.9 there is the Netherlands (TE=0.839). The highest TE, ranging from 0.9 to 1, is reached by Belgium (TE=0.952). Belgium is therefore country which most effectively uses their inputs, connected with beer market and transforms them to the final outputs, thus beer production. Based on the division of multiplicities presented in table 3, we can see that the most of the analyzed countries reaches rather low values of TE and does not utilize their inputs effectively. The average technical effectiveness for the countries is 0.439, it may possibly be distorted by existence of extreme values in positive meaning.

In conclusion we focus on the comparison of the order of the countries depending on the level of beer production and reached level of technical effectiveness. We verify assumption that the countries reach high production due to effective transformation of input indicators. Most countries, which reach higher positions as for the level of beer production, as well hold higher positions as for the technical effectiveness.

Table 4. Ranking of countries according value of production and TE

Country	**Rank-production**	**Rank-TE**
Belgium	2	1
Czech Republic	1	5
Italy	30	30
Malta	27	31
Netherlands	4	2
Slovakia	22	25
Turkey	31	24

Source: own counting, STATA software is used

On the first place of the ranking, according to the beer production, there is the Czech Republic, which has the fifth position in ranking of the technical effectiveness, though. Higher effectiveness of transformation of the inputs into outputs in case of the Czech Republic would lead to even higher level of production. Belgium is on the second place according to the beer production although they transform their inputs most effectively of all the analyzed countries (but not like the model TE≠1). The Netherlands holds the second position in TE but fifth position in production. Slovakia is approximately on the same positions in both rankings, on the 22nd and 25th place (low level of production and low effectiveness of transformation). Italy and Malta hold the ending places in rankings, it means they have low production level and they do not use their inputs effectively. Verified assumption was not proved within all the countries, though, the exception may be for example Turkey, which has the lowest beer production compared to other countries, even though according to TE it is placed on the 24th place from 31 analyzed countries.

4. Conclusion

By analysis of the model of stochastic frontier production function we resulted in conclusion that from the given input indicators the significant influence has only indicators which explain consumption. Thus, only increase in consumption via better quality products, marketing and so forth we can provide the increase in production. Assumed values of technical effectiveness explain that most countries do not use their inputs effectively. In the most numerous interval there are 11 countries and it has frontier of TE from 0.3 to 0.4. In the last four intervals of TE (0.6 – 0.7; 0.7 – 0.8; 0.8 – 0.9 a 0.9 – 1) there is only one country. The most effectively transforms to the final output = beer production Belgium. In the last part of the paper we verify the assumption that countries reach high or low level of beer production due to effective or ineffective transformation of input indicators. From the given ranking, except some countries like Turkey for example, we may confirm that countries which have higher places according to the level of beer production, have higher positions according to the technical effectiveness as well with smaller deviations.

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REGIONAL LABELLING SYSTEMS IN AUSTRIA: RECOGNITION OF THE SO SCHMECKT NIEDERÖSTERREICH BRAND AMONG CONSUMER´S CHARACTERISTICS

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Annotation: Current popularity of regional and local food products is the result of consumer's pressure on food quality and alternative for those who prefer local products to global ones. This paper builds on previous papers published by authors in this area and the region of Austria and Lower Austria. Lower Austria is an example of working regional branded systems. The importance is particularly for geographically isolated areas and published results could be used in other European regions, i.e. in the Czech Republic. The results show that the brand So schmeckt Niederösterreich is mostly recognized by women (66 %) and respondents with high school and apprenticeship (71 %) and young and middle-aged customers (66 % or 65 %, resp.). Therefore, the most important target group for the Lower Austrian Government are women, younger and middle-aged consumers, and consumers with secondary education. The main aim of this article is also to compare the research results with other regional labelling systems in Lower Austria and neighbouring regions - South Moravian Region and Vysočina Region in the Czech Republic - for possible use of a system like the brand *So schmeckt* in the Czech Republic.

Key words: Marketing, Branding, Food Labelling, Regional Labelling System, Lower Austria, So schmeckt Niederösterreich

JEL classification: Q13, M31

1. Introduction

Popularity of regional and local food products is the result of consumer´s pressure on food quality and alternative for those, who prefer local products to global ones. This article is focused on one of the associations of brands due the branding´s Aaker´s theory - recognition - of the regional labelling system *So schmeckt Niederösterreich* among consumers in Lower Austria. Kögl and Tietze (2010), among others, state that, market saturation from both global as well as local products, product indistinguishability, the increasing awareness and demands of consumers. Developing regional brands and certifying goods is one of the ways regions are seeking to react to new marketing trends. Van Huylenbroeck, Mettepenningen (2011) says, that the goal of the regional branding is creating typical image for the region and to improve the competitive ability. By McEntee (2003), regional branding of food is the result of consumers´ pressure on food quality and alternative for those, who prefer local products to global ones. As Hollis (2008) points out, regional branding of food can be based on several pillars, e.g. local culture, traditions and habits, nostalgia but on the advantages in logistics etc., too. As for regional food, La Trobe (2001) sees advantages for the consumers in freshness and in case intermediaries in supplying chain are left out, in quality food production for reasonable prices. He also thinks that regional food branding can be significant mainly for distant regions depending on agricultural production; thus, those systems can bring economic improvement to them. Regional food brands seem to be a suitable opportunity for small and middle-sized local or regional producers; they produce quality food products but their weak aspects (e.g. because of lack of knowledge or high costs) lie in wrong communication with customers not informing them about this fact. Regional brands are among other things connected to development of local identity (GoDu, 2015). Messely et al. (2015) states that implementation of regional branding would increase region's attractiveness for local inhabitants in all areas of their activities – working and family life as well as leisure time. Local brands/labels being known by local inhabitants is the important factor for functioning of such regional brand systems.

So schmeckt Niederösterreich

At the time of the research realization, this labelling system of Lower Austria is the most unique regional brand in the region and managed directly by the Lower Austrian Government. (logotype see Fig. 1a).

Fig. 1a: So schmeckt Niederösterreich

Source: http://www.soschmecktnoe.at, 2016

2. Materials and Methods

This paper brings result of the research explaining what social-demographical characteristics recognition of the brand So schmeckt Niederösterreich is connected with.

2.1 Hypothesis

The paper presents the first results of the following hypotheses testing (using Pearson's Chi-square test of independence):

H1: Recognition of regional brand *So schmeckt Niederösterreich* does not depend on the respondents´ gender.
H2: Recognition of regional brand *So schmeckt Niederösterreich* does not depend on the respondents´ age.
H3: Recognition of regional brand *So schmeckt Niederösterreich* does not depend on the respondents´ highest finished education.

2.2 Data collection and Statistical analysis

Primary research was provided among consumers of Lower Austria (Map of the Region see Fig. 1b) at the turn of the years 2014 and 2015. Respondents were addressed based on quota selection. There were 450 answers chosen to be further elaborated. Data were analyzed by Pearson's Chi-square test of independence, which tests null hypothesis "Recognition of regional brand *So schmeckt Niederösterreich* does not depend on chosen social-demographic characteristics".

In questionnaire survey analysis, categorical data were often obtained and contingency tables are an easy way of displaying relations among this data. Depending on the data character, suitable tests of independence were used, see Hendl (2006). According to Řezanková (1997).

By means of the Statistica software, the p-value was calculated for each hypothesis, and if $p < 0,05$, the null hypothesis was rejected in favour of an alternative hypothesis assuming dependence of variables.

Fig. 1b: Map of the Region of Lower Austria (Niederösterreich)

Source: https://en.wikipedia.org/wiki/Lower_Austria, 2017

3. Results and Discussion

The research results show, that customers in Lower Austria recognize the regional food label *So schmeckt Niederösterreich*. Positively answered the question of whether this brand was encountered when buying food, a total of 295 respondents, it is 65.55 % of the sample surveyed.

Table 1. Recognition of the brand *So schmeckt Niederösterreich* according to respondents´gender

Recognition of brand	**Men**	**Women**	**Row Totals**
No	71	84	155
Column %	33.81	35.00	
Yes	139	156	295
Column %	66.19	65.00	
Total	210	240	450
Chi-square		df	P-value
Pearson Chi-square	0.07	df=1	p=0.79

Source: Authors

Table 1 shows that *Recognition of the regional brand So schmeckt Niederösterreich statistically does not depend on the respondent´s gender* (the H1 hypothesis of independence was not rejected at a level of independence of 5%). The results in Table 1 show that women and man in Lower Austria recognize the label *So schmeckt Niederösterreich* very similar (65.00 % by women vs. 66.19 % by man).

Table 2. Recognition of the brand *So schmeckt Niederösterreich* according to respondents´age

Recognition of brand	**18 to 35 years**	**36 to 50 years**	**51 to 65 years**	**Row Totals**
No	47	47	61	155
Column %	31.33	31.33	40.67	
Yes	103	103	89	295
Column %	68.67	68.67	59.33	
Total	150	150	150	450
Chi-square			df	P-value
Pearson Chi-square		3.86	df=2	p=0.15

Source: Authors

The results of the research presented in Table 2 show that the brand recognition of *So schmeckt Niederösterreich* label is the highest (68.67%) among the two youngest consumers groups (age category 18-35 and 36-50 years years). Lowest level of the brand recognition - only slightly less is the brand recognized by respondents in the age category 51-65 years (59.33 %). The H2 hypothesis was not rejected at a level of significance of 5% - H2 hypothesis *"Recognition of the regional label So schmeckt Niederösterreich does not depend on the respondent´s age"* was confirmed.

Table 3. Recognition of the brand *So schmeckt Niederösterreich* according to respondents´ highest finished education

Recognition of brand	**Elementary school**	**Apprenticeship**	**High school**	**University and College**	**Row Totals**
No	17	42	66	30	155
Column %	37.78	25.45	38.82	42.86	
Yes	28	123	104	40	295
Column %	62.22	74.55	61.18	57.14	
Total	45	165	170	70	450
Chi-square				df	P-value
		Pearson Chi-square	9.76	df=3	p=0.02

Source: Authors

Table 3 shows that label recognition is the highest among those respondents with the middle education - Apprenticeship (74.55 % of respondents). The brand recognition levels among respondents with completed elementary school, high school or college education were very similar, ranging between 57.14 – 62.22 %. The H3 hypothesis was rejected at a level of significance of 5% - H3 hypothesis "Recognition of the regional label *So schmeckt Niederösterreich* does not depend on the respondent´s age" was rejected and confirmed an alternative hypothesis: ***"Recognition of the regional label So schmeckt Niederösterreich statisticaly does depend on the respondent´s age"***.

Discusion

Research results show that consumers in Lower Austria recognize the label So schmeckt Niederösterreich despite the socio-demographic characteristics surveyed. Almost 70 % of all respondents recognized this brand. It is necessary to present and compare the results in the context of the research results (recognition) of the other regional labelling systems and brands in Lower Austria - Genuss Region Niederösterreich, Echt aus Niederösterreich, Gutes vom Bauernhof and Waldland - in the same time period and at the same sample and place, and to compare them with neighbouring regional labelling systems and brands in the South Moravian region in the Czech Republic as well. While in Lower Austria, there is recognition of individual brands at the level of 30 - 65 % (the lowest recognition is at the Waldland brand and the highest at by the Genuss Region Niederösterreich brand), the recognition of the most recognized regional food label in the Czech Republic (Regionální potravina Jihomoravský kraj) is only at the level of almost half of the respondents (Rojík, 2015), with other brands (Zlatá chuť jižní Moravy; Moravský kras and Znojemsko Regionální produkt) at the level of only 10-20 %. In another neighbouring region of Lower Austria - the Czech Vysočina Region, which is also a partner region of Lower Austria, the unknown brand of Vysočina is a regional product which was known by almost one fifth of the respondents (23.55 %) in 2012 (Chalupová, Rojík and Prokop, 2012) and by more than 50 % in 2015 (Chalupová, Prokop, 2016). Results presented in the discussion therefore show that situation in Czech regions is very different and Austrian customers, compared to Czech customers, recognize the regional brand and, as the results show (Rojík et al., 2016), Austrian customers also buy products labelled this way and prefer local Austrian food products to imported food products. Similarly, the reality of higher preference of the regional and local products due to greater tradition, spread and custom(s) of the regional designation in the German-speaking countries is confirmed by research results identified by research organization LUBW (2008). Above mentioned results show that regional labels in Lower Austria (and other German-speaking countries as well) are more preferred by local customers than regional labels in Czech regions. Therefore authors say that in the marketing communications point of view, Austrian regional brands are more effective than regional brands in the Czech Republic.

4. Conclusion

The advantage of labels in Austria is, in addition to longer tradition, also close cooperation across the region and the support of the Lower Austria government in this particular case.

Regional labelling systems and brands in Lower Austria are (with some exceptions) well-working - in the point of view of marketing communications and consumer's recognition (compared to i. e. regional brands in the neighbouring Czech regions). The advantage of brands in Austria is, in addition to great tradition, also close cooperation across the region and the support of the Lower Austria government in this particular case. The strength of these brands is also cooperation with high schools and vocational schools, and education of future professionals to prefer such foods. As can be seen from the results of the research, especially younger respondents recognize this brand. However, a brand coordinator should be more focused on consumers with higher education and the elderly who recognize the least as well. Nevertheless, it turns out that the deviations in *So Schmeckt Niederösterreich*'s recognition are relatively man among the sociodemographic characteristics of the respondents, which can demonstrate the correct marketing management of this brand in brand awareness.

The authors consider this type of label as a suitable tool for use in the Czech Republic, as several labelling systems compete on regional markets in the Czech Republic, not only for the benefit of customers, but also for the financial resources that are a prerequisite for successful operation of these labelling systems in the market. In Lower Austria, there is a different situation - the label *So schmeckt Niederösterreich* is bound to meet the required criteria and get a specific regional label. The marketing communication activities of the region thus relate exclusively to this label, which in part reduces the rivalry between different systems. An interesting fact is also (broadly in the relation to the Czech regional brands) an extended range of Austrian brands in the field of tourism and gastronomy. This is another major reason for the existence of the *So schmeckt Niederösterreich* label. The authors in this area see the possibility of inspiration for the Czech region(s) for how to approach regional brands in order to focus the funds in one direction, which is advantageous in terms of the effectiveness of marketing communication, and at the same time it is a way to promote a wide range of areas in the region effectively, for example by non-profit organizations.

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MINIMUM LAND REQUIREMENTS FOR AVERAGE FAMILY INCOME PRODUCED IN THE SLOVAK AGRICULTURE

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Annotation: The family farming represents the predominant business model in the agriculture in the European Union. The family farms, with their 97 percent share, represent the most common type of farms, including large and small farms, full-time as well as the part-time ones. In 2013, the average acreage of agricultural holding in the EU-28 was 16.1 hectares, while in Slovakia it was 80.7 hectares of agricultural land per holding.
The aim of submitted paper is to determine the minimum size of agricultural land of a small family farm focused on crop production at various cost variants of farms.
The partial aim of the paper is primarily to find dependence between expenditure (costs) and the acreage of agricultural land. Another aim is to determine the minimum acreage in hectares needed to support one average Slovak family with 4 members (2 adults and 2 children).
In the paper was analyzed dependence of expenditures (costs) of farmers on the acreage of agricultural land. Based on the correlation results, the total expenditures of physical entities associated with land management are not clearly dependent on the acreage of the farm. Subsequently, we have provided 3 variants of economic-mathematical models for determining the minimum acreage of agricultural land for sustaining one average farm family. The results of the submitted paper proved, that the more agricultural activities are realized by the farm family itself, the smaller acreage of agricultural land is needed to cover the household expenditures.
The results of the paper proved that, according to the model of an average farm focused on crop production, the acreage of 41.35 ha of agricultural land is needed for one family. This option assumes that the family farm will not hire another employee and will not bear production and administrative costs.

Key words: farm size, agricultural land, plant production, costs

JEL classification: Q12

1. Introduction

Entrepreneurship on the agricultural land belongs among the oldest economic sectors of every country. Slovakia and its countryside was for many centuries a typical agrarian country. Despite the areal industrialization after 1950 agriculture remained its characteristic feature. Evidential sector organization of agricultural production was created as a result of manufacturing expansion. It was caused by industrialization process. It caused largely one-side orientation of rural regions towards the agricultural activities. In the current era of globalization, especially after the accession to the EU, the position of agriculture is changing especially in the trend of EU CAP reforms (Horská, Nagyová and Felixová, 2010; Kleinová and Neománi, 2010).

Faced to sustainability problems, European agriculture is looking after better solutions to maintain jobs and economic activities while respecting the natural resources (Cvik and MacGregor Pelikánová, 2015).

The changing position of agriculture and the differentiated rural areas is also reflected in the theoretical approaches trying to explain this transformation with agriculture seen as one of the sectors and industries in the rural areas which can ensure the sustainability of rural households and the quality of life in rural areas through combination of agriculture and other activities (tourism or other services) in the frame of multifunctionality concept. (Konecny, 2015)

According to the Common Agricultural Policy of the EU, agriculture needs to attain higher levels of production of safe and quality food, while preserving the natural resources that agricultural productivity depend upon. This can only be achieved by a competitive and viable agricultural sector operating within a properly functioning supply chain which contributes to the maintenance of a thriving rural economy (European Commission, 2013). Consumer demands and governmental legislations are becoming stricter and agricultural entrepreneurs need to commit increasing resources to animal welfare, environmental measures and landscape maintenance. Furthermore, farmers have to face challenges of: increased competition due to the gradual opening of markets, the need for integration within the agricultural chain, the diminishing attractiveness of the sector as an employer and the increasing flexibility of working hours and contracts (De Lauwere, 2005; Fuller-Love, 2006; Batterink et al., 2006).

Agricultural entrepreneurs are indeed facing many challenges. Many of these have been identified by the Common Agricultural Policy as economic in nature, such as food security and globalization, a declining rate of productivity growth, price volatility, pressures on production costs due to high input prices and the deteriorating position of farmers in the food supply chain. Other challenges are environmental in nature, relating to resource efficiency, soil and water quality, and threats to habitats and biodiversity. Others still are territorial, especially where rural areas are faced with demographic, economic and social developments, including depopulation and relocation of businesses (European Commission, 2013).

There is considerable debate regarding what type or scale of agriculture should be promoted in order to most effectively achieve these goals (Larson et al., 2014).

Nagayets (2005) used agricultural census data from FAO to estimate that there are about 525 million farms of all sizes in the world. Several other sources maintain that worldwide there are about 500 million farms smaller than 2 ha (see for example Hazell et al., 2010; Wiggins et al., 2010; IFAD, 2011 and HLPE, 2013), many of them refer to Nagayets (2005).

There are many authors who are calculating with size of farm and economical results. Some results show that there is a negative relationship between farm size and productivity and positive relationship between credits and productivity. According to the reached results by authors Ladvenicová and Miklovičová (2015) can say that for Slovak farmers it would be better to operate on smaller size of farm than they do. Many studies estimated that in agriculture there are constant returns to scale. In our case we can follow decreasing returns to scale – each hectare of land leads to the decrease of production. Positive effect can be follow in credits. Access to credits can depend on farm size. If the amount of credits depends on collateral, then larger farms may have easier access to credits. They can use more inputs and it causes that productivity will depend positively on farm size.

The aim of submitted paper is to determine the minimum size of agricultural land of a small family farm focused on crop production at various cost variants of farms. The partial aim of the paper is primarily to find dependence between expenditure (costs) and the acreage of agricultural land. Another aim is to determine the minimum acreage in hectares needed to support one average Slovak family with 4 members (2 adults and 2 children). The aim of the paper is based on following three variants of model: First model calculates with full costs calculation. Calculation items are listed in the methodology. The second variant is based on the total calculation costs, deducted by wage costs and social charges. This variation involves the idea that all field work will be carried out by the farm family in its own production line, which means that there will not be used the services of other companies. The third variant is based on the assumption that the farm family does not use the administrative and operating costs in management and these are deducted from the total costs. Small farms do not exploit the administrative and operating costs.

2. Materials and Methods

In the submitted paper had been used the data on farmers in Slovakia from Information Letters as well as the data of business calculations by Research Institute of Agricultural and Food Economics in Bratislava, which is engaged as recommended model for agricultural holdings.We use the method of correlation analyze.

Correlation analysis examines the existence of binding - the correlation between the observed variables. Let´s suppose there is a linear dependence between X and Y. May (x1, y1),...,(xn, yn) be the values of the independent random selection of the range n of the system of two random variables X, Y from the two-dimensional normal distribution, and let $\bar{x}$ and $\bar{y}$ be their sample average. Pearson's sample correlation coefficient applies formula:

$$r_{x,y} = \frac{\overline{x.y} - \bar{x}.\bar{y}}{\sqrt{\overline{x^2} - (\bar{x})^2} \cdot \sqrt{\overline{y^2} - (\bar{y})^2}} \tag{1}$$

where:

$$\overline{x^2} = \frac{1}{n}\sum_{i=1}^{n} x_i^2\ ,\ \overline{y^2} = \frac{1}{n}\sum_{i=1}^{n} y_i^2\ ,\ \overline{x\,.\,y} = \frac{1}{n}\sum_{i=1}^{n} x_i\,.\,y_i \tag{2}$$

Pearson's sample correlation coefficient rx, y measures the tightness of the linear dependence between variables *X* and *Y* on both sides, i.e. rx, y= ry,x =r.

Pearson's sample correlation coefficient takes values from the interval ⟨-1; 1⟩ and expresses the degree of linear correlation between the variables *X* and *Y*. The closer is the value of |*r*| to 1, the stronger is the linear correlation and the closer is the value of |*r*| to 0, the weaker is linear correlation.

For the alternative calculations of the economic - mathematical model solution of a small family farm in the economic and production conditions of the SR had been used following data and methodology:

By calculating the own costs are found out the own costs per unit of production. The calculations include the following items: seeds and grains, fertilizers, chemical protection products, other direct material, wages and remuneration, social costs, repairs and maintenance, depreciation of tangible investment property, agrochemical services, other direct costs and services, costs of auxiliary activities, administrative and operating costs.

The structure of the crop rotation is expressed as follows:

$$x_1 + x_2 + \ldots + x_n = 100\ \% \tag{3}$$

Where x_1 - x_n represents the percentage of crops on arable land.

3. Results and Discussion

The business structure in agriculture is in constant motion. In the presently existing forms of business is changing the number of farms, their size structure and their representation on the managed land plots. Agribusiness is determined mainly by the EU CAP and internal socio-political development, with an emphasis on agrarian government policy (state aid) and the formation of a business environment (legislation, economic instruments, financial sector policy). The family farming represents the predominant business model in the agriculture in the European Union. The family farms, with their 97 percent share, represent the most common type of farms, including large and small farms, full-time as well as the part-time ones. In 2013, the average acreage of agricultural holding in the EU-28 was 16.1 hectares, while in Slovakia it was 80.7 hectares of agricultural land per holding.

We analyzed dependency between the indicator income and expenditure statement. Data are given in Euro and are listed per one average agricultural holding. The data show that by increasing acreage of agricultural land of analyzed groups of farms, increase also the total expenditures. From the data is not possible statistically evaluate whether there is a dependence between the size of the farms according to the acreage of the agricultural land and the total expenditures indicator, so we have to use the correlation analysis.

Up to 5875 numeric data were used for the analysis and regression for the entire reference period 2005 to 2015. Defining dependence and independence is based on the context of variables, and therefore, in our case, total expenditures indicator is totally dependent on the acreage of the agricultural land and the number of employees. We determined the total cost determinant as a dependent variable. The acreage of agricultural land and the number of employees are independent variables.

From the point of view of the correlation analysis between the agricultural land and the total expenditures determinants results, that the Pearson correlation coefficient is 0.66695 ($p < 0.0001$) and coefficient is significant. From the point of view of the interpretation of the correlation coefficient size, there is a slight correlation between determinant of the acreage of the agricultural land and total expenditures.

The results proved that the expenditures of physical entities associated with the land management are not clearly dependent on the acreage (size) of the farm.

Alternative Calculations of the Economic - Mathematical Model Solution of a Small Family Farm in the Economic and Production Conditions of the SR

The model is based on the idea of one family, i.e. 4 family members. Household income was reported from the Statistical Office of the Slovak Republic which was the expenditure of households in 2016, amounted to 19,084.32 EUR.

Subsequently, the model is based on compliance with the principles of crop rotation, with maximum positive and minimal negative interactions between crops. These interactions greatly affect the physical, chemical, and biological properties of the soil and consequently the quality of grown crops. The crop rotation and arrangement of the soil fund must also respect other agro-ecological criteria for the elimination of negative factors, as for example, in the crop rotation of integrated systems, should not be higher than 50 percentage of cereals (Lacko-Bartošová, 2005).

According to the above crop rotation, the crops such as wheat, barley, grain maize, sunflower, oilseed rape, soybean and pea were included in the model. Their representation is shown in Table 1. The main crops grown in the conditions of the Slovak Republic enter the model at the following percentages. From the point of view of the variation of crop yield per hectare in individual years, we had chosen the average of crop yield per hectare in the last 5 years (2011-2016).

Table 1 Development of Chosen Crop Yield (in t.ha^{-1})

	2011	**2012**	**2013**	**2014**	**2015**	**Average 2011-2015**
wheat	5.05	3.72	4.96	5.98	6.02	5.15
barley	4.22	3.56	4.13	5.42	5.35	4.54
grain maize	8.28	6.17	5.58	9	4.77	6.76
sunflower	2.47	2.24	2.58	2.68	2.38	2.47
oilseed rape	2.55	2.32	3.08	3.82	2.79	2.91
soybean	1.88	1.91	1.36	2.36	1.74	1.85
pea	3.42	1.95	2.49	3.06	3.81	2.95

Source: Information Letters 2005-2015 and own calculation

Another variable in the model is the price expressed in EUR per 1 ton for the year 2016, as well as own costs, closer described in the methodology per hectare per individual crops (Table 2).

Table 2 Economic - Mathematical Model of Acreage of Family Farm – Variant 1

	Share on arable land	**Price in EUR.t^{-1}**	**Own Costs Total**	**Revenues Total**	**Yield in t.ha^{-1}**	**Economical result in EUR.ha^{-1}**	**Economical result in EUR.ha^{-1} x Share on arable land**
wheat	37%	157	933.80	1171.31	5.15	237.51	87.87
barley	13%	164	830.80	997.69	4.54	166.89	21.69
grain maize	23%	140	1107.00	1275.63	6.76	168.63	38.78
sunflower	7%	310	913.51	1007.29	2.47	93.78	6.56
oilseed rape	12%	337	1248.90	1571.82	2.91	322.92	38.75
soybean	3%	369	802.95	993	1.85	190.05	5.70
pea	5%	283	655.80	1033.718	2.95	377.92	18.89
TOTAL economical result per 1 ha of arable land (for this variant)							218.27

Source: Information Letters 2005-2015 and own calculation

From Table 2 appears that, according to mentioned crop rotation and all costs metering, will be achieved a profit of 218.27 EUR per hectare of agricultural land. If the family farm hired the employees and paid their wages and social costs, there would be need for 87.43 hectares acreage. This was calculated as the share of household expenditures (19,084.32 EUR per year for the 4 member family) to the economical results per 1 ha from Table 2.

Table 3 Economic - Mathematical Model of Acreage of Family Farm – Variant 2

	Share on arable land	**Price in Euro.t^{-1}**	**Own Costs Total in EUR. ha^{-1}**	**Wages and Remune-ration in EUR. ha^{-1}**	**Social Costs in EUR. ha^{-1}**	**Own Costs – Wages and Social Costs**	**Revenues Total in EUR. ha^{-1}**	**Yield in t. ha^{-1}**	**Econo-mical result in EUR.ha^{-1}**	**Economical result in EUR.ha^{-1} x Share on arable land**
wheat	37%	157	933.80	24.19	7.02	902.59	1,171.3	5.15	268.72	99.43
barley	13%	164	830.80	24.91	7.09	798.80	997.69	4.54	198.89	25.86
grain maize	23%	140	1107.00	36.02	10.9	1,060.08	1,275.6	6.76	215.55	49.58
sunflower	7%	310	913.51	32.19	10.43	870.89	1,007.3	2.47	136.40	9.55
oilseed rape	12%	337	1,248.90	28.14	8.24	1212.52	1,571.8	2.91	359.30	43.12
soybean	3%	369	802.95	20.25	5.78	776.92	993	1.85	216.08	6.48
pea	5%	283	655.80	21.92	5.1	628.78	1,033.7	2.95	404.94	20.25
TOTAL economical result per 1 ha of arable land (for this variant)										254.25

Source: Information Letters 2005-2015 and own calculation

Table 3 shows that, according to the structure of the crop rotation and the deduction of wage and social costs of employees, will be achieved a profit of 254.25 EUR per one hectare of agricultural land. This variant assumes that the farm family will not hire another employee. In the given variant, in order to cover the expenditures for the 4-member farm family (19,084.32 EUR per year) the acreage of the farm was reduced to 66.86 ha of agricultural land.

Table 4 shows that, according to the structure of the crop rotation and the deduction of employees' wage and social costs and production and administrative costs, will be achieved a profit of 411.16 EUR per one hectare of agricultural land. This variant assumes that the family farm will not hire another employee and will not bear the administrative and operating costs. In the given variant, in order to cover the expenditures for the 4-member farm family (19,084.32 EUR per year), the acreage of the farm was reduced to 41.35 ha of agricultural land.

Table 4 Economic - Mathematical Model of Acreage of Family Farm – Variant 3

	Share on arable land	**Price in EUR. t^{-1}**	**Own Costs Total in EUR. ha^{-1}**	**Wages and Remu-neration in EUR. ha^{-1}**	**Social Costs in EUR. ha^{-1}**	**Admini-strative and Opera-ting Costs in EUR. ha^{-1}**	**Own Costs – Wages and Social Costs in EUR. ha^{-1}**	**Reve-nues Total in EUR. ha^{-1}**	**Yield in $t.ha^{-1}$**	**Econo-mical result In EUR $.ha^{-1}$**	**Econo-mical result in EUR. ha^{-1} x Share on arable land**
wheat	37%	157	933.80	24.19	7.02	142.48	760.11	1171.3	5.15	411.20	152.14
barley	13%	164	830.80	24.91	7.09	142.46	656.34	997.69	4.54	341.35	44.37
grain maize	23%	140	1,107.00	36.02	10.9	170.14	889.94	1,275.6	6.76	385.69	88.71
sunflower	7%	310	913.51	32.19	10.43	132.29	738.60	1,007.3	2.47	268.69	18.81
oilseed rape	12%	337	1,248.90	28.14	8.24	191.88	1,020.64	1,571.8	2.91	551.18	66.14
soybean	3%	369	802.95	20.25	5.78	114.62	662.30	993	1.85	330.70	9.92
pea	5%	283	655.80	21.92	5.1	216.28	412.50	1033.7	2.95	621.22	31.06
TOTAL economical result per 1 ha of arable land (for this variant)											411.16

Source: Information Letters 2005-2015 and own calculation

4. Conclusion

In 2015, the Ministry of Agriculture and Rural Development of the Slovak Republic drew up a concept to support small, family and young farmers as a supporting tool for policy. For this reason, the agro-sector creates more favorable conditions for agricultural entrepreneurship for young, small and family farmers in order to tackle generational change in agriculture and to promote employment in the Slovak countryside. One of the supporting mechanisms is the definition of state land for small and young farmers. Access to the soil is preceded by the approval of the Rural Development Program (RDP) of the SR 2014-2020 and the call by the Agricultural Paying Agency (APA). The young farmers and small farmers, in order to be successful applicants for accessing to land under the management of the Slovak Land Fund (SPF), have to meet the conditions for compliance with the minimum stocking density of livestock by large livestock units (LU) at the level of 0.4 LU/ ha or *perform special crop production using at least 50 % of the area of agricultural land,* which is rented by amended applicant from the Slovak Land Fund (SPF).

Therefore, the reason for the realization of the research was the calculation of the minimum land requirements for one average family income produced in the Slovak agriculture, i.e. determining the minimum acreage of agricultural land for sustaining one average farm family.

In the paper was analyzed dependence of expenditures (costs) of farmers on the acreage of agricultural land.

Based on the correlation results, the total expenditures of physical entities associated with land management are not clearly dependent on the acreage of the farm.

Subsequently, we have provided 3 variants of economic-mathematical models for determining the minimum acreage of agricultural land for sustaining one average farm family. The results of the submitted paper proved, that the more agricultural activities are realized by the farm family itself, the smaller acreage of agricultural land is needed to cover the household expenditures.

The results of the paper proved that, according to the model of an average farm focused on crop production, the acreage of 41.35 ha of agricultural land is needed for one family. This option assumes that the family farm will not hire another employee and will not bear production and administrative costs. Nowadays in Slovakia, a successful applicant (small and young farmer) will be able to apply for state support to establish the farm from the Rural Development Program of the SR with support at level 100% of the farm land, to a maximum of 28 hectares. The state allocated 11,019 hectares in individual regions. From above mentioned it is obvious that if farmers according our variant dispose the land area with acreage of 20.68 hectares, they could ask the state for another 20.67 ha. In this way, up to 533 small and young farmers could be satisfied.

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FORMING NETWORKS STRATEGY IN AGRIBUSINESS

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Annotation: The increase in complexity and dynamics of the today's environment forces business entities to seek new management concepts, as well as new methods and analytical instruments. It is necessary to keep track of any changes, but first and foremost, to recognize that the organization itself is a multi-layered, complex, diverse relationship. Therefore, the article recommends new patterns that allow to perceive an organization through the "10E" or "11F" prism. The aim of the article is to point out the necessity of looking for analytical models which take into greater account the variability of the environment, especially in agribusiness. Looking for ways to determine the shape of an effective company, researchers refer to the "7S" Mc Kinsey's model. Within the network concept, two types can be distinguished. A business network is self-generated, poorly formalized, without clearly defined borders, and without the leading business. Strategic networks, on the other hand, are based on long-term agreements between entities which aim is to acquire a competitive advantage over other networks or the companies functioning outside the networks. Usually, there is a leader in the strategic network (a hub firm, a network captain) that defines the idea of a value creation network and, by implementing its strategy, decides on the choice of partners and the nature of the relationship. Forming a network strategy in agribusiness requires a particular care in the selection of analytical instruments, since the quality of the strategy depends on the information base for decision-making. It was assumed that the formed strategy must be flexible, and to a large extent emergent. It is therefore proposed to use an original algorithm based on the characterization of competitive advantages, appropriate to the current environmental conditions, using all available resources, especially those available for the network.

Key words: agribusiness, networks, strategy, competitive advantage, supply chain

JEL classification: Q13

1. Introduction

The sluggish global economic system, characterized by fast-paced and increasingly complex business conditions, has made those who want to be more successful are more sensitive to changes in the environment. These changes, creating new conditions, can vary from favourably to hostile. Thus, depending on the attitude of the company, they can be treated as a threat or as a chance. The perceived need to adapt to new conditions is already in itself, the cause of numerous crises and even chaos in various areas of the enterprise. The new order is introduced using the available methods and resources. Often, however, the desired results are not achieved, despite the use of proven methods and techniques under existing conditions. The cause of this state is the ineffectiveness of existing methods and barriers in their practical use in new conditions. In addition, as in any crisis situation, insiders, neglect, neglect or omission are identified as internal threats. During the crisis, the tendency to reach for new methods and approaches is increasing. Increasing complexity and dynamics of today's environment forces searchers to seek new management concepts as well as new or modified analytical methods and instruments. The aim of the article is to point out the need to seek analytical models that take greater account of the variability of the environment, particularly in agribusiness. You can use the well-known model "7S" by Mc Kinsey (Strategy, Structure, Staff, Skills, Shared Value, Systems, Style) (Peters and Waterman, 2000), which is enriched with sensibility, understood as the ability to perceive signals generated by various entities from the corporate environment, is suitable for use in the process of creating excellent business.

It is necessary not only to follow any changes, but also to see that the organization itself is a multi-layered, complex, diverse relationship. "Organization is a lot of things at the same time" (Morgan, 1997). So, in order to effectively manage or design an enterprise, it is necessary to use the right amount of perspectives to define and describe the states of many levels of business. So two sets of perspectives for in-depth analysis are proposed: the "10E" (Ecology, Economics, Empathy, Energy, Aesthetics, Emotions, Ethics, Eristic, Eclecticism) or "11F" (Focus, First, Fast, Flexibility, Friendly, Fairness, Feasibility, Future, Facility, Feedback, Foresight).

Particular attention, in the times of economic crisis, deserves "empathy" to create rational basis for creating favourable relationships with customers, develop cooperation between competitors and suppliers, and also reduce the scale of possible conflicts. At the same time, ethic is gaining in importance, so that participants in the value-added network and other stakeholders can trust the organization and the credibility of the organization is estimated by the dimensions of transparency, honesty, competence, friendliness and reliability, based on personal experience and information from the third party. Behaviour with values.

Basically, no firm is assumed to be self-sufficient. For proper functioning, it must establish a variety of relationships with other participants in the market processes. In addition to those in the same industry that you can compete with or work with, there are also organizations and people that shape the general operating environment in the network of analysed relationships.

2. Organization in network. Theoretical aspects.

Businesses operate in a complex, indeterminate heterogeneous network (horizontal, vertical, formal, informal, layered, interlinking, targeted, random, primary, secondary, etc.) with other organizations with whom they maintain diverse relationships. Due to the complexity of such a system, it is not possible to develop an optimum system structure or flows of mass, energy and information flows. The simpler problem of the salesman is to simplify the distance between, only 25 objects, each of which is directly connected to the others, belongs to the NP class, and is practically insoluble in polynomial time (Coveney and Highfield, 1996). Complexity is an immanent feature of nature and not just the result of many combinations of simple processes taking place at a more elementary level. The social reality surrounding us is also very complex, so we have to agree that there is no way to develop an optimal, well-thought-out corporate strategy, especially for companies operating in fast-paced environments.

Every company has to decide where to place in the chain / value system (Bielski and Sikora, 2016). This is tantamount to choosing a business model, opening the way to developing a detailed and credible business plan. In other words, the right choice of business model is the starting point for business development and profit making. This is particularly true of networks that can be considered as "extender enterprises" (Wolffgram, 1999). For efficient operation in a complex environment, companies can make alliances with other parties pursuing similar goals and create a network of relationships that support the implementation of the strategy.

The concept of network approach emerged directly from the interaction approach and marketing. The network approach adopting the supplier-customer relationship priority also takes into account the whole of the relationship with the environment, which creates extensive and complex network links. Within the network concept, there are two main types of networks. A business network that spontaneously generates, regardless of the consciousness and will of its entities, is weakly formalized, non-centralized, without clearly defined borders, and maintains control over the business. Strategic networks, on the other hand, are based on long-standing agreements between independent entities to acquire and maintain competitive advantage over other networks or off-grid companies. Typically, there is a leader in the strategic network (hub, a network captain) that defines the idea of a value creation network and, by implementing its strategy, decides on the choice of partners and the nature of the relationship. Regardless of the type of network, each party should clearly define its strategic objectives to achieve a satisfactory state of relations. This facilitates the choice between classical attitudes towards the subjects, with the intention of pursuing the same goals. At the same time, in place of routine ways of resolving strategic tensions such as the dilemma of "either cooperation or competition" or the "something", you can look for ways to reconcile the contradictions, and then, perhaps, "the strategist ... will try to do both, Striving to utilize the best in each approach" (De Wit and Meyer, 2007). This principle can be applied not only to the problem / topic of cooperation and competition but should be taken as a mindset in solving many other problems that arise during the organization / orchestration of the network. Among the basic principles necessary for chain / supply chain integration is (Funggroup, 2017):

- customer orientation and current demand,
- focus on core business and outsourcing support activities,
- working closely with business partners to assess and share risks and returns,
- design, implementation, evaluation and permanent streamlining of streams of work, information and money in the delivery system,
- shortening of production time and delivery cycles,
- lowering the costs of supply, storage and transport.

Strategic network management, requiring a deeper influence on the competencies of network participants, so far operating in the operator model, has resulted in the emergence of the network orchestration concept (Dhanara and Parkhe, 2006), which includes network stability management processes, pension management and knowledge mobility management. A model of network conductor / orchestra that uses the skills of specialized companies that provide services under certain conditions often involves the possession of specialized equipment and specific certifications. The entire configuration of the company is subordinated to one core activity, best realized by sector competitors. The model of the conductor requires new competences, characteristic for the network economy, and in particular:

1. Network members, similar to human resources management procedures.
2. Constructing the bonds between the network members and exploiting the economic potential of the social network, 4W cooperative infrastructure: mutual knowledge of reciprocity, credibility, common values. Networking that is based on core competencies, customer value, and relationships is a value-adding partnership.
3. Set up rules for creating and sharing value added.
4. Respond to tensions, conflicts and operational dysfunctions.

For Poland, which is the sixth largest food producer in the European Union, and the value of food sold is 6% of GDP, agribusiness is particularly important. In agribusiness, typical networks are the unions of producers of milk, poultry, apples, etc. that are created by entities operating at different stages of creating and delivering value to customers (MRiRM, 2017).

In most agricultural markets, networks are dominated by an integrator – a food processing company. Agreements between producers - farmers and agri-food companies may take a more or less formal nature. With a low level of formalization, for example on the pig livestock market, many duties concerning quality assurance, certification, transport are offloaded onto the manufacturer. There is often a delay in payments to a farmer, and a price that depends on demand-supply relationships often does not guarantee covering the production costs.

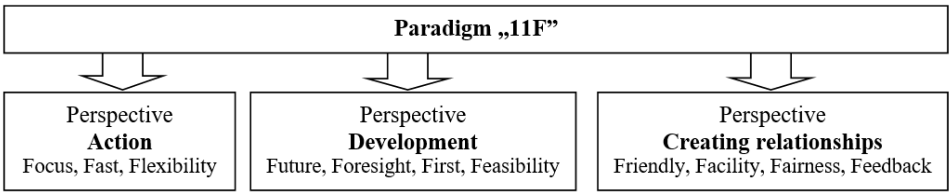
Concluding a contract between suppliers of agricultural raw materials (e.g. in the market of rapeseed, sugar beet or milk) and the integrator allows to determine quantity and quality of raw materials, delivery dates, price, mode and date of payment, additional services provided by the integrator to the manufacturer. The recipient is the dominant party and determines the essential elements of the transaction, such as price, while shifting part of the transaction costs to the supplier. Cooperation between agricultural producers can also be one of the effective solutions reducing the probability that agricultural production may be unprofitable by dividing risks in agriculture to other market players. One of the forms of such cooperation is a food-producing contract or integration within groups of agricultural producers. These factors can effectively reduce the risk associated with running a farm. (Bojar et al., 2014)

3. Result and Discussion

For the purposes of defining integration problems, literature research and own surveys, telephone and direct interviews were conducted.
The number of producer groups in Poland has increased from 70 in 2002 to 985 at the end of 2012 and 1814 in May 2017 (ARR, 2017), but this development is not as dynamic as it might be expected. Networking in business systems is extremely important for creating a value chain. In the case of food economy networks are relatively poorly developed, which hampers creating value and developing the food system as a whole (Kujaczyński, 2009). As indicated by Prus and Drzazdzynska (2017), an extensive system of transmission and distribution of information and professional advice is needed.

The development and growth of companies inevitably leads to the need for building extensive networks of links with other participants in the market processes, as well as to develop rules for the cooperation of various entities, so that they form an integrated logistics system. Initiating networks is implemented and planned by many companies. Globalization gives to already large players new opportunities for rapid growth, provided that they are able to recognize and correctly evaluate this chance. For a complete understanding of each system, eclecticism is needed, understood as the integration of knowledge from different disciplines and sources (Bielski, 2015). "*The changes that have the greatest effect on knowledge in a given field usually come from outside*" (Drucker, 2010). It is believed that uniting different approaches is the main distinguishing feature of an entrepreneurial attitude. It is also likely that even the scale of possible success, as prizes for the concept boldness, will depend on the distance of the field from which knowledge is incorporated, from the core of the theoretical field of knowledge. (Bielski, 2015). The "10F" model in form enlarged by Foresight (since 2014) is shown in Figure 1.

Figure 1. "11F" paradigm - division of components into groups of decision perspectives



Source: (Bielski, 2015: 82)

The "11F" paradigm, which were verified in previous form of "10F", had not been known to any entrepreneur. In the period of 2013-2014, an own survey was conducted with the participation of 65 agribusiness managers. It concerned the perceived value/usefulness of the components of the proposed "10F" standard. The respondents could identify the components which were the most important according to them. However, all managers acknowledged that it was a very interesting tool, and most of its components, including those previously overlooked in their "fast" analyses, should be used in the creative process of today's company. The following indications of the standard ingredients were obtained: Future - 63, Fairness - 62, Focus - 38, Fast - 28, Friendly - 28, Feedback - 23, Flexibility - 22, Foresight - 19, Facility - 17, First - 5.

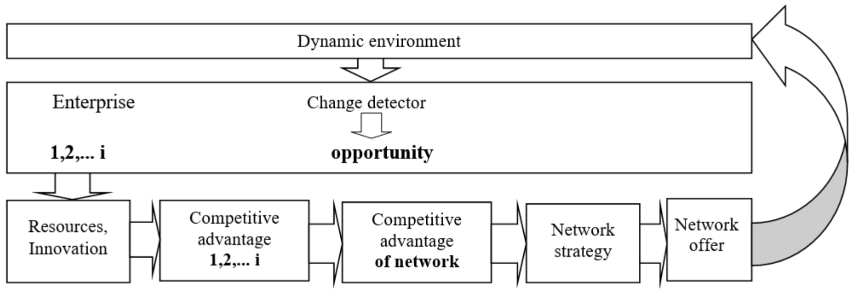
Using the “11F” pattern can facilitate the grouping (Figure 1) of the paradigm components into perspectives: action, development and creation of relationships with the environment, based on the idea of corporate social responsibility. Each company, created to develop new states of the future, must also develop its ability to anticipate and prepare for future events and needs, and to build a vision of the future, combining monitoring, forecasting and environmental impact, taking into account its future development along with its vision in new realities, reading future opportunities and undertaking research in terms of their use before or at the time of their appearance. However, foresight is a skill which only a few are equipped in. “*The best leaders ... have a sixth sense thanks to which they can sense the market changes. Perceptiveness is the ability to visualize unimaginable things”* (Welch and Welch, 2005).

The CAGE (Culture, Administration, Geography, Economics) model is useful for creating relatively safe visions, especially when considering the company's expansion into new remote markets. (Ghemawat, 2001) and the SEPT model, which distinguishes four general categories (social, economics, politics, technology) of contextual subjects of relationships, may be also used in analyses (De Vit and Meyer, 2007).

Achievable benefit surplus related to the network over its costs should encourage the actors to take action in creating extensive business networks (Noga, 2009). Meanwhile, in Polish agribusiness, the typical networks are unions of the producers of milk, poultry, apples, etc. The networks created by entities operating at different stages of creating and delivering value to customers are less common. The only benefits of a vertical integration with food-processing companies perceived by farmers are market reliability (75.6% of the sample), guaranteed prices (18.8%), the possibility of planning the production (15.6%) and knowledge of the sale date (13.8%) (Pondel and Pondel, 2002).

In 2017, the authors conducted research in the form of face-to-face and phone interviews on a sample of 50 different agribusiness actors. Among the tested objects 12 ones are in a relatively stable relationships with two other vertical entities (one means a forward integration and the other means a reverse integration) and only 3 companies with three or more organizations, attempting to determine quality standards, building common strategies for all participants and improving the logistics infrastructure in a wide range (information, raw materials and other materials, and payment flow). According to the respondents, a full implementation of an effective system takes about 5 years, while clear effects can be observed after two seasons. A full transparency of objectives and a fair division of tasks and benefits are considered as one of the most important conditions for development. This can be done by implementing an entrepreneurial model (Figure 2), using environmental opportunities and the synergy effect, allowing a maximized transformation and the exploitation of resources from all network organizations.

Figure 2. Change in the environment as an inspiration for creating a strategic network in agribusiness



Source: own study

4. Conclusion

For efficient operation in a dynamic environment, companies should make alliances with others and create networks that help them achieve their goals. A variety of known analytical models such as CAGE, SEPT or the modified “7S” model and especially author's the “10E”, “11F” and can be designed to design the appropriate network configuration. Considering the aim of the paper, which assumes the necessity to seek for analytical models taking greater account of the environment variability, it should be emphasized that an entrepreneurial approach to strategic planning may be helpful in achieving network objectives. When creating your own strategic network model, consider the following recommendations:

1. The individual elements of the network should be analysed as target markets for which targets need to be achieved.
2. A program for building competitive advantages for each network element should be developed. To do this, you need to identify areas where innovation can be implemented. For each network participant, it is possible to designate his or her individual strategy.
3. For the whole network, the characteristics of the competitive advantage of the network and the formation of a general strategy, including the relationships between the network elements, in particular on mutual settlements, should be identified. It should be advantageous to compare the strategic effects of individual elements with the efficiency of the whole network strategy.
4. An important element in the process of building a network model is innovation (Figure 2), which should be an important part of the strategy of this new organization and permeate as superior philosophy, its functions and organizational structures.

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DEVELOPMENT OF FOOD SECURITY IN VISEGRAD COUNTRIES AFTER EU ACCESSION

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Annotation: After the EU accession agriculture in Visegrad countries went through difficult times, sometimes called second phase of agricultural transformation. Production patterns changed as well as changed self-sufficiency in particular products. And because land is being constantly lost, not only due to urbanisation processes, food availability and food security becomes a policy agenda. Main aim of this contribution is to determine development of the index of food security in Visegrad countries (Czech Republic, Hungary, Poland and Slovakia) between 2004 and 2015. Partial aims are comparison of the resulting index among countries and identify the main variables in the reporting period affecting the overall result. The Index of Food Security (IFS) is evaluated using base index, where year 2004 was selected as base due to the EU accession. Based on reached results it can be concluded, that in the Czech Republic food security fluctuated significantly over the examined period, but in long-term perspective it does not change a lot. The IFS is rather stable in Hungary, the only exception was in 2007 and 2011. In Poland, Index of Food Security is rather constant with the exception of 2006 and 2014. Index is very stable in Slovakia, neither significant increase nor decrease is observed.

Key words: Food security, Visegrad countries, EU accession, Czech Republic, Poland, Slovakia, Hungary

JEL classification: Q18, R14

1. Introduction

Food security means, in the narrowest definition, enough food for the population, country, community or household (Pinstrup-Andersen, 2009). But concept of food security is best described by OECD (2016): „Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life“. According to FAO (2008), there are four dimensions of food security: (I) physical availability of food, (II) economic and physical access to food; (III) food utilization and (IV) stability of aforementioned indicators. To fulfil food security objectives, all four dimensions need to be fulfilled simultaneously. According to Pawlak (2016), food security problem occurs mainly in developing counties, where defined dimensions are not frequently met. Insecurity is often a consequence of many factors, including poverty, poor infrastructure, insufficient funds for technology, inadequate access to markets (Lenihan, Onakuse and Bogue, 2011) or intensity of commercialisation (Asante, Osei-Asare and Kuwornu, 2016). Pawlak (2016) solved the problem of food security from the malnutrition and hunger point of view. At the beginning of 1990s, the number of starving people approached 1 billion, between 2014 and 2016 it fell close to 800 million (FAO, 2015). Whole concept of food security, on contrary to food self-sufficiency, does not take in consideration whether food is imported or produced locally (Clapp, 2014). It only questions availability, access, utilization and stability of food supply no matter of its origin. The concept that is used in this contribution is based on Stachowiak's (2003) ideas and approaches that are based on his food security approach connected to country defence capacity and is based on supply, demand and infrastructure conditions of a country. From that point of view food security is analysed for the purpose of possible military conflict and counts with local food sources, which makes it different from concept of sovereignty defined by FAO and UN.

Article tries to find trends in food security in Visegrad countries (Czech Republic, Hungary, Poland and Slovakia) as food security was according to Pokrivčák (2003) one of the main reasons for interventions in agriculture. EU enlargement process resulted in changes of agricultural policy in accessing countries (Luca 2013). But before the enlargement, preparation for the EU accession was the most significant factor influencing pre-EU policies. The accession by itself led to changes in policy instruments as well as level of protection (Pokrivcak and Ciaian, 2004). This process can be called 2nd phase of agricultural transformation (Klepacki and Zak, 2013). First wave occurred after political changes in 1989 and was referred to swift from centrally planned to market oriented economy. The second phase is connected with changes that occurred after application of the common agricultural policy in new member states. Significant changes in agriculture occurred (Wigier, 2014) which led, among others, to transformation of agri-food trade, competitiveness, marketing possibilities, policy reforms, (Fertő, 2008; Baráth et al., 2010) changes in self-sufficiency, (Slaboch and Kotyza, 2015; Gebeltová, 2012). Observing latest political circumstances and constant change in world population and its nutrition habits, authors are aware of increasing probability of future instability. From this perspective, analysed food security concept is becoming important issue among politicians and policy makers. Defining food security trend development is from that perspective important indicator that can be considered by all actors of policy making processes.

2. Materials and Method

The main aim of the present paper is to determine development of the index of food security in the Visegrad countries (Czech Republic, Hungary, Poland, Slovakia) between 2004 and 2015. Partial aims are comparison of the resulting index among countries and identify the main variables in the reporting period affecting the overall result.

Index of Food Security (IFS) was calculated according to the formula presented by Stachowiak (1999). He adjusted formula of simulation analyses developed for population, steel and electricity for the purposes of agriculture and food security. The formula is:

$$IFS = \frac{(L^{a}P)+(A^{p}L)+(P^{l}A)}{3} \quad \textbf{(1)}$$

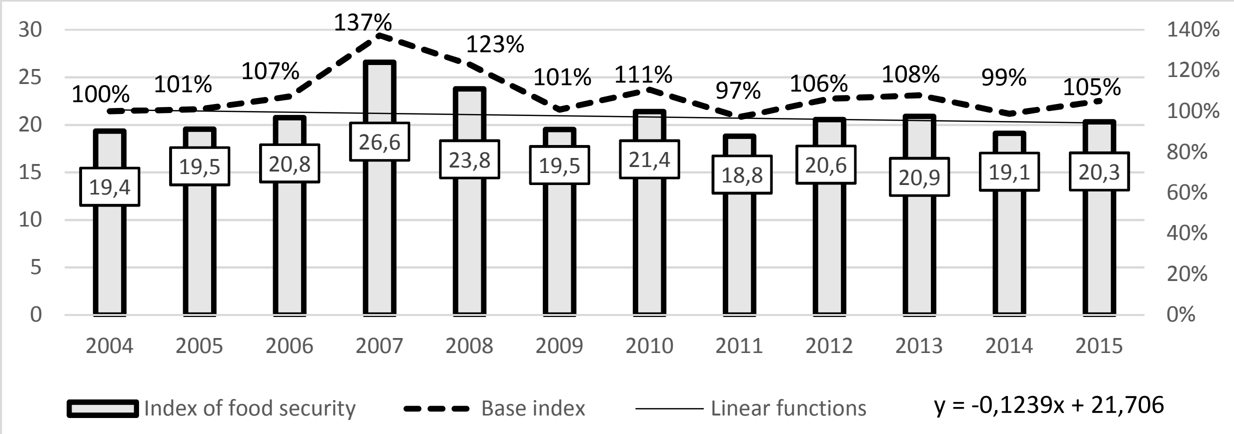
where: (L) represents country population (in millions); (A) represents area of agricultural land (in millions of hectares); (P) stands for output of agricultural industry (in producer prices, euro); (a) represents the area of agricultural land per 1 capita (in hectares); (p) stands for food production change in comparison with the previous year (chain index); (l) represents natural growth rate of population (in percentages). All needed data are sourced from Eurostat and therefore are fully comparable. Time series covers years from 2004 to 2015 (last available). The Index of Food Security is evaluated using base index, where year 2004 was selected as base due to the EU accession. Calculated values suggest the direction (decreasing, increasing or constant) of the national food security.

3. Results and Discussion

For each evaluated country was calculated the Stachowiak Food Safety Index. Within observed period, the population of the Czech Republic grown by 3.5%, as population increased by 359 thousand inhabitants between 2004 and 2015. Within the monitored period, amount of agricultural land fell by 137 thousand hectares and total agricultural production (in producer prices) increased by 390 million euro. Population, land availability and agricultural production have a major impact on the overall outcome of the food safety index.

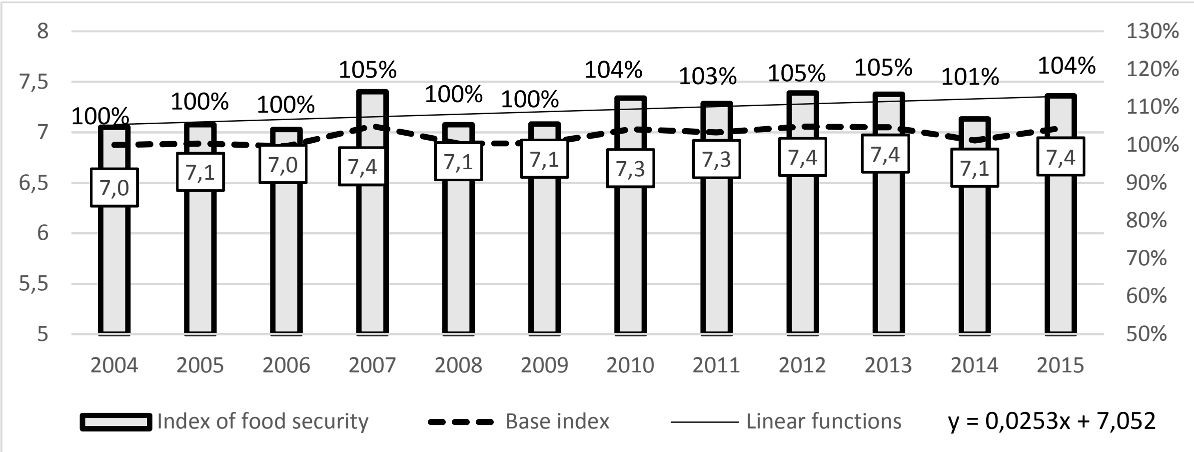
The IFS results presents fluctuations. The highest value was achieved in 2007. This increase was mainly caused by growth of agricultural production, caused by increase of agricultural commodity prices on global level. Production was by 290 million euro higher compared to 2006. After 2009, IFS is relatively stable, with no significant fluctuations. This period can be characterized by population growth and decline of agricultural land. In general population growth and decline of land would reduce IFS, but increasing value of agricultural production compensated losses and stabilized the results. Figure 1 present index development and its downward sloping trend. Left axis indicate IFS values.

Figure 1. Index of food security - Czech Republic, 2004-2015



Source: Own calculation based on Eurostat data

Figure 2. Index of food security - Slovakia, 2004-2015

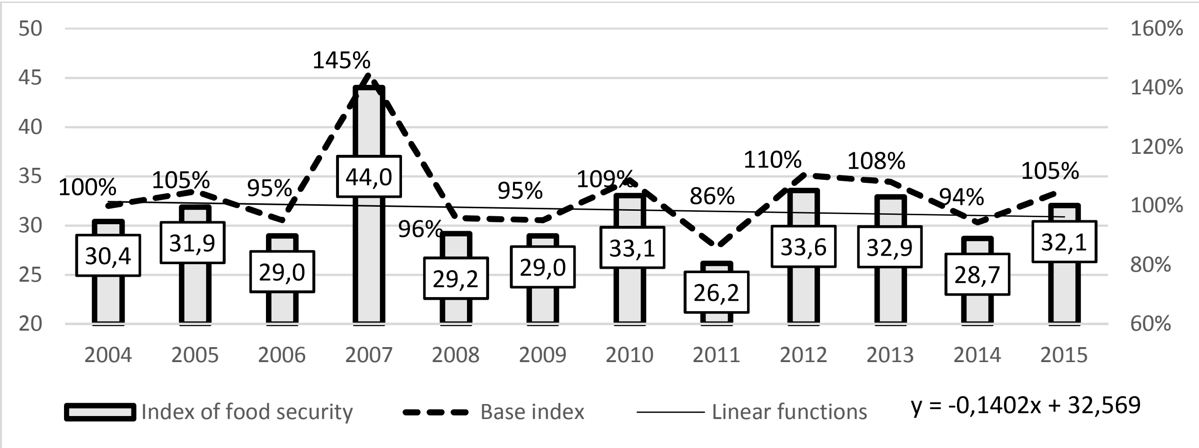


Source: Own calculation based on Eurostat data

For Slovakia, the results are shown in the Figure 2. The Food Security Index is stable over the analysed period, no major fluctuations are observed. Index values range from 7 to 7.4. The most significant change was observed in 2007, similarly to the Czech Republic. Observed increase was caused by increase in agricultural output (+10% year-over-year) given by high world commodity prices. By observation of individual factors influencing index value, it has been obvious that the population is growing in Slovakia (+ 54 thousand inhabitants over analysed period), agricultural land shrank by 13 thousand hectares and total agricultural production does not follow one clear trend, it behaves volatilely (minimum: 1,824 mil. euro in 2010; maximum: 2,206 mil. euro in 2014). Although Slovakian agricultural sector went through significant structural problems, its food security tends to have increasing trend.

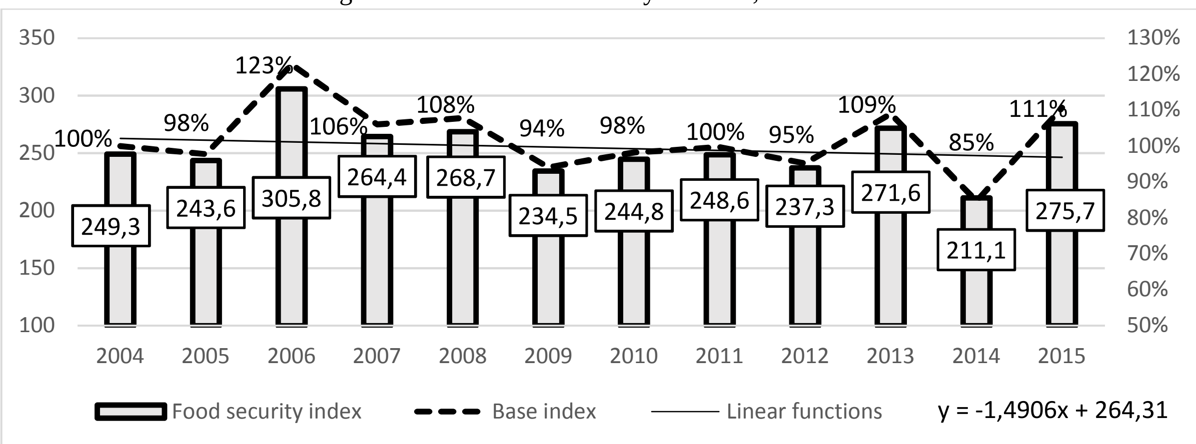
In Hungary, the IFS was observed to be very volatile over the analysed period. The highest value of IFS was reached in 2007. That extreme was caused by several factors. Most importantly, agricultural production increased by 1.5 billion euro year-over-year due to global price shocks, population decreased by 21 thousand inhabitants. In terms of population, in Hungary was observed the fastest decrease of population among other Visegrad countries. Between 2004 and 2015 the number of inhabitants decreased by 286 thousand. Although fertility rate for Hungary is not the lowest (1.4 comparing to 1.3 in Poland, 1.4 in Czech Republic and 1.5 in Slovakia) according to World Bank (2017), the loss of population is mostly explained by steadily high level mortality in EU comparison (HCSO, 2015). Above mentioned decline had significant impact on the final indicator of food security. Similarly to other Visegrad counties, Hungary face problem of agricultural land loss. Between 2004 and 2015 amount of available agricultural land decreased by 515 thousand hectares (-9.1% compared to 2004).

Figure 3. Index of food security - Hungary, 2004-2015



Source: Own calculation based on Eurostat data

Figure 4. Index of food security - Poland, 2004-2015



Source: Own calculation based on Eurostat data

In Poland, 2 extremes occurred in 2006 and 2014. In the other years, IFS did not showed significant fluctuations. In 2006, ISF reached its maximum due to the increase in agricultural production compared to the previous year (an increase of 1.3billion euro year-over-year) and decrease of population by 17 thousand inhabitants compared to 2005. The IFS is affected by size of agricultural land, as amount of agricultural land decreased (1.9 million hectares between 2004 and 2015) it had negative impact on IFS. Population in Poland fell by 223 thousand between 2004 and 2015. In 2014, food security reached its minimum. It is only 84% of the 2004 index value. This significant decline occurred mainly due to the decline in agricultural production, in 2014 it decreased by 793 million euro year-over-year. In 2015, the value of agricultural production increased, which positively influenced the level of the food security index.

The questions connected to food security needs are on rise as total number of hungry people in the world increases. In times of globalization and international trade, securing of food is the subject of international regulation. Food security belongs among the dimensions of national economic sovereignty and it also is considered as component of demographic policy. In the globalized world, many countries try to protect domestic producers by restricting foreign imports aiming at increasing domestic self-sufficiency. According to Kotyza and Slaboch (2014), self-sufficiency of the Czech Republic in main plant production is sufficient except for potatoes, fruits and vegetables. After the accession to the EU, meat self-sufficiency deteriorated significantly, especially production of pork and poultry was harmed in the Czech Republic and Slovakia. In Poland and Hungary, the production of all kinds of meet is able to satisfy domestic demand (Slaboch and Kotyza, 2016).

4. Conclusion

The results show that food security in the Czech Republic has changed significantly over the monitored period. In 2004, the resulting index was worth 19.36 (100%) and was above that level until 2010. In 2011 there was a significant drop 97% against the base. This fall occurred for several reasons. The most important is the fall in total production of agricultural industry (down by EUR 250 million) combined with a population growth of 20 thousand of inhabitants and a decrease in arable land by 19 thousand hectares. Between 2010 and 2014, the food security index remains close to level of 2004 and ranges from 98-105%. In Hungary, the IFS is relatively stable, with the exception of 2007 and 2011. In 2007, the index increased by 49% compared to 2006 mainly due to the significant increase of agrarian production by 1.5 billion euro and decrease of population by 21 thousand. The change in 2011 is negative, IFS is down by 22% compared to 2010. This change was caused by decrease in total production of 670 million euro. In the case of Poland, the food safety index is very constant, with the exception of 2006 and 2014. In 2006, the overall index increased by 25% year-over-year. This is explained by rise in arable land by 57 thousand hectares, drop in population and increased agricultural production. In 2014 IFS declined by 23% year-over-year mainly due to decline in agricultural production. In Slovakia, the IFS is very stable and does not evince volatility, between 2004 and 2015 the base index value ranges from 99-105%. This result is given by a stable level of agricultural production combined with a very low decline in arable land and population.

Of all the countries surveyed, only the Czech Republic and Slovakia evince increase in population. Difference between 2004 and 2015 was 350,000 in the Czech Republic and 54,000 in Slovakia. In Poland and Hungary population declined and positively influenced IFS. Difference between 2004 and 2015 was 286 thousand in Hungary and 223 thousand in Poland. The decline in agricultural land is undoubtedly a negative trend affecting the food security index in all countries. Czech Republic lost 137 thousand hectares. Agricultural land loss is very slow in Slovakia. In Poland total observed decrease of land was 1.9 million hectares and 515 thousand hectares in Hungary. But agricultural land is lost not only in Central Europe. The decline of agricultural land in other countries is confirmed, for example, by Pandey and Seto (2014); Govindaprasad and Manikandan (2014) and others. Decline of agricultural land availability and changes in nutrition habits, mainly in the developing countries (Keating et al., 2014) will have a significant impact on overall agricultural production affecting food security on global level. Therefore exploring food security in European context while using other scientific approaches become plan for future research.

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THE STATE OF ORGANIC FOOD PROCESSING IN POLAND

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Annotation: Recently the dynamic development of organic farming in Poland has taken place, however it has not resulted in significant supply growth, especially in processing sphere. The objective of the paper is to discuss the current state of the Polish organic food processing as well as its main strengths and weaknesses. The study is based on an inquiry research carried out on 75 organic food processing companies and the data of the Agricultural and Food Quality Inspection. The conducted investigation proved that undertaking the organic food processing may be recognized as an advantage. The main reasons for starting organic food processing were gaining new markets and competitiveness enhancement. Having undertaken the organic processing, the entrepreneurs observed financial condition and image improvement. The weaker parties of this kind of business activity were insufficient level of organic raw material supply and lack of delivery continuity. The next disadvantage was dispersion of organic farms that impeded efficient flow of products. Solutions to this problem may become close cooperation between market actors in these two spheres and creating producers groups.

Key words: organic farming, organic food, processing, state, strengths, weaknesses

JEL classification: Q56, Q57, O44

1. Introduction

Dynamic growth of organic area and amount of organic farms recently observed in Poland (respectively seven- and eight-fold) has not resulted in corresponding increase of supply and processing of organic food (Komorowska, 2009). Production and processing turned out to be a weak chain of organic food economy, which is distinguished for low cohesion of its components (Kociszewski, 2014). The stage of raw material production is insufficiently connected to both processing and market. The reasons for such situation may be found in volume and price of raw material offered by the farmers as well as in the organic food processing limitations (Koreleska, 2009). Persistent obstacles in the processing sphere are ones of the reasons for maladjustment of organic food to the increasing demand. In turn, this results in seller's market of organic food with negative occurrences accompanying this situation. One of the most disturbing phenomena is high level of prices limiting organic food availability for the definite majority of the consumers. The persistence of the high prices of organic food denies the basis for the sustainable development – the principle of social justice, and yet organic farming and organic food market are the elements of the sustainable development. Therefore, a question arises, which limitations occurring in the processing sphere lead to persistence of supply imbalance on the organic food market? What are their sources, character and specific features?

The objective of the paper is to present the state as well as strengths and weaknesses of the organic food processing in Poland. The results of inquiry research covering 75 companies dealing with processing of this kind of products were presented in the paper. The data concerning organic food processing provided by Agricultural and Food Quality Inspection (AFQI) were discussed in the paper as well.

The organic food processing in Poland

The organic food processing is based on utilization of raw materials originating from organic farming. It is a subject to specific regulations, which refer to organic farming and its product. Processing of products from organic raw materials has to fulfil particular conditions resulting mostly from two EU legal acts:

- Council Regulation (EC) No 834/2007, which specifies objectives and organic production rules,
- Commission Regulation (EC) No 889/2008 referring to detailed rules for the implementation of the Council Regulation (EC) No 834/2007 on organic production and labelling of organic products with regard to organic production, labelling and control.

Regulation No 889/2008 specifies the conditions for organic food processing concerning raw materials, production methods, labelling, storage and transportation. They are specifically important, when a company simultaneously runs conventional and organic food processing, which is a common practice. Therefore, it becomes necessary to obey strictly specified rules for organic food processing, in order to ensure its separation on each stage of food chain. In particular, it is about compliance with the following, most important requirements:

- spatial and time production separation in case of using the same machines and devices for organic and conventional processing,
- storage, packaging and transportation ensuring physical separation of organic products from other products, in order to avoid their mixing,
- keeping a register of all activities, i.e. practices, procedures, substances used in production and monitoring processes.

The manufacturing process is important for the overall assessment carried out by inspection bodies, which is a base for a certificate valid for one year.

According to the current law, raw material has to originate from certified domestic farming or from imports. In the second case, there is an obligation to obtain a confirmation issued by the AFQI that the material originates from organic production system. The manufactured product has to contain at least 95% organic material and the remaining 5% may consist of other ingredients approved for processing. Regulation (EC) No 889/2008 contains the list of permitted ingredients. The supporting substances, such as food dyes, preservatives and antioxidants may not be used in the processing. Mechanical, physical and fermentation methods may be applied, whereas food radiation is forbidden.

The development of organic food processing is one of the most important factors determining the improvement of the organic market supply side (Śliwowska, 2012). It has been a weak chain of organic food economy for years. The reasons for these weaknesses may be observed on the organic raw materials production side as well as on the side of the processing itself. As a reason for difficulties with selling for some products (e.g. milk), the organic producers mainly indicate lack of sufficient amount of processing companies. In turn, processors see lack of organic raw material as the most significant obstacle of production growth. On the other hand, the market expects greater diversity of product range, particularly in situation of growing and not fully satisfied demand, especially for dairy and confectionary products.

Although the amount of organic food processing companies has been increasing in the recent years, they have not met the expectations of organic farmers and consumers. For the last decade (2005-2014), the number of processing companies grew fivefold from 99 to 484, but only part of them showed production (AFQI, 2015). Currently there are about 700 organic food processing enterprises and the majority of them deal with cereals, fruit and vegetables, because they are relatively easily available, in regard to the fact that quite large amount of the organic farms deals with their cultivation (Nowak and Szewczyk, 2015). Meanwhile, there is definitely less meat processing companies and butcheries, because animal production is rather low and concentrated mainly in podlaskie and małopolskie voivodships. The situation seems to be better in case of milk production, but its processing is not sufficiently developed (table 1). Therefore, there is a shortage on the market of highly processed dairy products, such as yoghurts, kefirs and homogenised cheese.

Table 1. The share of particular branches in total number of organic food processing companies (%)

Branch	2013	2014
Fruit and vegetables	29.2	34.1
Cereal milling	23.8	19.8
Meat	4.9	7.0
Coffee and tea	6.3	4.8
Milk processing and cheese	3.6	3.1
Vegetable and animal fats	2.7	2.4
Sugar	1.6	1.5
Other	27.9	27.3

Source: AFQI, Agricultural and Food Quality Inspection, Raport o stanie rolnictwa ekologicznego w Polsce w latach 2013-2014, Warsaw, 2015.

The organic production of processing companies is relatively low. In 2014, in milk processing and cheese, it amounted to 1,093 t, in fruit and vegetables 383,925 t and in cereals milling 4204 t. In comparison to 2013, the fruit and vegetable processing dropped by 46% and cereals milling by 14%, only dairy production grew by 21%. It is quite surprising, because in the same period, organic production of cereals, potatoes, vegetables and fruit clearly increased, respectively by 12%, 11%, 27% and 8% (AFQI, 2015). This may prove the lack of proper relations between production and processing sphere.

2. Materials and Methods

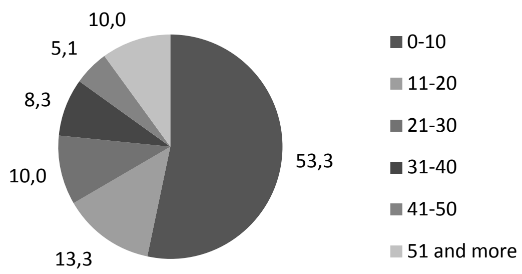
In 2016, an investigation covering 75 organic food processors was carried out, in order to specify their basic features as well as strengths and weaknesses. The basis for the research was an inquiry questionnaire sent by post to all organic food processors in Poland.

The vast majority of the investigated companies (84%) were established after 2004, when Poland accessed the European Union and new possibilities for financing modernisation of agri-food sector enterprises occurred. They were mainly small and medium sized companies (96.2%). There were enterprises and organic farms dealing with processing among the inquired units. The indicated range of business activity showed that they were mostly related to the international market (52.7%) rather than the domestic and local ones (respectively 45.9% and 16.2%), which may prove the export orientation of organic food processing in Poland.

3. Results and Discussion

Most of the investigated firms (80%) were running simultaneously processing of organic and non-organic food. In enterprises running organic and conventional processing, the share of the first one was low, in every second company the share of the organic processing was at the level not exceeding 10% and in every tenth it amounted to at least 50% (fig. 1).

Figure 1. The share of the organic food processing in the total processing of the investigated companies (%)

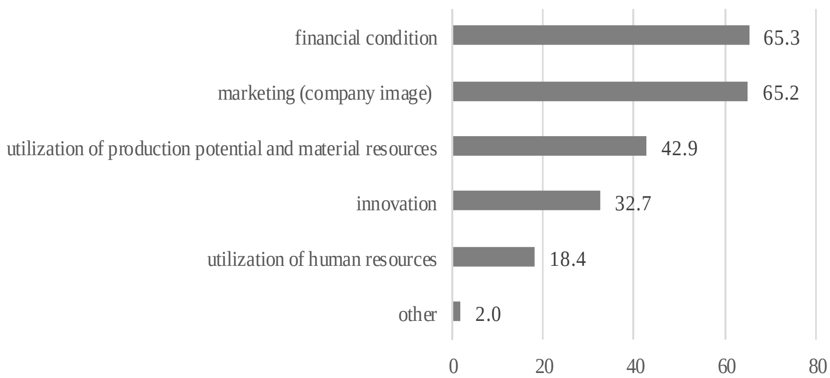


Source: authors' own research.

Undertaking organic food processing may be recognized as a competitive advantage and strength of the investigated units, because diversification of production not only reduces the economic risk, but also creates possibilities to enter new markets. The research showed that from the variety of reasons for undertaking organic food processing, gaining new markets (76.4%) and competitiveness improvement (63.9%) were the most important for the investigated. Relatively low percentage of the enterprises indicated the diversification of risk (9.7%). Nevertheless, the importance of the reasons was slightly different for the companies established between 1996 and 2003 and founded after 2004. In the first case, gaining new markets was more important, whereas in the second case – competitiveness improvement.

The investigated units mainly dealt with fruit and vegetable processing and to a small extent with other product groups. Low level of processing reflects in small supply of organic food market, where, besides fruit and vegetable products and partly cereal milling products, in the group of the remaining products the imported products have a significant share. The supply gap is supplemented mostly by imports from other EU countries (e.g. Germany, France, Italy, and Czech Republic). In the situation of increasing demand for organic food, it proves some unused possibilities in processing and weakness of two groups: organic farmers and processors. Ii is confirmed by the research results (fig. 2). Having undertaken organic processing, the companies observed financial condition and image improvement (both 65%) rather than better utilisation of production potential and material resources (42.9%).

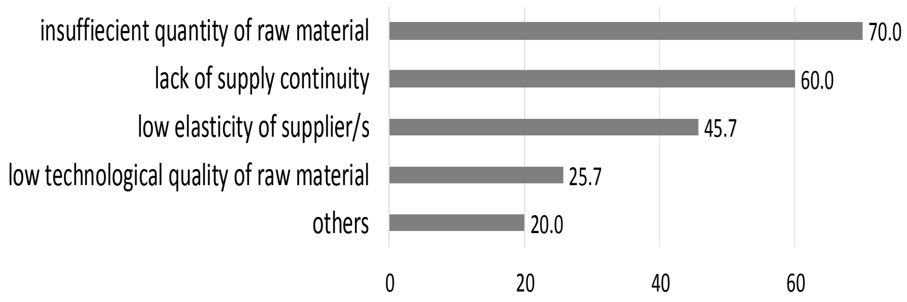
Figure 2. The influence of organic food processing on improvement of selected areas of activity (%)



The respondents could choose more than one option.
Source: authors' own research.

According to the inquired, worse effects in production potential area resulted from inadequate level of raw material (fig. 3). Insufficient amount of raw material (70%) and lack of supply continuity (60%) were two indicated weaknesses of supply.

Figure 3. Weaknesses of raw materials supplies for organic food processing (%)



The respondents could choose more than one option.
Source: authors' own research.

The availability of raw material is one of the most important criteria for delivery choice. It takes the second place in this field (76.7%), after raw material quality (93.2%) and before price level and delivery distance (24.7%). The vast majority of processors (82.4%) cooperated with more than three providers, which resulted from difficulties in obtaining particular amount of raw material from one provider. An additional problem was dispersion of organic farms and lack of elasticity in reacting to further orders. However, on the other side, the investigation conducted on organic farmers proves that they have difficulties with selling their products, also to the processing plants, and therefore part of them sell their products at conventional food prices level. Problems occurring in mutual adjustments of raw material and processing sphere prove the need for establishing deepened cooperation forms that would contribute to solving this problem. Establishing producers' groups (currently there are seven) seems to be an urgent need, which is dictated by specificity of both organic raw material production and processing (Pawlewicz, 2009; Pawlewicz and Szamrowski, 2012).

A weak side of providers and processors of organic food is a lack of developed forms of cooperation. Farmers, as provider of organic raw material, do not have strong need for cooperation as well as awareness of benefits resulting from the cooperation, in order to undertake intensive activities aiming at its formalization with processing companies. Processors adopt similar attitude, because the majority (over 65%) did not undertake cooperation with other market actors besides providers and trade. Only in a few cases, they cooperated with universities (2 indications) and promoters (1 indication). It results in a lack of deeper connections between units in different degree linked to the organic food market, which would influence functioning efficiency improvement.

The inquired entrepreneurs' attitude to innovation is worth mentioning. However, organic farmers and processors participate in creating product, process and organizational innovation, they do not cover the sphere of relational behaviour. Their activities are housed in Schumpeterian closed innovation, which does not go out beyond business entity and does not cover networks of cooperation (Domagalska-Grędys, 2016). Therefore, it seems that persistent difficulties in adjusting of raw material supply to processing sphere result, among others, from lack of such cooperation and exclude both groups from benefits originating from it (Nasalski, 2006).

4. Conclusion

Recently a significant increase in amount of organic food processing companies has been observed, but the production level is still low. In development of organic processing, the state and the availability of raw material base as well as location of provider have the key meaning. The current state of organic farming development characterised by low production is one of the most important limitations of organic farming development. Therefore, there is a need for establishing organic food producers' groups, which would influence better adjustment organic raw material supply to the demand from processing side. Otherwise, despite increasing demand for organic food, imported processed products will dominate the market.

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CZECH AGRARIAN TRADE COMPARATIVE ADVANTAGES IN RELATION TO EU28: TRANSFORMATION 2001 – 2015

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Annotation: This paper primarily focuses on Czech agrarian foreign trade comparative advantage issues. The main aim of this paper is to identify and explain changes in comparative advantages distribution and trade commodity structure which have occurred during the above mentioned time period. In addition, this paper also focuses on the problem of Czech agrarian trade volume growth and decreasing unit price development. The analyzed time period spans the years 2001 to 2015. Trade structure and comparative advantages distribution are evaluated in relation to EU countries (28 current EU members). Differences in the date of their EU accession are not taken in account. The commodity structure (HS system applied) is specifically analyzed in relation to unit value, trade volume development and comparative advantages distribution development. To successfully accomplish the above mentioned objectives, this paper applies basic competitiveness analyses (Lafay index and Trade balance index). The results derived from individual analyses are highlighted by utilizing the "Product Mapping Method". The data source for individual analyses was obtained from the Czech Statistical Office. During the period of analysis, Czech agrarian trade increased its dependency on EU Countries. The share of EU countries in regards to Czech agrarian trade turnover has increased from 78% to 88%. Czech agrarian exports are dominated by low processed and semi-processed aggregations having a low unit value. On the other hand, imports from the EU can be characterized by a much higher unit value and a much higher processing level. Unfortunately, the unit value of Czech agrarian exports has been consistently decreasing. However, on the opposite side, the unit value of imports has been steadily increasing. Czech agrarian trade comparative advantages are typical, especially for low processed products such as e.g. cereals, oilseeds, living animals, milk, animal and plant fats, oils, mineral water, sugar, fish etc.

Key words: Agrarian trade, Czech Republic, territorial structure, commodity structure, EU28, third countries, comparative advantages.

JEL classification: Q02, Q13, Q17

1. Introduction

This article examines the basic transformation trends related to Czech agrarian foreign trade territorial and commodity structure from the period of 2001 to 2015. In relation to the specific process of Czech agrarian foreign trade formation, it is necessary to emphasize several factors that significantly influence its development and the current performance. The character of Czech agrarian trade was affected by the transformation process from a central planned economy to a market economy (Lukas, 1998). The significant driving factor affecting Czech agrarian trade was the collapse of The Council for Mutual Economic Assistance (COMECON). In the 1990's the dynamic of Czech agrarian trade was significantly influenced by applied protectionist policies (Lukas, 1998). The dynamic of agrarian trade was also affected by the efforts of the Czech Republic to achieve EU membership. In the precession period, the liberalization process, especially in relation to the EU was not a symmetrical. The Czech agrarian market was reducing its applied protection measures in relation to the EU faster than EU countries were reducing its applied protection measures in relation to the Czech Republic (Lukas, 1998; Svatoš et al., 2013). The transformation process especially in the period before Czech accession was not very positive (Presová et al., 2008). Czech agrarian imports experienced a much faster growth rate than Czech exports. The result was a consistently increasing negative trade balance.

The most important event for the Czech agrarian market was the moment of the EU accession. The tariff and quota barriers existing among the old and new EU countries (including the Czech Republic) were suddenly non-existent and mutual trade received new stimuli (Clark et al., 2015). The importance of EU territory for Czech agrarian trade even increased. Since the Czech Republic, as other Central European countries, also reduced the importance of non-EU territories (Fertö, 2008; Lukas, 1998; Kennedy and Sonnier, 1997).

Immediately after the EU accession, the Czech Republic agrarian trade performance began to be affected by the EU Common Trade Policy, as well as Common Agricultural Policy (Fuller et al., 2002; Csaki and Nash, 1999; Bašek and Kraus, 2009). These processes significantly encouraged not only exporting, but also importing (Svatoš, 2008). During the initial years of Czech EU membership, import value was growing faster in comparison to export value development. The result was consistently increasing negative trade balance performance. This constantly growing negative trade balance was interrupted in 2011/2012. However, recently the trade performance has experienced some improvement. The current Czech agrarian trade is standing at very important crossroad. The process of territorial and commodity re-structuralization is still not finished. And more significant changes affecting the future value, volume and structure can be expected especially in relation to future possible liberalization processes e.g. CETA, Doha Development Agenda etc. The main goal of this paper is to identify and to explain changes in comparative advantages distribution and trade commodity structure which have occurred during the above mentioned time period. In addition, this paper also focuses on the problem of Czech agrarian trade volume growth and decreasing unit price development. We are primarily interested in answering the question of whether or not the changes in Czech agrarian exports are positive.

2. Materials and Methods

This paper primarily focuses on Czech agrarian foreign trade comparative advantages and value and volume development issues. The analyzed time period spans the years 2001 to 2015. Trade structure and comparative advantages distribution are evaluated in relation to the non-EU members and to EU countries (28 current EU members). Differences in the date of their EU accession are not taken into consideration. The commodity structure (HS system applied) is analyzed specifically in relation to unit value, trade volume development and comparative advantages distribution development. To successfully accomplish the above mentioned tasks, this paper applies basic competitiveness analyses (Lafay index and Trade balance index). The results derived from individual analyses are highlighted by utilizing the "Product Mapping Method". The product mapping matrix divides the entire set of exported products into four groups according to the two selected indicators (LFI and TBI). The LFI index has been chosen for the "product mapping" approach because of its ability to take into consideration only those transactions which are truly related to an individual country's trade performance. The TBI index has been utilized for its ability to divide the products according to their real trade performance into the below specified four quadrants. The data source for individual analyses has been obtained from the Czech Statistical Office. The Commodity structure (we applied HS system dividing agrarian trade into 24 commodity groups3) is analysed especially in relation to its export competitiveness.

[3] HS01 Live animals, HS02 Meat and edible meat offal, HS03 Fish and crustaceans, molluscs and other aquatic invertebrates, HS04 Dairy produce birds' eggs natural honey edible products of animal origin, not elsewhere specified or included, HS05 Products of animal origin, not elsewhere specified or included, HS06 Live trees and other plants bulbs, roots and the like cut flowers and ornamental foliage, HS07 Edible vegetables and certain roots and tubers, HS07 Edible vegetables and certain roots and tubers, HS08 Edible fruit and nuts peel of citrus fruit or melons, HS09 Coffee, tea, mate and spices, HS10 Cereals, HS11 Products of the milling industry malt starches inulin wheat gluten, HS12 Oil seeds and oleaginous fruits miscellaneous grains,seeds and fruit industrial or medicinal plants and fodder, HS13 Lac gums, resins and other vegetable saps and extracts, HS14 Vegetable plaiting materials vegetable products not elsewhere specified or included, HS15 Animal or vegetable fats and oils and their cleavage products prepared edible fats animal or vegetable waxes, HS16 Preparations of meat, of fish or of crustaceans, molluscs or other aquatic invertebrates, HS17 Sugars and sugar confectionery, HS18 Cocoa and cocoa preparations, HS19 Preparations of cereals, flour, starch or milk pastrycooks' products, HS20 Preparations

As it was mentioned before, the authors applied several different types of indices to measure the level of Czech agrarian trade competitiveness. Using the LFI (1992) index authors focused on the bilateral trade relations between the Czech Republic and EU28 and between the Czech Republic and non-EU countries. The Lafay index helps to explain how the comparative advantages are distributed. For a given country, i, and for any given product j, the Lafay index is defined as:

$$LFI_j^i = 100\left(\frac{x_j^i - m_j^i}{x_j^i + m_j^i} - \frac{\sum_{j=1}^{N}(x_j^i - m_j^i)}{\sum_{j=1}^{N} x_j^i + m_j^i}\right)\frac{x_j^i + m_j^i}{\sum_{l=1}^{N} x_j^i + m_j^i} \qquad \textbf{(1)}$$

where x^i_j and m^i_j are exports and imports of product *j* of country *i*, towards and from the particular region or the the world as a whole, respectively, and *N* is the number of items.

Positive values of the Lafay index indicate the existence of comparative advantages in a given item; the larger the value, the higher the degree of specialization. (Zaghini, 2003)

Trade Balance Index (TBI) is employed to analyze whether a country has specialization in exports (as net-exporter) or in imports (as net-importer) for a specific group of products. TBI is simply formulated as follows:

$$TBI_{ij} = (x_{ij} - m_{ij})/(x_{ij} + m_{ij}) \qquad \textbf{(2)}$$

where TBI_{ij} denotes the trade balance index of country *i* for product *j*; x_{ij} and m_{ij} represent exports and imports of group of products *j* by country *i*, respectively (Lafay, 1992).

A country is referred to as a “net-importer” in a specific group of products if the value of TBI is negative, and as a “net-exporter” if the value of TBI is positive. (Widodo, 2009)

The next part of the analysis presented in this paper was conducted using the analytical tool, called “Products Mapping”. This tool enables us to assess leading exported products from two different points of view, i.e. domestic trade-balance and international competitiveness. Figure 1 represents the matrix for the distribution of the entire set of exported products into 4 groups according to the two selected indicators.

Figure 1. – Modified product mapping scheme

<table>
<tr><td rowspan="2">Lafay index</td><td>LFI>0</td><td>Group B:
Comparative Advantage
Net-importer
(LFI>0 and TBI<0)</td><td>Group A:
Comparative Advantage
Net-exporter
(LFI>0 and TBI>0)</td></tr>
<tr><td>LFI<0</td><td>Group D:
Comparative disadvantage
Net-importer
(LFI<0 and TBI<0)</td><td>Group C:
Comparative disadvantage
Net-exporter
(LFI<0 and TBI>0)</td></tr>
<tr><td colspan="2" rowspan="2">Czech Agrarian Foreign Trade Commodity Structure</td><td>TBI<0</td><td>TBI>0</td></tr>
<tr><td colspan="2">Trade Balance Index</td></tr>
</table>

Source: own modification and processing, 2016

of vegetables, fruit, nuts or other parts of plants, HS21 Miscellaneous edible preparations, HS22 Beverages, spirits and vinegar, HS23 Residues and waste from the food industries prepared animal fodder, HS24 Tobacco and manufactured tobacco substitutes

3. Results and Discussion

When looking at the territorial structure of Czech agricultural trade, it is apparent that it is more and more primarily focused on EU-countries. The EU share in the Czech agricultural trade reaches about 90% in the long-term. Czech exports are able to compensate for the growth of imports – especially through its increasing volume performance. The key aspect of the Czech agrarian trade is its competitiveness. The Czech agrarian sector has not finished the process of its restructuring, in addition its commodity structure profile is constantly changing.

The value of Czech agrarian trade is typical, in particular because of its specific character in relation to partner territories. As it was mentioned already before, Czech agrarian trade is heavily focused on European territories. If we compare the period from 2001 to 2015, it is possible to see significant growth of export and import value performance especially in relation to the EU (Smutka et al., 2016). In addition, the Czech agrarian export growth rate exceeded the import growth rate particularly in relation to the EU28 (Smutka et al., 2016). The positive impact of the intensive export value growth rate is the ability of the Czech Republic to significantly reduce its negative trade balance share both in relation to total agrarian trade turnover and export value. In this case, the situation improved specifically in relation to the EU28. During the last 15 years, Czech agrarian trade has become extremely concentrated (Smutka et al., 2016). The concentration is not related only to territorial structure (focused especially on European region), but it is also related to its commodity structure (Smutka et al., 2016). All indices has proved the existence of Czech agrarian trade comparative disadvantages both in relation to the EU28 and also in relation to third countries. But on the other hand, Czech agrarian trade is probably able to be competitive, especially because of its constantly improving trade performance. The existence of comparative advantages is proved through the application of LFI and TBI indices, taking into consideration only agricultural trade performance.

Distribution of comparative advantages in relation to different groups of countries

The results coming from LFI and TBI analyses provide a very interesting overview of current and past situations. The significant dynamics of commodity structure development can be seen both in relation to the LFI and the TBI index. The structure of agrarian trade has still not stabilized and agricultural trade still seems to be searching for an ideal state. These findings were also confirmed by other authors - e.g. Pohlová and Mezera (2014), Doubek et al. (2012), Bašek and Kraus (2009), Smutka et al. (2016). EU28 members – are the main trade partners of the Czech Republic (their share in total Czech agrarian trade within the analysed time period was cc 78% respectively 88%). During the analysed time period, EU trade experienced significant restructuring. The value of exports and imports increased by cc 350% respectively cc 268%. The share of Group A transactions in total agrarian trade increased from 38.55% (HS12, HS22, HS24, HS04, HS11, HS01, HS17, HS03) to 55.21% (HS10, HS24, HS01, HS12, HS15, HS04, HS22, HS11, HS17, HS03, HS16, HS09, HS13, HS14). The share of Groups B and C were reduced from cc 4.74% (HS02, HS13) to 0%. And the share of Group D was reduced from 56.7% (HS10, HS14, HS09, HS05, HS16, HS18, HS20, HS15, HS21, HS06, HS19, HS23, HS08, HS07) to 44.8% (HS05, HS21, HS19, HS23, HS18, HS06, HS20, HS08, HS07, HS02).

Third countries – represent only a minor share of Czech agrarian trade – cc 11.6%. During the analysed time period, the share of those countries was significantly reduced (in 2001 it was cc 22%). Despite significant share reduction – Czech agrarian exports and imports realized in relation to third countries, the significant growth by cc 101% respectively cc 80%. The growth rate was significantly lower in comparison to the EU28 members. The commodity structure (according to TBI and LFI) experienced the following changes during the analysed time period: The share of Group A showed a very little change in 2001 of only 27% (HS04, HS17, HS22, HS11, HS01, HS13, HS19) and in 2015 the share only reached 29.4% (HS04, HS17, HS01, HS24, HS12, HS19, HS11, HS13, HS18), the share of Groups C increased from 8% (HS12, HS02) to 16% (HS23, HS22) and the share of Group D recorded a significant reduction from cc 65% (HS14, HS06, HS16, HS15, HS10, HS05, HS07, HS18, HS20, HS03, HS09, HS24, HS23, HS21, HS08) to 54% (HS14, HS05, HS06, HS10, HS15, HS16, HS21, HS20, HS07, HS01, HS09, HS03, HS08).

On the basis of the above mentioned information, it is possible to determine that during the last fifteen years, the Czech agrarian trade profile and competitiveness experienced some very important changes. While the territorial structure has become even more concentrated, the commodity structure has become more diversified. While in 2001 the share of TOP5 and TOP10 commodity items in total agrarian exports reached 52% respectively 76%, in 2015 it was 41% respectively 69%. The export commodity structure is particularly based on the set of commodities that have comparative advantages – especially at the bilateral level (it was already proved by Smutka et al., 2016). While Czech trade is quite competitive, especially in relation to the EU28, the competitiveness in relation to other territories is limited. The applied product mapping approach proved that the process of Czech agrarian trade restructuralization in relation to traditional partners (especially the EU28) is still progressing. In relation to other partners, the trade profile is also developing and the Czech Republic has a long road ahead, until it reaches the final state of commodity structure. There are still far too many items exported under group D. The significant weakness of the Czech agrarian trade is its inability to generate added value. Czech agrarian trade is still growing, particularly through constant volume growth and through low export unit prices. While the value of Czech agrarian exports and imports increased 4.1 times respectively 3.2 times, the volume of Czech agrarian trade in particular that of exports, has increased more than 5.2 times. The export volume is growing much faster in comparison to import volume (2.5 times). During the monitored time period (2001 – 2015), the volume of Czech exports increased by cc 13 million tonnes, while the import volume increased by cc 4.5 million tonnes. The result is the significant disproportion between the Czech agrarian trade export and import unit price. While in 2001 the export and import unit prices reached 16.01 CZK/kg respectively 22.25 CZK/kg, in 2015 it was about 12.5 CZK/kg respectively 29 CZK/kg. The competitiveness of Czech exports is based on a constantly decreasing unit price value and export price/import price unit ratio (Pohlová and Mezera, 2014; Burianová, 2011; Smutka et al., 2016). Another important stimulus supporting Czech agrarian trade, especially during the last couple of years, was the significant effort of the Czech central bank to keep the exchange rate at a low level (cc 27 CZK/EUR). The low added value in addition to the low unit price of Czech agrarian exports represents a significant problem in regard to stability and future development (Pohlová and Mezera, 2014). Many authors have already criticised the limited ability of the Czech foodstuff industry to compete in the field of high processed products (Lukas, 1998; Doubek et al., 2012; Burianová and Belová 2012). Czech agrarian trade has been suffering because of lack of investment and efficient marketing, and the lack of technological advances (Vasary et al., 2014; Bojnec and Fertö, 2009). The significant changes in Czech agrarian trade competitiveness between 2001 and 2015 can be seen specifically in relation to EU28. The share of A group products in total agrarian exports significantly increased between the years 2001 and 2015. On the opposite side, the share of items located in group D has significantly decreased. Non-EU countries did not change their role in Czech agrarian export and import activities according to TBI and LFI values distribution. Changes in relation to the EU are related to the continual process of Czech agrarian trade re-structuralization under the CAP and CTP (for details see Burianová and Belová, 2012, Burianová, 2011a; Burianová, 2011b).

4. Conclusion

This paper provides the following important findings: The Czech agrarian trade value and volume performance is constantly increasing. The current trade volume is growing even faster than the value. The most significant problem of the Czech agrarian trade is a rather low added value of its exports. The growth of exports is driven by the growth of trade volume. Czech agrarian trade competitiveness is primarily based on low processed or high volume items. On the other hand the significant part of imports is represented by high processed products. The weakness of Czech agrarian exports is a constantly decreasing share of high processed items in total trade performance. The semi-finalized or non-processed items represent the pillars of Czech agrarian exports. Czech agrarian trade competitiveness must be analysed at two separated levels (the EU28 and non-EU countries). In relation to the EU28, the combination of TBI and LFI analyses proved the existence of comparative advantages in relation to the following set of aggregations (at the level of bilateral agreements): Cereals, live animals, oil seeds, tobacco products, dairy products, sugar, vegetable oils, saps and plaiting materials, milling products, beverages and alcohol, animal and vegetable fats, fish, preparation of meat, coffee, tea, and spices, gums and resins. In relation to non-EU countries, Czech agrarian trade is competitive particularly in relation to the following commodity groups: Live animals, dairy products, sugar, oil seeds, preparation of cereals, milling products, cocoa preparations, gums and resins and tobacco products. It is possible to see significant changes in commodity structure profile and in addition to its volume and value performance. The EU market is rapidly changing not only because of internal factors, but also because of changes in the external environment. Those changes represent not only threats, but also opportunities for Czech farmers and food producers to fully reach their potential in production, especially in relation to rapidly developing regions.

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ARE INVESTMENT SUBSIDIES FOR FARMS STILL UNEXPLORED? A SYSTEMATIC REVIEW

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Annotation: The main objective of this paper was to identify research approaches to investment subsidies in the agricultural sector. A link of this type of support to economic and financial situation of farms was underlined. In the five-procedure systemic review academic and practitioner-oriented literature were explored. A growing body of literature deals with various aspects of farm investment (including to so-called investment behaviour, assessment of investment projects, the impact of various CAP measures on investment activity) and there is only a limited number of studies dealing with the role 'investment subsidies', in particular, at farm level. Grouping and classification of analytical dependencies related to investment subsidies may be useful for potential meta-analysis and contribution for ongoing discussion on the shape of CAP 2020+. There is a strong need for implementing some approaches used in analysis of the impact of non-agricultural subsidies. Modern streams of empirical research on investment subsidies in farms include behavioural approach, ecological and environmental economic and finance.

Key words: investment, investment subsidies, farms, agricultural finance, Common Agricultural Policy.

JEL classification: Q14, Q18, H25.

1. Introduction

The agricultural sector is responsible for providing food and fulfils various needs (inter alia, related to providing public goods and mitigating negative externalities). Moreover, agriculture may be characterized by "high proportion of capital assets" and "high proportion of equity capital investment". This results from "biologically driven cycles of production" (Barry and Ellinger, 2012). The problem of financing real investment projects is very important in agriculture because farmers (even in developed countries) have to deal with credit constraints (O'Toole, Newman and Hennessy, 2014; Fertő et al., 2017).

Investment subsidies have been used as an important tool of public interventionism (Cerqua and Pellegrini, 2014). Similarly, as in other sectors, they can be used in order to reduce market imperfections and counteract credit restrictions affecting, in particular, small-sized businesses (see: Haapanen, Tokila and Ritsilä, 2005).

The main objective of this paper is to identify research approaches to investment subsidies in the agricultural sector. Particular attention is paid to a link of this type of support to economic and financial situation of farms. Our article contributes to an ongoing discussion on the role of investment subsidies in agricultural policies.

2. Materials and Methods

We adapted a methodological approach of Denyer and Tranfield (2009) who presented a five-step procedure for a systematic review: *Question formulation; Locating studies; Study selection/evaluation; Analysis/synthesis; and Reporting/using results.* Key research questions in our review included: (1) What are key research approaches to investment subsidies for farms? (2) Which types of proposals for further research may be derived from existing empirical studies? In order to analyse research approaches to investment subsidies (mainly, from a microeconomic perspective) we explored both academic and practitioner-oriented literature (FAO, World Bank, OECD, EU institutions). In search engine Scopus (S) we used the type of string TITLE-ABS-KEY (*investment* *subsidies* AND *farm*; *"investment subsidies"* AND agriculture, *"farm investment"*, *"investment subsidies"*, *investment* AND *subsidies* AND *farms*). In Web of Science (WoS) we searched by "Topic" (a string TITLE-ABS-KEY was unavailable). Only articles or reviews were included in search results. Our review covered the years from 1970 to 2017, but the importance of studies from EU MS after accession in 2004 was underlined. Additionally, quantitative bibliometric analysis (ranks of frequently used terms; counts generated by search engines) was also employed.

3. Results and Discussion

Table 1 presents search results (both in S and WoS). A sum of results from search on "farm investment" (142 papers in Scopus, 107 - WoS) or "investment subsidies" (208 - Scopus, 139 – WoS) indicate that a strong need for a flexible approach to empirical analysis of investment subsidies. There was a limited number of articles and reviews referring to *"investment subsidies"* and *farm*. This indicates that a growing body of literature deals with various aspects of farm investment (including to a so-called investment behaviour, assessment of investment projects, the impact of various CAP measures on investment activity, even accounting as in Sedláček, Kouřilová and Pšenčík (2012). More flexible approach to search (*investment* AND *subsidies* AND *farms*) indicates a strong differentiation of research approaches, because the variables related to farm investment occurred both as dependent and independent. A part of studies after 2010 in New MS of EU contains empirically proven determinants of investment activity of farms (e.g. Fertő et al., 2017).

Table 1. Search results according to sting used related to investment subsidies for farms

String used in search engine	**Total number of research papers***	**Number of papers related to EU MS**	**Number of papers related to EU MS after 2004**
investment subsidies AND farm	S: 160, WoS: 160	S: 67, WoS: 94	S: 62, WoS: 70
"investment subsidies" AND farm	S: 13, WoS: 12	S: 10, WoS: 11	S: 10, WoS: 9
"investment subsidies" AND agriculture	S: 14, WoS: 12	S: 10, WoS: 10	S: 10, WoS: 9
investment AND subsidies AND farms	S: 160, WoS: 160	S: 62, WoS: 117	S: 57, WoS: 87
"farm investment"	S: 142, WoS: 107	S: 49, WoS: 53	S: 41, WoS: 44
"investment subsidies"	S: 208, WoA: 139	S: 917, WoS: 109	S: 670, WoS: 75

Source: own studies (date: 25.05.2017).
*Note: * S – Scopus, WoS – Web of Science.*

As shown in Table 2, frequently used key words (only in two narrowest search range in Scopus) included categories related to economic and technical efficiency. Moreover, key words describing the connection of farms with EU (e.g. *Common Agricultural Policy, Subsidy System*).

Table 2. Ranks of frequently used keywords referred to investment subsidies

String used	The number of frequently used key words
"investment subsidies" AND farm	Investment (4), Agriculture (3), Common Agricultural Policy (2), Investment Subsidies (2), Malmquist Index(2), Milk Production (2), Subsidy System (2),Technical Improvement (2)
"investment subsidies" AND agriculture	Investment (5), Agricultural Labour (2), Agriculture (2), Common Agricultural Policy (2), European Union (2), Farms (2), Investment Subsidy (2), Malmquist Index (2), Milk Production (2), Soft Budget Constraint (2), Subsidies (2), Technical Improvement (2)

Source: own studies computed by Scopus (date: 25.05.2017).

Table 3 presents main research problems with methodological approaches (methods and data used) referring to investment subsidies at various levels (focus on farm-level analysis is dominant). Comparing several research papers, results and conclusions seem to be inconsistent at the EU level (see: Latruffe, Guyomard and Le Mouël, 2009; Sckokai and Moro, 2009). This stems from various determinants of development of the agricultural sectors in EU MS. Identifying dependencies for various type of farms seems to be very valuable because differences in capital- and labour-intensity exist between them. Key research approaches included econometric methods (such as linear regression models OLS, binary models) and multivariate comparative analysis (MCA), incl. cluster analysis, based on analysis of economic efficiency or financial analysis. A critical analysis of literature related to the impact of investment subsidies on situation of farms indicates that this issues has been explored in the context of assessment of CAP measures (incl. country level - Svoboda, Lososová and Zdeněk (2016), FADN regional data - Špička and Machek (2015) or both country and micro data - Buchta and Buchta (2009)).

Bojnec and Latruffe (2011) identified non-significant impact of investment subsidies for Slovenian farms. It should be noted that transition processes were captured in their analysis. Nevertheless, a positive impact of other subsidies for small-sized farm households (given financial constraint) was significant. Špička and Machek (2015) explored difference in the level of investment subsidies (e.g. per livestock unit) between the FADN regions. The levels of investment subsidies were higher in the regional units where negative change in the production efficiency was detected. Moreover, investment subsidies stabilised technical efficiency that was found at FADN macro-region data level. On the other hand, Petrick and Ziel (2012) focused on how direct payments, as well as other CAP measure may affect employment in the agricultural sector. This is important from the standpoint of structural changes in agriculture. Petrick and Ziel (2012) found that "there is some indication that investment subsidies have halted labour shedding on farms, a rise in the general wage level reduced labour use in agriculture". This conclusion referred to German agricultural sector.

It should be noted that most empirical studies based on farm-level data from the Farm Accountancy Data Network (FADN), mainly from national liason agencies. The FADN data may be treated a valuable source of verified and harmonised (at EU level) microeconomic data on 'agricultural holdings'. From the perspective of monitoring of agricultural policies (Common Agricultural Policy as a "toolbox" of harmonised agricultural policies for EU) input as FADN data, moreover, survey data, was employed in econometric models that are useful for generating estimates of the net impact of investment support under CAP (European Commission, 2014).

Table 3. Methodological approaches of selected empirical studies on the role of investment subsidies on economic and financial situation of farms

Research objective	Research method	Data used	Examples of studies
To identify the financial determinants of farm investment decisions of family farm households during the economic transition	Standard and augmented accelerator models	Farm-level data, year 1994-2003	Bojnec and Latruffe, 2011
To investigate into "the effects of government-supported farm-investment measures on structural change in Austrian agriculture"	Direct covariate matching and difference-in-difference (DiD) estimator	Integrated Administration and Control System (IACS) data of 98,000 Austrian farms (years 2000–2011)	Kirchweger, and Kantelhardt, 2012
To assess the impact of direct payments and other measures of CAP (incl. investment subsidies/grants) on employment in agricultural sector	A dynamic labour demand equation + the set of CAP measures	Panel data of 69 East German regions	Petrick and Zier, 2012
To assess the impact of direct payment on farm investment decision	Descriptive statistics, OLS	Farm-level secondary data; primary data from CATI survey	European Commission, 2013
To identify "the key structural, yield and economic determinants of the change in regional efficiency of specialized milk farms" - within this perspective investment activity and investment subsidies allocated in the sample of regions were explored	Quantitative methods were applied on the: the Malmquist productivity index, the Welsh two-sample t-test, and the linear regression analysis	Regional FADN data (panel data of 100 regions), (years 2007-2011	Špička and Machek, 2015
To assess the impact of "economic indicators", identifying the connections and links between economic indicators and IS" (p.154)	A cluster analysis accompanied by descriptive statistics	EU FADN state-level data (years 2004-2013)	Svoboda *et al*., 2016

Source: own studies.

Note: IS – investment subsidies, E&FS – economic and financial situation, references used in the table.

The important research stream in farm investment refers to determinant of investment behaviour of farmers. This is a very important, but still unexplored stem in agricultural economics and finance. Conclusions from empirical studies of LaDue, Miller and Kwiatkowski. (1988) may be still useful for formulating research questions in research on the impact of investment subsidies (Olsen and Lund, 2011). Various factors affecting farm investment behaviour (expressed by investment intentions, investment rate) inter alia economic variables (public policy measures depicted by subsidy rates, agricultural price scissors, macroeconomic situation, incl. interest rates), farmer's attitudes to risk and socio-demographic characteristics, such as age, educational background) were used for identification of groups of farms that are willing to use investment subsidies (Soliwoda, 2015).

An in-depth analysis of concluding remarks of selected research papers may lead to formulating proposals for further research on investment subsidies/research questions, inter alia:

- How to include behavioural determinants in assessment of investment subsidies for farms? What may determine switching from conventional to organic farming? (see: Hermann, Agethen and Mußhoff, 2015)?
- May different econometric models with adequate time horizons for types of farming be required and implemented? How may estimators addressing problems with fixed effects and endogeneity of the lagged dependent variable be used? (see: Petrick and Ziel, 2012).
- Is the real option approach useful for the analysis of real investment projects in agriculture (a micro focus), in particular these related to 'green investment'? (see: Wolbert-Haverkamp and Musshoff, 2014).

As presented above, some proposals for further research on investment subsidies in agriculture refer to contemporary trends in methodology of economics/finance, for example behavioural approach (see: Maart-Noelck, Musshoff and Maack, 2013). Still, investment subsidies seem to be 'unexplored' as for 'ecological' and 'environmental' investment projects in the agriculture.

4. Conclusion

Selected characteristics of farms that are strongly affected by a significant variability of agricultural production should be included in the analysis of the impact of investment subsidies at farm-level. Grouping and classification of analytical dependencies related to investment subsidies may be useful for potential meta-analysis and contribution for ongoing discussion on the shape of CAP 2020+. Given a limited number of studies focused investment subsidies at farm level, reasonable adaptation of some methodological approaches (e.g. survey-based methods, case studies with some limitations) from non-agricultural enterprises may be recommended. There is a strong need for implementing some approaches used in analysis of the impact of non-agricultural subsidies (but from food industry that is strongly related to agriculture within the agri-food supply chains, e.g. Špička, Naglova and Gurtler (2017)).

Modern streams of empirical research on investment subsidies in farms include behavioural approach (based on behavioural economics and financed, accompanied by economic psychology), ecological and environmental economic and finance. Results from this systemic review indicate that since 2010 (after microeconomic implications of Global Financial Crisis 2007/8+) particular attention has been paid to reasonable implementation of methodology related to behavioural approach, including features of family farm households (Colen et al,, 2016).

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MONITORING VISUALIZATION OF THE ANIMAL MOVEMENT IN BUILDINGS

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Annotation: The main objective of the paper is to analyze methods and technologies useful for monitoring of movement of domestic animals in an enclosed space, and especially their activities indoors. Behavioral studies of animals, both wild and domestic, is a long-term interest of biologists throughout the world. Despite the attention to this topic there are however a number of issues and phenomena which remain unexplained. The amount of time the city cat or other pet operates in the absence of people, leads to activities that are not adequately documented. Generally, the research of behavior of urban cats lacks data and it is difficult to obtain it. City cat is considered a senior municipal predator and its impact on the ecosystem is always essential. There are a number of collars for pets (dogs, cats, etc.) available on the market, which allow monitoring of movement in an outdoor environment (mainly using GPS technology). What is missing is the ability to track reliably inside buildings and rooms. There are a number of ways to visualize movement inside buildings. Display modes can be divided into two main groups, namely three-dimensional and two dimensional views. This paper discusses the visualization options in two dimensions. The analyzed views in this paper include paths, polygons, heats maps and spot maps. The paper also deals with the issue of tools for creating underlying maps and building plans.

Key words: animal, movement, monitoring, special data, indoor, visualization

JEL classification: L86 - Information and Internet Services; Computer Software

1. Introduction

Behavioral studies of animals, both wild and domestic, is in the long-term interest of biologists throughout the world. Despite the long-term studies there are however a number of issues and phenomena which remain unexplained. The amount of time the city cat or other pet operates in the absence of people, leads to activities that are not adequately documented. Generally, the research of behavior of urban cats lacks data and it is difficult to obtain it. City cat is considered a senior municipal predator and its impact on the ecosystem is always essential (McDonald et al., 2015).

On the market there are a number of collars for pets (dogs, cats, etc.), which allow monitoring of movement in an outdoor environment (mainly using GPS technology). What is missing is the ability to track reliably inside buildings and rooms. A number of animals in cities (especially cats) then live their entire lives only inside the apartment and rarely go outside. For long-term monitoring and study of the behavior of animals such devices are used which actively or passively collect data about their users (Jarolímek et al., 2012). Most often these are collars that track movement, physical activity and health of one particular individual. However, there are technologically limiting constraints that prevent or restrict the sending and receiving of data in buildings or heavily congested areas. At the same time these devices have effect on the individual itself. (Kasbaoui et al., 2016).

The issue of internal localization is also related to the now common method called Animal chipping. In the USA alone, each year approximately 5 million pets are lost. They are identified by common chips of various kinds, which are inserted under the animal’s skin. Both directions - the ability to track the movement of pets and their precise identification is therefore of growing importance (Dingman et al., 2014).

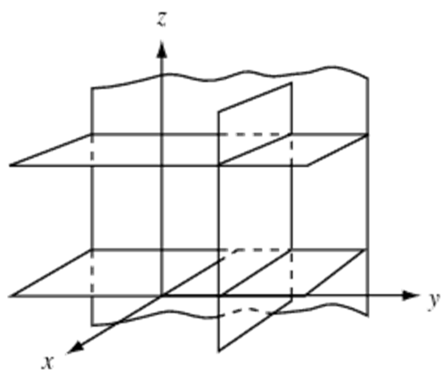
The growing trend of technological means for more comfortable daily life is beginning to affect even people's homes. People turn to the "smart home" technologies as a means to easily build, manage and analyze data from the home environment. Development responds to this demand with low power sensors or standards for energy-efficient wireless transmission (Davidovic and Labus, 2016). At the same time networks connect technology with hobbies and lifestyle. Tracking of daily user activity of users is common, but there is a gap when pets are involved. Smart home may in the future, for example, react to the presence of pets by setting the alarm system of the house, the heating or lighting. In this regard, there are limits arising from the existing technologies used and research should be oriented towards more effective monitoring, navigation systems and 3D movement tracking inside buildings.

Existing problems for the use of location technologies inside buildings are the limitations of commercially available systems, in particular GPS, because its signal degrades inside buildings in strength. Research in this area provides a number of approaches from a targeted signal amplification through the use of new computational methods, filtering and calibration. Motion detection and walking with the aid of motion sensors are now commonly available in smartphones (Chen, Zhu and Soh, 2016). A widespread tracking collars then shows possible commercial potential of the proposed project (Benda, Šmejkalová and Ulman, 2015).

2. Materials and Methods

In order to describe the position of the object in three dimensional space using the Cartesian coordinate system (Figure 1), three dates are required - X, Y and Z coordinates. Coordinates X and Y represent the position of the object in the area and the third expresses the height above the surface. Inside buildings, the Z axis can be expressed by marking the floor in which the object is located. (Crespo, Barber and Mozos, 2017)

Figure 1. Cartesian coordinate



Source:Mathworld, 2017

Where: X – east-west direction

Y – north-south direction

Z – height information

A visualization of motion can be viewed using models featuring two spacious and three spacious displays. Creating three-dimensional visualizations is usually more demanding. Three dimensional visualizations are more effective for the end user, but not always easy to understand. There are a number of tools for virtual reality to work with three dimensional visualizations (Li et al., 2017).

Basemaps

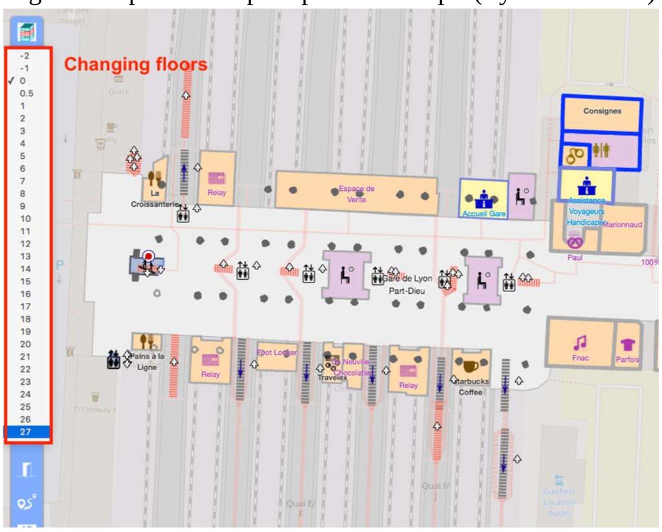
An integral part of displaying location data in two dimensions, both inside and outside the building, is the base on which the motion data is visualized. The base layers are mainly in the form of maps, plans, photographs etc. (Šimek et al., 2017). There are a number of outdoor maps and map services that can be used to show the location of the object outdoors. The most well-known and most used ones are google maps from Google or Project OpenStreetMap. However, for the purposes of monitoring indoor movement, these services are very limited. Building plans can be used with Google Indoor maps (Figure 2). (Pearson, Robinson and Jones, 2017)

Figure 2. Google Maps is a web mapping service - indoor maps (Madison Square Garden)

Source: Google maps, 2017

This service has the ability to upload plans for publicly accessible buildings. Currently, there are plans for shopping and sports centers and airports. Uploading private building plans is not possible. In the OpenStreetMap community, there are several projects that focus on building mapping, perhaps the most sophisticated is the OpenLevelUp project (Figure 3). Additionally, there are many commercial projects that deal with the creation of indoor navigation software solutions.

Figure 3. OpenLevelUp - OpenStreetMap - (Lyon Part Dieu)



Source: openlevelup.net, 2017

Additionally, certain methods to monitor and visualize the movement and behavior of domestic animals inside buildings were analyzed.

3. Results and Discussion

Figure 4. Indoor heat map of occurrence

Source: http://www.businessinsider.com/how-retailers-track-shoppers-in-heat-maps-2014-1

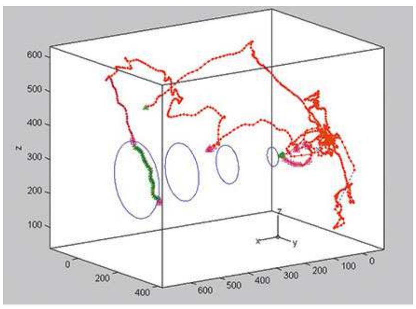
More authors deal with the issue of displaying animal movement data.

There are many views of positional data:

1. *Points Maps* - showing points of occurrence of the given animal in time,
2. *Path of Movement* - a visualization showing a line and a direction to represent the path of an animal,
3. *Home* Range - represents the MCP (minimum convex polygon) of the occurrence of an animal over a given time period,
4. *Heat Maps* - these are maps that use color-coding of areas, depending on the frequency of the animal's occurrence at the site (Figure 4) (Jarolímek et al., 2014).

Kays et al. (2015) describes visualization and tracking capabilities using advanced sensors. A combination of position sensors and a gyroscope can be achieved fairly accurate 3D model movement. Spitzen et al. (2013) demonstrates the use of Noldus's 3D Track tool (Figure 5). However, this solution is designed to visualize movement inside small enclosed spaces.

Figure 5. 3D visualization of the track



Source: Spitzen et al., 2013

Movement data is often supplemented by other metadata related to the specific position and time of the occurrence of the animal. Physical indicators (temperature, pulse), activity data – the measurements from accelerometer indicates the activity of the animal (sleep, feeding, etc.) or metadata related to the area of occurrence (ambient temperature, air pressure, ...). These additional data may, along with localization, serve to get a deeper understanding of the animal's life or to predict future behavior. Visually, these metadata can be displayed as a text field complementing the occurrence point. By aggregating metadata for a given date range, you can create a graph to visualize the activities of the animal. The result may be, for example, a pie chart which shows how many percent of the day the animal spends on certain activities.

4. Conclusion

In the paper basic types of visualization of moving animals inside buildings were described. The main methods include: points maps, path of movement, home range, heat maps. All these views depend on the time period for which they are displayed. The Cartesian coordinate system is the most appropriate coordinate system for displaying objects inside buildings. There is currently no mapping service suitable for mapping and tracking the movement of small animals inside private buildings. The issue of visualization of the third dimension – the above floor in buildings is best addressed by layers in the plan or map. For each above-ground floor, you need to create an extra layer. Trafficking in animals within buildings has great potential in the field of smart homes and precision farming as well.

Another issue to be explored in the following studies is the analysis of technologies suitable for recording the movement of animals inside buildings and the analysis of possible uses of these technologies.

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TESTING SCALES FOR ATTITUDE TOWARDS BEER: THE CASE OF TWO BRANDS OF BEER OF THE SAME PRODUCER

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Annotation: There is an increasing amount of literature focused on beer purchase and consumption, both micro- and macro-economic studies. The aim of the paper is to tests scales for attitudes towards Tuborg and Carlsberg beers, and to compare Cronbach's alphas for the two brands when evaluated by the same respondents. Both brands are produced by the Carlsberg Group, and both are lagers. The Carlsberg Group markets Tuborg as a more premium brand, and it also aims at women. The research was conducted in Denmark using an on-line questionnaire. The attitudes were measured in three dimensions - affective, cognitive, and conative. Affective and cognitive dimensions were measured using already validated instruments, while the conative dimension (for which no validated instrument was found) is based on consumption of a particular brand of beer. With regards to finding, Cronbach's alpha for the affective dimension was .944 for Tuborg and .956 for Carlsberg; Cronbach's alpha for the cognitive dimension was .785 for Tuborg and .886 for Carlsberg; and Cronbach's alpha for the conative dimension was .843 for Tuborg and .906 for Carlsberg. Although all scales had their Cronbach's alphas over .7, it is surprising that the difference in Cronbach's alpha for the cognitive dimension for the two brands was approximately .1 in spite of the fact that the statements for the scales were evaluated at the same time by the same respondents.

Key words: attitude, beer, consumer behavior

JEL classification: M31, C83

1. Introduction

There exists a body of literature focused on beer denmand, both from a micro-economic perspective (e.g. Aquilani et al., 2015; Castiglione et al., 2011; Maier, 2012) and from a macro-economic perspective (e.g. Grosová et al., 2017; Maier, 2015; Tomlinson and Branston, 2014). The aim of the paper is to tests scales for attitudes towards Tuborg and Carlsberg beers, and to compare Cronbach's alphas for the two brands when evaluated by the same respondents at the same time. Both brands are produced by the Carlsberg Group, and both are lagers. It can be expected that all Danes had a possibility to taste both brands on many occasions.

Homer's (2006) constructs will be used to measure the affective and the cognitive dimensions of attitude. Although these constructs are featured in Brunner's (2012) Marketing Scales Handbook, and her article is cited 31 times (only 29 are listed though) in the Web of Science Core Collection database, it appears that none of them deals with beer, so her constructs were not tested by others. Begley and Ellis (2012) discovered that only six of selected 53 high-profile papers could be reproduced in the field of cancer biology. In the field of psychology, Open Science Collaboration (2012) project replicated 100 investigations of which 39 matched the original results and another 24 were at least “moderately similar” to findings of the original experiments. Therefore, replications are necessary in order to figure out whether findings hold under any conditions or not. It is also a motivation of this paper.

The paper is organized in the following way: after the introduction, there is a description of data, their collection, and how they were analyzed. In the following section, results of the analysis are presented. Conclusions are offered in the last section.

2. Materials and Methods

The research was conducted in Denmark in 2014. Qualtrics was used for the on-line questionnaire. The questionnaire was in English, and it was administered on several pages. First, statements for Tuborg scales were asked, so respondents certainly understood that statements on the following pages for Carlsberg did not include all brands of the Carlsberg Group but only the Carlsberg brand. Respondents, who did not respond to Carlsberg statements, were excluded from also from the sample evaluating Tuborg statements, in order for all the statements to be evaluated by the same respondents. It means that even though 318 respondents answered questions about Tuborg, the effective sample size is 288 because only so many respondents answered questions about Carlsberg.

Attitudes towards Tuborg and Carlsberg were measured in three dimensions - affective, cognitive, and conative. The affective and the cognitive dimensions were measured using instruments developed by Homer (2006) specifically for beer brands. The statements were preceded by the instruction "Please indicate to what degree you agree with the following statements about Tuborg" and then "Please indicate to what degree you agree with the following statements about Carlsberg". The affective dimension was measured using statements: is fun, is refreshing, is satisfying, tastes good, is pleasurable, is relaxing, is enjoyable, is exciting. The cognitive dimension was measured using statements: has a long-lasting head, is a good buy for the money, is made of the finest ingredients, is not bitter, has few calories, is thirst-quenching, is nutritious, is healthy, has a strong taste, all natural, has fruit flavoring, is cheap. All the statements were evaluated on a 1-5 Likert scale where 1 meant strongly agree and 5 stood for strongly disagree. The conative dimension is based on consumption of a particular brand of beer, because no validated instrument was found. The questions were (first for Tuborg, then for Carlsberg):

- About how much Tuborg/Carlsberg did you drink in the last 7 days?
- About how much Tuborg/Carlsberg per week did you drink in the past 1-2 months?
- About how much Tuborg/Carlsberg per week do you think you will drink in the upcoming 1-2 months?

Possible answers were (1) none, (2) less than a liter, (3) 1-2 liters, (4) more than 2 liters. The questionnaire contained additional questions which are not analysis presented in this paper.

Correlation matrices for the three dimensions of attitude will be provided in the next section. The matrices will contain Pearson product-moment correlation coefficients. The aim is to check if all correlation coefficients are non-negative; a negative correlation coefficient would indicate a variable with an opposite orientation, and it could possibly lead to a negative Cronbach's alpha. Non-negative correlation coefficients are an assumption for calculation of Cronbach's alpha. Cronbach's alpha will be used to evaluate reliability of the constructs. According to Nunnally (1978), constructs should have Cronbach's alpha of at least .7. The value of providing correlation matrices, not only commenting them, in further text is that certain variables with lower correlation coefficients can be omitted in future research achieving a shorter questionnaire and a higher Cronbach's alpha. SPSS software will be used.

3. Results and Discussion

The correlation matrix with Pearson product-moment correlation coefficients between all statements measuring the affective dimension of attitude towards Tuborg is provided in Table 1.

Table 1. Correlation matrix for the affective dimension of attitude towards Tuborg

Statement	Code	Aff1	Aff2	Aff3	Aff4	Aff5	Aff6	Aff7	Aff8
is fun	Aff1	1	0.526**	0.558**	0.467**	0.559**	0.526**	0.561**	0.627**
is refreshing	Aff2	0.526**	1	0.721**	0.723**	0.698**	0.744**	0.723**	0.610**
is satisfying	Aff3	0.558**	0.721**	1	0.746**	0.814**	0.793**	0.831**	0.611**
tastes good	Aff4	0.467**	0.723**	0.746**	1	0.778**	0.737**	0.805**	0.545**
is pleasurable	Aff5	0.559**	0.698**	0.814**	0.778**	1	0.798**	0.821**	0.618**
is relaxing	Aff6	0.526**	0.744**	0.793**	0.737**	0.798**	1	0.809**	0.618**
is enjoyable	Aff7	0.561**	0.723**	0.831**	0.805**	0.821**	0.809**	1	0.620**
is exciting	Aff8	0.627**	0.610**	0.611**	0.545**	0.618**	0.618**	0.620**	1

Source: own processing

*Note: ** Correlation is significant at the 0.01 level (2-tailed)*

As it can be seen in Table 1, all correlation coefficients for Tuborg-related statements for the affective dimension are positive, so the assumption for calculation of Cronbach's alpha is fulfilled.

The correlation matrix with Pearson product-moment correlation coefficients between all statements measuring the affective dimension of attitude towards Carlsberg is provided in Table 2.

Table 2. Correlation matrix for the affective dimension of attitude towards Carlsberg

Statement	Code	Aff1	Aff2	Aff3	Aff4	Aff5	Aff6	Aff7	Aff8
is fun	Aff1	1	0.588**	0.662**	0.575**	0.598**	0.582**	0.647**	0.732**
is refreshing	Aff2	0.588**	1	0.796**	0.756**	0.797**	0.735**	0.740**	0.694**
is satisfying	Aff3	0.662**	0.796**	1	0.821**	0.858**	0.789**	0.819**	0.745**
tastes good	Aff4	0.575**	0.756**	0.821**	1	0.823**	0.733**	0.827**	0.634**
is pleasurable	Aff5	0.598**	0.797**	0.858**	0.823**	1	0.804**	0.878**	0.724**
is relaxing	Aff6	0.582**	0.735**	0.789**	0.733**	0.804**	1	0.746**	0.655**
is enjoyable	Aff7	0.647**	0.740**	0.819**	0.827**	0.878**	0.746**	1	0.679**
is exciting	Aff8	0.732**	0.694**	0.745**	0.634**	0.724**	0.655**	0.679**	1

Source: own processing

*Note: **Correlation is significant at the 0.01 level (2-tailed)*

As it can be observed in Table 2, all correlation coefficients for Carlsberg-related statements for the affective dimension are positive, so the assumption for calculation of Cronbach's alpha is fulfilled here as well.

Overall, it is possible to evaluate that this construct measuring the affective dimension of attitude is well designed as all correlation coefficients are higher than .5 with one exception. On the other hand, it is possible to observe that correlation coefficients for the same pair of statements differ; in some cases, the difference is higher than .1. But considering Cronbach's alphas in the first row in Table 7, even such difference have only a marginal effect on values of Cronbach's alpha for Tuborg and Carlsberg.

The correlation matrix with Pearson product-moment correlation coefficients between all statements measuring the cognitive dimension of attitude towards Tuborg is provided in Table 3.

Table 3. Correlation matrix for the cognitive dimension of attitude towards Tuborg

Statement	Code	Cog1	Cog2	Cog3	Cog4	Cog5	Cog6
has a long-lasting head	Cog1	1	0.242**	0.420**	0.265**	0.169**	0.353**
is a good buy for the money	Cog2	0.242**	1	0.388**	0.378**	0.111*	0.352**
is made of the finest ingredients	Cog3	0.420**	0.388**	1	0.357**	0.089	0.273**
is not bitter	Cog4	0.265**	0.378**	0.357**	1	0.097	0.345**
has few calories	Cog5	0.169**	0.111*	0.089	0.097	1	0.194**
is thirst-quenching	Cog6	0.353**	0.352**	0.273**	0.345**	0.194**	1
is nutritious	Cog7	0.227**	0.153**	0.218**	0.224**	0.354**	0.300**
is healthy	Cog8	0.175**	0.242**	0.254**	0.222**	0.367**	0.298**
has a strong taste	Cog9	0.213**	0.076	0.220**	0.031	0.007	0.099
all natural	Cog10	0.352**	0.331**	0.436**	0.294**	0.180**	0.359**
has fruit flavoring	Cog11	0.221**	0.142*	0.208**	0.077	0.337**	0.289**
is cheap	Cog12	0.134*	0.310**	0.104	0.101	0.230**	0.156**

Source: own processing

*Note: ** Correlation is significant at the 0.01 level (2-tailed)*

** Correlation is significant at the 0.05 level (2-tailed)*

Table 3. Correlation matrix for the cognitive dimension of attitude towards Tuborg (continued)

Statement	Code	Cog7	Cog8	Cog9	Cog10	Cog11	Cog12
has a long-lasting head	Cog1	0.227**	0.175**	0.213**	0.352**	0.221**	0.134*
is a good buy for the money	Cog2	0.153**	0.242**	0.076	0.331**	0.142*	0.310**
is made of the finest ingredients	Cog3	0.218**	0.254**	0.220**	0.436**	0.208**	0.104
is not bitter	Cog4	0.224**	0.222**	0.031	0.294**	0.077	0.101
has few calories	Cog5	0.354**	0.367**	0.007	0.180**	0.337**	0.230**
is thirst-quenching	Cog6	0.300**	0.298**	0.099	0.359**	0.289**	0.156**
is nutritious	Cog7	1	0.572**	0.070	0.316**	0.325**	0.225**
is healthy	Cog8	0.572**	1	0.057	0.342**	0.393**	0.259**
has a strong taste	Cog9	0.070	0.057	1	0.112*	0.071	0.193**
all natural	Cog10	0.316**	0.342**	0.112*	1	0.250**	0.230**
has fruit flavoring	Cog11	0.325**	0.393**	0.071	0.250**	1	0.207**
is cheap	Cog12	0.225**	0.259**	0.193**	0.230**	0.207**	1

Source: own processing

*Note: ** Correlation is significant at the 0.01 level (2-tailed)*

** Correlation is significant at the 0.05 level (2-tailed)*

Although some correlation coefficients, in Table 3, for Tuborg-related statements for the cognitive dimension are small/not significant, all are positive (i.e. all variables have the same orientation), the assumption for calculation of Cronbach's alpha is fulfilled.

It is possible to state that this construct for measuring the cognitive dimension of attitude is not designed as well as the construct for measuring the affecting dimension due to lower, sometimes even insignificant correlation coefficients. Moreover, it is possible to observe much higher differences in correlation coefficients between Tables 3 and 4 in comparison to difference observed between Table 1 and 2. This has an impact on Cronbach's alphas in the second row in Table 7 where the value for Carlsberg is higher by .1 than for Tuborg.

The correlation matrix with Pearson product-moment correlation coefficients between all statements measuring the cognitive dimension of attitude towards Carlsberg is provided in Table 4.

Table 4. Correlation matrix for the cognitive dimension of attitude towards Carlsberg

Statement	Code	Cog1	Cog2	Cog3	Cog4	Cog5	Cog6
has a long-lasting head	Cog1	1	0.470**	0.501**	0.400**	0.326**	0.458**
is a good buy for the money	Cog2	0.470**	1	0.458**	0.521**	0.293**	0.512**
is made of the finest ingredients	Cog3	0.501**	0.458**	1	0.416**	0.359**	0.445**
is not bitter	Cog4	0.400**	0.521**	0.416**	1	0.254**	0.501**
has few calories	Cog5	0.326**	0.293**	0.359**	0.254**	1	0.408**
is thirst-quenching	Cog6	0.458**	0.512**	0.445**	0.501**	0.408**	1
is nutritious	Cog7	0.398**	0.281**	0.416**	0.317**	0.579**	0.401**
is healthy	Cog8	0.306**	0.353**	0.314**	0.240**	0.714**	0.418**
has a strong taste	Cog9	0.504**	0.283**	0.515**	0.171**	0.107	0.268**
all natural	Cog10	0.521**	0.429**	0.603**	0.387**	0.413**	0.516**
has fruit flavoring	Cog11	0.403**	0.297**	0.435**	0.226**	0.557**	0.351**
is cheap	Cog12	0.348**	0.527**	0.386**	0.299**	0.405**	0.394**

Source: own processing
*Note: ** Correlation is significant at the 0.01 level (2-tailed)*
** Correlation is significant at the 0.05 level (2-tailed)*

Table 4. Correlation matrix for the cognitive dimension of attitude towards Carlsberg (continued)

Statement	Code	Cog7	Cog8	Cog9	Cog10	Cog11	Cog12
has a long-lasting head	Cog1	0.398**	0.306**	0.504**	0.521**	0.403**	0.348**
is a good buy for the money	Cog2	0.281**	0.353**	0.283**	0.429**	0.297**	0.527**
is made of the finest ingredients	Cog3	0.416**	0.314**	0.515**	0.603**	0.435**	0.386**
is not bitter	Cog4	0.317**	0.240**	0.171**	0.387**	0.226**	0.299**
has few calories	Cog5	0.579**	0.714**	0.107	0.413**	0.557**	0.405**
is thirst-quenching	Cog6	0.401**	0.418**	0.268**	0.516**	0.351**	0.394**
is nutritious	Cog7	1	0.605**	0.217**	0.475**	0.525**	0.342**
is healthy	Cog8	0.605**	1	0.126*	0.469**	0.506**	0.375**
has a strong taste	Cog9	0.217**	0.126*	1	0.412**	0.299**	0.235**
all natural	Cog10	0.475**	0.469**	0.412**	1	0.472**	0.376**
has fruit flavoring	Cog11	0.525**	0.506**	0.299**	0.472**	1	0.436**
is cheap	Cog12	0.342**	0.375**	0.235**	0.376**	0.436**	1

Source: own processing
*Note: ** Correlation is significant at the 0.01 level (2-tailed)*
** Correlation is significant at the 0.05 level (2-tailed)*

All correlation coefficients, in Table 4, for Carlsberg-related statements for the cognitive dimension are positive, so the assumption for calculation of Cronbach's alpha is fulfilled here as well.

The correlation matrix with Pearson product-moment correlation coefficients between all statements measuring the conative dimension of attitude towards Tuborg is provided in Table 5.

Table 5. Correlation matrix for the conative dimension of attitude towards Tuborg

Statement	Code	Con1	Con2	Con3
About how much Tuborg did you drink in the last 7 days?	Con1	1	0.582**	0.542**
About how much Tuborg per week did you drink in the past 1-2 months?	Con2	0.582**	1	0.803**
About how much Tuborg per week do you think you will drink in the upcoming 1-2 months?	Con3	0.542**	0.803**	1

Source: own processing
Note: Correlation is significant at the 0.01 level (2-tailed).

As it can be seen in Table 5, all correlation coefficients for Tuborg-related statements for the conative dimension are positive, so the assumption for calculation of Cronbach's alpha is fulfilled.

The correlation matrix with Pearson product-moment correlation coefficients between all statements measuring the conative dimension of attitude towards Carlsberg is provided in Table 6.

Table 6. Correlation matrix for the conative dimension of attitude towards Carlsberg

Statement	Code	Con1	Con2	Con3
About how much Carlsberg did you drink in the last 7 days?	Con1	1	0.726**	0.686**
About how much Carlsberg per week did you drink in the past 1-2 months?	Con2	0.726**	1	0.876**
About how much Carlsberg per week do you think you will drink in the upcoming 1-2 months?	Con3	0.686**	0.876**	1

Source: own processing

Note: Correlation is significant at the 0.01 level (2-tailed).

As it is obvious from Table 6, all correlation coefficients for Carlsberg-related statements for the conative dimension are positive, so the assumption for calculation of Cronbach's alpha is fulfilled here as well.

Both for Tuborg and Carlsberg, the highest correlation is between the second question (reported past behavior) and the third question (behavior intention/planned bevavior). If there is a need to shorten a questionnaire, the first question may be omitted.

Cronbach's alphas for all dimensions of attitude towards both brands is provided in Table 7.

Table 7. Cronbach's alphas for all dimensions of attitude towards Tuborg and Carlsberg

Dimension of attitude	Tuborg	Carlsberg
Affective	0.944	0.956
Cognitive	0.785	0.886
Conative	0.843	0.906

Source: own processing

As it is obvious from Table 7, all Cronbach's alphas are above Nunnally's (1978) threshold of 0.7. Homer (2006) reported Cronbach's alphas of 0.88, 0.93, and 0.87 for the various sets of items used in Study 1, a pre-test of Study 2, and Study 2, respectively for the affective dimension. Cronbach's alphas for the affective dimension for Tuborg and Carlsberg were even marginally higher (0.944 and 0.956 respectively). Homer (2006) reported Cronbach's alphas of 0.87, 0.82, and 0.86 for the various sets of items used in Study 1, a pre-test of Study 2, and Study 2, respectively for the cognitive dimension. Cronbach's alphas for the cognitive dimension for Tuborg and Carlsberg were both higher the her highest alpha and lower than her lowest alpha (0.785 and 0.886 respectively). It may be advisable to refine the construct so it leads to approximately the same alpha when evaluated by the same respondents at the same time. Removing item Cog9 (has a strong taste), which correlates significantly only with four of the remaining 11 items for Tuborg while it correlates significantly with 10 of 11 items for Carslberg, would increase Cronbach's alpha for Tuborg from 0.785 only to .797, while keeping Cronbach's alpha for Carlsberg almost the same (it would change from 0.886 to 0.888). Cronbach's alphas for the conative dimension for Tuborg and Carlsberg are in between alphas reported by Homer (2006) for the other two dimensions.

4. Conclusion

The aim of this methodological research was to tests scales for attitudes towards beer brands and to compare Cronbach's alphas for two approximately equally well-known beer brands when evaluated by the same respondents at the same time. Cronbach's alpha for the 8-item scale measuring the affective dimension of attitude was .944 for Tuborg and .956 for Carlsberg. Cronbach's alpha for the 12-item scale measuring the cognitive dimension of attitude was 0.785 for Tuborg and 0.886 for Carlsberg. Cronbach's alpha for the 3-item scale measuring the conative dimension of attitude was 0.843 for Tuborg and 0.906 for Carlsberg. To sum up, all scales had their Cronbach's alphas over 0.7 but it is surprising that the difference in Cronbach's alpha for the cognitive dimension for the two brands was approximately 0.1 (precisely 0.101) although the statements for the scales were evaluated at the same time by the same respondents. Future research should modify (shorten, extend, or change some statements), so the Cronbach's alpha is more stable.

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IMPACT OF MANAGEMENT PRACTICES ON CROP PRODUCTION IN ECONOMICAL AND ENVIRONMENTAL CONTEXT

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Annotation: Changes in land use management represent the way to adapt to the future climatic conditions, including local adjustments of agricultural choices. This paper aims to analyze the impact of agricultural industry – especially the crop production, on environment. The research is primarily focused on crop production in land constraint area of Slovakia. The main aim of paper is to develop integrated modelling framework which combines bio-physical and economic optimization models. The integrated modelling framework is developed to analyze different cost-effective crop production choices. The model integrates agronomic and bio-physical data into a regional bottom-up land use optimization model to account for heterogeneity in opportunity costs of agricultural production choices and environmental outcomes. The results suggest that from the economical point of view, most of the crops with highest net returns are cultivated under intensive, high nitrogen fertilizers input management practices (with 80□120 kg of nitrogen per hectare). On the other hand crops like pea, soy or potatoes achieves the highest net returns under low or medium input management practices. For the period of 2004-2014 on average, the net returns were higher without use of additional irrigation in all observed regions (depending on production area).

Key words: crops, management practices, net returns

JEL classification: C61, Q10, Q15

1. Introduction

The dominated agricultural sector in Slovakia is crop production. The cereals which are cultivated the most in Slovakia are wheat, barley, rye, oats and corn. Among the oil crops rapeseed and sunflower are of greatest importance. Industrial crops typical in Slovakia are hemp, sugar beet, flax seed, hops and others (Svetlanská and Turčeková, 2016). After the Slovakia accessed the EU in 2004, the country's performance of agriculture was expected to raise – Slovakia considerable lagged behind in this field compared to the original EU countries – however, the development of gross crop and animal production did not correspond to these expectations. Animal production stagnates and the development of crop production is marked by a considerable year-on-year volatility. Since its admission to the EU, Slovak agriculture has not recorded any distinct change in the orientation towards an effective utilisation of domestic production factors and the growth of competitiveness (Szabo and Grznár, 2012).

The use of bioeconomic models linking crop bio-physical models with economic decision models has been suggested in various studies as a way toward integrated assessments (Challinor et al., 2009, Finger et al., 2011). Most of the early crop optimization models were developed to integrate and document current understanding of crop physiology and its ability to quantify the effects of environment and basic management on crop productivity. In more recent scientific research emphasis has been placed on improving model flexibility to support the simulation of different crops, cropping systems and production choices (Ewert et al., 2014). The main aim of paper is to develop integrated modelling framework which combines bio-physical and economic optimization models and applied it for the Slovak regions. The model integrates agronomic and bio-physical data into a regional bottom-up land use optimization model to account for heterogeneity in opportunity costs of agricultural production choices and environmental outcomes.

2. Data and methodology

The input data for regional bottom up integrated model are divided into economic and biophysical dataset. The economic dataset consists of direct costs (DirCost) and price for crops and regions. The direct costs per hectare are the expenditures for fertilizers - purchased and produced, chemical protection, agrochemicals and seed – purchased and produced and are provided by Research Institute of Agricultural and Food Economics (NPPC-RIAFE, 2015). The crops under consideration are: alfa (ALF), barley (BAR), wheat (WHE), grain maize (MAI), green maize (GMA), rye (RYE), rapeseed (RAP), oat (OAT), peas (PEA), sunflower (SNF), soy (SOY), sugar beet (SGB) and potato (POT). The observed period is 2004-2014.

The biophysical data set is based on EPIC (environmental policy integrated climate model) simulation for selected crops. It provides information on crop yields under eight selected management practices as the average for time period 2004-2014. Management practices (Mana) involve: N0I – low nutrient input, full irrigation; N0R – low nutrient input, no irrigation; NHI – high nutrient input, full irrigation; NHR – high nutrient input, no irrigation; NMI – medium nutrient input, full irrigation; NMR – medium nutrient input, no irrigation; NPI – not limited nutrient input, full irrigation; NPR – not limited nutrient input, no irrigation. Arable land in Slovakia is divided into four production areas all with different soil conditions, altitude and structure of cultivated crops. Maize production area –MPA- (West-south plain, East plain) has the most favourable condition for maize and wheat cultivation, rape production area –RPA- (West part of Slovakia, Košice hollow-basin, South Slovakian hollow-basin) with wheat cultivation and appropriate condition for sugar beet cultivation, potato-oat area –POPA- (500-600 m.a.s.l.) with potato, wheat and perennial forage cultivation and mountains production area –MNPA- (from 600 m.a.s.l. – less favoured areas) with perennial forage and less demanding cereals.

The linear program for bottom-up optimization model is simplified version of Austrian agricultural and forestry sector model PASMA (Schmid and Sinabell, 2007) adjusted for regional model of Slovakia in form:

$$\pi_{r,c} = \sum_{c=1}^{C} YLDG_{r,c,m} * price - (DirCost_{r,c} + FerCost_{r,c} + IrCost_{r,c}) \quad \textbf{(1)}$$

$$max\pi = \sum_{r=1}^{R}\sum_{m=1}^{M}(\pi_{r,m} * x_{r,m}) \quad \textbf{(2)}$$

$$s.t. = \sum_{r=1}^{R}\sum_{m=1}^{M}(a_{r,m} * x_{r,m}) \leq b_p$$

where: π - net return; r – region; c – crop; m – management practice; a – hectare; b_p - land constraint

x – positive variable representing crop production choice

DirCost – direct cost of crop in region

FerCost – fertilizer cost (1.2€/kg nitrogen fertilizer, 1.6€/kg phosphorus fertilizer)[4]

IrCost – irrigation cost (1€/mm irrigation water)

[4] Cost of fertilizers and irrigation cost were estimated based on the RIAFE data

Table 1. Nitrogen input under different management practices kg/ha

Crop	Mana	NRate	Crop	Mana	NRate
ALF	N0	20	RAP	NM	120
BAR	N0	40	RYE	NM	80
GMA	N0	40	SGB	NM	120
MAI	N0	80	SNF	NM	80
PEA	N0	40	SOY	NM	80
POT	N0	40	WHE	NM	80
OAT	N0	40	ALF	NH	80
RAP	N0	80	BAR	NH	120
RYE	N0	40	GMA	NH	120
SGB	N0	80	MAI	NH	200
SNF	N0	40	PEA	NH	120
SOY	N0	40	POT	NH	120
WHE	N0	40	OAT	NH	120
ALF	NM	40	RAP	NH	200
BAR	NM	80	RYE	NH	120
GMA	NM	80	SGB	NH	200
MAI	NM	120	SNF	NH	120
PEA	NM	80	SOY	NH	120
POT	NM	80	WHE	NH	150
OAT	NM	80			

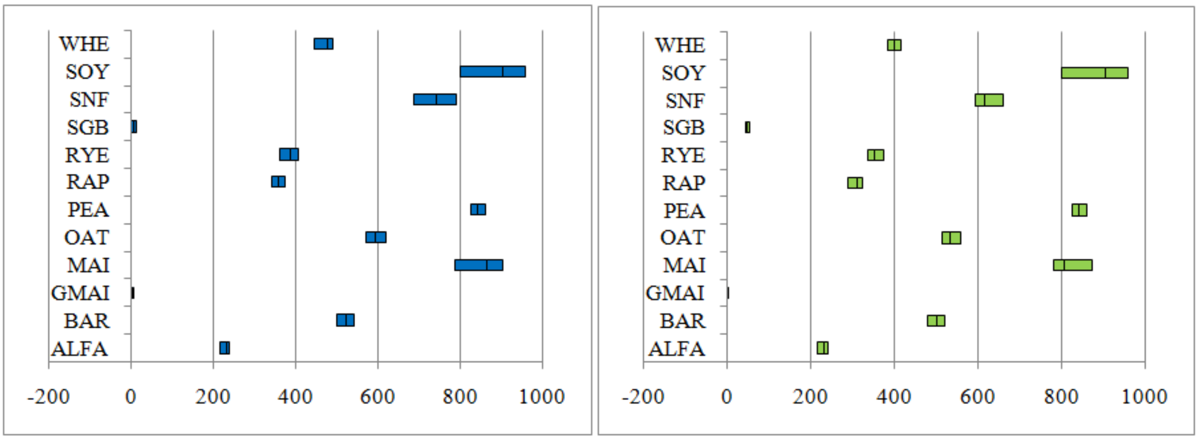
Source: EPIC data – Soil Science and Conservation Research Institute (SSCRI)

3. Results

The integrated model works on the principle of calculating the net returns, and their consequent optimization assuming the land constraints of individual regions. Furthermore it enabled calculations of shadow prices for each management practice. The shadow price or the opportunity cost represented how would the net return in individual regions change if the crops where cultivated under different management practice. We firstly calculate the net returns for all crops in all regions. These calculations are captured in box plots represented by figure 2-5. Box plots show the ranges of crops´ net returns under NHR and NMR management practice, in order to demonstrate the different economical performance under these managements.

MPA is production area favourable especially for demanding crops like maize and cereals (Figure 2.). This is proved by highest net returns of maize in all regions. In SA (Šala), which is the region with the most significant share of arable land devoted to the crop production the net returns of maize was 1,020.81 €/ha. This high return was quantified under the NHR (most intensive management practice). Other crops which should be cultivated based on the high net returns were soy, pea and sunflower. The highest shadow price for MPA was observed under N0I. Each hectare managed under N0I would cause decline of overall net returns by more than 2000 € in all observed regions. On the other hand the NMR was identified as the second best alternative in all regions because of lowest shadow price. This means that the production area could be potentially shifted to the medium input management without significant consequences in terms of net returns.

Figure 2. Range of net returns for selected crops in regions of MPA (in €/ha)

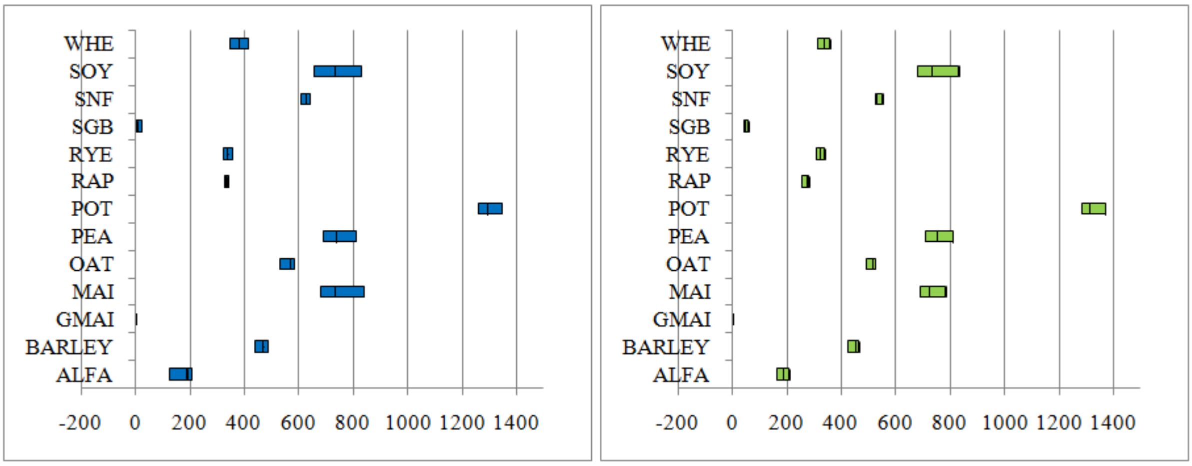


Source: own processing

Note: left hand chart represents NHR management practice and right hand chart represents NMR management practice

RPA (Figure 3.) has suitable conditions for cultivation of sugar beet and demanding crops, especially cereals like wheat, maize or barley. According to the calculated net returns for the RPA the highest results achieved maize, all cereals, pea and soy. The most profitable management practices were proved to be NMR in case of potatoes, NHI in case of maize and NHR for barley, sunflower, rye, rape and wheat. The highest net returns were achieved for potatoes, but as for the average share in cropping structure, it is not considerable. For these regions the highest net returns were calculated for maize amounting 800€/ha on average. In case of all regions all arable land should be managed by intensive management practice in order to achieve optimal net returns. The smallest opportunity cost also occurred under the NMR suggesting the second best management practice. Another area, POPA (Figure 4.), is the production area which has favourable conditions for production of potatoes, due to the wet and colder climate. This was proved by highest net returns of potatoes in this production area. Other crops with high net returns were sunflower, maize and oat. The most profitable management practices were proved to be NMR in case of potatoes, NHI in case of maize and NHR for the rest of crops. NMR seemed to appear as the management practice with relatively low value of opportunity cost (from 135 € in PU – Púchov, to 264 € in ZA - Žilina). Management practice which led to the highest net returns in MNPA (Figure 5.) was again NHR, except potatoes where the highest net returns were calculated under NMR. Crops which achieved the best economic results were potatoes, oat, barley and rapeseed. Maize, pea, sugar beet, soy and sunflower were not considered for calculation of net returns in production area due to the missing economic data provided by RIAFE. However, these are crops which are not typical for this mountain area. In the MNPA, like in all previous production areas, regions should be managed under NHR to achieve optimal net returns. All arable land which was devoted to crop production should be therefore managed by intensive managements in order to gain high yields, thus high returns. N0I which was the management with highest opportunity cost, would lead to decline of the net returns on average from 1,565€ (ZH-Žiar nad Hronom) to 1,255€ (CA - Čadca). Management practices with relatively low opportunity cost were calculated to be NMR and NHI. Unlike in MPA, RPA and POPA, the alternative management practices were less costly in MNPA. This was due to the fact that MNPA is considered as less favoured; therefore crops are more demanding in terms of nutrient application.

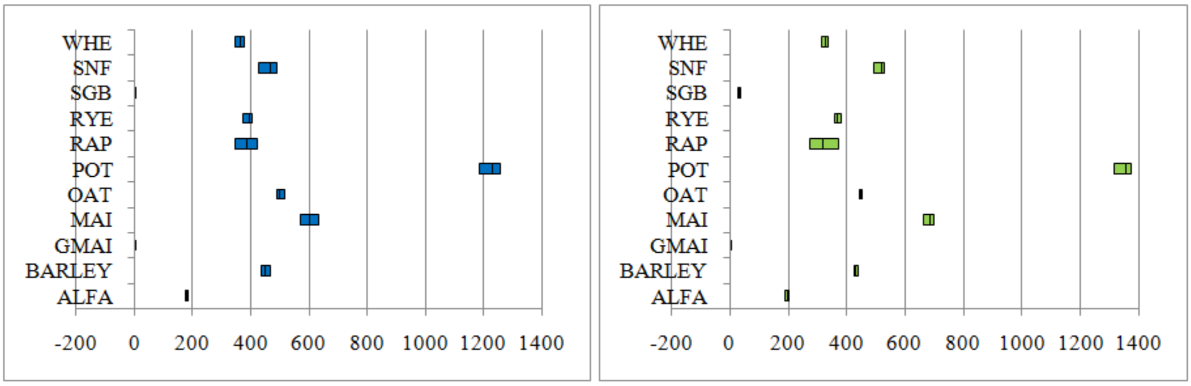
Figure 3. Range of net returns for selected crops in regions of RPA (in €/ha)



Source: own processing

Note: left hand chart represents NHR management practice and right hand chart represents NMR management practice

Figure 4. Range of net returns for selected crops in regions of POPA (in €/ha)



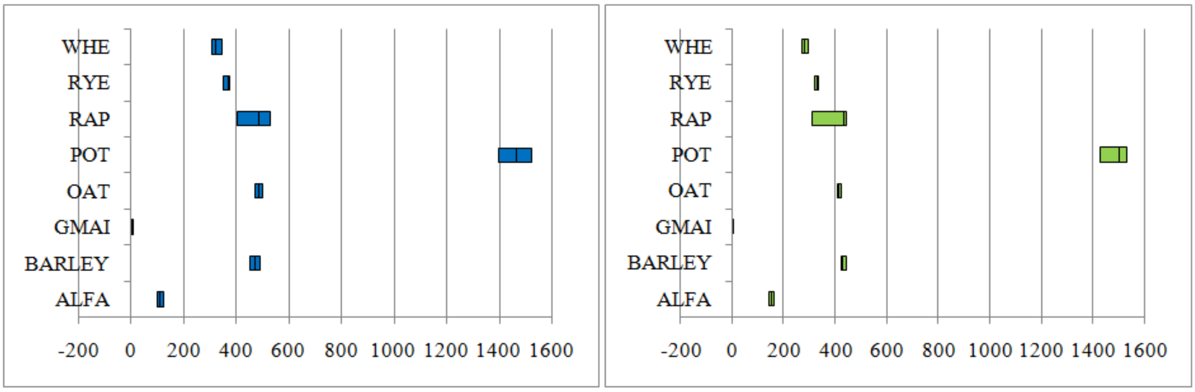
Source: own processing

Note: left hand chart represents NHR management practice and right hand chart represents NMR management practice

In terms of optimal management practices from economical viewpoint, all arable land in production areas should be cultivated under NHR. Second best option in terms of volume of net returns was NMR. These results were optimized with respect to historical crops´ shares observed on arable land of Slovakia. Therefore maximum net returns represent the net returns of combination of all crops in regions based on their crop shares. In MPA, under the NHR the regions achieved the net returns in range from 21 mil. € to 98 mil. € (SA - Šala). In RPA the value of net return is in the range from 6.5 mil € to 16.7 mil. € under NHR. In POPA the net returns were in the range from7 mil. € to 9.9 mil.€. In MNPA, the net returns under NHR ranged between 2.4 mil. € to 7 mil. €.

According to Mitter et al. (2015) who applied a portfolio optimization model for Austria, crop production farming portfolios which include intensive crop management practices, lead to increasing of an average crop yields by 2- 15% and gross margins by 3-18% under changing climate. They suggest the threefold increase in agri-environmental premiums which would reduce nitrogen inputs by 23–33%. Lechenet et al. (2014) claims that agriculture is widely dominated by conventional intensive farming systems, with highly specialized crop productions and a heavy reliance on pesticides and mineral fertilizers. This is also proved for case of Slovakian regions, where the most intensive management practices leads to the highest net returns in almost all of them.

Figure 5. Range of net returns for selected crops in regions of MNPA (in €/ha)



Source: own processing

Note: left hand chart represents NHR management practice and right hand chart represents NMR management practice

For most of the crops the highest net returns are achieved under the NHR. NHR represents the management with highest nitrogen input. It varies from 80 kg/ha in case of alfa to 1200 kg/ha in case of barley, green maize, pea, potato, oat, rye, sunflower, soy, wheat and 200 kg/ha in case of maize, rapeseed and sugar beet. These nutrient inputs are the best reflection of reality in terms of crops management practices in Slovakia. The high nitrogen input may appear as the potential environmental pressure especially from the point of leakages of nitrogen to groundwater. Each of management practices influences the soil fertility. To see the impact we compare the nutrient input of individual managements with requirements of crop´s yields. From the viewpoint of environmental implications of crop production, the most suitable management practice is NMR. This fact is proved by lowest gap between the nitrogen applied and taken with yield. This management system is particularly favourable for barley, maize, green maize, oat, rye, rapeseed, sugar beet and wheat. NMR represents the management with medium nitrogen input. It varies from 40 kg/ha in case of alfa to 80 kg/ha in case of barley, green maize, pea, potato, oat, rye, sunflower, soy, wheat and 120 kg/ha in case of maize, rapeseed and sugar beet. In case of low input management practices (N0I, N0R) the nitrogen input is lower than the nitrogen taken from the soil with crop yield. On the other hand in case of unlimited nitrogen input (NPI, NPR) there is the extreme pressure on soil in case of all observed crops. With respect to the Nitrates Directive of EU it is basically not applicable.

4. Conclusion

Crop yield variability is heavily dependent on fertilizer use, irrigation, climate and intensification of production. All of these factors raise a question of more sustainable crop management practices. To minimize the environmental impacts of production intensification, increased irrigation and nutrient application should be complemented by efforts to decrease overuse of crop inputs wherever possible to close crop yield gaps. The main aim of paper was to develop integrated modelling framework which combines bio-physical and economic optimization models and applied it for the Slovak regions. The integrated model enabled calculating the net returns and their optimization assuming the land constraints of all regions divided according four production areas. Calculated net returns for all crops and regions proved that the most profitable management practice is NHR, which represent most intensive management practice. The second best alternative is NMR in terms of lowest shadow prices. In fact, NHR is the management system which best describes the reality of crop production in Slovakia. However, this management causes that the soil is over fertilized with the aim to achieve the highest possible hectare crop yields. This leads to the soil organic carbon losses and pollution of groundwater caused by agricultural activity. From the viewpoint of environmental implications of crop production with respect to achieving high net returns, the most suitable management practice is NMR. Quantification of alternative costs of individual management practices, might serve as the tool for regulations of agricultural support measures. Therefore for direction of future research it would be possible to work on policy scenarios in order to determine the possible policy initiatives toward lower input management practices.

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FACTORS DETERMINING THE LEVEL OF AGRICULTURAL AWARENESS OF ACADEMIC YOUTH IN POLAND

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Annotation: The aim of the work is to pinpoint selected factors determining the level of agricultural awareness of academic youth in Poland. The main source of the data used for the analyses and applications was the primary information obtained from personal research (436 respondents from Małopolskie Province). In order to measure and evaluate the youth awareness on agriculture the index of agricultural awareness was used which encompasses seven thematic areas connected with agriculture including the meaning of agriculture, rural policy, the influence of agriculture on the natural environment, information concerning plant and animal production, processing and food marketing. The statistical analysis of the studied material encompassed aggregate statistical indicators as well as the non-parametric test „chi square". Apart from the primary sources they also used secondary sources which encompassed both domestic as well as foreign literature. The completed studies among Polish students enabled the identification of factors determining and diversifying the level of agricultural awareness of this group of respondents. The determinants included gender, faculty, abode and the fact of the respondents or their parents having a farm. A higher level of agricultural awareness was characterised by men, students of technical faculties, people from rural areas as well as the respondents who run a farm. The thematic area which requires urgent educational actions is the issue concerning the influence of agriculture on the natural environment. In this case students marked the most wrong answers. For most students the main source of information about agriculture is the Internet.

Key words: agricultural awareness, student, Poland

JEL classification: A20, I25, Q00

1. Introduction

Agriculture is one of the economic sectors whose contribution to GDP is gradually dropping following socio-economical development. This regularity is present in all highly developed economies. However, it does not mean that the sector is becoming less important. The main role of agriculture is still the production of foodstuffs and raw materials for the agro-food industry. Agricultural raw materials are also used in other industry branches, such as: pharmaceutical, chemical, cosmetic, and textile industries. Other potential agricultural raw materials sales markets, such as energy production (developing energy from solid biomass, biogas, and biofuels) (Piwowar, 2014; Malicov et al., 2016). These are not the only production functions of agriculture. Agriculture, as an integral part of the economy, has a huge potential of fulfilment of diverse extra-production functions including: biodiversity protection, matter and energy circulation improvement, water quality protection, maintaining vitality of rural areas and rural identity, or assuring food security (Hrabankova and Bohackova, 2009; Smutka et al., 2014; Marzban, Allahyari and Damalas, 2016).

Therefore, agriculture is important not only for the economy, but also for the society. According to Urban (2014), the level of knowledge of Polish society on this subject is low. It is especially worrying that young people are the least aware of the role of agriculture in the economy, society, and environment.

In consequence, the main aim of the work is to pinpoint selected factors determining the level of agricultural awareness of academic youth in Poland. Familiarity with these determinants might serve as a basis for actions of various entities, which contribute to the increase in the agricultural awareness of the young generation.

Agricultural awareness recently became the subject of scientific research. Its complex research is conducted mainly in the United States. In other countries, the subject of most works is only partially connected with agricultural awareness of the citizens. These works focus on environmental awareness of the society (MS PL, 2017; Prochazkova, Prasilova and Laputkova, 2016; Zhang et al., 2016) or food literacy of consumers (Goryńska-Goldman and Ratajczak, 2010; Zinovchuk and Orel, 2016).

2. Materials and Methods

The main source of data used in the study was primary information from authors' own study conducted in 2016 using the PAPI method on a group of 436 people (minimum sample size was determined as 433 people). University students from the Małopolskie Province were interviewed. The gender composition of the sample reflects the general population. 59% of the respondents were women and 41% were men. The average age was 22 years. The youngest participant was 18 years old, the oldest was 26 years old. Persons studying natural sciences (31%) and humanities (30%) were dominant. The remaining group were students of technical (24%) and other (15%) faculties. Almost 55% of the respondents lived in rural areas, the remaining persons lived in urban areas. Half of the inhabitants of rural areas lived in an agricultural household. Average area of such agricultural holding was 7.6 ha.

The index of agricultural awareness (IAA) was used to measure and assess the agricultural awareness of young people. The index was constructed based on the principles described by B. Birkenholz (1993). The questionnaire was made up of two parts. The first part included 24 questions. The respondents could obtain between 0 and 24 points. Therefore, IAA allows for values of 0–24 points. A high score indicates a high level of agricultural awareness, but not necessarily an expert level. The second part contained the respondent's particulars.

The statistical analysis of the studied material encompassed aggregate statistical indicators as well as the non-parametric "chi square" (χ^2) test allowing the assessment of the significance of relationship between variables if at least one of them is non-measurable. All the hypotheses were verified on the significance level $\alpha = 0.05$.

Apart from the primary sources, secondary sources, which encompassed both domestic and foreign literature, were used. The results were presented in a descriptive, tabular and graphic form.

3. Results and Discussion

The term agricultural awareness was first used in 1988 by the National Research Council (NRC) in the US in the context of creating college curricula. This organisation emphasised the necessity of including nutritional and agricultural information in the curricula, so that every citizen can make informed choices regarding e.g. their diet (Williams, 1991).

In the literature, there are also other definitions of this term. M. J. Frick defined agricultural awareness as knowledge necessary for every citizen, including basic information about plant and animal products, their processing and distribution, agricultural policy, impact of agriculture on natural environment, and global significance of agriculture (Frick, Birkenholz and Machtmes, 1995).

New trends and changes in agriculture as such at the beginning of the 21st century, such as genetically modified organisms, ecological agriculture, ethanol production, and environmental management forced the modernisation of the notion of agricultural awareness. In 2003, D. L. Meischen and C. J. Trexler (2003) proposed an "updated" definition of the term. They stated that basic agricultural awareness should not be limited to the knowledge of general terms and processes of agriculture.

They believe that the consumer’s ability of judgement and using acquired knowledge to make decisions should be emphasised.

Taking both the classic and the “updated” definition of agricultural awareness into account, 7 thematic areas were used to determine the level of university students’ agricultural awareness: importance of agriculture, importance of agricultural policy, impact of agriculture on natural environment, plant and animal production, food processing and marketing (Table 1).

Table 1. The respondents' answers concerning basic knowledge about agriculture (%)

Specification	Correct answers (%)	Incorrect answers (%)	The answer “I don’t know” (%)
Importance of agriculture	70	13	17
Agricultural policy	53	19	28
Natural environment	43	43	14
Plant production	79	11	10
Animal production	91	7	2
Food processing	48	26	26
Marketing	56	15	29
Total	63	19	18

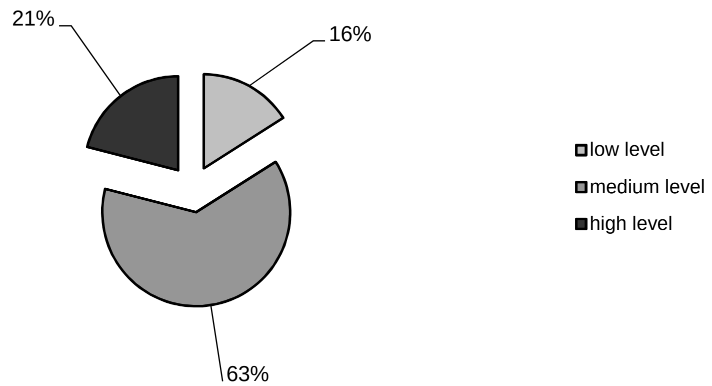
Source: own research, n=436

Almost 2/3 (63%) of the answers were correct. Almost 20% were incorrect, and 18% of the respondents marked the answer “I don’t know”. These results correspond with the results obtained by other authors (Birkenholz, 1993). The questions regarding animal production had the highest percentage of correct answers. Over 90% of the participants knew the answers. They also did well in plant production and importance of agriculture. According to T. Wilkin (2013), there are several reasons. Firstly, the majority of the Polish population has its roots in the countryside. Secondly, almost 40% of the Polish population lives in rural areas and almost 15% of the workers are involved in agricultural activities generating ca. 4% GDP. The questions regarding the influence of agriculture on the natural environment had the smallest percentage of correct answers (only 43%). The obtained results confirm the results of previous studies, according to which the Polish society is characterised by a low level of environmental awareness (MS PL, 2017), understood as the level of interest in natural environment and its protection. Young people from Austria and Germany have a higher level of environmental awareness, whereas Greek, Cypriot, Romanian, and Bulgarian citizens had the lowest level of knowledge about the environment (Ruben and Blanco, 2010). The areas where the respondents marked the most “I don’t know” answers were marketing and agricultural policy. According to the research conducted within Eurobarometer (EC, 2016), 47% of persons aged 24 or younger have never heard of the Common Agricultural Policy. The inhabitants of Sweden, Lithuania, and Finland knew the most about agricultural policy, whereas Italian, Spanish, and UK citizens knew the least.

The average value of the general agricultural awareness index in the studied group was 15.5 points. In the studied group, no one answered all the questions incorrectly. Respondents with the lowest level of agricultural knowledge scored 8 points (2% of the group). Almost 7% of the students answered all the questions correctly.

In order to verify the result using the χ^2 test, the results were divided in three ranges: low level of agricultural awareness (8–13 points), average level (14–18 points), and high level (19–23 points). According to the conducted study, the majority of the participants had an average level of agricultural awareness (63%). One in five respondents had a high level of agricultural awareness, and the remaining group represented the low level (Figure 1).

Figure 1. The levels of the indicator of rural awareness in the group of respondents under study (%)



Source: own research, n=436

Based on the conducted analysis, one can state that the level of agricultural knowledge is determined by several factors, one of which is gender (χ^2=7.1; *df*=2). Women were characterised by a lower level of agricultural knowledge (Table 2). The average result in women was 12 points, whereas in men it was 15 points. Among women, there were more persons representing a low level of agricultural awareness. Men were mostly at average and high levels. Analysing particular modules of the index, a higher level of knowledge of agricultural policy, plant production, and food marketing can be observed in women. Men had worse average results in modules regarding the natural environment and processing. In the importance of agriculture and animal production, no gender differences were noted.

Table 2. The structure of respondents according to the levels of rural awareness index (%)

Specification		**The level of agricultural awareness**		
		Low	Medium	High
Gender	Woman	21	60	19
	Man	15	64	21
Place of residence	Village	6	69	25
	Town	22	59	19
Studied faculty	Technical	10	66	24
	Humanistic	25	55	20
	Natural science	20	60	20
	Other	33	50	17
Farm	Yes	10	66	24
	No	29	57	14

Source: own research, n=436

Another factor determining the level of agricultural awareness is the place of residence (χ^2=8.5; *df*=2). According to the conducted studies, the inhabitants of rural areas had a higher level of agricultural awareness. The average score of this group was 15 points. The inhabitants of urban areas scored 2 points less. χ^2 test analysis showed that there are statistically significant differences in the level of agricultural awareness between the inhabitants of rural and urban areas. In both groups, persons with an average level of agricultural awareness dominated, but in rural areas inhabitants, their percentage was higher by 10 pp. The inhabitants of rural areas were also characterised by high level of agricultural knowledge in comparison with the other group (6 pp difference). The score of the inhabitants of urban areas was lower than the score of the inhabitants of rural areas in all the modules forming the agricultural awareness index. The biggest difference was observed in questions related with plant production. It was surely due to the fact that 50% of the students from rural areas were owners of agricultural holdings or their parents had a holding dedicated to plant production, which had direct impact on the level of agricultural awareness in this field.

The relation between agricultural awareness level and ownership of agricultural holding was also studied. The conducted statistical analysis shows that agricultural holding owners have higher average level of agricultural awareness (χ^2=7.7; *df*=2). Running a holding requires some industry knowledge after all. Nevertheless, in the group of agricultural holding owners and children of agricultural holding owners almost 15% had high level of agricultural awareness. It is also worth emphasising that persons not owning an agricultural holding represent a higher level of knowledge on the impact of agriculture on natural environment.

A statistically significant correlation between the level of agricultural awareness and the studied faculty was revealed (χ^2=14.4; *df*=6). On average, the students of technical faculties had the highest score (16.6 points). 90% of this group had average or high level of agricultural awareness. In the group of natural sciences students, the average result was 14.6 points. An average and high level of agricultural knowledge was represented by 80% of the group. Average result of humanities students was 13.3 points. ¾ of the respondents from this group represented average or high level of agricultural awareness. The students of other faculties had the lowest result (12.9 points). Almost 70% of them had average or high level.

The internet was the most popular source of information on agriculture (34%) for the students. Family members were on the second position (26%), television on the third (18%), classes included in the curriculum on the fourth (13%), press on the sixth (5%), and radio on the seventh (1%). The remaining participants answered “other sources”. A statistically significant relation between the choice of information source and ownership of agricultural holding by the respondents or their parents (χ^2=4.5; *df*=1) was revealed. For this group, the most important sources were family and television.

4. Conclusion

Conducting the study on Polish university students allowed identifying the factors conditioning and differentiating the level of agricultural awareness in this group of respondents. The determining factors were: gender, studied faculty, place of residence, and ownership of agricultural holding by the respondents or their parents. Men, technical faculties students, rural areas inhabitants and agricultural holding owners were characterised by a higher level of agricultural awareness.

The field requiring urgent educational actions is the influence of agriculture on the natural environment, as the participant gave the highest number of incorrect answers in this module. The fact that people working in agricultural holdings have lower level of awareness of this subject than people from the remaining groups is alarming. It means that the manner of teaching about the impact of agriculture on the natural environment at all levels of school as well as the methods of education of the entire society are not effective enough and insufficient.

In the designed educational actions, the preferences of young people regarding the source of information should be taken into account. In the studied group, the most effective channel of educational actions was the internet.

The IAA index can be used to monitor and assess the level of agricultural awareness not only of young people, but also other groups of citizens. The information obtained this way can be used to build effective training programmes for particular typological groups and their knowledge of the discipline.

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INTELLIGENT TOOLS FOR DATA AND INFORMATION EVALUATION

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Annotation: : The paper deals with the problematic of processing and utilization of data stored in individual modules of enterprise information system in the decision making process, particularly to support decision making at tactical and strategic management levels. Two hypotheses will be addressed by the contribution: H1 – agricultural enterprises use the management information systems (MIS) software to support their decision making processes. This hypothesis expects the MIS usage in 35 % of agricultural enterprises. H2 – supposes the data model design according to user requirements. Based on a survey between agricultural enterprises and enterprises not focused on agricultural production, the proportion on MIS usage for data and information processing was found. The results of the survey will be analytically processed and compared to the results of survey in non-agricultural businesses performed by Voříšek (2015). Long-term investigations and connection with practice enables authors to propose the data model structure of farm management information system supporting the competitiveness of the agricultural enterprise. The situation in agricultural enterprises is very specific. Data stored in databases are used in decision making processes only occasionally. Hypothesis H1 was not filled, MIS are used only in 10 % of agricultural enterprises. The proposed data model integrates data from all activities of the agricultural business and enables further utilization of these data for increasing company competitiveness. The level of data, information and knowledge utilization in agricultural enterprises is currently very low. It is affected by the fact that the group of suppliers and customers is smaller than in other sectors and therefore the supply-demand chain is closed. The situation is also strongly influenced by the current possibilities for further processing and utilization of data and information already stored in the enterprise data sources.

Key words: information, farm management information systems, agriculture, database

JEL classification: JEL Q13, M15, O32

1. Introduction

Data and information enhanced by knowledge are driving force of the present times. To succeed in fighting with the competition, data and information must flow in the whole decision-making process. Owner of the knowledge is usually a person, who uses actual data and information for its use. Information is a source with a specific attribute. Unlike the others company sources, which are consumed in the process of use, it is a renewable source that even generates itself. Thus, it can be stated that whoever does not have the necessary information in the required time and at the desired place loses his position. In this sense, we can talk about critical information needs, which define the necessary needs of the management to ensure successful operation. Whoever owns information resources on a timely basis, often creates the benefit of access to other information and increases the quality of its position in the entire market environment. In today's vast amount of information, their information ability is fully dependent on the quality of the company's information system. In the agricultural sector, most farms process data and information through the basic modules of the information system – economic area (accounting, warehouse), crop production (crop rotation, harvesting, fertilizer use), livestock production (stables, production, turnovers), human resources (employees, wages).

To improve the position on market and improve competitiveness, data and information stored in information system needs to be used and further developed. Saved data and information in primary databases are otherwise only registration character and does not significantly affect the entire decision-making process. The processing of stored data and information on farms enables the Farm Management Information Systems (hereinafter FMIS). Proper use of FMIS (especially throughout the decision-making process) can significantly affect the company's competitiveness. If in the early 1990s was a problem of the lack of data organized in the systems and the related information, we can now find a surplus of information and the problem of finding the relevant information for the right decisions. Through information technology, employees in the enterprise can have all the necessary information available from enterprise databases and all available databases outside of enterprise resources. The potential of freely accessible information, which is free of charge, is mainly information accessible via the Internet. By their nature, the information is more focused on the support of business, marketing, services of the given enterprise or the organization which provides the information.

The amount of information currently exceeds its quality. A huge amount of information is available today in all media, with a wealth of information offered by the Internet, various industry-oriented portals are being created, which provide information oriented in the field. Finding the right information is fully dependent on the ability of the worker who needs that information. The rapid development of communication technologies also brings new approaches of gaining and working with information. Access to a huge amount of information is greatly influenced by the ability of staff to use modern communication technologies. Statistics show that managers currently have only 40% of the information (due to their volume) that workers had in the 1960s. Now, workers have far more information, but only 30% are those who are relevant to their decision-making. Systems used by business management enable analysis based on historical data (internal) in conjunction with data, particularly external, to enable simulation of the future state.

Future usage of ICT in firms is also related to the question whether there will be sufficient number of ICT specialists to keep the current level of competitiveness in this sector, economic potential and creation of the innovation. As Šimpach and Langhamrová (2016) show, the “age-and-sex structure will upsize in the top and the average age significantly increases”.

2. Materials and Methods

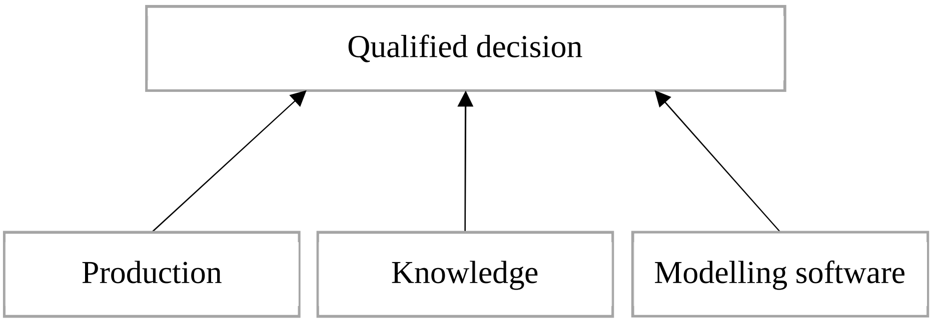
Despite the declared need to use internal and external data to increase the competitiveness of firms, they are still not widely used on farms. There is still no integrated information system specializing in agricultural production related to crop and livestock production with technical services, economics and management that would support farmers' decision-making processes. Data and information are often stored locally - almost 65% of the companies surveyed. The article was elaborated based on scientific methods – using holistic method, analysis, synthesis, induction and deduction. The theoretical part was created using secondary sources, studying scientific and professional articles. Based on the established hypotheses, a questionnaire was compiled, consisting of 15 questions – 12 questions were closed and 3 questions were open. A total of 97 farms were contacted – 67.1% (65 enterprises responded). The structure of enterprises was chosen, which corresponds to the representation of enterprises in the national structure. From 97 addressed enterprises, there were 38 enterprises with an area of over 2,000 ha, 24 enterprises with an area of 1,000-2,000 ha, 26 enterprises with an area of 400-1000 ha and 9 enterprises with an area of 100-400 ha. All respondents had plant and livestock production, 15 respondents had other activities - agritourism, hydraulics production, milk processing, meat, feed production, etc. Based on the results of the questionnaire survey, 56 direct enterprises were interviewed directly. Direct survey enterprises were selected per the results of the questionnaire survey. Questions for direct questioning were given to the respondents based on the long-term experience of the authors of the article (cooperation with practice) on agriculture issues, data usage, information, knowledge and management issues in the entire primary agricultural sector. Outputs from the questionnaire survey were used to draw conclusions from established hypotheses.

Two hypotheses will be dealt with in the submitted paper: H1 - Farming enterprises use management information software (MIS) to support decisions in management processes. The first hypothesis assumes the use of MIS in 35% of farms. H2 - assumes design of a data model per the users' demand - farmers.

3. Results and Discussion

The economic benefit of precision farming is still unclear. Positive benefits can be given by precisely specifying the cost of the entire production process. Figure 1 shows that accurate agriculture requires accurate information (internal and external), highly skilled human capital, and local applications - factors that create ideal data sources for further processing and evaluation of economic efficiency.

Figure 1. Principle of FMIS



Source: own elaboration, 2017

Lewis (1998) said that hardware and database management tools can improve the information available for decision-making. Only a few FMISs use information technology with the ability to use the Internet and all its added value. There is currently no such information system available in the Czech Republic. Most information systems for agriculture offer only basic modules - e.g. economic modules, basic modules for crop production and livestock production. Extensive modules for tactical and strategic management are not fully available. Data and information are stored in modules of individual business segments, and they are mostly used for processing only where the data originated and where they are stored, the modules are not integrated and do not support the entire decision-making process of the enterprise. Nowadays, managers are getting information about the whole farm in one place very problematically. If the information is needed for their decision (the controller needs the information from the section where it was produced, for example, about the realization of the product), they must mostly ask the heads of the individual sections to provide them. In such cases, the decision may not be quick and especially up to date.

Owners of farms and managers are particularly committed to quality production, increasing production trends and good production. Unfortunately, the results of the production are mostly realized per the current models. In most enterprises, stored data are not used to simulate the most optimal production or product realization. Utilization of cloud computing in agricultural holdings in the Czech Republic concerns for example Šilerová et al. (2016). They found out that the use is still mild.

Research on data use on farms was mainly focused on supporting decisions on computational biological models - for example crop yield forecasts. The Australian project has focused on support functions for wheat growing - a system called - WHEATMAN), field operations - machine planning, planning of fertilizer consumption, determination of travel speed in relation to predicted yield, nutrient reserves in the soil and other technological decisions. The use of data processing systems and qualified decisions for nitrogen fertilizer fertilization is addressed by Fiez (1994).

In recent years, the development of automated systems in agriculture has gained increased interest, which has led research teams to explore the development of rational and adaptable systems based on a behavioral approach (Sørensen et al., 2010). The combined use of new communication technologies, sensor systems, GPS systems, geographic systems (GIS) have enabled the development of new systems for growing and harvesting crops (Slaughter et al., 2008). Robotic applications in agriculture, forestry and horticulture have been developed for various activities - dairy robots, robots for monitoring wine quality and determining the harvest time and others.

Management Information Systems (MIS) in agriculture have evolved from simple farm holding systems to extensive and comprehensive farm management information systems (FMIS) in response to the need for communication and data transfer between databases and meeting the requirements of different stakeholders. (Fountas et al., 2015)

In 2010, Canavari carried out a survey that identified the most common use of the following field management functions in the FMIS - management of field operations (63%), reporting (57%), finance (45%), management of specific locations (40%), inventory (38%) and human resource management (25%). Less frequently used features included traceability (19%), quality assurance (19%), sales (18%) and best practices (16%). It is clear from the survey that the functions supporting field management and financial management are more widely used. FMIS sales units for farmers are still very rare because farmers usually do not sell directly to end-users. However, one of the strategies of the EU Directorate-General for Agriculture and Rural Development through the new Common Agricultural Policy is to facilitate direct sales between farmers and consumers, and therefore more FMIS solutions can be introduced in the coming years. (Canavari et al., 2010)

Precise agriculture is a long-term term used for modern farming approaches in plant and livestock production that respect the natural variability of the production environment and seek to respond to it. However, it turns that technical advances in navigation, sensory, electronics, information technology, transmission, preservation, processing and interpretation of data exceeds the possibilities of individuals or individual companies to use this information effectively, and thus the potential of their own ideas of precision farming.

Exact agriculture is technically and comprehensively more demanding than traditional agriculture. This complexity is not only due to accurate measurements and accurate applications but also to the use of data and information from the information system, which is a central element of the precision farming system. For traditional FMIS, the output is created in the form of documents and reports. The structure of the current output reports is usually predefined and the farmer receives regular data sets in which only the data is changed. Thus, there is no change in the structure of output requirements, which is often not feasible. Changing the structure of the output report is a long-term issue and is often associated with a significant financial burden for the enterprise. Precise agriculture allows creation of on-line output structure and is realized with much greater precision on individual plots, stables, machines, employees, directly depending on the requirements of the management. The principles of information systems creation are solved by Stail et al. (2011). Data security has become one of the most important factors (Halová, 2017).

Precise agriculture in crop production allows to control all processes from soil preparation to harvesting - you can create application maps, target individual plots, process acquired data, analyze and evaluate data, optimize costs, and thus achieve higher profits.

This means that the used input quantity exactly matches the costs incurred. Seeds, fertilizers and pesticides are precisely applied by quality of soil. In the same way, the soil can be adjusted depending on precise spatial conditions. Using the GPS localization system, field mapping can be mapped accurately and lead the application technique to respond to field variability and to make the most efficient use of all resources.

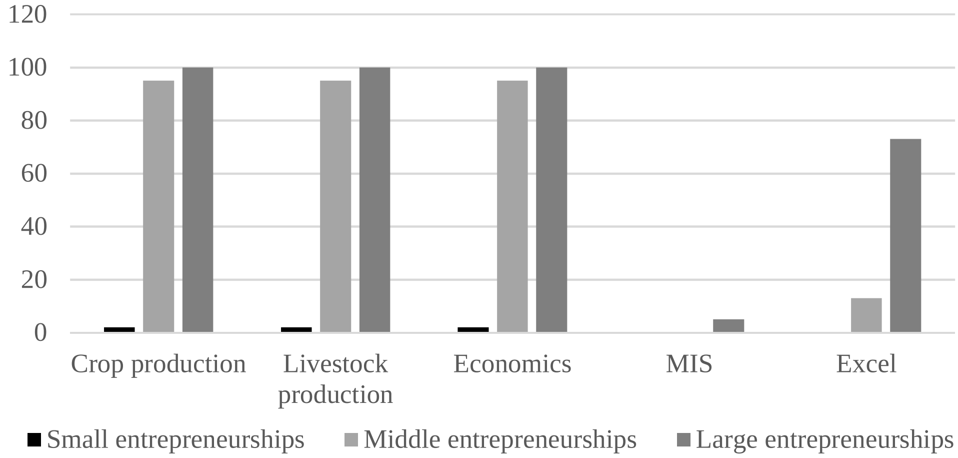
Precision farming in livestock production solves individual dairy cows monitoring, animals with specific characteristics that the zootechnician should know - e.g. udder health, physical activity, weight, overcrowding. Tracking allows not only monitoring of individual dairy cows, but also whole herds. The data stored in the database allows to create outputs that are presented in the form of a report and present data about a group of dairy cows that has some difference. It is therefore necessary to monitor the group more to create the prerequisites to eliminate the problem.

Accurate tracking of land, accurate tracking of dairy cows is only part of the whole agricultural production. It is important to monitor all activities in the enterprise and, above all, to have all the data from the entire farm - from all business activities, mainly economic data and information to make predictions for the future. In the Czech Republic, agricultural production is mostly implemented in the previous year - for example, in the case of plant production in the year of sowing. Then it is very important to model the predicted situation. It is necessary to have the data and information stored in the information system databases from the entire holding, to monitor the time series and the partial situations that affect the realized price.

The development of FMIS must consider the nature of human-related business processes, namely the marketing / sales and supply chain functions, where social aspects are of greater importance. This awareness is necessary to ensure the required progress from the basic use of agricultural data recording and processing systems to the adoption of sophisticated FMIS that genuinely supports the decision-making process of the farm manager.

The results from the questionnaire survey to H1 (usage of software similar to manager information system) show the situation in the use of FMIS on farms. In small farms, no software is used at all. Companies records all records manually on paper. In medium-sized farms, only software for monitoring crops and livestock production and economic area is used. Stored data is no longer used for company management. In large companies (size over 3,200 ha) are data and information stored in enterprise databases and used for management by only 10% of respondents. None of the respondents uses a sophisticated information system. Data is processed in Excel, where only 50% of respondents are exporting. Others are acquiring data to Excel manually. Multiple data acquisition is taking place.

Figure 2. Usage of different types of software in agricultural holdings



Source: Own elaboration, 2017

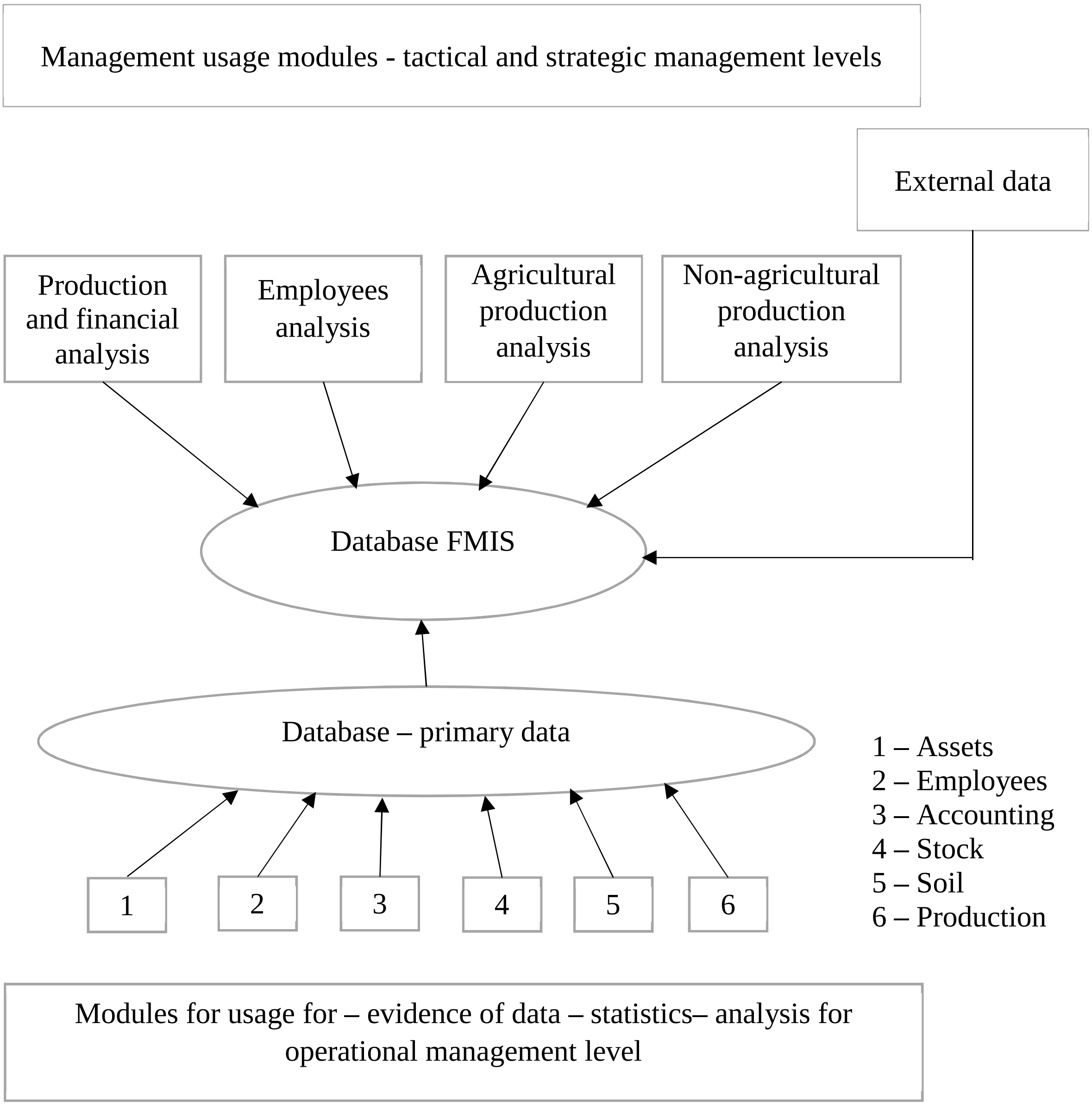
Based on performed questioning in the selected group of agricultural holdings it is possible to design the structure of the usage of data and information stored in the databases of agricultural holdings for further processing and to propose basic structure of FMIS. Proposed structure of FMIS fully supports the creation of the reports and particularly the realization of simulations directly with the comparison of external data and the possibility of the creation of predictions – e.g. development and need of employees, realization of the production according to the needs of the market... Possibility of usage of the data from all entrepreneurship creates the possibilities for increase of the competitiveness, better market position and decrease of costs and hence increase of the profit.

4. Conclusion

In agricultural holdings are stored huge volumes of data and information. Unfortunately, their usage in the whole decision-making process is rather small. The situation of low usage of data is influenced also by the fact that the groups of suppliers and customers are closed. Agricultural firms then do not use their data further, because the inputs and outputs are strongly influenced by suppliers and customers. It is possible to predict to the future the realization of the production non-dependent on the suppliers (of feed, of manure, of seeds, etc.) and hence the need of bigger simulation of the realized price of the production and realized profit. Software of FMIS type is needed to make better position on the market and to create more quality support for realized price. Also the possibility of direct realization of the production of agricultural firms helps to better realization and particularly in those situations it is important to simulated the process from costs realized in the whole production up to the sale itself.

As stated by Voříšek (2015), the situation in non-agricultural firms is different. Large firms use software of MIS type from 85.6%, from 58.2% in case of middle-sized entrepreneurships and in small firms, the situation is close to that in agricultural holdings – the usage is around 5%.

Figure 3. FMIS structure proposal



Source: Own elaboration, 2017

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ANALYSIS OF OPTIONS AND TOOLS FOR SEMANTIC AND EFFECTIVE DESCRIPTION OF DATA AND RESEARCH RESULTS IN THE AREAS OF AGRARIAN SECTOR

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Annotation: The main objective of this article is a thorough analysis of tools for the semantic description of data and results from research activities in the agrarian sector (agriculture, water management and rural development). The basic scientific methods of analysis and synthesis were used to approach the issue. In the analytical part the analysis of tools for semantic description of data and results of scientific research activity (thesauri, metadata formats, linked data, etc.) was realized. The metadata formability analysis clearly showed that the most suitable metadata formats for describing the data from the agrarian sector are VOA3R Metadata AP (Virtual Open Agriculture and Aquaculture Repository Metadata Application Profile), respectively Universal DC (Dublin Core). However, a great potential is provided by the technique of the linked thesaurus data, especially AGROVOC. AGROVOC is the most comprehensive thesaurus with over 32,000 phrases in 27 languages covering food, nutrition, agriculture, fisheries, forestry, environment and other related topics and serves to index documents in agricultural information systems, especially in the international AGRIS system. The Czech Agricultural Thesaurus for the cataloging of AGROTERM documents can also be used in the Czech Republic, which is used for the factual description of documents in the Agricultural and Food Library. Another useful thesaurus, especially in the European Union, is EuroVoc. A great feature is a description of geographic data, which in many cases is bound to a particular format.

Key words: data, metadata, thesaurus, linked data

JEL classification: D83, L86, C88

1. Introduction

The current scientific research community is characterized, among other things, by a growing number of information sources and results from all fields, in various forms, with very different quality, relevance and availability. These source change very dynamically, not only in their number but also in their form, structure and semantics used. Filtering and retrieval mechanisms that allow identification of key bibliographic data are essential for researchers. Restrictions with standard techniques based on syntactic search and handwritten descriptors are long overcome. Therefore, different types of semantic descriptions, searches, knowledge bases, or thesauri are often used (Beneventato et al., 2016). Thesauri or dictionaries are very useful in classifying texts from certain areas of human activity, e.g. in agriculture, engineering, the EU legal framework, etc. (Pudaruth et al., 2016). Increased international communication also calls for multilingual terminology databases and language tools. In these cases, a formal language is often used for the standardized representation of structured dictionaries such as SKOS - Simple Knowledge Organization System (Cagdas and Stubkjaer, 2015). Very sophisticated thesauri contain a high number of generic names, and there is no direct route to assessing the specificity of the term (Martin-Moncunill et al., 2015).

A contextual semantic analysis can be a valid technique based on knowledge of document similarity. However, these techniques are often not transferable to other knowledge bases (Benedetti et al., 2016). Another problem is the identification of important concepts in documents using a thesaurus or vocabulary relationships depending on indexing (Willis and Losee, 2013). Monitoring the origin of scientific research results by simply identifying their reproductions is far from perfect today. Semantics that are usable in visual outputs (Zhang et al., 2017) or semantic dictionaries have certain limits (Santana-Perez et al., 2017), on the other hand, they may be used to describe the results of scientific research very effectively (Pauwels et al., 2017).

Nowadays, great emphasis is on Open Access. The COM 2007 EU Commission (Commission of the European Communities, 2007) stressed that access, dissemination and preservation of scientific data and information are key elements for development of the European research area. Particular attention to the open access is given by European or international consortia (Aguillo, 2012). For example, CERN (European Organization for Nuclear Research), among others, seeks to focus on an open-access publication environment (Pepe and Yeomans, 2007). It is therefore very reasonable to assume that this trend will be broadened and gradually developed in many other fields of human activity.

Based on available articles and publications, it is possible to confirm that there is no unified approach or methodology in the area of efficient semantic description, disclosure and storage of scientific research results for their subsequent presentation, publishing and sharing.

2. Materials and Methods

The basic scientific methods of analysis and synthesis were used to tackle the topic. There are many metadata formats describing different types of objects by their individual elements that have been developed in the framework of scientific research projects, associations or directly by standardization institutions. The methodic approach consisted of:

- compiling an overview of metadata formats, application profiles and thesauri
- selection of formats suitable for describing the scientific and research outputs in the agricultural sector
- the analysis of selected metadata formats and thesauri based on:
    - international usage
    - support and development
    - applicability

The following metadata formats and thesauri that are suitable for describing scientific and research outputs in the agricultural and related industries have been further analyzed:

1. **DC (Dublin Core)** is one of the most versatile metadata formats for data description. It includes 15 basic (recommended) DC elements that are suitable for describing almost any object, including data in the agrarian sector (The Dublin Core Metadata Initiative, 2010).
2. **MARC (MAchine-Readable Cataloging)** represents standards, consisting of MARC formats for machine-readable cataloging (The Library of Congress, 2009).
3. **MODS (Metadata Object Description Scheme)** is a metadata scheme created by experts from the Library of Congress of Network Development and the MARC Standards Office. MODS version 3.4 contains 20 top-level elements with optional attributes. (The Library of Congress, 2016).
4. **VOA3R The Metadata AP** (**Virtual Open Access Agriculture and Aquaculture Repository Metadata Application Profile**) has been specially developed to describe and share scientific and research data from agriculture, water management, the environment

and rural development within the Virtual Open Access Agriculture and Aquaculture Repository. This metadata format is partly based on the DC standard (Šimek et al., 2012).

5. **AGROVOC** is the most comprehensive thesaurus with over 32 thousand terms in 23 languages covering topics related to food, nutrition, agriculture, fisheries, forestry, the environment and other related areas and serves to index documents in agricultural information systems, especially in the international system AGRIS. The development and maintenance of the AGROVOC thesaurus is coordinated by the Food and Agriculture Organization of the United Nations (FAO) within the AIMS (Agricultural Information Management Standards).

6. The Czech Agricultural Thesaurus for cataloging documents **AGROTERM** is used for the factual description of documents in the Agricultural and Food Library Fund. The Agricultural and Food Library has established and further develops AGROTERM, which fully complies with the standard ČSN 01 0193 on the creation and development of monolingual thesauri from 1995. It is maintained by specialists from various branches of agriculture (Agricultural and Food Library).

7. Thesaurus **EuroVoc** is a multilingual and multidisciplinary thesaurus related to EU activities. The Eurovoc thesaurus is used, amongst others, by the institutions and bodies of the European Union, such as the parliaments of the EU Member States including the Czech Republic, or the EU Publications Office.

3. Results and Discussion

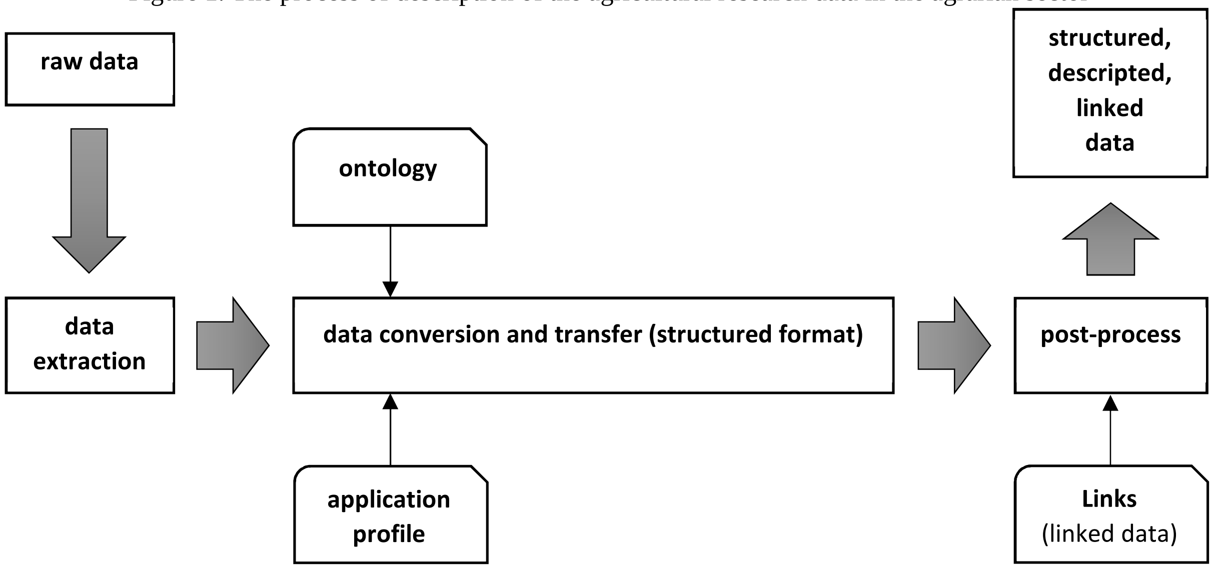
The need not only to describe metadata of scientific and research articles, but also to provide these metadata is becoming stronger. The analysis of metadata formats usability suggests that most suitable metadata format for describing scientific and research outputs from agriculture and rural areas would be VOA3R Metadata AP. It can also be used to integrate various APs (Application Profile) from different archives with scientific research in the field of agriculture (Protonotarios et al., 2011). The results of previous research have shown that it is also suitable for describing audiovisual or sensory data in agriculture, forest water management, food industry and rural development (Šimek et al., 2013). The downside is that this format is currently not being developed any further.

Unlike VOA3R Metadata AP, the Dublin Core metadata format is still being supported and can therefore in many cases be sufficient. The advantage of DC is that digital document creators can use DC to semantically describe their documents, web pages, and other digital objects without having to be experts on factual descriptions of documents or having to study other methods and standards used for these purposes. In addition, this metadata format can be used as the basis for a specialized metadata format designed for a particular case, which can then be compatible with other systems thanks to the common DC base.

The entire process of an efficient semantic description begins with the identification of data in the form of scientific research outputs. The problem is that the data is often not machine-readable, i.e. data is in various long text formats or images. After unambiguous identification of data, it is necessary to extract the necessary data, convert it into structured form and describe the metadata (e.g. by DC, VOA3R, etc.). It is also appropriate to use the predefined thesauri to streamline storage, search options and machine-readability. For the field of agrarian sector, the thesaurus AGROVOC is available. This thesaurus is expressed as a conceptual system of SKOS, which is a data model for representation of structured dictionaries. This system provides for terminological relations between terms and their specific meaning. This process is not restricted to just one thesaurus, more can be used if necessary.

An effective semantic description of scientific research results and outputs will also be supported by an ontological description of the content itself and the description of their significance. During the last post-process, these outputs can be interlinked, increasing the reporting capabilities and historical development of these data (Figure 1). The output of the process is machine-readable data and semantically described data, which can also be open.

Figure 1. The process of description of the agricultural research data in the agrarian sector



Source: Own research.

4. Conclusion

There are a number of options for semantic description of data and results of scientific research. Based on the analysis of metadata formats usable for a semantic description of scientific or professional results or outputs from agriculture, food, water, environment, or rural development, it is clear that each such output should be described by metadata that effectively characterize its content and properties. One of the most suitable metadata formats is VOA3R AP, which, however, is not currently being developed further. Another possibility is DC combined with the AGROVOC thesaurus. Lastly, special metadata formats and application profiles can be designed on the DC basis. The advantage is that metadata records in such formats can be partially processed by systems that support only the basic DC metadata format.

The filling in of the metadata elements itself is the most tedious step in the process. It depends on the depth of the data description. The different depth of description also depends on the type and format of the scientific research outputs being handled. Sensor data, audio-visual records, or publications with many citation will require different levels of description, including linking and ontological descriptions. The greater the depth of the data description, the better is the content characterized.

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EFFECTS OF CAP ON ACCESS TO CREDIT IN SLOVAK FARMS

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Annotation: Access to financial funds affects the development of business. Banking sector plays a major role as banks provide an important portion of funds to business sector. Banks offer loans based on the performance of each individual firm. The criteria of selection change over time. In 2004 after adoption of Common Agricultural Policy (CAP) in Slovakia the agriculture did change. Decoupling of direct payments from the first Pillar in combination with the average size of the farm cause even bigger changes as in the old member states. The paper aims to measure the effects of CAP on access to credit of individual farms and the changes in the bank preferences. Agriculture in Slovakia has different structure compared to agriculture in old EU member states. The majority of UAA (75%) is cultivated by large farms –agricultural holdings- with 1200ha per farm on average. Therefore although subsidies in form of direct payments per hectare are lower than in old member states, the payment per farm is one of the biggest in EU. Direct payments play an important role also in connection with access to credit. Subsidies granted by Agricultural Paying Agency serve as collateral for banks and they significantly decrease the default risk of agricultural holdings. There is a significant difference between small and large farm access to credit. Profitability is one of the key criteria of banks to offer loans to businesses. The profitability of agriculture in Slovakia remains very low on average. The CAP favors crop production and therefore crop farms are much more profitable when compared to animal production.

Key words: agriculture, bank loans, CAP, farm performance

JEL classification: Q12, Q14, G23, G32

1. Introduction

Access to credit of farms refers generally to problems in obtaining funds in form of bank loans. Agricultural credit market depends on the extent to which subsidies have direct and indirect effects on the credit constraints, on whether farms rent or own land, and on farm heterogeneity (Ciaian, Swinen, 2009). European Commission supports the introduction of several Financial Instruments including support through financial intermediaries in form of guarantees and increase in access to credit. (EC 2014). The argument is the increase of additional funds in agriculture by leverage. Overall effect in each country depends on the existence of market failure in form of credit constraints. Slovakia has a different structure of farms in agriculture. 75% of the land is cultivated by large agricultural holdings (Lancaric et al., 2013). The land is owned by individuals and rented by farms. Due to collectivization during the period 1948 to 1989 there is no tradition of small family farms in Slovakia (Zahorsky and Pokrivcak, 2016). The paper aims to evaluate the effect of CAP on access to credit and by this imply the effects of Financial Instruments introduction in countries with large farms.

2. Materials and Methods

We analyze individual farm data over the period 2009 to 2013 divided in two groups based on the criterion, whether the farm did receive a bank loan or not. Individual farm data cover large farms from the database of the Ministry of Agriculture and Rural Development in Slovakia (Information letters of farms with double entry accounting).

First, data were characterized using descriptive statistics and groups were compared using appropriate statistical test to find out, if indicators in two groups have different values. In this case, variables do not follow normal distribution, which implies using of non-parametric method. Appropriate test to compare two independent samples is Mann-Whitney U test. The null and two-sided research hypotheses for the nonparametric t*est* are stated as follows:

H0: Two populations are equal.

H1: Two populations are not equal.

The procedure for the test involves pooling the observations from the two samples into one combined sample, keeping track of which sample each observation comes from, and then ranking lowest to highest from 1 to n1+n2, respectively. The test statistic for the Mann Whitney U Test is denoted U and is the smaller of U1 and U2, defined below.

$$U_1 = n_1 n_2 + \frac{n_1(n_1+1)}{2} - R_1 \quad \textbf{(1)}$$

$$U_2 = n_1 n_2 + \frac{n_2(n_2+1)}{2} - R_2 \quad \textbf{(2)}$$

Where: R1 - sum of the ranks for group 1 and R2 - sum of the ranks for group 2, n1 -size of the group 1, n2 -size of the group 2. Test was evaluated using P-value. P-value<0,05 suggests accepting H1 (two populations are not equal) which means significant differences between groups.

Effect of individual variables on the credibility of farm was estimated using logit model for binary data in basic form:

$$Ln\frac{P}{1-P} = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_7X_7 + B_8X_8 + B_9X_9 + B_{10}X_{10} + B_{11}X_{11} + B_{12}X_{12} \quad \textbf{(3)}$$

Where: P -the probability of getting bank loan, x1-Return on Assets, x2-Liabilities/Assets, x3-Share of bank loans on Liabilities, x4-EBITDA in €, x5-Number of Employees per farm, x6-EBITDA per Employee, x7-Sales per Employee, x8-Average annual salary, x9-Number of hectares per farm, x10-Sales per hectare, x11-Number of owners, x12-Share of sales from crop production on total sales.

B0,B1....B12 are estimated parameters of model, which measure the influence of change in the x variable on the odds ratio in logarithm form.

This model undergone the process of backward elimination and all insignificant variables were removed. Result includes only final model with all significant variables. Direct influence of the explanatory variables on the chance of getting loan is presented by Odds ratios. These can be computed by raising e to the power of the logistic coefficient.

$$\frac{P}{1-P} = e^{B_j} \quad \textbf{(4)}$$

Odds are defined as the ratio of the probability of success and the probability of failure. If odds equal to 1, "success" and "failure" are equally likely. If odds > 1, then "success" is more likely than "failure”, If odds < 1, then "success" is less likely than "failure".

3. Results and Discussion

Slovakia joined EU in 2004 and the CAP was implemented the same year. Two pillars of CAP were introduced and the total amount of subsidies increased. The first Pillar (direct payments) has a form of SAPS which grants subsidies based on the Utilized Agricultural Area (UAA) of the farm. Resulting from the history and political system before 1989 there are large farms in Slovakia with UAA well over 500 ha. Therefore the first Pillar plays an important role. The second Pillar of CAP is the Rural Development Program (RDP) mainly relying on grants linked to individual Measures. The overall increase in subsidies after 2004 did stabilize the Slovak agriculture on one hand, but also the common market increased the competition and commodity prices became more volatile.

The nature of agricultural production and the distribution of cash flow over the production year are the reason, why bank loans are an important source of finance. From 2004 to 2014 the amount of bank loans as of the 31.12.increased by 115% from 221.8 mil. € to 477.1 mil. € (Tab. 1).

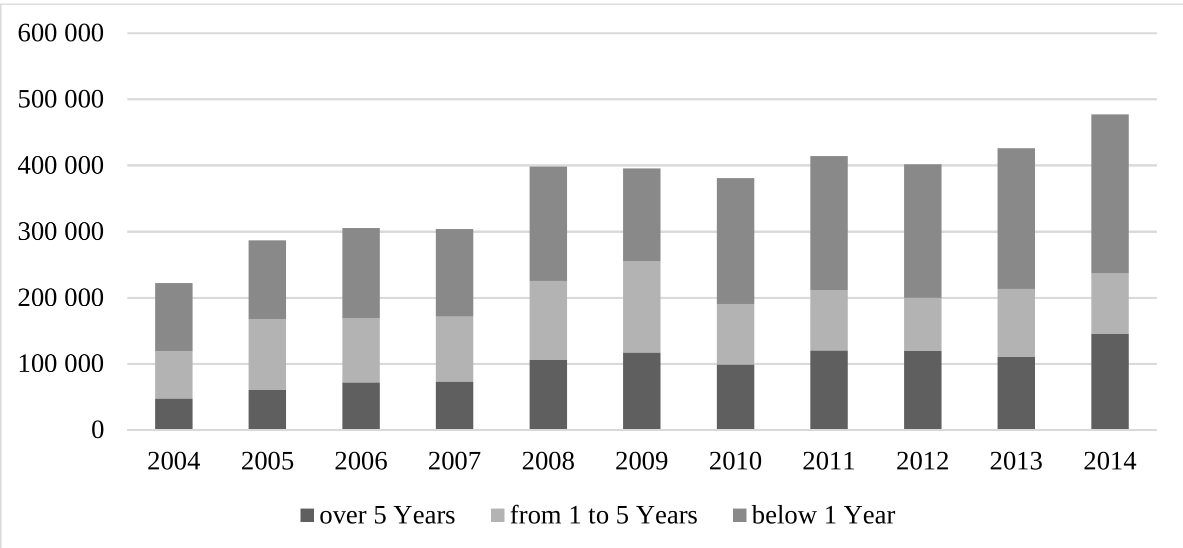
Table 1. Bank loans in Agriculture, Forestry and Fishery in Slovakia as of 31.12. by maturity (in thousands of EUR)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
over 5 Years	47,167	60,263	71,783	72,907	105,736	116,646	98,853	120,080	119,205	110,226	144,904
from 1 to 5 Years	71,570	107,395	97,213	98,632	119,598	138,961	92,001	91,300	80,764	103,273	92,232
below 1 Year	103,089	118,843	136,501	132,383	172,646	139,780	190,113	202,924	201,501	212,435	239,946
Total bank loans	221,826	286,501	305,497	303,922	397,980	395,387	380,967	414,304	401,470	425,934	477,082

Source: National Bank of Slovakia

The main type with respect to volume are short term loans with maturity below 1 year (Picture 1). In agriculture this group is used to finance operations and to overcome the time lack between cash out- and inflow. Loans with longer maturity are used to finance investments and in Slovakia they are linked to periods when the RDP measures are implemented to co-finance the investments.

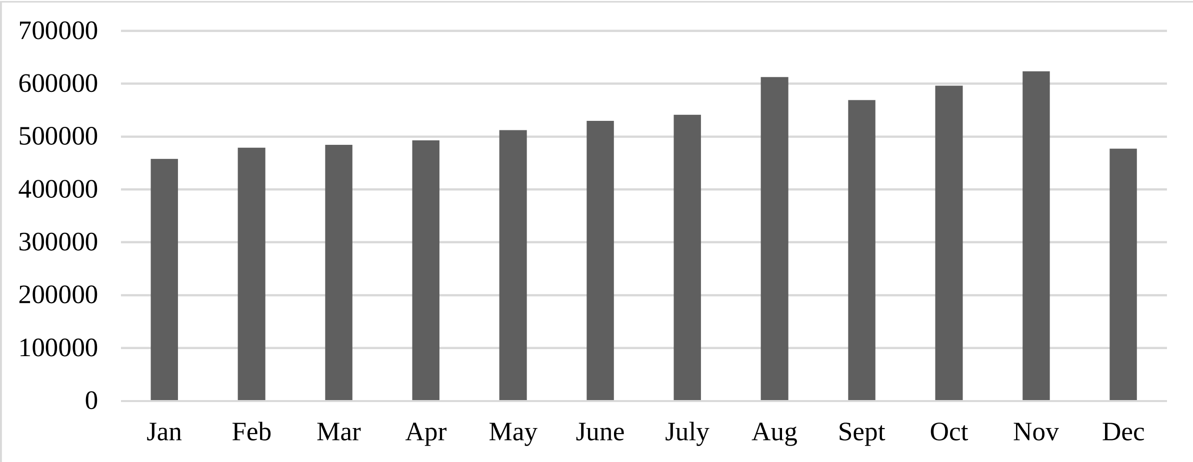
Figure 1. Bank loans in Agriculture, Forestry and Fishery in Slovakia as of 31.12. by maturity (in thousands of EUR)



Source: National Bank of Slovakia

The system of bank loans in Slovak agriculture is affected by the first and also second Pillar of CAP. The amount as of the end of the year is not the highest when compared on the monthly basis. Subsidies from the first Pillar in form of direct payments are payed by the Agricultural Paying Agency (APA) mainly in December and a part is used to repay the bank loans. This can by observed in development of the bank loans in picture 2. Bank loans in Slovak agriculture culminate in November and the difference between November and December is a decrease by 140 mil. €, which is 28% from the end of year level. Direct payments serve as a guarantee for banks and banks claim directly the repayment from the farm bank account.

Figure 2. Total bank loans in Agriculture, Forestry and Fishery in Slovakia as of end of month in 2014 (in thousands of EUR)



Source: National Bank of Slovakia

We analyzed individual farm data to reveal the differences in farms which did take (label 1, total number of observations 3,198) and did not take a bank loan (label 0, total number of observations 1,627) by several indicators. We did observe financial and non-financial indicators. Out of the financial we focused the profitability of the farm measured by return on assets (ROA), debt of the farm by liabilities to asset ratio and share of bank loans on total liabilities and EBITDA of the farm. In the group of non-financial indicators we focused on number of employees, EBITDA and sales per employee, average salary, UAA of the farm, sales per hectare, number of owners and the share of crop production on total production.

Table 2. Descriptive statistics for observed indicators

	Mean		**Median**	
	0	**1**	**0**	**1**
Financial indicators				
Return on Assets	0.02	-0.01	0.01	0
Liabilities/Assets	0.41	0.48	0.29	0.46
Share of bank loans on Liabilities	0.07	0.33	0	0.25
EBITDA in €	253,288.5	264,123.1	102,616	154,480.5
Non-financial indicators				
Number of Employees per farm	23.99	35.64	14	25
EBITDA per Employee	14,048.96	10,925.41	8,152	7,358,57
Sales per Employee	48,505.9	40,727.96	33,669	26,936,08
Average annual salary	7,776.82	7,474.95	7,753.36	7,249.23
Number of hectares per farm	911.46	1,366.01	631	1,061
Sales per hectare	4,160.69	1,513.52	805.45	627.49
Number of owners	49.71	82.29	3	4
Share of sales from crop production on total sales	0.65	0.54	0.79	0.56

Source: Own calculation

Financial indicators:

Farms without a loan (0) compared to farms with a loan (1) have on average higher profitability. We also conclude, that the overall profitability of farms is very low (table 2). Debt of farms with loan is higher and measured by liabilities to assets the ratio is 48% compared to 41% in farms that did not take a loan. The share of bank loans on total liabilities is 33% in farms which did take a loan and 7% in farms which did not. Very interesting is the 0 median of share on bank loans on total liabilities.

In the following research we will focus on this group of farms. Lower EBITDA in farms without loan indicates that this group consists of smaller farms.

Non-financial indicators:

Farms without loan have less employees (23.99 AWU) when compared to farms which did take a loan (35.64 AWU). Farms without a loan generate higher EBITDA per employee, higher sales per employee and also higher average annual salary. Farms which did not take a loan are generally smaller with average UAA 911.46 hectares on average and median value 631 hectares. These farms record higher sales per hectare have higher share of crop production and limited animal production (median value 79% of crop production and only 21% animal production. In comparison farms which did take a loan have the share of crop production (median) 56% and 44% animal production.

Table 3. P-values of indicators based on non-parametric test

Variables / Year	2009	2010	2011	2012	2013
Return on Assets	0.0111	0.0057	<.0001	<.0001	0,0077
Liabilities/Assets	<.0001	<.0001	<.0001	<.0001	<.0001
Share of bank loans on Liabilities	<.0001	<.0001	<.0001	<.0001	<.0001
EBITDA in €	0.0321	<.0001	0.0021	0.0016	0.0024
Number of Employees per farm	<.0001	<.0001	<.0001	<.0001	<.0001
EBITDA per Employee	0.2376	0.2786	0.0218	0.0624	0.9801
Sales per Employee	0.0036	0.0102	0.0074	0.0112	0.0567
Average annual salary	0.0774	0.201	0.1988	0.0161	0.3368
Number of hectares per farm	<.0001	<.0001	<.0001	<.0001	<.0001
Sales per hectare	0.0062	0.0045	0.0002	0.0008	0.0009
Number of owners	0.0001	<.0001	0.0024	0.0062	0.0004
Share of sales from crop production on total sales	<.0001	<.0001	<.0001	<.0001	<.0001

Source: Own calculation

Firstly the statistically significant differences between group of farms that received a loan, and did not receive a loan are tested. The Mann-Whitney U test is used to compare differences between two independent groups when the dependent variable is either ordinal or continuous, but not normally distributed. In the case of our analysis, the test is used to reject or not reject the hypotheses about statistically significant differences in mean values of selected variables between groups of farms during the period 2009 - 2013. The differences are tested at the level alfa=0.05. The critical values p (sig. 2-tailed) summarized in table 3 show that there exist the statistically significant difference in mean values of variables *Return on Assets, Liabilities/Assets, Share of bank loans on Liabilities, EBITDA in €, Number of Employees per farm, Number of hectares per farm, Sales per hectare, Number of owners, Share of sales from crop production on total sales* between groups of farms in each year of analysis (2009 -2013). In each test the null hypothesis H_0 is rejected in the favour of H_1 hypothesis. It can be claimed that the mean values of selected variables between the groups of farms that received a loan, and did not receive a loan differ (are not equal). The values of ratio *sales per employee* are significantly different between farms that received and did not receive a loan in years 2009, 2010, 2011 and 2012. We do not have statistically significant evidence at α =0.05, to show that there is difference in sales per employee between groups of farms in 2013. However the H_0 hypothesis would be rejected at the alfa level 0.10. The H_0 hypothesis is not rejected when testing the differences of ratio *EBITDA per Employee* during each year of analysed period except for 2011 year. The similar results are reached when considering the differences in ratio *Average annual salary*. We can support the null hypotheses that the mean values of ratio are equal between groups in each year except for 2012. We do not assume that these variables might be selected to the logit model in the next step of analysis.

Table 4. Results of logistic regression

Parameter	DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq	odds ratio	95 % confidence interval	
Intercept	1	-0.7943	0.1076	54.4825	<.0001			
Liabilities/Assets	1	1.3498	0.1368	97.4109	<.0001	3.857	2.95	5.042
Share of bank loans on Liabilities	1	5.779	0.2509	530.67	<.0001	323.434	197.81	528.837
EBITDA in €	1	-8.41E-07	1.10E-07	58.249	<.0001	1	1	1
Number of hectares per farm	1	0.00047	5.2E-05	80.8973	<.0001	1	1	1.001
Sales per hectare	1	-7.41E-06	2.75E-06	7.2494	0.0071	1	1	1
Number of owners	1	0.00092	0.00028	10.6637	0.0011	1.001	1	1.001
Share of sales from crop production on total sales	1	-0.5128	0.1046	24.0351	<.0001	0.599	0.488	0.735

Source: Own calculation

$$\ln\left(\frac{\hat{p}}{1-\hat{p}}\right) = \text{-}0{,}7943 + 1{,}3498 \cdot X_1 + 1{,}3498 X_2 + 5{,}779 X_3 - 8{,}41\text{E-}07 \cdot X_4 + 0{,}00047 X_5$$
$$- 7{,}41\text{E-}06 X_6 + 0{,}00092 X_7 - 0{,}5128 X_8 \qquad \textbf{(5)}$$

In the next step, the binary logistic regression model (logit), which estimates the probabilities of a response variable Y as a function of explanatory variables X_1, X_2,…, X_{12} (predictors) is created. The categorical variable Y with value 1 indicates the farms that received a loan and with value 0 the farms that did not receive a loan during the period 2009 - 2013. The explanatory variables of analysis represent the selected financial and non-financial ratios. The backward stepwise selection analysis starts with a model that contains all explanatory variables given in the model statement and gradually removes the variables with low statistical significance (p-value > 0.05). In the 5 steps of analysis the variables EBITDA per Employee, Average annual salary, Sales per Employee, Return on Assets (ROA) and Number of Employees per farm were removed. Table 4 summarizes the results of model estimates. The variables Liabilities/Assets, Share of bank loans on Liabilities, EBITDA in €, Number of hectares per farm, Sales per hectare, Number of owners, Share of sales from crop production on total sales are statistically significant at the level alfa=0.05 and therefore have been included to the logit model, which predicts the probability of farms to access a credit in the overall period 2009 – 2013 (Equation 5). The coefficients in logistic regression are in terms of logarithm of odds. An odds ratio is the exponentiated coefficient, and can be interpreted as the multiplicative change in the odds for a one unit change in the predictor variable. The value of coefficient more than 1 increases the chance of farm to belong to companies that received a loan. The first variable of logistic regression is the Liabilities/Asset ratio that reflects the indebtedness of company, the portion of company´s asset being financed through debt. The increase of ratio by 1 unit increases the odds (chance) to receive a loan 3.857 – times. The ratio Share of bank loans on Liabilities expresses the portion of borrowed capital in the form of bank loan on the value of liabilities of company. When the ratio Share of bank loans on Liabilities increases by 1 unit the odds to belong to companies that received a loan is increased 323.434 – times. The odds ratio 1 for variables EBITDA in €, Number of hectares per farm and Sales per hectare means that the probability to be included to group 1 (company with loan) is 0.5. Even if these variables are statistically significant for the model their unit increase does not cause the change of odds. There is a relatively low increase of odds (1.001) to belong to companies with loan (Group 1) when the Number of owners increases by 1.

Share of sales from crop production on total sales is the only ratio in the model which increase by 1 unit causes the decrease of odds to belong to the companies that received a loan. The overall model is statistically significant at the 0.05 level, and the quality of model expressed by Percent Concordant shows that almost 82 % of companies were classified correctly.

4. Conclusion

Bank loans play important role in financing farms in Slovakia. The volume did increase by 115% during the period of 11 years. The majority of bank loans is short term with maturity below 1 year. Direct payments of the I. Pillar of CAP serve as a guarantee for banks and farms use subsidies to repay bank loans at the end of each year.

We observed differences in farms which did take a loan and which did not take a loan. During the period 2009-2013 farms without loans are more profitable although the profit is generally low. Farms which did not take a loan have lower debt and the bank loans are only 7% out of all liabilities on average. According to all nonfinancial indicators we conclude, that farms which did not take a loan are smaller, have higher salaries on average and focus more on crop production.

Generally farms not relaying on bank loans perform better and have no problem with access to credit. In further research we will focus on the analysis of farms with no credit history.

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QUALITY IN USE EVALUATION OF ONLINE SERVICES: A CASE OF THE eAGRI PORTAL IN THE CZECH REPUBLIC

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Annotation: The eAGRI portal is the key web portal provided by the Ministry of Agriculture and is target to a wide spectrum of users from the agricultural sector in the Czech Republic. Despite the portal significance for data exchange and reporting between farmers and the ministry, the quality of portal online services has not been thoroughly examined yet. Recently, a usability and accessibility study of 30 randomly selected web pages that are publicly accessible at eAGRI portal has revealed that there are several major flaws on websites. The Registry of Land, the Registry of Animals, the Registry of Plant Protection Products and Fertilizers, and the eAGRI Portal for Subsidies are available only for registered users. The paper addresses following research question: What is the perceived quality in use among users of the online services on the eAGRI portal? What are the biggest issues of agricultural e-services assessment?

Key words: Agriculture, electronic services, e-government, quality in use, evaluation, ISO/IEC 25010.

JEL classification: Q1 L86 O32

1. Introduction

As the provision of electronic services by state authorities has advanced to most of sectors of national economy, the evaluation and measurement of service quality has gained more attention. The governments want to see return on their investments and cost efficiency, farmers and other users expect simplicity and good quality like in commercial services such as e-banking, while academics seek out to find an optimal approach to evaluation and comparison of e-services.

In past decades, the infrastructure and supply of e-services by governments has been massively built up especially in developed countries. However, the uptake of e-services, mainly among individuals, is still rather moderate. The agricultural sector is not an exception. Lack of e-services, low awareness, poor quality or insufficient skills of users has been stated as root causes for low use of e-government services, to name a few.

Since the agriculture sector is highly subsidized in the European Union, many interactions are required in an electronic form between an agriculture business or farmer and state authorities. Moreover, the supply of electronic services is given by the authorities while the user’s perspective could be underestimated or completely omitted. Therefore, the quality of electronic services evaluation might provide an invaluable feedback for state agencies to improve their provision and efficiency of invested resources. At the same time, the measurement of electronic services quality could provide better understanding of user’s perspective and behaviour during interactions with those services.

In this paper, a case of the eAGRI portal is used to demonstrate evaluation of agricultural e-services. eAGRI is the key web portal provided by the Ministry of Agriculture and is central to a wide spectrum of users from the agricultural sector in the Czech Republic. Despite the portal significance for data exchange and reporting between farmers and the ministry, the quality of portal online services has not been thoroughly examined yet. Recently, Benda et al. (2015) conducted a usability and accessibility study of thirty randomly selected web pages that are publicly accessible at eAGRI portal and revealed that there are several major flaws on the portal.

To make an overview of conceptual approaches to quality of online services evaluation, literature review has provided following results. As Ulman et al. (2013) observed, the research of service quality got strong drive in 1980s drawing on marketing research methods. The most notable method SERVQUAL was introduced by Parasuraman et al. (1988) assessing the service quality as a difference between customer's perceived quality and expected quality. Since then, with the advancements of Internet and e-commerce, the method has been adapted to assess quality of electronic services such as e-shops or e-banking - see E-S-QUAL by Parasuraman et al. (2005), e-government services (Papadomichelaki and Mentzas, 2012), or agricultural e-government services (Ulman et al., 2013).

Following on the findings presented above, the paper aims to address following research questions: RQ1) What is the perceived quality in use among users of the eAGRI portal online services?; RQ2) What are the biggest issues of agricultural e-services assessment?

2. Materials and Methods

The quality in use of eAGRI portal was examined by the questionnaire survey administered among 135 farmers in 2013 in the Czech Republic. The paper presents basic statistical characteristics of the sample in terms of the Internet use towards public administration and perceived quality in use of selected online services. A non-probability approach was used to build a sample out of population of small farmers who were active members of the Association of Private Farming of the Czech Republic. Out of 5,000 active members of the Association, around 500 were asked to fill in the form, and 135 really did fill in the questionnaire. The survey data were collected both via online questionnaire and e-mail. After that, data were transferred into SPSS for quantitative analysis. There were five demographics questions and in total twelve assessment questions regarding quality in use of the eAGRI Portal. All quality related questions were close-ended items using 5-point scoring scale ranging from 1 (no problem – best score) to 5 (critical problems – worst score). However, all the scale values were treated as equidistant.

The quality in use measurement followed ISO/IEC 25010 standard defining characteristics of results of system interactions (ISO, 2011). The measurement was conducted in form of a user satisfaction survey of portal applications and functions as introduced above. The eAGRI portal was evaluated from the user's view to verify to what extent users' needs are met during the use of system within certain context.

3. Results and Discussion

The basic demographics of the user survey is presented in the Table 1 below.

The Registry of Land, the Registry of Animals, the Registry of Plant Protection Products and Fertilizers, and the eAGRI portal for Subsidies are available only for registered users, and according to the respondents' replies they are also the most important applications on the portal. Moreover, the public website of the eAGRI portal was also highly visited by the respondents.

The frequency of use of particular applications is summarized in Table 2 below. However, the evaluation was focused on the web interface of the eAGRI portal implying that there could be variances among respondents as some of them might use dedicated software for animal or plant production or other having direct communication interface connected to the eAGRI portal. This would explain lower use of the eAGRI portal via web interface. Furthermore, a lower uptake might be explained by the fact that a high number of farmers is using agricultural extension services including their portal account operation.

Table 4. Respondents' demographics

Characteristics	Relative frequency
Production	
Plant production	90 %
Animal production	52 %
Number of employees:	
Less than three	67 %
Three to nine	30 %
Ten or more	3 %
Land:	
below 50 hectares	18 %
50 – 99 hectares	21 %
100 – 499 hectares	50 %
above 500 hectares	9 %
Subsidies:	
Direct payments from SAIF*	98 %
Guaranteed supportive fund for forestry and agriculture	53 %
National subsidies	42 %
Rural Development Program of CR	29 %

Source: adapted from (Kubata et al., 2014, Tyrychtr et al., 2015).
*Note: * SAIF = Subsidies Administration and Intervention Fund.*

Table 5. The most used applications at the eAGRI portal

The eAGRI portal	Frequency (N=135)
Registry of Land (Land)	99.7 %
eAGRI portal – public website(Public)	72.5 %
eAGRI portal for subsidies (Subsidy)	71.5 %
Registry of Animals (Animal)	61.4 %
Registry of Plant Protection Products and Fertilizers (Plant)	57.4 %

Source: adapted from (Kubata et al., 2014, Tyrychtr et al., 2015).

The eAGRI portal quality in use evaluation results

The portal was assessed from the users' perspective in terms of fulfilment of users' needs during the work with the application which falls within so-called quality in use as defined in (ISO, 2011). Therefore, ISO/IEC 25010 measures were taken and the quality in use was measured according to the five characteristics: effectiveness, efficiency, satisfaction, freedom from risk, context coverage.

Each characteristic is assessed based on answers to a question that are measured on a scale from one to five as described above. The questions and scale were adapted from a method proposed by (Ulman et al., 2013). The evaluation questions and their allocation to quality characteristics are listed below in Table 3.

Table 6. eAGRI portal quality in use assessment questions and characteristics

No.	Quality assessment - questions	Characteristics
1.	How accurately the service works? (E.g. Data precision, correct computation, land parcel display, etc.)	Effectiveness
2.	How big advantages are brought to you by the service? (E.g. Faster dispatch, access to funds, more precise information about economics, better information about competition, etc.)	Efficiency
3.	How often do you use the service? (Daily, once a week, once a month, less often, not use at all)	Efficiency
4.	How fast response does the service provide?	Efficiency
5.	How well does the service meet your requirements? (I.e. It allows you to do what you need.)	Satisfaction
6.	To what extent is the service web site user friendly? (E.g. Resizable font, colour contrast on the screen, comprehensible page navigation, easy to open, etc.)	Satisfaction
7.	How are you satisfied with service functions?	Satisfaction
8.	Does the service meet your expectations?	Satisfaction
9.	To what extent is the use of service safe for you? (E.g. The risk of loss of data, leakage or loss of sensitive figures, etc.)	Freedom from risk
10.	How well are information organized on the website?	Context coverage
11.	How easy is to navigate on the page?	Context coverage
12.	To what extent does the page help you to understand its control? (E.g. Such as user help, manual, guidelines, etc.)	Context coverage

Source: adapted from (ISO, 2011, Ulman et al., 2013).

The respondents answered to those questions and assessed the level of problems they experienced during interactions with eAGRI portal applications. The scale interpretation is such as following: no problem, some problems, average problems, serious problems, critical problems as depicted in Table 4 below.

The total results of quality in use evaluation of the eAGRI portal applications and public website are presented in Table 4 above. A more detailed insight and comments are provided in the text below. The list follows the order of survey questions as given in Table 3 and Table 4.

1. *How accurately the service works?*

Positive answers to the first question were dominating. Certain problems were reported with the Land Registry, the Animal Registry and the Plant Protection Products and Fertilizers Registry. Some users complained about repetitive data feeds and variances in map presentations.

2. *How big advantages are brought to you by the service?*

Merely 30 to 45 % of respondents perceived given registries and public portal website as contributing for their business. One fifth of respondents stated that they work daily with the Animal Registry and Plant Protection Products and Fertilizers Registry, public website of the portal and the portal for subsidies. The evidence shows that the use of all given services is very frequent.

3. *How often do you use the service?*

The public website of the portal and the subsidies portal were used at least once a week in more than 40 % of cases.

4. *How fast response does the service provide?*

Problems were reported by fifteen percent of users of the Animal Registry, four percent of the Land Registry, six percent of the Plant Protection Products and Fertilizers Registry and two percent of the Subsidy Portal. However, the respondents did not provide any details about the cause of problems and we could only assume that those stemmed from poor quality of the internet connection or insufficient hardware capacity at users' side.

Table 7. eAGRI portal assessment results

	No. 1 - How accurately the service works?						**No. 2 - How big advantages are brought to you by the service**					
Application	**None**	**Some**	**Average**	**Serious**	**Critical**	**No. of responses**	**None**	**Some**	**Average**	**Serious**	**Critical**	**No. of responses**
Land	34 %	43 %	20 %	3 %	0 %	89	43 %	40 %	15 %	2 %	0 %	87
Animal	41 %	47 %	6 %	6 %	0 %	49	39 %	49 %	6 %	4 %	2 %	49
Plant	41 %	41 %	17 %	0 %	2 %	54	45 %	35 %	16 %	2 %	2 %	51
Subsidy	23 %	62 %	15 %	0 %	0 %	61	31 %	58 %	12 %	0 %	0 %	59
Public	29 %	61 %	10 %	0 %	0 %	41	30 %	63 %	8 %	0 %	0 %	40
	No. 3 - How often do you use the service?						**No. 4 - How well does the service meet your requirements?**					
	Daily	**Weekly**	**Monthly**	**Less often**	**Not at all**	**No. of responses**	**None**	**Some**	**Average**	**Serious**	**Critical**	**No. of responses**
Land	10 %	40 %	40 %	9 %	0 %	77	16 %	56 %	22 %	4 %	1 %	85
Animal	20 %	39 %	36 %	5 %	0 %	44	18 %	57 %	12 %	8 %	4 %	49
Plant	26 %	45 %	23 %	6 %	0 %	47	26 %	48 %	22 %	2 %	2 %	50
Subsidy	20 %	64 %	15 %	2 %	0 %	55	19 %	64 %	16 %	2 %	0 %	58
Public	23 %	68 %	8 %	3 %	0 %	40	24 %	63 %	12 %	0 %	0 %	41
	No. 5 - How fast response does the service provide?						**No. 6 - To what extent is the service web site user-friendly?**					
	None	**Some**	**Average**	**Serious**	**Critical**	**No. of responses**	**None**	**Some**	**Average**	**Serious**	**Critical**	**No. of responses**
Land	14 %	54 %	29 %	4 %	0 %	84	10 %	58 %	25 %	5 %	1 %	79
Animal	15 %	51 %	19 %	11 %	4 %	47	12 %	60 %	19 %	7 %	2 %	42
Plant	20 %	48 %	26 %	4 %	2 %	50	18 %	50 %	25 %	7 %	0 %	44
Subsidy	18 %	61 %	20 %	2 %	0 %	56	16 %	55 %	22 %	6 %	2 %	51
Public	20 %	70 %	10 %	0 %	0 %	40	16 %	57 %	24 %	0 %	3 %	37
	No. 7 - How are you satisfied with service functions?						**No. 8 - Does the service meet your expectations?**					
	None	**Some**	**Average**	**Serious**	**Critical**	**No. of responses**	**None**	**Some**	**Average**	**Serious**	**Critical**	**No. of responses**
Land	20 %	54 %	20 %	4 %	1 %	83	19 %	49 %	24 %	4 %	4 %	70
Animal	20 %	50 %	15 %	11 %	4 %	46	16 %	68 %	16 %	0 %	0 %	38
Plant	22 %	51 %	24 %	2 %	0 %	49	19 %	49 %	28 %	0 %	5 %	43
Subsidy	23 %	61 %	14 %	2 %	0 %	56	17 %	57 %	21 %	2 %	2 %	47
Public	28 %	63 %	8 %	3 %	0 %	40	13 %	63 %	20 %	0 %	3 %	30
	No. 9 - To what extent is the use of service safe for you?						**No. 10 - How well is information organized on the website?**					
	None	**Some**	**Average**	**Serious**	**Critical**	**No. of responses**	**None**	**Some**	**Average**	**Serious**	**Critical**	**No. of responses**
Land	35 %	45 %	14 %	5 %	1 %	74	22 %	48 %	26 %	4 %	0 %	85
Animal	24 %	54 %	17 %	5 %	0 %	41	23 %	53 %	15 %	6 %	2 %	47
Plant	30 %	42 %	21 %	5 %	2 %	43	22 %	55 %	20 %	2 %	0 %	49
Subsidy	22 %	50 %	28 %	0 %	0 %	50	18 %	70 %	11 %	2 %	0 %	57
Public	20 %	60 %	17 %	3 %	0 %	35	20 %	73 %	7 %	0 %	0 %	41
	No. 11 - How easy is to navigate on the page?						**No. 12 - To what extent does the page help you to understand its control?**					
	None	**Some**	**Average**	**Serious**	**Critical**	**No. of responses**	**None**	**Some**	**Average**	**Serious**	**Critical**	**No. of responses**
Land	17 %	59 %	21 %	1 %	1 %	76	9 %	58 %	25 %	7 %	1 %	89
Animal	16 %	66 %	9 %	7 %	2 %	44	14 %	65 %	8 %	6 %	6 %	49
Plant	22 %	53 %	22 %	2 %	0 %	45	8 %	41 %	22 %	25 %	4 %	51
Subsidy	13 %	76 %	9 %	2 %	0 %	54	8 %	53 %	20 %	18 %	0 %	60
Public	11 %	82 %	8 %	0 %	0 %	38	12 %	47 %	23 %	14 %	5 %	43

Source: own processing.

5. *How well does the service meet your requirements?*

More than half of respondents encountered some problems during work with the applications (besides the Plant Protection Products and Fertilizers Registry). Twelve percent of respondents reported serious or critical problems during work with the Animal Registry. Moreover, these applications are binding for farmers and provide the only way how to meet legal requirements.

6. *To what extent is the service web site user-friendly?*

The users stated serious problems or critical problems with user-friendliness in six percent of cases with the Land Registry, nine percent with the Animal Registry, seven percent with the Plant Protection Products and Fertilizers Registry, and three percent with the public website of the portal. More than half of users encountered a sort of problem with those web pages. Only ten to nineteen percent of respondents reported flawless user-friendliness.

7. How are you satisfied with service functions?

Problem free services was reported by a fifth of respondents. Serious or critical problems were traced at the Land Registry (in total five percent), the Animal Registry (fifteen percent), the Plant Protection Products and Fertilizers Registry (two percent), the Subsidies Portal (two percent) and the public website (three percent). Dissatisfaction of respondents was influenced by their opinion about the portal user-friendliness (number six), information organization (number ten), navigation (number eleven) and application control comprehensibility (number twelve).

8. Does the service meet your expectations?

Meeting expectations was achieved only for around one fifth of respondents while average problems were reported by twenty-four percent of users of the Land Registry, twenty-eight percent of users of the Plant Protection Products and Fertilizers Registry, and twenty-one percent of users of the Subsidies Portal. Serious or critical problems with meeting users' expectations were reported with the Land Registry (in total eight percent of responses), the Plant Protection Products and Fertilizers Registry (five percent), the Subsidies Portal (four percent) and the public website (three percent).

9. To what extent is the use of service safe for you?

The farmers perceived the eAGRI portal as safe in following manner: thirty-five percent of cases (the Land Registry), twenty-four percent the Animal Registry, thirty percent the Plant Protection Products and Fertilizers Registry, and twenty percent the Subsidies Portal.

10. How well is information organized on the website?

Problems with information organisation on the website experienced more than half of respondents. Serious or critical problems were reported by four percent of users of the Land Registry, eight percent of the Animal Registry, two percent of the Plant Protection Products and Fertilizers Registry, and two percent of the Subsidies Portal. Despite the fact that the users were not beginners in work with the portal, they still struggled with information search on the eAGRI portal.

11. How easy is to navigate on the page?

Average problems with page navigation were experienced by fifty-nine percent of respondents at the Land Registry, sixty-six percent of the Animal Registry, fifty-three percent of the Plant Protection Products and Fertilizers Registry, seventy-six percent of the Subsidies Portal and eighty-two of the public website users. Trouble free navigation was claimed only by eleven to twenty-two percent of users depending on the application.

12. To what extent does the page help you to understand its control?

The highest frequency of the problems was observed with the comprehensibility of application control. Serious or critical problems reached eight percent of users of the Land Registry, twelve percent of the Animal Registry, twenty-nine percent of the Plant Protection Products and Fertilizers Registry, eighteen percent of the Subsidies Portal and nineteen percent of the public website users.

As the portal quality in use assessment was done by its users, the results are rather subjective. In line with findings of (Halaris et al., 2007), users did not possess specific technical skills and knowledge to evaluate quality metrics set out in an ISO standard, which seems to be a substantial issue in the agriculture portal quality evaluation. Therefore, the proposed procedure considers only site quality such as usability and interface, and user's overall satisfaction as (Halaris et al., 2007) summarize.

4. Conclusion

This paper presents an introductory survey results of the agricultural e-services quality evaluation. The first research question was addressed by basic descriptive statistic evaluation of the questionnaire data. Even though low users' satisfaction with quality of services was expected, as Rysová et al (2013) argued, the information needs of farmers are high and precisely specified. Thus, the provision and user experience of agricultural e-government services must be improved by the Ministry of Agriculture to improve the services quality. Lack of empirical evidence of agricultural service quality evaluation in other countries and missing methodological frameworks for this specific domain of e-services currently seems to be the biggest issues, which was the aim of the second research question in this paper.

Regarding the information gap and growing pressure of governments on the efficiency and effectiveness of spending on e-government, the quality evaluation of online service is highly relevant. However, the appropriate measures and methodologies should be sought, tested and implemented.

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RELATIONSHIP BETWEEN SUBSIDIES AND FARM OUTPUT: EU 28 WITH THE FOCUS ON SLOVAKIA

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Annotation: Agriculture is one of the most supported areas of EU policy. Farmers' incomes are supported by direct payments. In return, farmers are obliged to carry out agricultural activity and respect the standards. This article deals with the problem of subsidies for 28 EU member states in the period of 2004-2013. As the indicators for the research, average subsidy in EUR pre farm and amount of subsidies per crop and livestock is used. Additionally total output and input is used to describe the economic effectivity and linked to the used amount of the subsidy per farm. According to the realized research it can be concluded, that Slovakia is among the other states specific with leading position of the received support in relation to its farm output. This situation can be connected with the fact that the subsidy is remunerated per hectare, which strongly motivates Slovakia's farmers to use vast amount of agriculture land and thus receive support as high as possible.

Key words: subsidies, EU 28, Slovakia, agriculture, farm, crops, livestock, economic effectivity

JEL classification: Q12, M21, N50

1. Introduction

Agriculture is the growing of both plants and animals for human needs (Abellanosa and Pava, 1987) and consequently it is one of the priority topics in European Union (EC, 2015). Nowadays agriculture means the art and science of growing plants and other crops and the raising of animals for food, other human needs, or economic gain (Bareja, 2014).

European Union has 500 million consumers which means that European Commission is responsible for food security of 500 million boarders but also it is responsible for supporting 11 million farms which employs more than 22 million regular workers whose existence depends on farm success on the market (EU, 2017). Just after the creation of European Economic Community as the precursor of today's EU in 1957 the importance of agriculture was highlighted. Launched in 1962, the EU's common agricultural policy as a partnership between agriculture and society and between Europe and its farmers was born. This partnership began to promote farmers' subsidies and this concept was highly successful. In 1984 farms became so productive that they grow more food than needed and EU decided to bring production level closer to market demand. Consequently, in 1992 CAP shifts from market support implemented through price support to producer support implemented through direct payments (EC, 2017) New system emphasises on the quantity of production and not on its quality and insufficiently urged farmers to be environmentally friendly and to emphasize sustainable development. As a reaction CAP cut the link between subsidies and production in 2003. Reform provide income support on condition that they look after the farmland and fulfil food safety, environmental, animal health and welfare standards (Buckwell et al., 2017). CAP helps to sustain rural communities, jobs creating and environmental sustainability. In spite of this charitable objectives of European Commission, farmers are still entrepreneurs and their production decisions are based on the market demands. The CAP therefore supports farmers in three ways: Income support - realized as direct payments, Market measures – support in case of difficult market situations and Rural development measures – national or regional programmes of development in rural areas. Market measures and income support are solely funded by the EU budget, whilst rural development measures are based on multiannual programming, co-financed by Member States. According to official statement of European Commission (EC, 2017) CAP requires about 40 % of the EU budget but on the other hand this amount means only 1% of all EU public expenditure. In 2016 this was about 61 billion EUR (Begg, 2016).

2. Materials and Methods

Paper is based on the Farm Accountancy Data Network (FADN) data from ten year time period from 2004 to 2013. Analysis includes 28 EU member states: (BEL) Belgium, (BGR) Bulgaria, (CYP) Cyprus, (CZE) Czech Republic, (DAN) Denmark, (DEU) Germany, (ELL) Greece, (ESP) Spain, (EST) Estonia, (FRA) France, (HRV) Croatia, (HUN) Hungary, (HRV) Croatia, (IRE) Ireland, (ITA) Italy, (LTU) Lithuania, (LUX) Luxembourg, (LVA) Latvia, (MLT) Malta, (NED) Netherlands, (OST) Austria, (POL) Poland, (POR) Portugal, (ROU) Romania, (SUO) Finland, (SVE) Sweden, (SVK) Slovakia, (SVN) Slovenia, (UKI) United Kingdom and EU 28 Total. FADN database includes data of agricultural holdings surveyed by the Farm Structure Survey (FSS), carried out by the EU countries and managed by Eurostat. This set of farms consists of all agricultural holdings in the European Union of at least 1 hectare and those of less than 1 hectare provided the latter market a certain proportion of their output or produce more than a specified amount of output (FADN, 2017).

Examined time period was chosen according to data availability and strategic bearing of EU's Common Agriculture Policy. Data from year 2004 to 2006 describes situation under Rural Development Policy 2000-2006. According to the fact, that Slovak republic joined EU in 2004 this time period was cut to two years of Slovak “Shortened Programming Period 2004-2006”. Subsequently data from year 2007 to 2013 describes situation of EU 28 member states under Rural Development policy 2007-2013. Situation in new programming period under Rural Development policy 2014-2020 is not included. Paper describes situation of all 28 EU member states. Considering the fact, that different member states entered EU in different time, analyzed data is complete only in 2013. BGR and ROU data starts in 2007 and HRV in 2012. Most of the indicators are consequently based on situation in 2013.

In chosen period these indicators were examined: subsidies per farm for (SPF) EU 28 in EUR, average subsidy per farm in EUR, the difference in subsidies between programming periods 2004-2004 and 2007-2012 per farm in EUR, the share of subsidies to crops and livestock in % for the year of 2013, average SPF for crops and livestock in EUR for the year of 2013, amount of input and output per farm in EUR for the year of 2013, effectivity calculated as a relation of total output to total input for the year of 2013, average farm size in hectares for the year of 2013, average output per hectare in $EUR.ha^{-1}$ for the year of 2013.

These indicators suggests that there is a link between subsidies and total output. Therefore the assumptions were set and examined by the correlation analysis:

Assumption 1: There is a statistical relationship between total subsidies (TS) and total output (TO) on farm level.

Assumption 2: There is a statistical relationship between TS and TO of crops on farm level.

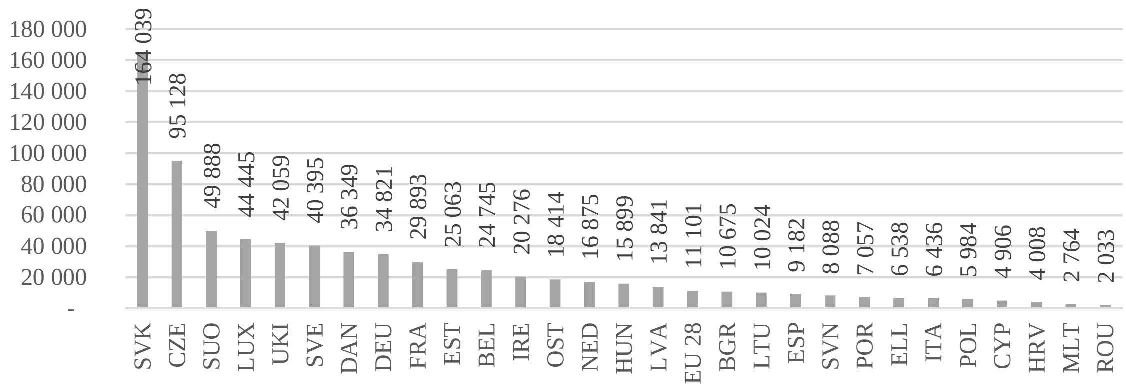
Assumption 3: There is a statistical relationship between TS and TO of livestock on farm level.

This quantitative research is based on the examination of the variables. If there is a reversible dependency between variables, which means that the dependence of the variable X from the Y variable has also meaning, then we found correlation dependency (Obtulovič, 2001). Methodically excel correlation analysis was applied to show either positive, negative or none correlation between two variables. To interpret correlation coefficient which can arise from -1 to +1, certain ranges were used: strong correlation (1–0,7), moderate correlation (0,7-0,5), weak correlation (0,5-0,3), no linear relationship (0,3-0). This ranges can gain both positive and negative linear relationship.

3. Results and Discussion

Total amount of subsidies contains the direct payments which farmers receive per hectare of utilized agriculture area and also indirect payments which are not related with the land. The distribution of the subsidies of EU 28 per farm was basically at the same level for the selected years of 2004-2013 and the average distributed subsidy was in all year around 11,000 EUR. The level of subsidy per farm in 2013 differs between the EU countries with the lowest amount of 2,033 EUR in ROU and the highest amount of subsidy in Slovakia with 164,039 EUR (Fig.1).

Figure 1. Per farm subsidies in EU 28 (EUR), 2013



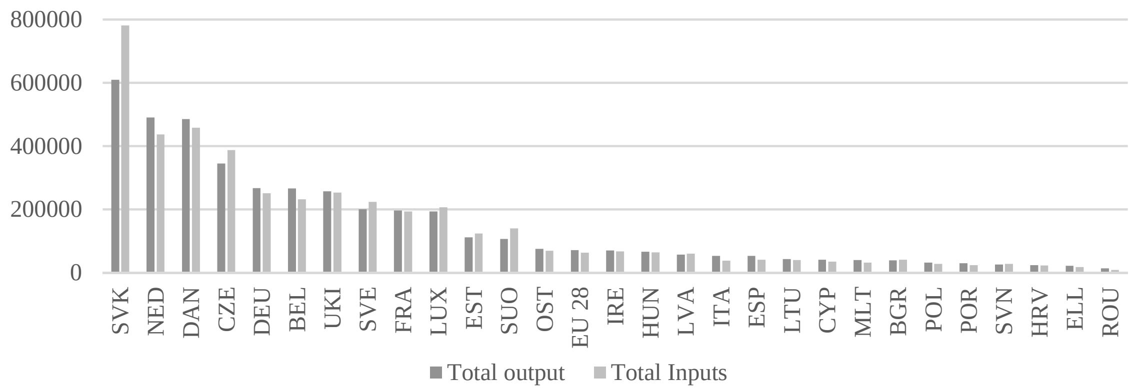
Source: authors own calculations based on FADN 2017

The gap between SVK and other EU countries is even more visible in whole time period 2004-2013 with the difference of 66,532 EUR compared to the second state of CZE. It can be caused also by the immense difference in total amount of subsidy in two examined programming periods in SVK. Under Rural Development policy 2007-2013 Slovak farmers receive more subsidy by 61,989 EUR in comparison with the 2004-2006 period. This difference was biggest in EU 28. Situation was partially caused by chosen system of payments. According to Bujdáková, Závodszká a Chreneková (2005) ten new Member States has been offered the chance to apply initially until the end of 2008 with the extension to 2010 instead of the single area payment scheme to the farm – the simplified single area payment scheme system (SAPS). Slovakia as well as POL, HUN, CZE, EST, LVA, LTU and CYP chose a system of SAPS

In most of the EU 28 countries the share of subsidies to crops and livestock was relatively equal (SVK, HRV, ESP, and EU 28). On the other side there were few exceptions where the level of subsidy strongly prevails to livestock (DEU, LUC, NED) and to crops (MLT, ELL, ITA). According to biggest amount of average SPF, Slovakia is also in leading position for the received subsidy to crop and the second (after SUO) to livestock. Compared to the EU 28, Slovakia received more SPF to crops by 6 150 EUR SPF and was one of 8 countries which overrun this average.

Subsidy affects the total input (TI) and therefore it is very important to look at the connection of TI to total output (TO). Surprisingly, there is visibly much bigger total input than output in Slovakia (Fig. 2) with the difference of 170,990 EUR in 2013. The difference between TO and TI can be linked to the farm effectivity. Bakhshoodem and Thomson (2001) define effectiveness in terms of production, as the maximization of output for a given set of inputs or production at a given level of output by using the minimum input level or a mixture of both.

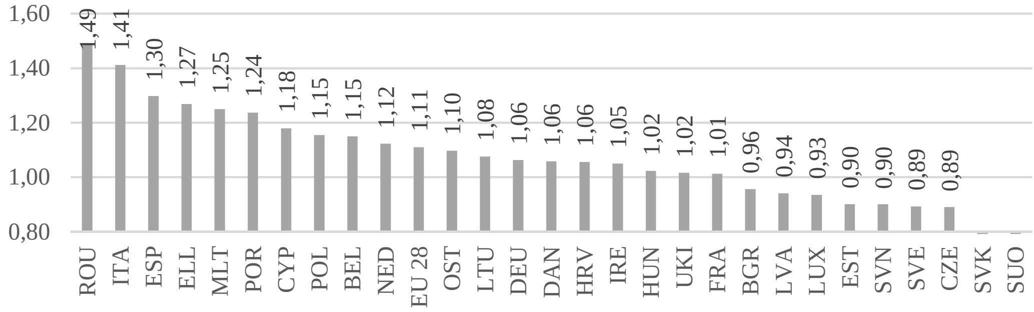
Figure 2. Total output and total input in EU 28 (EUR), 2013



Source: authors own calculations based on FADN 2017

Effectiveness in the Slovakia was (0,78) which was the second lowest of the all EU 28. The leader in farm effectivity in 2013 was ROU with the number of 1.49, (Fig. 3) while the most of EU 28 stayed in the range of 1 to 1.15. Thomka (2004) states that the economy pushes producers to higher effectiveness, and this gradually affects agricultural primary production.

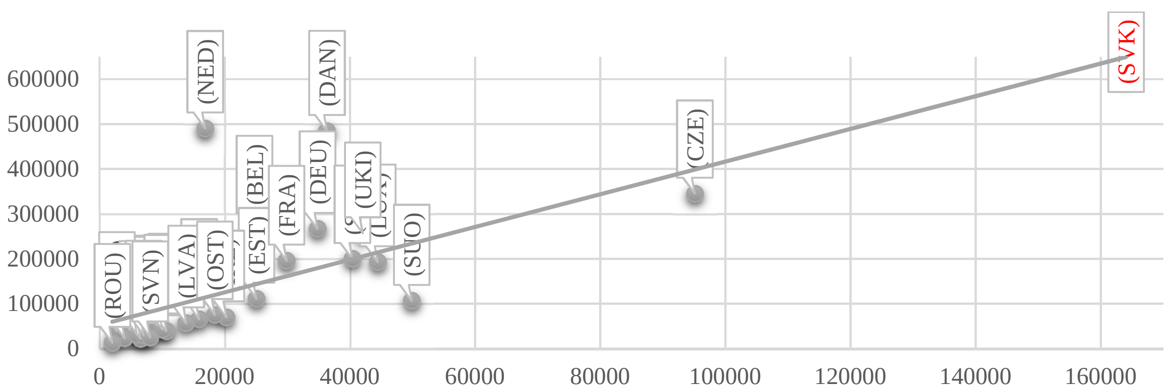
Figure 3. Effectiveness in EU 28, 2013



Source: authors own calculations based on FADN 2017

This extremely low farm effectivity in Slovakia can be related to average farm size in hectares, where SVK is at the foremost position with more than two times higher number of hectares than the second CZE (Tóth, et al., 2016). However, mentioned acreage does not provide expected output. Despite of the enormous Slovak farm size it brings extremely low output (1,025 EUR per farm), while other member state farms lower in size, provide much bigger amount of output.

Figure 4. Total subsides versus total output in EU 28, 2013

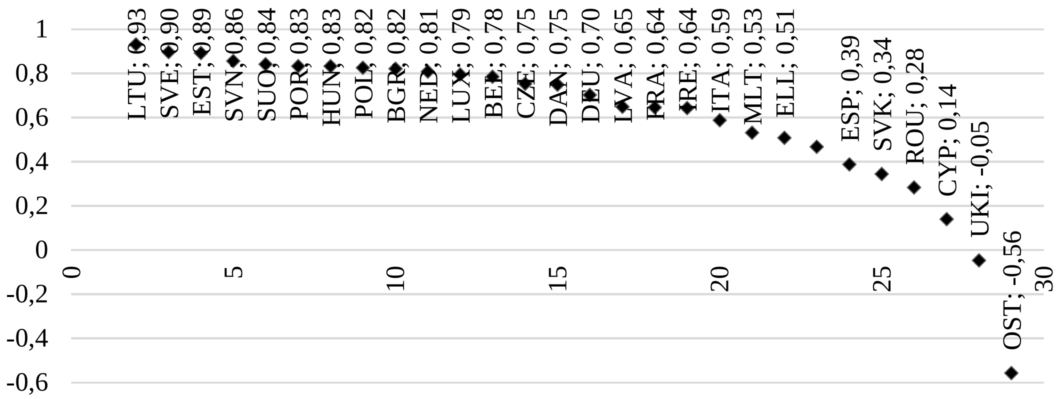


Source: authors own calculations based on FADN 2017

Graphically it is clearly visible that Slovakia is in unusual position than the other EU 28 states, which follow more comparable level (Fig. 4). According to the above mentioned partial results we assumed the relation between subsidies and output and set the assumption 1.The results of the correlation analysis confirms relation between total output and total subsidies. In the range of strong positive correlation belongs 15 EU members (LTU, SVE, EST, SVN, SUO, POR, HUN, POL, BGR, NED, LUX, BEL, CZE, DAN, and DEU).

According to the realized research in case of most EU 28 countries, there is strong positive relationship between total subsidies and total output (Fig. 5) which means that when total subsidy increases, the value of total output also increases. However, because the correlation does not imply causation between two variables, this result can't be related explicitly with the subsidies. Therefore, it would be essential to examine this problem along with the other factors that affects total output.

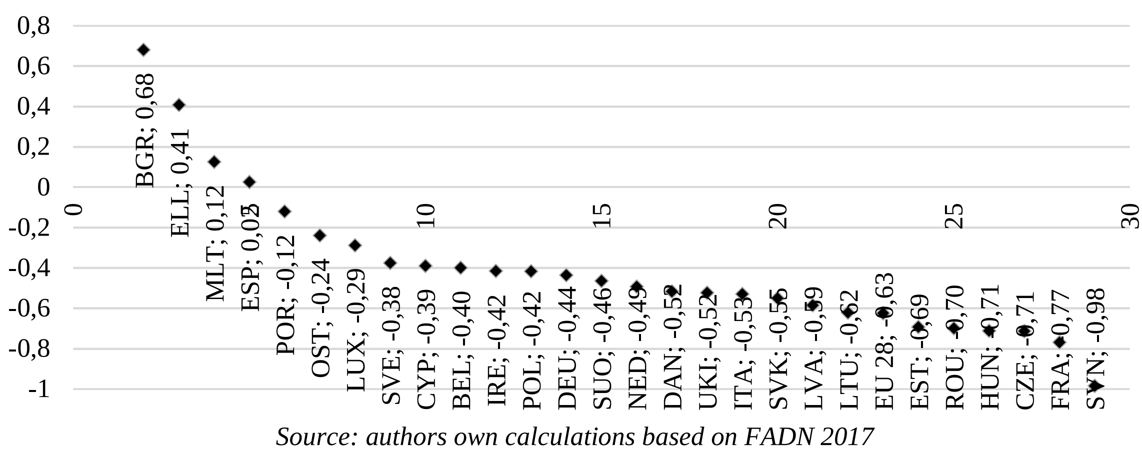
Figure 5. Correlation between TS- total subsidies (EUR) and TO-total output (EUR) in EU 28, 2013



Source: authors own calculations based on FADN 2017

The result of the correlation indicates no relation in case of ROU, CIP, UKI and OST. Slovakia's coefficient indicates moderate positive relationship with the number of 0.34. Observing separately crops and livestock indicators it can be concluded that the coefficient of 0.34 is the result of no correlation for livestock (0.05) and moderate negative correlation for crops (-0.54). After the results of the assumption 1, the relation of subsidies and output separately for crops and livestock was examined. Therefore the assumption 2 and 3 were set.

Figure 6. Correlation between TS (EUR) and TO (hectares) for crops in EU 28, 2013

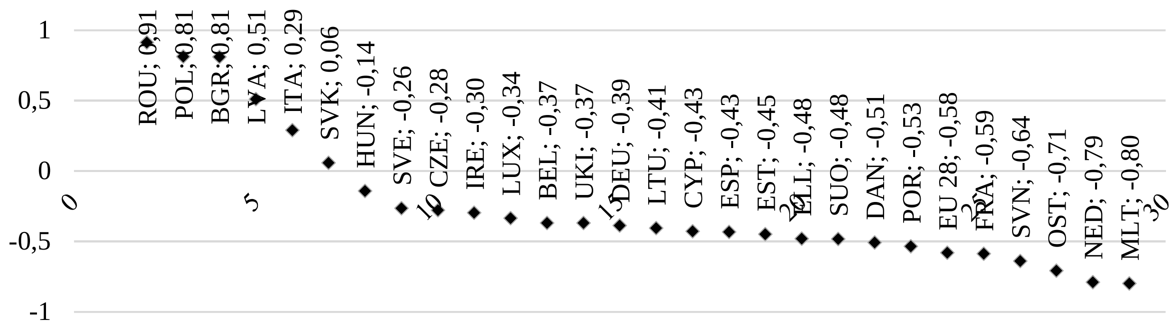


Source: authors own calculations based on FADN 2017

From the correlation of assumption 2, we can see the strong negative correlation between total subsidies and total output for crops (Fig.6) in case of SVN, FRA, CZE, HUN, ROU. The moderate negative correlation has EST, LTU, LVA, UKI and DAN. Slovakia was also part of this range with the correlation of -0.55. No linear relation was seen in countries of LUX, OST and POR.

On the other hand, positive correlation was seen for the three countries: MLT, ELL and BGR which was the highest, but still just in the range of moderate correlation.

Figure 7. Correlation between TS (EUR) and TO (LU-livestock units) for livestock in EU 28, 2013



Source: authors own calculations based on FADN 2017

The correlation of TS and TO for livestock was strongly positive for ROU, POL and BGR. LVA has moderate positive correlation. ITA and SVK shows no linear correlation as well as HUN, SWE and CZE. Strong negative correlation is visible in case of OST, NED and MLT. The rest of the countries had negative moderate correlation (Fig. 7)

4. Conclusion

EU farm policy is arranged into The Common Agricultural Policy (CAP) scheme with the goal of production sufficient quantities of food, ensure its safeness and traceability, protect farmers by price volatility and investments in modernizing. Slovakia joined EU in May 2004 and adopted CAP principles. Despite the scheme is relatively identical in 28 member states it is not successful on the same level in all EU members. Slovakia is a leader for the received subsidy to crop and the second to livestock. On the other hand there is much bigger total input than output in Slovakia with the difference of 170,990 EUR in 2013, what resulted in the second lowest effectiveness from the all EU 28 countries. This can be connected to the highest number of hectares of average farm size. Slovakia's coefficient of the correlation between total output and total subsidies indicates moderate positive relationship with the number of 0.34, which means that when total subsidy increases, the value of total output also increases. The moderate negative correlation of total subsidies and total output for crops was indicated and for livestock Slovakia shows no linear correlation. These results can be connected with the fact that the subsidy is remunerated per hectare, which strongly motivates Slovakia's farmers to use immense amount of agriculture land and therefore receive support as high as possible, but it does not push them to the higher output. Therefore this policy does not work effectively in Slovakia and should be reformed. Tangermann, s. (2007) expressed similar opinion and stated that the CAP after 2013 must go from the decoupling of direct payments to their coupling to specific goals and achievements useful for the society. The future development of the CAP will be significantly affected by the financial and then economic crisis. The Slovak agriculture economy was greatly affected by the accession to the EU, because in this sector annually runs a large number of funds in the form of subsidies.

Acknowledgments

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CZECH AGRARIAN FOREIGN TRADE – COMPARATIVE ADVANTAGES DISTRIBUTION IN RELATION TO OECD AND DEVELOPING AND TRANSITIONAL COUNTRIES

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Annotation: The Czech agrarian foreign trade recorded the significant changes between years 2001 and 2015 that affected not only its commodity, but also its territorial structure. This article identifies the main changes in territorial and commodity trade structure. Another goal is to specify the level of comparative advantages distribution in relation to OECD countries and developing and transitional countries. Comparative advantages distribution is analysed in relation to both groups of countries. Key indicators (export, import, balance and turnover) are analysed using basic and chain indices. The analysis takes into account not only value (in CZK) but also the volume (in tones) of individual commodities. Commodity structure (we applied HS system for more detailed analyses trade is divided into 24 aggregations) is analysed especially in relation to the unit value (unit price analysis) and in relation to comparative advantages or disadvantages distribution. The actual analysis of the comparative advantages distribution is based on Lafay index and the index of the trade balance (TBI). The above-mentioned indices allow us to divide commodities into four basic categories. The results obtained from the individual analysis are presented by the modified product mapping method.

Key words: comparative advantages, commodity structure, Czech agrarian foreign trade, developing countries, OECD countries, unit price value

JEL classification: Q13, Q17

1. Introduction

The aim of this paper is to identify the main changes in distribution of comparative advantages of the Czech Republic in the relation to the OECD countries and the developing countries between years 2001 and 2015.

Agrarian foreign trade is a very important part of world trade. Despite the fact that agrarian trade is a small part of the total world trade, it plays a very important role for human health and development. (Proudman and Redding, 2000) This share is not evidence of declining value or volume of trade, but lower growth rates of agrarian foreign trade compared to dynamic growth in industrial products or minerals or fuels. (Svatoš, 2009)

Czech agrarian trade recorded significant changes in recent years. Exports of agrarian products increased from 49 billion CZK to 202 billion CZK during years 2001 and 2015. Imports grew from 69 billion CZK to 222 billion CZK. Trade turnover of the Czech Republic increased 3.5 times during the period under review. These factors led to a trade balance improvement from -19.8 billion CZK to -18.3 billion CZK (negative trade balance did not drop under 24 billion CZK from 2002 to 2013). These facts led to an improvement of coverage of imports by exports from 70% to 90%. Exports to OECD states increased from 39 billion CZK to 181 billion CZK. Imports to OECD states increased from 55 billion CZK to 195 billion CZK. Total trade turnover with OECD increased 3.9 times. In the case of developing countries exports grew from 9 billion CZK to 20 billion CZK (imports from 13 billion CZK to 25 billion CZK). Trade turnover increased 1.9 times.

The Czech Republic's accession to the European Union in May 2004 was an essential factor in the development of agrarian trade. The Czech producers gained access to the 500 million market where they could export their products. (Volosin, Smutka and Selby, 2011) These events have fundamentally influenced the territorial structure of agrarian trade in the sense that it has become the EU's most important trading partner. The EU's share of agricultural turnover has increased from 87% in 2005 to around 92% at present. (Smutka et al., 2016) The territorial structure is more focused on European countries, especially the member states of OECD and the European Union (Burianová and Belová, 2012) The importance of third countries (including developing countries) has been declining for a long time. (Burianová, 2011) Agrarian foreign trade with OECD and developing countries were also influenced by the Common trade policy and the Common agricultural policy (Alexiadis, Ladias and Hasanagas, 2013).

On the other hand, entry into the EU and its subsidy policy had negatively affected livestock production. The decline in livestock production has affected pigs, poultry and cattle (Svobodová, 2014).

Czech agrarian trade recorded several basic trends in recent years. These include a regularly growing agrarian trade turnover since 2009, in which imports and exports of agrarian products are actively involved. Another important trend is the declining the trade balance of agrarian foreign trade, which started in 2012. (Ministry of Agriculture of the Czech Republic, 2016) Agrarian foreign trade shrared approximately 5% of the total trade turnover of the Czech foreign trade (Burianová and Belová, 2012).

The Czech agrarian exports are constantly evolving, moving from exports of raw materials to exports of products with higher added value and therefore higher prices. (Mezera and Špička, 2013) The most exported agrarian commodities in 2015 were milk and dairy products, tobacco products and cereals. On the other hand, the most imported commodities were meat, fruit, food products and beverages (Pohlová and Bříšková, 2016).

2. Materials and Methods

This paper aims to identify changes which have occurred during the analysed time period from 2001 to 2015. Except for individual changes, other individual factors responsible for them are specified. Territorial structure is analysed in relation to the OECD countries and developing countries. We applied HS system dividing agrarian trade into 24 commodity groups for the commodity structure analyses[5]. The mentioned commodity structure system is applied because of the simplicity of interpretation of results and also because of data availability. To reach the above mentioned objectives, the paper applies the basic statistics and competitiveness analyses (Lafay index and trade balance index). The results coming from individual analyses are highlighted through the modified

[5] **HS** 01-Live animals; **HS** 02-Meat and edible meat offal; **HS** 03-Fish and crustaceans, molluscs and other aquatic invertebrates; **HS** 04-Dairy produce, birds' eggs natural honey, edible products of animal origin, not elsewhere specifik or included; **HS** 05-Products of animal origin, not elsewhere specifik or included; **HS** 06-Live trees and other plants, bulbs, roots and the like, cut flowers and ornamental foliage; **HS** 07-Edible vegetables and certain roots and tubers; **HS** 08-Edible fruit and nuts, peel of citrus fruit or melons; **HS** 09-Coffee, tea, mate and spices; **HS** 10-Cereals; **HS** 11-Products of the milling industry, malt, barches, inulin, wheat gluten; **HS** 12-Oil seeds and oleaginous fruits ,miscellaneous grains,seeds and fruit, industrial or medicinbal plants, straw and fodder; **HS** 13-Lac, gums, resins and other vegetace saps and extracts; **HS** 14-Vegetable plaiting materials, vegetace products not elsewhere specifik or included; **HS** 15-Animal or vegetace fats and oils and thein cleavage products prepared edible fats, animal or vegetace waxes; **HS** 16-Preparations of meat, of fis or of crustaceans, molluscs or other aquatic invertebrates; **HS** 17-Sugars and sugar confectionery; **HS** 18-Cocoa and cocoa preparations; **HS** 19-Preparations of cereals, flour, starch or milk, pastrycooks' products; **HS** 20-Preparations of vegetables, fruit, nuts or other parts of plants; **HS** 21-Miscellaneous edible preparations; **HS** 22-Beverages, spirits and vinegar; **HS** 23-Residues and waste from the food industries, prepared animal fodder; **HS** 24-Tobacco and manufactured tobacco substitutes (CZSO, 2017)

"product mapping method". Data sources for individual analyses are following: UN COMTRADE, Czech statistical office.

We used in this paper the Lafay index (Lafay, 1992). Using the LFI index we can focus on the bilateral trade relations between the countries and regions. For a given country, *i*, and for any given product *j*, the Lafay index is defined as:

$$LFI_j^i = 100\left(\frac{x_j^i - m_j^i}{x_j^i + m_j^i} - \frac{\sum_{j=1}^{N}(x_j^i - m_j^i)}{\sum_{j=1}^{N} x_j^i + m_j^i}\right)\frac{x_j^i + m_j^i}{\sum_{l=1}^{N} x_j^i + m_j^i} \quad \textbf{(1)}$$

where x^i_j and m^i_j are exports and imports of product *j* of country *i*, towards and from the particular region or the rest of the world, respectively, and *N* is the number of items. Positive values of the Lafay index indicate the existence of comparative advantages in a given item; the larger value the higher degree of specialization. (Zaghini, 2003)

Trade Balance Index (TBI) is employed to analyze whether a country has specialization in export (as net-exporter) or in import (as net-importer) for a specific group of products. TBI is simply formulated as follows:

$$TBI_{ij} = (x_{ij} - m_{ij})/(x_{ij} + m_{ij}) \quad \textbf{(2)}$$

where TBIij denotes trade balance index of country *i* for product *j*; x_{ij} and m_{ij} represent exports and imports of group of products *j* by country *i*, respectively (Lafay, 1992). A country is referred to as a "net-importer" in a specific group of products if the value of TBI is negative, and as a "net-exporter" if the value of TBI is positive. (Widodo, 2009) The next part of the analysis presented in this paper was conducted using the analytical tool, called "products mapping".

Figure 1. – Modified product mapping scheme

Group B: Comparative Advantage Net-importer (LFI>0 and TBI<0)	Group A: Comparative Advantage Net-exporter (LFI>0 and TBI>0)
Group D: Comparative disadvantage Net-importer (LFI<0 and TBI<0)	Group C: Comparative disadvantage Net-exporter (LFI<0 and TBI>0)

Source: own modification and processing (2016)

3. Results and Discussion

When we are looking at the territorial structure in Table 1, it is clear that Czech agrarian foreign trade is mainly oriented on trade with the OECD countries and the European Union member states (20 states belongs to the both groups). In both years, these groups reached the highest level of exports and imports. These groups have made a total agrarian trade turnover of more than 90%. However, the overall trade balance is negative for both groups. In the case of EU countries, the negative balance was significantly reduced to 3.4 billion CZK. We have seen marginal improvements in OECD countries. Exports to OECD countries grew 4.5 times during the survey period (import increased 3.5 times). The developing countries were the third most important group of countries. The trade of the developing countries with the Czech Republic recorded an increase of about 50% in the survey period. Exports to the developing countries recorded increase of 2.2 times. Imports from developing countries grew 1.8 times. From the point of view of the total trade balance there were no significant changes.

Table 1. – Czech agrarian foreign trade value between 2001 and 2015 (in ths. CZK)

2001	**OECD**	**EU28**	**Developing economies**	**CIS**	**World total**
Export	39,951,650	41,116,307	9,459,853	1,578,945	49,411,503
Import	55,267,004	51,181,539	13,957,937	281,304	69,224,941
Balance	-15,315,354	-10,065,232	-4,498,084	1,297,641	-19,813,438
Balance/Export	-38.33%	-24.48%	-47.55%	82.18%	-40.10%
2015	**OECD**	**EU28**	**Developing economics**	**CIS**	**World total**
Export	181,291,061	185,235,908	20,776,006	3,746,814	202,067,067
Import	195,918,421	188,674,925	25,293,295	2,005,897	221,211,716
Balance	-14,627,360	-3,439,017	-4,517,289	1,740,917	-19,144,649
Balance/Export	-8.07%	-1.86%	-21.74%	46.46%	-9.47%
Export Basic index 2015/2001	4.54	4.51	2.20	2.37	4.09
Import Basic index 2015/2001	3.54	3.69	1.81	7.13	3.20

Source: CZSO, 2016 and own calculations

Agrarian foreign trade of the Czech Republic recorded a significant increase in the survey period, approximately 3.5 times. Export and import of agricultural commodities were actively involved in this increase. However, the overall trade balance remained passive (below 20 billion CZK).

Distribution of comparative advantages in relation to the OECD countries

In 2001, the Czech Republic had comparative advantages (sector A) in those commodities - HS 01, HS 03, HS 04, HS 11, HS 12, HS 17, HS 22 and HS 24. These commodities contributed to total exports to countries OECD 57.7% (in value 23 billion CZK) and 26.6% (in value 14.7 billion CZK) in imports. The total trade of these commodities amounted to CZK 37.7 billion. Comparative disadvantages (sector D) were recorded by the Czech Republic for these agrarian commodities – HS 05, HS 06, HS 07, HS 08, HS 09, HS 14, HS 15, HS 16, HS 18, HS 19 HS 20 HS 21 and HS 23. The above mentioned agrarian commodities contributed to the total export 35.37% (14.1 billion CZK). These items accounted for 67% of imports (in value 37 billion CZK). The total trade of these commodities amounted to approximately 51 billion CZK. The commodities HS 02, HS 13 and HS 10 were found in sector C (TBI> 0 and LFI <0). These commodities accounted for around 6% of total exports and imports to OECD countries.

In 2015, the Czech Republic recorded comparative advantages for these 12 agrarian commodities - HS 01, HS 04, HS 10, HS 11, HS 12, HS 13, HS 14, HS 15, HS 16, HS 17, HS 22 and HS 24. The Czech Republic exported these commodities to the OECD in value of 109.2 billion CZK (60.3% share on total exports to OECD countries). These 12 commodities contributed to imports of approximately 70 billion CZK (35.64% of total OECD imports). In sector D were these commodities - HS 02, HS 03, HS 05, HS 06, HS 07, HS 08, HS 18, HS 19, HS 20, HS 21 and HS 23. These agrarian commodities contributed to total exports to the OECD 61.6 billion CZK

(34% share). Imports of these commodities reached almost 59%, in total value 115.1 billion CZK. Only the commodity HS 09, which appeared in sector D in 2001, was in sector C in 2015. The Czech Republic became a pure exporter for this commodity. Sector B remained empty this year as well.

When comparing the period between 2001 and 2015, it is possible to see an increase in the share of sector A over the three remaining sectors. The share of exports has increased from 57.7% to 60.3%. Import recorded a significant increase from 26.6% to 35.6%. One of the major influences on Czech agrarian comparative advantages is unit prices. In 2001, the Czech Republic exported an average of 14.55 CZK/kg (it was only 9.53 CZK/kg in 2015). In the case of the average price of the imported unit, it increased from 21.6 CZK/kg to 27.64 CZK/kg. The comparative advantages of the Czech Republic are based on declining unit prices in the case of trade with OECD countries.

Distribution of comparative advantages in relation to the developing countries

In the case of the developing countries, the Czech Republic had comparative advantages in 2001 in these agricultural commodities - HS 01, HS 02, HS 04, HS 11, HS 13, HS 17, HS 19 and HS 22. These commodities contributed to total exports to the developing countries 77, 7%. These exports had a total value of 7.3 billion CZK. Export of agri-commodity HS 04 was the most significant export (it reached 45.3% share of exports). Comparative disadvantages were recorded by the Czech Republic in relation to these agricultural commodities - HS 03, HS 05, HS 06, HS 07, HS 08, HS 09, HS 10, HS 12, HS 14, HS 15, HS 16, HS 18, HS 20, HS 21, HS 23 and HS 24. These 16 commodities had a total trade turnover of 15 billion CZK. Commodities from sector D accounted for 22.3% of total exports and 91.9% of total imports. Sectors B and C remained empty in 2001.

In 2015 there was a significant increase in the number of commodities for which the Czech Republic had a comparative advantage in relation to the developing countries. Out of 8 agrarian commodities in 2001 there was an increase to 12. Among these commodities were HS 01, HS 04, HS 11, HS 12, HS 13, HS 15, HS 17, HS 18, HS 19, HS 21, HS 22 And HS 23. The highest trade turnover was retained by the commodity HS 04 (in value 4.1 billion CZK). In total, these commodities were exported at 15.6 billion CZK, representing 75% of the total exports of the Czech Republic. In the group without comparative advantages, there were 11 agrarian commodities - HS 02, HS 03, HS 06, HS 07, HS 08, HS 09, HS 10, HS 14, HS 16, HS 20 and HS 24. Commodities HS 02, HS 08 and HS 09 reached 42% of total imports (in value more than 10.5 billion CZK). In sector C, there was just HS 05, which reached CZK 0.5 billion CZK in imports and also in exports. Sector B remained empty as in the previous case.

Although the total numbers of commodities in sector A increased, their total export share fell from 77% to 75%. Imports of these commodities grew from 8% to 27.4% in 2015. Negative changes occurred at unit prices. In 2001, the Czech Republic exported an average of one kilogram of the commodity for 27.69 CZK and imported on average for 25.24 CZK/kg. In 2015 was exported on average for 35.66 CZK/kg and imported for 39.16 CZK/kg. It follows that the Czech Republic is primarily promoting the volume of traded commodity rather than trade in agrarian commodities with high added value.

4. Conclusion

Based on the above results, several major trends can be seen. Czech agrarian foreign trade grew dynamically during the fifteen years surveyed. The total turnover of agrarian trade increased 3.54 times, export increased 4.06 times and import 3.16 times. The biggest problem we have seen is the decreasing value of the average weighted units and the rising value of the average imported units.

In the case of trade with OECD countries, there was an increase in the importance of commodities in sector A (the share of exports increased from 50.7% to 60.3%, in the case of imports from 26.6% to 35.6%). This fact, of course, led to a decline in the sector D, because sector B was empty in both cases and the sector C had only a marginal share. The Czech Republic had a comparative advantage in relation to the OECD in both the years - HS 01, HS 04, HS 11, HS 12, HS 17, HS 22 and HS 24.

Trade with developing countries has grown just as did it with the OECD countries. The most important sector A recorded a percentage decline in the case of exports from 77.7% to 75.1% (from 8.1% to 27.4% in the case of imports). This change was reflected in the sector D (sector B remained empty in both years and sector C had only a marginal share in 2015). The position of the net exporter and the comparative advantage had the Czech Republic in both agrarian commodities – HS 01, HS 04, HS 11, HS 13, HS 17, HS 19 and HS 22 in both years. Trade with the developing countries is a specific because of commodities which the Czech Republic can not grow itself because of climatic conditions.

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FOREIGN TRADE OF CZECH REPUBLIC AND EURASIAN ECONOMIC UNION IN AGRICULTURAL AND FOOD MARKET: ADDITIONAL TOOLS FOR THE ANALYSIS

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Annotation: In this paper some additional tools for the analysis of the foreign trade between the EU and EAEU countries will be examined, the ones that involve mirror statistics and identification of the revealed comparative advantages. Through the example of the trade in food and agricultural products between the Czech Republic (EU) and Belarus (EAEU) it is demonstrated that mirror statistics enables, analysis and estimation of the capital flight flow and budget loss, identification of a "force majeure" situation when changes in trade policy. Also, additional opportunities of indexes of revealed comparative advantages for the detection of trade peaks and external trade policy changes were pointed out.

Key words: agriculture in International Trade, comparative advantages, import, export, trade balance, Balassa index

JEL classification: Q13, Q17

1. Introduction

The Eurasian Economic Union (EAEU) is the largest integration association of the five post-soviet countries (Russia, Belarus, Kazakhstan, Kyrgyzstan, and Armenia) with the population of 184 million. The EU consists of 28 countries and has a total population of 510 million. The EAEU countries and the EU countries maintain mutually beneficial relations that are regulated both at the level of individual countries and in general within the framework of integration associations (the European Commission and the Eurasian Economic Commission). The increasing obstacles to the trade between the EU and EAEU countries, especially the currently existing lists of the reciprocal sanctions, including trade restrictions between the EU and Russia, have significantly affected the volume and structure of the mutual trade and continue to do so. Against this background, the trade and trade policy demand regular and comprehensive monitoring, including the statistics analysis with the use of traditional tools – analysis of the dynamics, commodity structure and commodity composition of exports-imports (Lebedev, 2014; Pushkin, 2009; UNDP Kyrgyz Republic, 2017) including using of index methods (Svatoš and Smutka, 2012; Ishchukova and Smutka, 2013; Svatoš and Smutka, 2009; Svatoš et al., 2014; Pushkin, 2009), as well as the development of the additional methodology to study emerging problems.

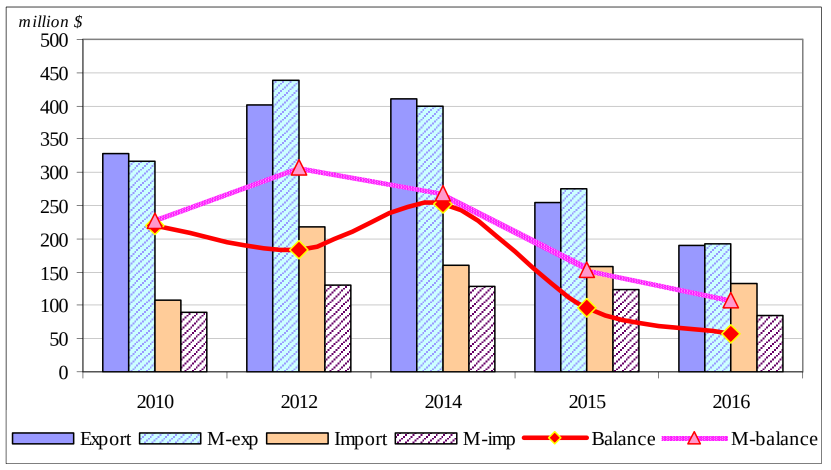
The aim of the paper is to study the possibilities of analyzing foreign trade between the EU countries and the EAEU. The subject of the study is trade in food and agricultural products between Czech Republic (EU) and Belarus (EAEU). The objectives are to study additional possibilities of the analysis of subject area using mirror statistics and indices of revealed comparative advantages (Balassa, 1965). The source of statistical information is the UN Comtrade database (UN Comtrade Database, 2017), Czech Statistical Office (Czech Statistical Office, 2017), National Statistical Committee of the Republic of Belarus (National Statistical Committee of the Republic of Belarus, 2017) and EAEU Statistics department (EAEU: Statistics Department, 2017).

2. Materials and Methods

2.1. Mirror statistics: differences in data. International trade between two countries is simultaneously monitored by the customs services of these countries. Export of goods of one country to the other one should be equal to the import of goods of the latter country from the former one, whereas import of the former country from the latter one should be equal to export of the latter country to the former one. In practice, however, the mentioned trade volumes usually differ, sometimes significantly. The reasons for such discrepancies can vary and should be separately examined in each case.

Let us elaborate on the above-said with the example of the trade balance statistics on the international trade between the Czech Republic and Belarus. The exports and imports flows between Belarus and the Czech Republic are tracked both by the Belarusian statistics and by the Czech statistics. Let us merge the data of the figures, taking the Czech statistics as the basis. The data for the Czech exports to Belarus is to be compared with the data for the Belarusian imports from the Czech Republic, whereas the data for the Czech imports from Belarus is to be compared with the data for the Belarusian exports to the Czech Republic. The comparison results are visualized in Figure 1.

Figure 1. TRADE BALANCE: ČR & BELARUS



Basis-source: Czech statistics COMTRADE ; Mirror-source: Belarus statistics COMTRADE

As can be seen in Figure 1, the statistics for the Czech exports to Belarus (Export) slightly differs from its mirror counterpart, the Belarusian imports from the Czech Republic (M-exp-Mirror-export) (in general, for the five-year period under review, the discrepancy in volumes did not exceed the statistical discrepancy, averaging 2% or $ 33 million). However, the statistics for the Czech imports from Belarus and its mirror counterpart, namely the Belarusian exports to the Czech Republic (M-imp-Mirror-import), significantly differed (for the five-year period the discrepancy accounted for about 28% of the total volume and totaled 220 $ million).

Meanwhile, the understatement of the volumes happened only to the Belarusian statistics. There are high chances that such an understatement is due to the capital flight from Belarus as a country with unfavorable business environment. Further on, for the analysis of the Czech exports of goods to Belarus we will use the Czech statistics and compare and check the details in the Belarusian statistics for the imports of goods from the Czech Republic.

2.2. Revealed comparative advantages: calculations for the analysis. One of the popular indicators to assess comparative advantages of a certain country in trade is the Balassa index (Balassa, 1965), which was called the "revealed comparative advantage" index (Revealed comparative advantage – RCA). The revealed comparative advantage index is calculated according to the formula:

$$RCA_i = \frac{X_i^U / \sum X_i^U}{X_i / \sum X_i}, \qquad \textbf{(1)}$$

where i is the commodity, X^u_i is the volume of the commodity i exports of the country U, X_i is the total volume of the commodity i world exports. If the index value is more than one that the country is considered to have a comparative advantage in the commodity. This means that the market share of that commodity exports in the country is larger than the average indicator for this commodity across the world, and the country has a revealed comparative advantage in that commodity.

In principle, one can utilize mirror statistics to calculate RCA indices. Therefore, in order to assess the revealed comparative advantages of the Czech goods in the Belarusian food products market we have calculated the RCA indices with the use of both the data for the Czech exports to Belarus (the Czech statistics) and the data for the Belarusian imports from the Czech Republic (the Belarusian statistics). The calculations results are presented in Table 1.

It follows from Table 1 that in 2014-2015 Czech food products had a comparative advantage in commodity group 01 "Live animals", which is confirmed by the value of the RCA indices > 1 in both the Czech and Belarusian statistics. Also, comparative advantages are revealed for group 11 "Products of the milling industry" and group 21 "Miscellaneous edible preparations" for each year of the reviewed period in both the Czech and the Belarusian statistics.

Table 1. RCA indices for the food products supplied to Belarus from the Czech Republic

HS codes	RCA: Food-export to Belarus *(Czech-stat)*				RCA: Food-import from Czech *(Belarus-stat)*			
	2010	*2012*	*2014*	*2015*	*2010*	*2012*	*2014*	*2015*
01-24	0,4	0,3	0,4	0,4	0,6	0,4	0,9	0,5
01	0,7	0,7	4,2	4,0	1,0	0,4	3,9	4,5
02	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
03	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
04	0,0	0,1	0,1	0,0	0,0	0,1	0,1	0,1
05	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
06	0,1	0,1	0,0	0,0	0,1	0,1	2,6	0,0
07	0,1	0,2	0,1	0,1	0,1	0,1	3,4	0,1
08	0,0	0,0	0,2	0,0	0,0	0,0	4,4	0,0
09	0,1	0,0	0,0	0,0	0,1	0,0	0,1	0,0
10	0,0	0,0	0,1	0,1	0,0	0,0	0,1	0,1
11	1,6	0,9	1,4	1,7	1,7	1,0	1,6	1,4
12	0,4	0,3	0,5	0,5	0,8	0,4	0,5	0,6
13	1,4	0,0	0,0	1,2	1,3	0,0	0,0	1,2
14	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
15	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
16	0,0	0,1	0,0	0,0	0,0	0,1	0,0	0,0
17	1,4	0,0	0,0	0,1	2,1	0,1	0,1	0,2
18	0,2	0,2	0,4	0,3	0,2	0,1	0,4	0,1
19	0,1	0,1	0,2	0,2	0,3	0,2	0,2	0,5
20	0,2	0,1	0,1	0,0	0,3	0,1	0,1	0,1
21	4,6	2,8	3,3	3,5	6,7	3,9	4,1	5,0
22	0,4	0,5	0,5	0,3	0,6	1,3	0,6	0,6
23	0,8	1,2	0,7	0,3	0,8	1,3	1,1	0,2
24	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0

Source: Czech statistics COMTRADE, Belarus statistics COMTRADE

Further, comparative advantages are revealed for group 13 "Lac; Gums, resins and other vegetable saps and extracts " for 2010 and 2015 (there is no data for the other years). There is also a comparative advantage revealed for group 17 «Sugars and sugar confectionery» for 2010. A comparative advantage is also revealed for group 23 «Prepared animal fodder» for 2010 and is confirmed by the Belarusian statistics for 2011. For all the above groups the value of the RCA indices >1 was deduced based on the data from both the Czech and the Belarusian statistics.

3. Results and Discussion

Analysis of the export of Czech food products to the Belarusian market: additional tools

Next, we will explore additional capabilities of mirror statistics and RCA indices. In our analysis, we will consider six commodity groups of the Czech export of food products to Belarus: 01, 11, 13, 17, 21, 23, the groups for which comparative advantages were revealed above (Table 1).

3.1. Mirror statistics. As already noted, the discrepancy between the Czech statistics for the Czech export to Belarus and the Belarusian statistics for the Belarusian import from the Czech Republic fits under the statistical discrepancy (about 2%). However, as the calculations show (Table 2), it is not the case for food products groups 01-24 as the Belarusian statistics shows larger volumes of the Czech food products import than the Czech statistics does for the food products export to Belarus.

It follows from Table 2 that during the period under review the value for food products (groups 01-24) in the Czech statistics was $ 30.3 million lower than the one in the Belarussian statistics. Hence, the import of the Czech food products reflected in the Belarussian statistics is 64.4% larger than the export of the Czech food products to Belarus as reflected in the Czech statistics.

Table 2. Difference in values for some Czech food products groups on the Belarusian market in the Czech and the Belarusian statistics (Czech statistics value minus Belarusian statistics value)

HS groups		*Volume,Thousand dollars*					
		2010	*2012*	*2014*	*2015*	*2016*	*10-16*
01-24	Food and agricultural products	-3 664	-4 891	-16 644	-3 025	-2 045	-30 270
08	Edible fruit	0	11	-9 335	0	-32	-9 356
21	Miscellaneous edible preparations	-1 907	-1 882	-886	-1 856	-1 198	-7 728
07	Edible vegetables and certain roots	-21	137	-4 610	-14	-15	-4 524
22	Beverages, spirits, and vinegar	-389	-2 181	-140	-493	-686	-3 889
06	Vegetable products	4	-6	-1 199	0	14	-1 187
19	Preparations of flour, starch or milk products	-206	-155	51	-372	-384	-1 067
17	Sugars and sugar confectionery	-582	-150	-59	-36	-71	-898
23	Prepared animal fodder	126	-368	-528	54	57	-658
	Other	-184	39	155	-177	241	74

Source: Czech statistics COMTRADE, Belarus statistics COMTRADE

As it follows from Table 2, the biggest discrepancies are detected for 2014 for groups 08, 07, 06 which include vegetable, fruit and plant products. In total, these discrepancies amounted to $ 15.1 million which makes up about 50% of the total discrepancy for food products groups 01-24 for the five-year period. The mentioned discrepancies of 2014 were of burst nature as they were caused by some force majeure reasons, namely the introduction of the Russian Federation (RF) prohibitive sanctions against the EU import, including the food products of groups 07-08. In all likelihood, the statistics of 2014 witnessed the intensive completion of the long-term contracts and the reassignment of the remaining products under group 06 which was not included in the sanctions list. As it follows from Table 2, after 2014 the situation with the statistics discrepancies for groups 06-08 came to normal. We should also note that the discrepancies between both statistics for groups 21,22,19 (other edible preparations, spirits, including beer) have been increasing in the recent years.

Therefore, mirror statistics provided us with the following additional analysis capabilities and allowed us to detect:

– 2014 as the year of the force majeure on the food products market when significant discrepancies were observed in the statistical data on the supply of fruit and vegetable products of group 07-08 due to the Russian Federation having introduced the reciprocal sanctions against the EU;

– increasing discrepancies between both statistics that concern group 22 of spirits and beer and group 21 of other edible preparations (some of its subgroups are included in the RF sanctions list). Those discrepancies require additional investigation, primarily from the statistical services.

3.2. Revealed comparative advantages (RCA indices). The analysis of the RCS indices (Table 1) will be conducted with the use of the additional information on the commodity structure of the Czech food export to Belarus for the food product commodity groups 01-24. This information is presented in Table 3 with an indication of the share of each group in their total volume.

As it follows from Table 3, the above selected for consideration six commodity groups with RCA>1 accounted for 75% of food exports in 2015. Let us remember that according to Table 1 high values of the revealed comparative advantages are observed for group 21 for the whole period (the RCA values range from 2.8 to 4.6) which indicates that the share of the Czech products of this group on the Belarusian market was higher than the world average. Also, the comparative advantages in group 01 for were revealed 2014-2015 (the RCA value is about 4) which indicates an increased intensity of trade with a share higher than the world average.

Table 3. Commodity structure of the food products export from the Czech Republic to Belarus

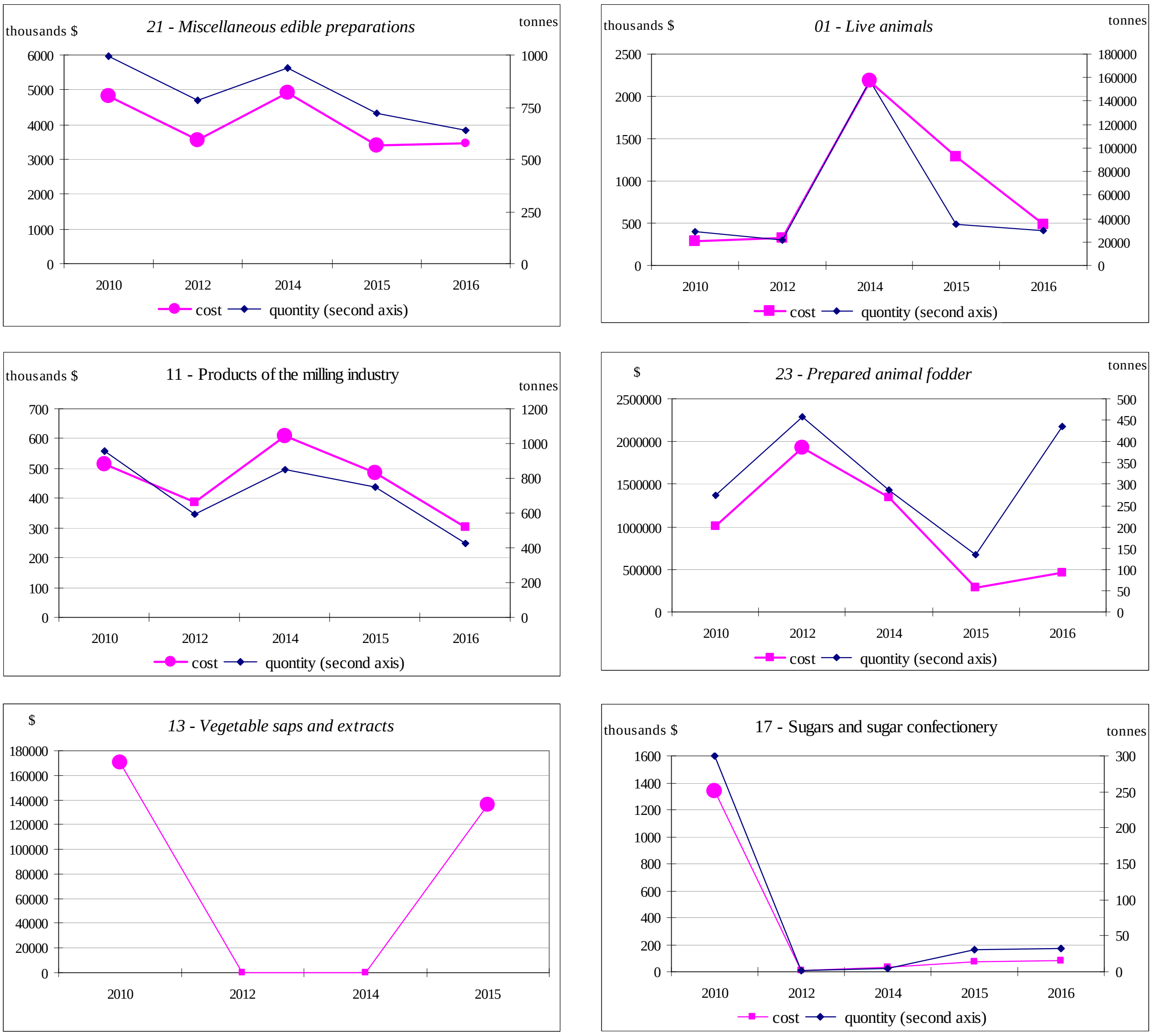
HS groups	*Volume of exports, Thousand dollars*					*Share in exports*				
	2010	2012	2014	2015	2016	2010	2012	2014	2015	2016
01-24	10 177	9 106	13 265	7 602	6 872	100%	100%	100%	100%	100%
21	4 812	3 566	4 923	3 399	3 462	47,3%	39,2%	37,1%	44,7%	50,4%
01	285	323	2 173	1 293	489	2,8%	3,5%	16,4%	17,0%	7,1%
12	618	609	1 060	736	691	6,1%	6,7%	8,0%	9,7%	10,1%
11	514	386	610	486	301	5,1%	4,2%	4,6%	6,4%	4,4%
22	717	1 195	1 196	482	563	7,0%	13,1%	9,0%	6,3%	8,2%
23	1 013	1 928	1 343	284	464	10,0%	21,2%	10,1%	3,7%	6,8%
18	185	238	378	214	353	1,8%	2,6%	2,9%	2,8%	5,1%
13	170	…	…	136	…	1,7%	0,0%	0,0%	1,8%	0,0%
17	1 339	9	36	76	82	13,2%	0,1%	0,3%	1,0%	1,2%
Other	522	851	1 545	494	467	5,1%	9,3%	11,6%	6,5%	6,8%

Source: Czech statistics COMTRADE

Note: the data are sorted with regard to volumes of 2014 in the descending order

Let us continue the interpretation of the indices RCA>1 for the selected groups using data on the value and physical volume of the export and presenting them in the form of following figures. The source of the data is Czech statistics (Czech Statistical Office, 2017). Note that in those figures the value curves are marked with large round markers at those years when the indices RCA were higher than one (>1).

Figure 2. The export volumes by groups



Source: Czech statistics COMTRADE

1. *Group 21 «Miscellaneous edible preparations»* – 45% of export of groups 01-24 (2015). As it follows from Table 1, group 21 has one of the highest indices of the revealed comparative advantages and makes up almost half of the total value of the food products export. Almost the entire volume of the group was formed by two subgroups: 2103 Sauces and their components, seasonings and 2106 Other food preparations (1/3 and 2/3 of the volume).

2. *Group 01 «Live animals»* – 17% of total export of groups 01-24 (2015). As it can be seen in the revealed for 2014-2015 comparative advantages coincide with the two peaks of the export growth for group 01. The export volume was mainly formed by subgroups 0103 и 0105 (live swine and live poultry). The supply of group 01 sharply increased in 2014 (sanctions and reexport through Belarus) and then returned to the previous level. Apparently, this group, not being included in the RF sanctions list, was involved in some schemes of smuggling of goods to Russia from the EU via Belarus. But due to the Russian Federation's tightening of control the trade volume fell to the previous level in 2015-2016.

3. *Group 11 «Products of the milling industry»* – 6% of food products export (2015). For this group, the revealed comparative advantages also coincide with the three peaks of the export growth. The supply volume of group 11 was almost entirely formed by subgroup 1107 Malt. The export

volumes of this group were at large maintained, but nevertheless significantly decreased by 2016, having reached its minimum.

4. *Group 23 «Prepared animal fodder»* – 4% of food products export of groups 01-24 (2015). In this group, the revealed comparative advantage for 2012 also coincided with the export value peak. Since then the export values of group 23 were intensively decreasing as well as the physical volumes. But in 2016 the decline stopped due to the massive growth in the supply of cheap products (average export prices (decreased by almost 70%).

5. *Group 13 «Vegetable saps and extracts»* - 2% of food products export (2015). In this group, the comparative advantages were revealed for 2010 and 2015, which indicates that the share of this commodity export is larger than the world average. The export is represented by the only subgroup 1302 (Vegetables sap and extracts) with some small trade volumes in 2010 and 2015, when such supply was documented by the statistics.

6. *Group 17 «Sugars and sugar confectionery»* - 1% of food products export (2015). The comparative advantage for this group was revealed only for 2010 in which the maximum value of the export supply was documented, connected with the smuggling schemes of sugar reexport to Russia via Belarus. After the RF established strict control, the export of sugar to Belarus, including the Czech export, declined sharply (the Czech Republic now mainly supplies sugar substitutes and sugar confectionary).

Therefore, it can be noted that the comparative advantages revealed for particular years tend to coincide with the peak values of the exports of the commodity groups which allows them to be used as indicators of export growth in a commodity group with account of the world average trade level, when the share of exports of goods is larger (RCA> 1) than the world average.

Moreover, with regard to sporadic indices RCA jumps (as in 2014 for commodity groups 06–08 of vegetables and fruit) the conclusion can be drawn that RCA indices can record critical changes in the trade in a particular commodity on a particular market (in our case, the introduction of the RF reciprocal sanctions against the food products imports from the EU).

4. Conclusion

Thus, having studied the additional tools for the analysis of the trade between the Czech Republic and Belarus we obtained the following results.

1. The analysis of the total results of the trade between the Czech Republic and Belarus showed that the Czech imports from Belarus significantly differed from its mirror counterpart, the Belarusian exports to the Czech Republic (its value reflected in the Belarusian statistics is understated by an average of 28% compared with the Czech statistics). Meanwhile, the Belarusian imports from the Czech Republic is slightly larger than the Czech exports to Belarus (by an average of 2%). The considerable discrepancy in the data for the supply of the Belarusian goods to the Czech market can be indicative of the schemes of the capital flight from Belarus as a country with unfavorable business environment (when a certain part of the export earnings is left abroad). It is noted that the data of mirror statistics should be analyzed separately for each relevant group of goods with account of the existing trade situation.

2. Further, through the example of the trade in food products (commodity groups 01-24) between the Czech Republic and Belarus it is demonstrated that mirror statistics enables:
– *analysis and estimation of the capital flight flow.* The Czech export of food products to Belarus is significantly smaller than the related Belarusian import from the Czech Republic (for the five-year period the discrepancy amounted to $30.2 million while the Czech export of food products totaled

$47 million). Here, among other things, some schemes of the capital flight from Belarus might have been implemented when paying for import contracts;

– identification of a "force majeure" situation when changes in trade policy occur. Thus, based on the analysis of the mirror statistics data on the food products for 2014 significant discrepancies in the statistical data on the supply of fruit and vegetables products of groups 07-09 were detected. The discrepancies were the result of the force majeure changes in the trade situation on the food products market caused by the introduction of the RF reciprocal sanctions against the EU;

– identification of the practical accounting problems, when the increasing discrepancies in statistics require additional clarification, also from the statistical services. With regards to the food products it applies to group 22 (supply of spirits and beer) where the Belarusian statistics records an average of 1.9 times more of the Czech alcohol goods on the market than the Czech statistics does for the supply of such goods to the Belarusian market. Meanwhile, the excess of annual volumes has been increasing for the last two years and has grown to 2.1 times.

3. With regard to the capabilities of the revealed comparative advantages indices RCA for the food products groups 01-24 it was demonstrated that:

– the revealed comparative advantages indices RCA>1 coincide with the peak values (absolute or relative maximums) of the exports of the commodity groups for each particular year, which allows them to be used as indicators of export growth with account of the world average trade level, when the share of exports of the commodity is larger than the world average;

– with regard to sporadic indices RCA jumps >1 it was noted that in such cases the indices can record critical changes in the trade situation for a particular commodity (such a case is examined through the example of the supply upswing in commodity groups 06-08 of vegetables and fruit in 2014 caused by the introduction of the RF reciprocal sanctions against the food products import from the EU).

Therefore, using of mirror statistics data and revealed comparative advantages indices while analyzing international trade allows one to expand the information realm and obtain information relevant for practice and statistics. Hereafter, we expect to use the discussed tools for the analysis of the Czech republic's trade on agricultural and food products markets of the EAEU, primarily of Russia, Kazakhstan and Belarus using EAEU statistical database (EAEU: Statistics Department, 2017).

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THE INFLUENCE OF THE DECREASE OF VALUE ADDED TAX

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Annotation: The aim of this paper is to detect the influence of the decrease of value added tax (VAT) on the basic food products in the Slovak Republic (SR). The analysis was conducted in period 2004-2016 based on available data. Data source was Eurostat and Slovstat (The Statistical office of the Slovak Republic), Ministry of Finance of SR. The influence the decreasing of VAT on basic food products market is in the article quantified by the trade and welfare analysis. We used functions of supply and demand for chosen basic food product. The consumption of basic food products decreased significantly in period 2004-2016. On contrary, the monthly net earnings per habitant in the Slovak Republic had been increasing on yearly basis. The Slovak Republic belongs to the countries with the lowest income in the EU countries. For these reasons the government decided on decreasing the VAT for basic food products (e.g. milk, bread and butter), on the level of 50 percent of the VAT base. The descriptive statistic of VAT charges for food products in EU countries shows, that the average charge is 9.92% with standard deviation 3.68. The most frequent charges are on the level 9 percent and 10 percent. Half of the countries has the charge lower than 9.5 percent. In the SR food products were charged by the basic VAT on the level 20 percent in 2015, which was the highest charge among the EU countries.

Key words: value added tax (VAT), consumption, basic food products, trade effects, welfare effects, income, demand, supply, reduced charge of VAT

JEL classification: D03 Behavioral Microeconomics: Underlying Principles

1. Introduction

Academics are commonly interested in the theoretical issues of taxation. The rise of the value-added taxes an unparalleled tax phenomenon. The history of taxation reveals no other tax that has swept the world in some thirty years, from theory to practice (Thait, 1988). Cizek et al. (2017) used new spatial survival model to investigate the implementation of value-added tax (VAT) in 99 countries over the period 1970-2009. The estimation results suggest the presence of a significant spatial correlation among the VAT introductions of neighbouring countries. VAT is one of the main income of the state budget. In comparison with EU average, the Visegrad Countries (V4) rely on incomes from production taxes, especially VAT (Remeta, 2015). The value added tax (VAT), as an instrument of fiscal policy, might have an important role on economic growth. Simionescu and Albu (2016) analyzed the impact of standard VAT rate on economic growth in five Central and Eastern European countries (CEE-5: Bulgaria, Czech Republic, Hungary, Poland and Romania). Different types of panel data indicated a positive influence of VAT rate on economic growth. Using database of 115 countries using Generalized Method of Moments estimation based on two-step estimate, founded Chan et al. (2017) that the VAT system is found to enhance the effect of an efficient government spending on the economic growth. Li and Whalley (2017) discussed how joint cross country indirect tax initiatives can be used to achieve global rebalancing. They confirmed that VAT structures are not only good for global rebalancing but also the changes they considered are beneficial for welfare and revenue collection. The purpose of Sidorova and Tikhonova (2017) was to assess fiscal effect of the three options for tax reform. Based on the calculations, the possible consequences of changes in tax rates are determined taking into account possible changes in consumer behaviour, systems approach to the investigation of the tax system, and the appearance of the feedback loop effect. Pesel and Sommer (2017) simulated stepwise increases in the value-added tax (VAT) rate, which are compensated by revenue-neutral reductions in income-related taxes. The overall effects on inequality and progressivity become lower when payroll taxes are reduced. The main aim of Hamplova et al. (2017) was to verify the basic hypothesis that the decrease of VAT rates will eventually lead into the increase of VAT collection, and vice versa. However, the results of obtained questionnaires show that this hypothesis has to be denied.

The value of VAT is regulated by the EU Directive. The member countries have the possibility to set two decreased VAT charges for selected kinds of goods and services. The lowest possible charge of VAT is set on the level of 5 percent.

Before the accession to EU the SR applied decreased charge of VAT on the level of 14 percent for wide range of goods and services. Food products, medicaments, energy, the constructions delivery, the construction services, books, newspaper, magazines, the hotel and restaurant services and catering belonged to the category. The existence of decreased charges was argued by non-fiscal measures. It was assumed, that the decreased charges would generate lower prices, enable better accessibility of basic food products and other selected goods for inhabitants with low income, or increase the consumption of goods, which are socially desirable. These expectations were not approved, therefore the government used more effective measures in the field of socially policy and healthcare (Banóciová, 2009).

With the accession of the SR in the EU in 2004 the VAT charge was harmonized on the level of 19%. In 2007 the government again set the decreased charge of VAT. This time the range of goods was shrank to pharmaceutical and medical products. The charge was decreased on the level of 10 percent. In 2008 the range was widen by books and musical stuff. In 2010 the third charge of VAT was set on the level of 6 percent. It was applied to selling of food products from the primary producers to final consumers, so called: „of the fence selling“ of farmers products. Because of non-efficiency of selection this decreased charge was valid only to 2011. In 2015, which is the subject of comparison of decreased charges of the SR with V4 countries, in Slovakia the decreased charge of VAT on level of 10 percent was used for pharmaceutical products, the healthcare products, book and musical stuff. In comparison with the neighbour countries, where the range of products with lower charge of VAT was even wider.

2. Materials and Methods

The aim of this paper is to detect the influence of the decrease of value added tax (VAT) on the basic food products in the Slovak Republic (SR).The analysis was conducted in period 2004-2016 based on available data. Data source was Eurostat and Slovstat (The Statistical office of the Slovak Republic), Ministry of Finance of SR. Before the analysis of influence the decreasing of VAT is necessary realize to estimation of the functions of supply and demand for basic food products, which provides information about market situation.

Among the significance determinants of basic food products belong the price of the food product and the own cost of production.

$$q_{sx} = f(pr_x, vn_x) \qquad \textbf{(1)}$$

For the modeling of supply the x-th food product is used linear model, which has the following form:

$$q_{sx} = a + b_1 * p_x + b_2 * vn_x \qquad \textbf{(2)}$$

and:

q_{sx}- supply of the *x-th* food product in the kilograms
a, b_i – estimated constant of location and regression coefficients i = 1,2,3
p_x- price of the *x-th* food product in EUR*kg-1

vn_x- average own cost of production *x-th* food product in EUR*kg-1

Among the significance determinants of demand for *x-th* food product belong the price of the *x-th* food product and the income of consumers.

$$q_{dx} = f(p_x, i) \quad \textbf{(3)}$$

For the modeling of demand the *x-th* food product is used linear model, which has the following form:

$$q_{dx} = a + b_1 * p_x + b_2 * i \quad \textbf{(4)}$$

and:

q_{dx}- demand for the *x-th* food product in the kilograms
a, b_i – estimated constant of location and regression coefficients i = 1,2,3
p_x- purchase price of the *x-th* food product in EUR *kg-1
i- average income of habitants

Welfare analysis of the decreasing of VAT

The influence the decreasing of VAT on basic food products market is in the article quantified by the trade and welfare analysis. We used functions of supply and demand for basic food product.

Adjusted model of supply for the *x-th* food product from producers is calculated as follows:

$$q_{sx} = a + b_1 * pr_x + b_2 * \overline{vn_x} \quad \textbf{(5)}$$

After the treatment we get:

$$q_{sx} = (a + b_2 * \overline{vn_x}) + b_1 * pr_x \quad \textbf{(6)}$$

Using substitution:

$$(a + b_2 * \overline{vn_x}) = c \quad \text{and} \quad b_1 = e \quad \textbf{(7)}$$

We get:

$$q_{sx} = c + e * pr_x; \quad \text{for } e > 0 \quad \textbf{(8)}$$

Inverse form:

$$pr_x = -\frac{c}{e} + \frac{1}{e} * q_{sx}; \quad \text{for } e > 0 \quad \textbf{(9)}$$

and:
q_{sx}, $p_{x,}$ a, – dtto (2)
e – dtto (7)
$\overline{vn_x}$, - constant expressing the average own cost of producing *x-th* food product in EUR*kg^{-1}

Adjusted model of demand of processing organizations for *x-th* food product is calculated as follows:

$$q_{dx} = a + b_1 * p_x + b_2 * \bar{i} \quad \textbf{(10)}$$

After the treatment we get:

$$q_{dx} = (a + b_2 * \bar{i}) + b_1 * p_x \tag{11}$$

Using substitution:

$$(a + b_2 * \bar{i}) = d \quad \text{and} \quad b_1 = f \tag{12}$$

We get:

$$q_{dx} = d + f * pn_x; \qquad \text{for } f < 0 \tag{13}$$

Inverse form:

$$pn_x = \frac{d}{f} + \frac{1}{f} * q_{dx}; \qquad \text{for } f < 0 \tag{14}$$

and: q_{dx}, a, f, p_x – dtto (4)

$\bar{i}$ - Constant expressing the average income in EUR

If the supply of *x-th* food product is expressing by (8) and (9) and demand for *x-th* food product is expressing by (13) and (14), then the equilibrium quantity traded and the equilibrium price is:

$$q_{sx} = q_{dx} \quad \text{and} \quad p_x = p_x \tag{15}$$

After induction:

$$c + b_1 * p_x = d - b_1 * p_x \quad \text{and}$$
$$- \frac{c}{b_1} + \frac{1}{b_1} * q_{sx} = \frac{d}{b_1} + \frac{1}{b_1} * q_{dx} \tag{16}$$

$$p^* = \frac{d - c}{e + f} \quad \text{and} \quad q^* = \frac{de - cf}{f + e} \tag{17}$$

Due to reduction in VAT (t = % of the VAT decreasing on *x*-th food product) linear empirical model of demand D becomes D 'and its form is follows:

$$pn_x = (\frac{d}{f} * t\%) + (\frac{1}{f} * t\%) * q_{dx}; \quad \text{for } f < 0 \tag{18}$$

The influence of VAT decreasing is quantified through trade and welfare effects.

Table 1. Trade effects of the VAT decreasing

Supply (producer)	$p\uparrow q\uparrow$
Demand (consumer)	$p\downarrow q\uparrow$

Welfare of consumers increases by:

$$\frac{(psd - pd)q_1}{2} - \frac{(psd - p^*)q^*}{2} \tag{19}$$

Welfare of producers increases by:

$$\frac{(ps - pss)q_1}{2} - \frac{(p* - pss)q*}{2} \quad \textbf{(20)}$$

Welfare of state decreases by:

$$(ps - pd) * q_1 \quad \textbf{(21)}$$

and:

psd – shock price of demandof *x-th* food product in $EUR*kg^{-1}$
pd – price of demand of *x-th* food product after decreasing of VAT in $EUR*kg^{-1}$
q_1 – quantity of *x-th* food product after decreasing of VAT in kg
*p** - equilibrium price of *x-th* food product in $EUR*kg^{-1}$
*q** - equilibrium quantity of *x-th* food product in kg
pss-shock price of supply *x-th* food product in $EUR*kg^{-1}$
ps – price of supply *x-th* food product after decreasing of VAT $EUR*kg^{-1}$

3. Results and Discussion

The descriptive statistic of VAT charges for food products in EU countries in table 2 shows that the average charge is 9.92% with standard deviation 3.68. The most frequent charges are on the level 9 percent and 10 percent. Half of the countries has the charge lower than 9.5 percent. In the SR food products were charged by the basic VAT on the level 20 percent in 2015, which was the highest charge among the EU countries.

Table 2. Descriptive statistics of VAT charges for food products in EU countries

N	Valid	28
	Missing	0
Mean		9.9286
Median		9.5000
Mode		9.00[a]
Std. Deviation		3.68107
Variance		13.550
Range		15.00
Minimum		5.00
Maximum		20.00

Multiple modes exist. The smallest value is shown

Source: authors calculations

The lowest applicable charge of VAT was used for food products in three countries. The most of countries has the charge set on the level between 8 to 13 percent. 89.3 percent of countries had the charge lower or equal to 13 percent. The SR had the charge for food products set on the level 20 percent in 2015.

Table 3. VAT charge for food products

VAT Charge		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	5.00	3	10.7	10.7	10.7
	6.00	2	7.1	7.1	17.9
	7.00	3	10.7	10.7	28.6
	8.00	2	7.1	7.1	35.7
	9.00	4	14.3	14.3	50.0
	10.00	4	14.3	14.3	64.3
	11.00	1	3.6	3.6	67.9
	12.00	3	10.7	10.7	78.6
	13.00	3	10.7	10.7	89.3
	14.00	1	3.6	3.6	92.9
	18.00	1	3.6	3.6	96.4
	20.00	1	3.6	3.6	100.0
	Total	28	100.0	100.0	

Source: authors calculations

The SR belongs to the countries with the lowest income in the EU countries. For these reasons the government decided on decreasing the VAT for basic food products on the level of 50 percent of the VAT base. Until than the Slovak Republic was characterised by the highest charge of VAT on food products in the EU countries. Moreover, when compared to its neighbours, the Slovak VAT was consistent for all off goods and was 20 percent. However, the most of EU countries have reduced the charge for food products in order to support consumers. In 2016, the SR government set decreased charge of VAT for food products and has defined the range of basic food products for applicable decreased charge. The aim of decreased charge of VAT is to support domestic producers by favorable price of domestic food products. The range of food products is as follows:

1) Domestic bovine meat fresh, chilled and frozen without entrails
2) Domestic swine meat fresh, chilled and frozen without entrails
3) Domestic sheep meat and goat meat fresh, chilled and frozen without entrails
4) Domestic poultry meat and giblets fresh, chilled and frozen
5) Domestic rabbit meat fresh, chilled and frozen
6) Fresh water fish
7) The fish filets and other fish meat from fresh water fish fresh, chilled and frozen
8) The liquid milk cow and goat low-fat, medium-fat and whole-fat
9) Butter of animal origin
10) Bread of weight at least 400 g

Trade and welfare analysis

The milk and dairy products were chosen from the consumer basket for the analysis. The purchased quantity shares of these products on the total purchased quantity (in kilograms) was the largest in the tracking period.

The assumption of supply of medium - fat liquid milk (5):

$$q_{s_x} = 83901128 + 240623072 * pr_x - 496.51 * vn^{**}$$

** - alfa 0.05, R^2 -0.73

Estimated milk supply model explains 73% of changes in milk supply during the observed period 2004 - 2016. The linear model and stated independent variables are explaining changes in milk supply with confidence of 95%. No heteroscedasticity, autocorrelation or multi-collinearity is detected in the model.

If the milk price increases by € 1, the supplied quantity will increase by 240 623 072 kilograms. Own costs increase by € 1, will reduce the milk supply by 496.51 kilograms. On the basis of the price elasticity of supply (1.42), milk processors react elastically to the price change. If the milk price increases by 1%, the supplied quantity of milk will increase by 1.42%. Equally elastically reacts the supply of milk to the change of its own costs. If the own costs increase by 1%, the milk supply will be reduced by 1.11%.

Using substitution (7), we get (8) supply of milk and the inverse form (9):

$$q_{sx} = -50701390.4 + 240623072 * pr_x \quad , \quad pr_x = 0.21 + 4.15E^{-09} * q_{sx}$$

The assumption of demand for medium - fat liquid milk (10):

$$q_{dx} = 38499360547 - 28773729.7 * p_x - 0.04 * \bar{i}^{**}$$

** - alfa 0.05, R^2 – 0.81

The estimated model explains 81% of changes in the demand of Slovak consumers for liquid milk during the observed period 2004 - 2016. The linear model and stated independent variables are explaining changes in demand with reliability of 95%. No multi-collinearity, autocorrelation, or heteroscedasticity was detected in the model.

With an increase in the milk price by € 1, the demanded quantity will be reduced by - 28,773,729.7 kilograms. On the price-elasticity coefficient -0.07 basis, the demand is non-elastic. If the liquid milk price increases by 1%, the demanded quantity of the same product decreases by 0.07%.

If consumer income increases by € 10, the demanded milk quantity will reduce by 0.4 kilograms. Based on the calculated income elasticity of demand (-0.3), consumers consider the liquid milk to as inferior good. If the Slovak consumers' income increases by 1%, their demand for milk will be reduced by 0.3%.

Using substitution (12), we get (13) demand of milk and the inverse form (14):

$$q_{dx} = 300830577.0 - 28773729.7 * p_x , \qquad p_x = 10.45 - 3.48E^{-08} * qd_x$$

Follow (17) the equilibrium quantity traded and the equilibrium price are:

$$p^* = 1.305 \qquad \text{and} \qquad q^* = 2\ 634\ 284\ 149.35$$

Table 4 provides the results of business effects analysis. The demand price will change more than the price of the supply in accordance with the assumptions. The realized milk amount on the market will increase by 13,021,201 kilograms, representing an increase of 4.95% over the initial equilibrium quantity. As a result of the VAT reduction, the price of milk received by producers increase by 4%. In comparison to the initial consumer price, the milk price will reduce by 37%.

Table 4. Trade and welfare effects of the VAT decreasing on liquid milk

	Trade effect: price (EUR)	Trade effect: quantity (kg)	Welfare effect (EUR)
Supply	+0.055	+13,021,201	+14,599,812
Demand	-0.453	+13,021,201	+122,059,500
State	-	-	-139,990,755
Total change	-	-	-3,331,443

Source: authors calcutations

If goods are cheaper because of lower tax, consumers will effectively have more purchasing power. After buying the same number of goods, they will have more money left over, therefore consumer spending may rise (Pettinger, 2015). Barell and Weale (2019) explored the effects of a temporary cut in VAT, identifying three possible effects: an income effect as people benefit from a lower cost of living during the period of the reduction, a substitution effect as people bring their consumption forward and an arbitrage effect as people buy non-perishable goods before the end of the period of low VAT for consumption after the VAT rate has been raised. Boesters et al. (2010) found, that the abolition of VAT differentiation had only negligible redistributive effects. Instead, reduced VAT rates are found to act as industry-specific subsidies. Whereas the overall welfare effects of pure VAT reforms are very small, a revenue- neutral introduction of a harmonized VAT combined with reductions in the marginal income tax rates or social security contributions turns out to yield substantial welfare gains for all households.

4. Conclusion

The supply and demand analysis results have pointed that the supply of liquid milk is more price elastic than demand. Against this background, the business and welfare effects of the VAT reduction should be more noticeable on demand than on the supply. The results of the business and welfare effects analyses confirmed the assumptions.

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