CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

FACULTY OF ECONOMICS AND MANAGEMENT

AGRARIAN PERSPECTIVES XXV.

GLOBAL AND EUROPEAN CHALLENGES FOR FOOD PRODUCTION, AGRIBUSINESS AND THE RURAL ECONOMY

PROCEEDINGS

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Agrarian perspectives XXV. – GLOBAL AND EUROPEAN CHALLENGES FOR FOOD PRODUCTION, AGRIBUSINESS AND THE RURAL ECONOMY

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FOREWORD

The tradition of facilitating all-faculty international conferences at the Faculty of Economics and Management, CULS Prague (FEM) with the title of "Agrarian Perspectives" started in 1992, the year of the 40th anniversary of the foundation of FEM. We are now happy to anounce that we have succeeded in reaching the objective set at the first conference, which was to create a tradition of regular (faculty) conferences held every September on the topic of "Agrarian Perspectives".

The basic format of the Conference: plenary sessions, discussions in technical sections, a social evening, publishing papers published in traditional or electronic forms, and the participation of foreign as well as other delegates from the education, research, management and business practices has been, in principle, maintained. The research programmme of FEM CULS in Prague is based on monitoring the leading European and world trends in specific areas of science. This also corresponds with international cooperation and efforts to join research grant competitions. Continuity, stability and efficiency in the procurement and financing the thematic focus of the FEM research can be described using the example of the long-term research plans of the Ministry of Education:

- The source approach to shaping the competitive advantage of businesses
- Effective integration of the Czech agrarian sector within the framework of European structures – a prerequisite for sustainable development
- Data processing and mathematical modeling in agriculture
- Social and Regional Development of Rural Areas in the Czech Republic
- Information and knowledge support of strategic management
- Economics of Czech agriculture resources and their efficient use within the framework of the multifunctional agri-food systems

The thematic focus of "Agrarian Perspectives "conference in each year reflects important topics in the given period, including expectations of their implications for the future. These topics therefore present a cross-section of the long-term research projects and received grants, while simultaneously documenting the profile of the FEM research programme.

Agrarian Perspectives I. – XXV. (1992 - 2016)

Volume	Year	No. of contributions*	Topic
I.	1992	73/14	ČSFR - EUROPE – WORLD
II.	1993	93/18	Transformation Phase
III.	1994	89/26	Sustainable Development
IV.	1995	70/27	Agrarian context of European integration
V.	1996	105/28	Education for XXI. Century
VI.	1997	127/50	Agrarian trade and European integration
VII.	1998	197/92	European integration and the use of natural resources
VIII.	1999	195/67	Competitiveness of the agricultural sector and integration processes
IX.	2000	126/36	Globalization and competitiveness
X.	2001	64/19	Globalization and regionalization
XI.	2002	69/18	Development of multifunctional agriculture
XII.	2003	148/18	New Economy and EU enlargement
XIII.	2004	167/25	Sustainable development of agrarian sector
XIV.	2005	190/18	Knowledge Economics
XV.	2006	213/30	Foreign trade and globalization processes
XVI.	2007	235/37	European Trends in agricultural and rural development
XVII.	2008	187/42	Challenges for the 21st Century
XVIII.	2009	204/31	Strategy for the Future
XIX.	2010	44/18	Proceedings of the 19th International Scientific Conference
XX.	2011	49/16	Proceedings of the 20th International Scientific Conference
XXI.	2012	27 / 19	100th Anniversary of the Czech agri-economic research: Innovation and competitiveness of the EU agrarian sector
XXII.	2013	37/5	Development trends in agribusiness
XXIII.	2014	37/6	The community-Led rural development
XXIV.	2015	62/17	Global agribusiness and the rural economy
XXV.	2016	55/21	Global and European Challenges for Food Production, Agribusiness and the Rural Economy

* - Total / Foreign Contributions/Posts

In respect to the choice of the topic, organisation and mission of the “Agrarian Perspectives” conferences certain changes have taken place, but the basic intent and meaning of these faculty conferences have remained unchanged. It means that the priority goals include creating a platform for the presentation of independent opinions, getting feedback

for the future orientation of economic research, teaching students, and also the formation as well as maintaining the tradition of regular meetings of local and foreign participants, graduates and entrepreneurs.

In the history of Agrarian Perspectives, i.e. within the framework of the 25 conferences, a total of 2863 contributions (of which 698 came from abroad) have been presented. This represents a correspondingly higher number of participants. It can be expected that this figure allows for adequate dissemination of the results presented in the conference proceedings (those from recent years have been indexed in the Web of Science).

The key theme of this year's jubilee conference on "Global and European Challenges for Food Production, Agribusiness and the Rural Economy" creates a scope for applying the results of scientific activities of the PEF staff and, simultaneously, also of the participants from a number of domestic as well as foreign partner universities and institutions.

The thematic framework of this year's conference is made up of invited presentations from the perspectives of USA, the PRC and EU (Meyers, Ting, Hanrahan, Burny, Šír).

This year a part of the conference will be two discussion forums (round tables), devoted to the topics of "The Retail Chains of a Globalized Economy" and " The Worth of Water, Worthy Water". With regard to the intention to invite the broad specialist public, the discussion will be in Czech with a simultaneous translation available for the foreign participants.

Contributions by the domestic and foreign participants, as well as meetings and discussions of the conference participants, within the framework of official meetings or social events will, undoubtedly, make it possible for everyone to promote the quality of scientific research and educational activities at their workplaces. The main topic of the conference is permanent in character, and can therefore be considered as inspiring for everyone involved.

prof. Ing. Miroslav Svatoš, CSc.

Chairman of the Programme Committee of the Conference

PLENARY SESSION – KEYNOTE SPEAKERS

Agriculture Towards a More Sustainable Development: the Case of Wallonia (South of Belgium)

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Abstract: The new Common Agricultural Policy (CAP) established the so-called "green payment", which obliges the farmers to practice crop diversification and to manage "ecological focus areas" on their arable land, which is supposed to be favourable to the environment. In Wallonia, nearly half of the farmers are obliged to have ecological focus areas on at least 5% of their arable land in order to get the green payment, and also, the direct payments. At the same time, thanks to public support through financial measures in favour of the farmers and through more general strategic plans, organic farming registered a significant increase during the last ten years and represents more than 10% of Walloon farmers in 2014, with 8.6% of the agricultural area. Consumption of organic food is continuously increasing and reaches 2.3% of the total food expenses in 2014. The main expenses for organic products concern dairy products, vegetables and fruits. Together, ecological focus areas and organic farming areas represent in 2014 the significant share of 12% of the Walloon agricultural area. In addition, quality specific products, including origin-labelled products, are also encouraged by the public authorities through financial support and advertisement campaigns. The "quality" can concern environmental aspects. In brief, Walloon agriculture is now going towards a more sustainable development model.

Key words: Wallonia, organic farming, ecological focus areas, quality products, sustainable development

JEL classification: Q 18

1 Introduction

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 last version of the Common Agricultural Policy, after three years of difficult negotiations (Bureau, 2012), was defined for the 2015-2020 period. One of its main characteristics is that it goes further in favour of the environment (Matthews, 2013). The new rules even establish the so-called "green payment" (Hart, 2015), which represents 30% of the total direct payments to farmers in each Member State. On the other hand, organic farming in Wallonia appeared in the 1980's (Burny and Gellens, 1988) and was officially defined in the European legislation in 1991. More recently, organic farming was considered to be a serious opportunity for a more sustainable development model all over the world (Dufumier, 2012) and became more popular among consumers (Petrescu et al, 2014). Simultaneously, the stress was put on the quality of the products rather than on the quantity. In 1992, the European legislation on origin-labelled products was published. At the Walloon level, the Ministry of Agriculture also encourages regional products which present a specific quality. The aim of this paper is to examine how Walloon agriculture is on the way to a more sustainable development model: what are the tools and new agricultural practices which are used, what are their importance and their dynamics, what are the main factors impacting these tools and practices.

2 Materials and Methods

Secondary data are collected from different sources and concern organic farming, the so-called "greening" of the CAP and specific quality products, which are new practices more sustainable than conventional agriculture. They are statistical and legal/administrative data. The data which are dealt with come from the annual general agricultural census organised by the federal ministry of economics (general directorate for statistics and economic information) through a sampling method which must ensure that the whole farming sector is duly represented, the regional integrated control and management system dealing with the farmers' declarations which are necessary to get the financial support from the CAP, a national survey on consumers' habits dealing with organic food products, information from the regional administration dealing with the dossiers of specific quality products, Walloon strategic plans for the development of organic farming and for sustainable development, the stakeholders' association for organic farming, and regulation at the European and Walloon levels.

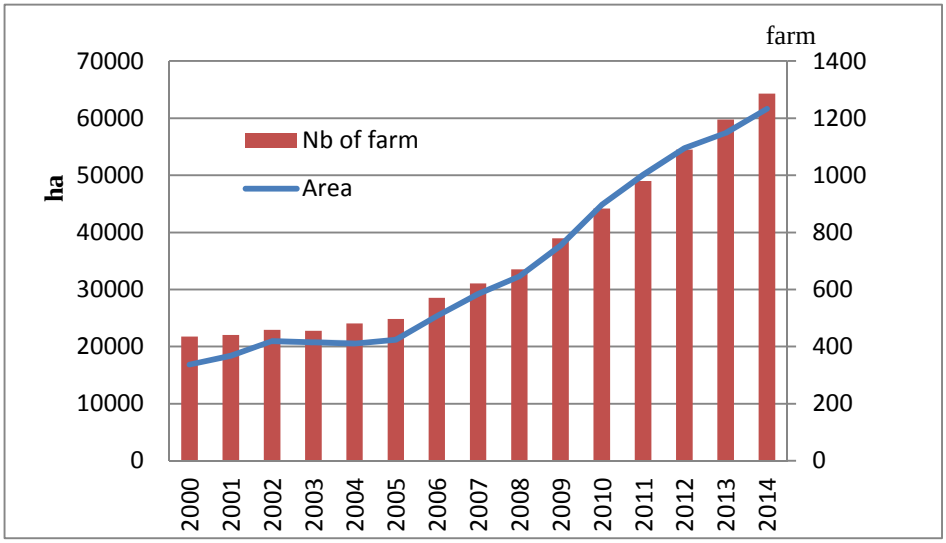
A chronological approach is adopted concerning organic farming, as data are now available since several years, while the situation is examined only for 2015 as far as ecological focus areas are concerned, as 2015 is the first year of implementation of the new CAP. By doing so, it is possible to see to which extent the alternative and more environment friendly ways of production lead Walloon agriculture towards a more sustainable development. The factors which could explain the situation and its recent evolution are then presented and discussed.

3 Results and Discussion

3.1 Organic farming

The evolution of the number of organic farmers and of the area devoted to organic farming shows a very significant increase since the beginning of the 21st century (figure 1). In 2014, more than 10% of Walloon farmers used organic methods, covering 8.6% of the regional agricultural area. The most important organic areas are meadows (83%) on which dairy and meat cattle is raised, and general crops (mainly cereals, of which the demand is increasing).

Fig. 1. Evolution of the number of organic farms and organic farming area in Wallonia from 2000 to 2014



Source of the basic data: BIOWALLONIE, 2015

This success is mainly due to two factors:

- a strong public support

The financial support granted to organic farmers for the 2015-2020 period is shown on table 1. This support is granted in addition to direct payments from the CAP (organic farmers are automatically eligible to the green payment, and so to all direct payments). It significantly improves farm profitability and so attracts farmers faced to low market prices to adopt organic farming as an alternative to their current financial problems.

In addition, a strategic development plan for organic farming was defined by the regional Walloon government in 2013 (Comase and Di Antonio, 2013) dealing with extension services, research, promotion, teaching and financial support, while the new strategy for sustainable development in general also supports organic farming.

- an increase of organic food products consumption

The expenses for organic food products are still increasing in Belgium, reaching 2.3% of the total market for food products in 2014, while the total expenses for the most common food declined for the first time since many years, showing a really positive dynamics of the organic food demand, even during a crisis period. The expenses per capita which are the most important concern dairy products, vegetables and fruits with 5.40, 4.74 and 3.71 € respectively.

Table 1. Financial support (€/ha) for organic farming in Wallonia (2015-2020)

Crops	Area of organic farming		
	0 to 60 ha		Over 60 ha
Meadows and forage crops	200		120
Other annual crops	400		240
	0 to 3 ha	3 to 14 ha	Over 14 ha
Fruit trees, horticulture and seed production	900	750	400

Source of the basic data: Service public de Wallonie, 2015

The most important market shares for organic food products concern meat substitutes (21.0%), eggs (11.0%) and vegetables (5.4%). Market prices for organic products are generally one third higher than the prices of conventional products.

Examining these figures, it could appear that the farmers do not necessarily meet the demand (they produce too much bovine meat and too less vegetables and fruits), and that the direct financial support for organic agricultural areas can have distortion effects.

3.2 Ecological focus areas

The green payment established by the CAP for the 2015-2020 period can be paid to the farmers if they respect three conditions:

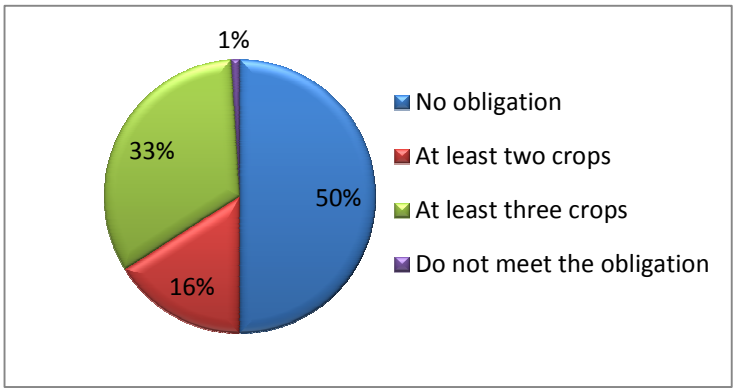
- the maintenance of permanent pastures;
- crop diversification;
- the implementation of ecological focus areas (Terrones Gavira, Burny and Lebailly, 2016).

Farmers must have at least two crops when they manage at least 10 ha of arable land, and at least three crops when they manage at least 30 ha of arable land (with the exception of farms for which pastures are very important).

The implementation of at least 5% of ecological focus areas is compulsory when farmers have at least 15 ha of arable land.

Concerning crop diversification, the results of its implementation are presented in figure 2.

Fig. 2. Number of farms concerned with crop diversification in Wallonia in 2015



Source: Terrones Gavira, Burny and Lebailly, 2016

50% of Walloon farmers have no obligation, while 16% must have at least two crops on their arable land and 33% at least three crops. In addition, 1% did not meet their obligations and are, as a consequence, exposed to financial penalties.

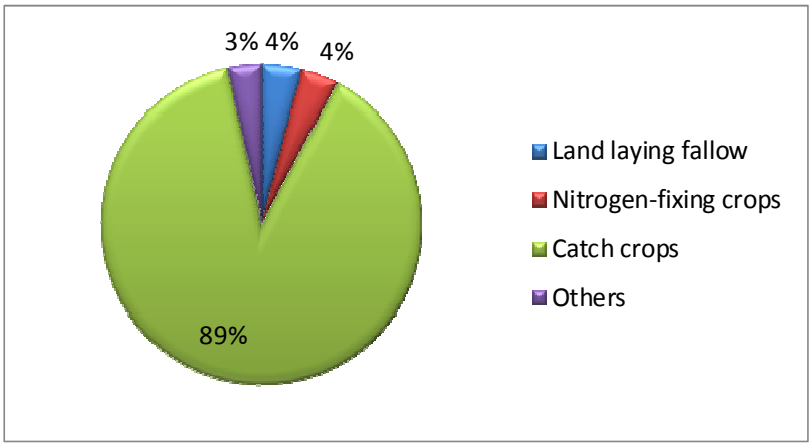
Concerning ecological focus areas, a list of elements which can be considered as such is proposed to the choice of the Member States/region, according to the Commission delegated Regulation (EU) No 639/2014. Conversion coefficients are used for elements which are not surface elements, and weighting factors are used because the positive impact on the environment is variable.

In 2015, 54% of Walloon farmers were not obliged to implement ecological focus areas (they have less than 15 ha of arable land, are organic farmers, …).

Among the farmers who were obliged to implement ecological focus areas in order to get the direct payments, 47% devoted from 5 to 6% of their arable land to these areas, 21% devoted from 6 to 7% and 29% more than 7%. In addition, 2.4% of these farmers did not meet the required 5% and could get financial penalties.

The choice of EFA is large, but 80% of the farmers use only one of them to meet their obligations, and 15% use only two of the possible ones. As far as the areas are concerned, it appears that “areas with catch crop or green cover” are by far the most important type of EFA, before land laying fallow and areas with nitrogen-fixing crops (figure 3).

Fig. 3. Area of the different types of ecological focus areas in Wallonia in 2015



Source: Terrones Gavira, Burny and Lebailly, 2016

While observing the results, it is not clear that the Walloon farmers had to change their methods of land management in order to get the direct payments. However, these good practices are, at least, fixed for the future.

3.3. Specific quality products

Another type of measure which can be favourable to the environment deals with specific products, including origin-labelled products. The first regional specific quality regulation was established by the Walloon Government in 1989, three years before the EU regulation dealing with the origin-labelled products. However, the first origin and specific quality guaranteed product, the "jambon d'Ardenne" (ham), was defined in a Belgian law as early as 1975. Later on, the Walloon Government continued to support specific products. A regional label, "EQWALIS", was registered at the European level in 2003. More recently, in a legal code gathering all the regulations dealing with agriculture (Walloon Government, 2014), chapter II precises the regional system for specific quality products.

Minimal criteria to be recognised as specific quality products have been defined by the Minister of agriculture concerning pork meat, poultry and bread. Some additional criteria can be proposed by the private operators in order to define more specific products, like in the pork sector.

The regional regulation published in 2014 precises what can be considered as a "specific" quality, compared to the standard one.

Compulsory criteria are the following:

- the producing farms must be family farms;
- the sharing of the added value among the partners of the production-distribution channel must be equitable, a significant added value being left to the farmers;
- a balanced relation between the development of agriculture and the expectations of the society;
- the exclusion of genetically modified organisms.

An additional difference with standard products must concern aspects like:

- the use of local inputs at different points of the food chain;
- the impact on the environment;
- the impact on human health;
- animal welfare;

- ethics and responsibility of the operators;
- the organoleptic quality of the products;
- the nutritional and dietetic quality of the products;
- the safety or the traceability of the products.

The respect of these criteria must be controlled by organisations which are officially registered and authorized by the regional government. The number of products is still limited, but increasing.

The promotion of the specific quality products is one of the tasks of the regional agency for the promotion of the quality agriculture. Financial support is granted to the producers' associations.

During the last years, it appears that Wallonia made significant efforts in order to meet the new demands of the society concerning a more sustainable development model for the economy in general and agriculture in particular. Organic farming, measures in favour of the environment and specific quality products registered a significant increase. This is also the case in many European countries, proving that farmers are able to adapt to new challenges.

4 Conclusion

The analyse of statistical data and legal and administrative documents shows that organic farming, the greening of the CAP and specific quality products play today – and will play tomorrow, if global policy does not change – a significant role to lead Walloon agriculture towards a more sustainable development model. Organic farming is particularly dynamic during the last ten years, representing today more than 10% of Walloon farmers, thanks to strong financial support from the public authorities and the regular increase of the domestic demand, even during economic crises. Besides, the implementation of the new CAP forced one half of Walloon farmers to practice crop diversification, and nearly one half to implement ecological focus areas. In addition, the number of specific quality products is also increasing. They constitute a more sustainable alternative to conventional agriculture, valorizing local products. However, some questions remain about the real impact on the environment compared to the previous situation: some farmers already respected organic farming rules without being recognized (so, the official recognition gives them the right to get financial support, but did not have any impact on their practices, with no added value for the environment) and many conventional farmers already practiced crop diversification and green cover. So, further research is necessary in order to precise what is the real impact of the new rules. On the other hand, it appears that organic farmers are more attracted by public financial supports than by better market prices, as there is a distortion between Walloon organic production and consumption. However, it is clear that the new regulations and the public support which is linked to their respect do have a positive influence on a more sustainable development model for Walloon agriculture, by at least maintaining good practices for the environment.

Acknowledgement

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Global Trends in Agriculture and Rural Development: a European and Eurasian perspective

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Abstract: This paper first assesses the recent past and medium term market conditions for agricultural markets. The recent shift from high and volatile prices to declining prices may be a return to the long term path of declining real prices. The shift in export supply also shows declines from U.S. and Canada while supplies are increasing from Russia, Ukraine, Brazil, Argentina and India. Trade relations and disruptions, however, are complicating market adjustments. World population projections to 2050 are analyzed for the main developed and developing regions. Policy and market developments indicate changes in projected growth of food supply relative to population growth and estimated food demand growth over the next four decades. The main food security challenge of the future, as in the present, is not insufficient production but rather increasing access and reducing vulnerability for food insecure households.

Key words: agricultural prices, policy and trade, food security, population growth

Introduction

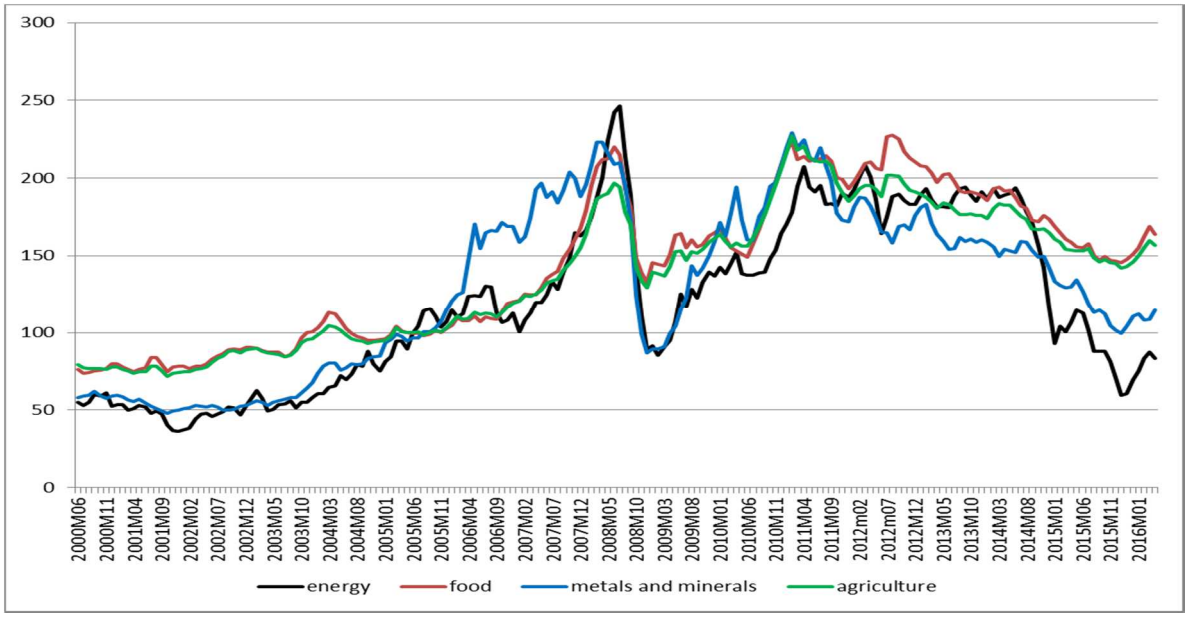
The paper provides an overview of the factors contributing to the decline in agricultural commodity prices and prospects to 2025 with a particular focus on supply, demand and policy factors. Agricultural and other commodity markets continue to be depressed, causing concern among farmers and their organizations as well as among policy makers concerned about the well-being of farmers. This is quite a change in policy concern compared to only a few years ago when high and volatile prices were the growing issue. Is this likely to be a temporary or persistent market condition? Factors contributing to these market changes are the excellent crops in recent years and growing stocks, the massive decline in petroleum prices that reduce production cost and slow biofuel demand growth, slowing economic growth in major importing countries like China, and changing exchange rate dynamics. Changing domestic and trade policies, floundering WTO negotiations, trade disruptions arising from trade disputes and sanctions, serve as added factors. There is trade disarray in the ECA region even while efforts are ongoing to expand the Eurasian Economic Union (EAEU) and implement the regional agreements such as the Deep and Comprehensive Free Trade Agreements of the EU. Future demand growth is linked to growing population and rising incomes but this challenge is weighed against addressing undernourishment and malnutrition both currently and in the future.

Big picture on prices and grain trade

The price shock of 2007/08 gave rise to increased concerns about feeding the world at reasonable prices and about price volatility and food security more generally. The last ten years have seen relatively high and volatile prices, at least when compared with the previous 20 years. Ever since the price surges of 2007/08, there has been an ongoing discussion among analysts on whether price levels and price volatility will continue to be different in the future than in the decades before this price surge. Despite the late 2008 plunge of commodity prices, market prices have continued to be higher and more volatile compared with pre-2005 behaviors (figure 1). Lately we have again seen a large decline in oil prices and also in agriculture and food prices but not as low as pre-2005 prices. Since the middle of 2014, energy prices have fallen much faster than food and agricultural prices, and the lows are still below the lows of 2008 and have persisted longer.

It is useful first to look at the causes of the sharp grain price increase in the 2012-13 crop-year and the price declines in the next marketing years. The primary cause of the increase in prices in 2012/13 was a historically deep drought in the Midwest that saw average U.S. corn yields fall by 16 percent and global grain production also dropped. This contributed to a large decline in global grain supplies, at a time when global stocks were already very low. Stock levels were low in part as a result of the fact that 2012/13 was the third consecutive year of low corn yields in the U.S. In the next crop year (2013/14) grain production had the largest increase in recent memory, led by the recovery of corn production in the U.S, and this year saw another record grain production. In response, grain prices declined dramatically. It is clear that in the last 5 years much of the price gyration was caused by simple supply and demand factors driven by weather shocks.

Figure 1. World Bank food, energy, metals price indices, 1/00 to 7/16, 2005=100

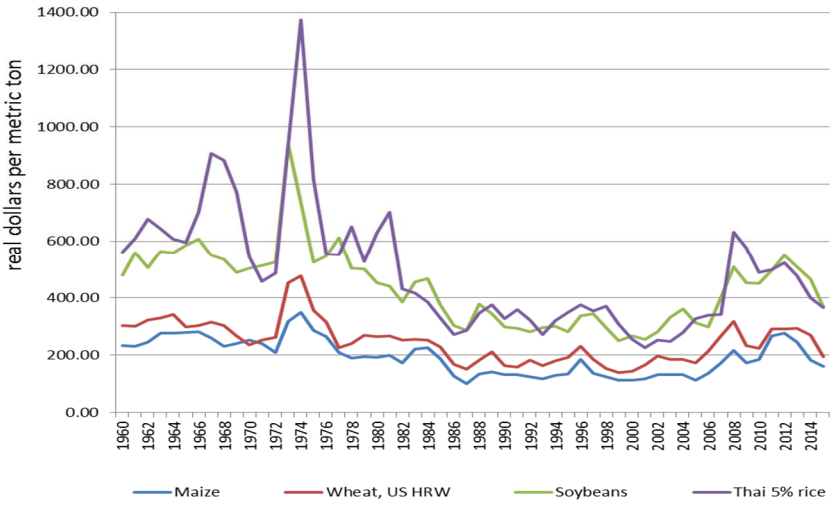


Source: Food, energy, metals and minerals price indices, pink data (World Bank, 2016)

While the recent price spikes have generated discussion among analysts on whether the long run pattern of declining real food prices will be reversed, the last price spikes pale in comparison to those of the mid 1970s (figure 2). The jury is still out on the future real price path, given longer run issues with climate change, water availability and the rate of technological change; but at least in the medium term the response to price spikes has been increased production and falling real prices as in the past.

This is not the time or place to do a detailed market outlook discussion, but the fact is that FAPRI-MU, USDA (Westcott and Hansen, 2016), and OECD-FAO (2016) all concur that we should expect real prices below recent highs and close to pre-2006 levels. These assessments also agree that the growth of biofuel use of grains and oilseeds has slowed now that it is a more mature industry; but grain and oilseed prices are still linked to the price of energy, though the strength of this linkage depends on price levels. Another dampening factor is the slowing economic growth in emerging economics, and especially China, which has been a major factor in demand growth during the last decade. Putting the projected average prices from the FAPRI-MU distributions into historical context, we can see how they tend to continue the path of flat or declining real prices (figure 3).

Figure 2. Real prices of grains 1960-2015

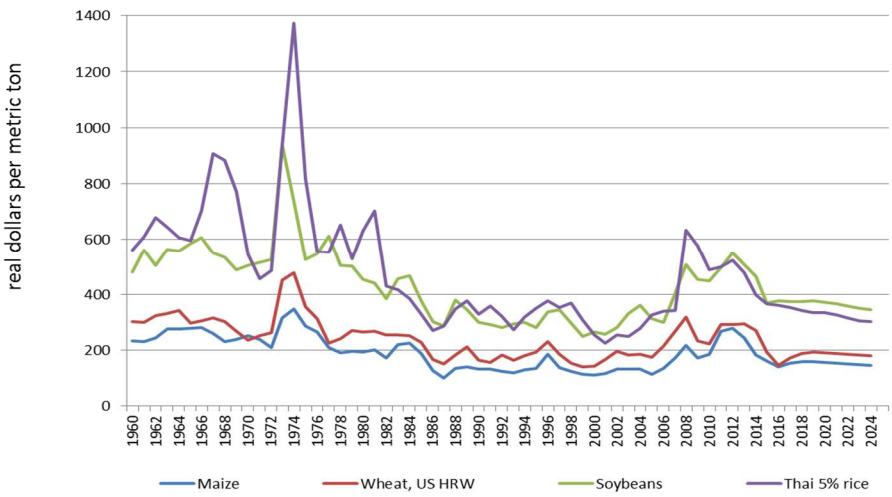


Source: Real prices of commodities, annual, pink sheet (World Bank, 2016)

Uncertainties in the outlook

As always there are uncertainties in the outlook. Production the last three years has been good and stocks have been rebuilt, but droughts can always be expected in any year. The El Nino effects this year have severely impacted white maize, but that market is isolated from main grain markets and its effects are very localized, especially in southern Africa. In the near term, there are uncertainties on weather shocks, exchange rates, petroleum prices, the US Federal Reserve decision on interest rates, and policy shifts, such as BREXIT, Argentina's reduction and removal of export taxes, and the (presumed temporary) Russian food import ban that began in 2014, and has just been extended to the end of 2017. It is not clear how these or similar changes may evolve over the next decade but they can impact the market outlook. In the medium term there is also the question of the slowing investment and economic growth rates in China and other emerging countries and whether that is a temporary or longer term phenomenon. Some of this slowdown has been driven by the weak commodity prices. Similarly, macroeconomic forecasts have usually included oil prices rising again, but the timing of those higher prices keeps being extended further into the future.

Figure 3. Real prices of grains 1960-2015

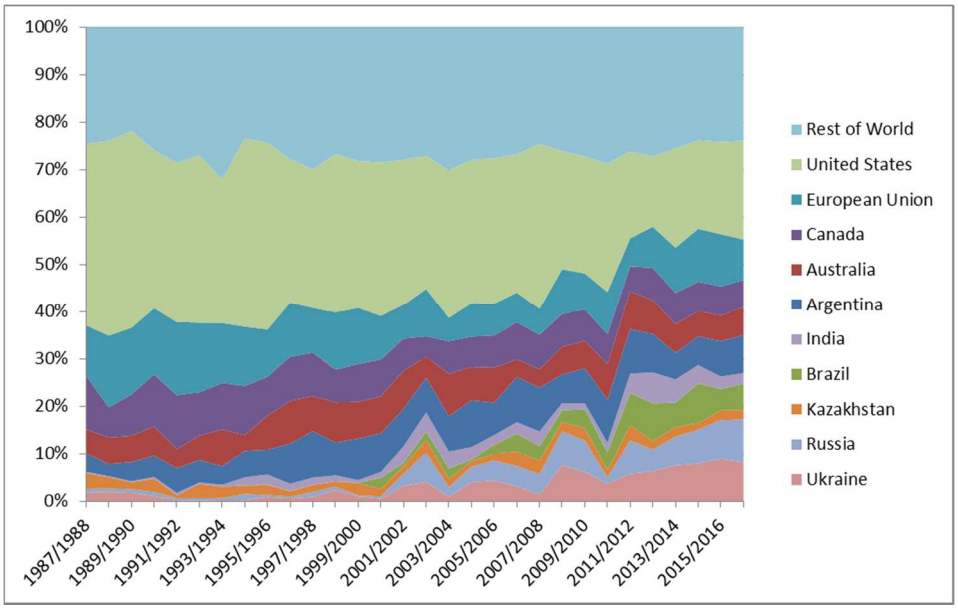


Source: Annual pink sheet (World Bank, 2016) and projections calculated from FAPRI August 2016 projections

Both trade and domestic policies of major market players have been changing. Aside from new EU and new US agricultural policies which have little trade or price effects, there are still floundering or dormant WTO negotiations, and trade sanctions and counter-sanctions in Europe. Efforts are ongoing in Russia and Central Asia to expand the Eurasian Economic Union (EAEU) to increase trade and policy harmonization within member countries. Regional agreements of the EU such as the Deep and Comprehensive Free Trade Agreements (DCFTAs) with Ukraine, Moldova and Georgia as well as continuing the EU accession processes with selected SEE countries are all expected to open more trade opportunities for those countries (FAO 2016). It is unlikely that these regional trade agreements will have a major impact on global markets but are more likely to influence within-region trade flows and have also increased geopolitical tensions.

There could also be "within region" tensions, such as when EAEU members were not consulted prior to the food import ban, that can also have impacts on other EAEU members (Shagaida et al, 2014). The recent TPP agreement is still to be ratified by the USA and other partners, and the TTIP is far from realization and seems highly unlikely. Reducing trade barriers is usually expected to improve market performance and increase trade, but regional trade agreements are also known to create trade diversion, so the results are not always clear. An important impact on trade in the near term has been the relatively large depreciations of currencies in Europe and Central Asia as well as Brazil relative to the US dollar, and that has supported the continued rise of Brazil, Russia and Ukraine as a share of total grain exports (Figure 4).

Figure 4. Share of grain exports1987-88to 2016-17e



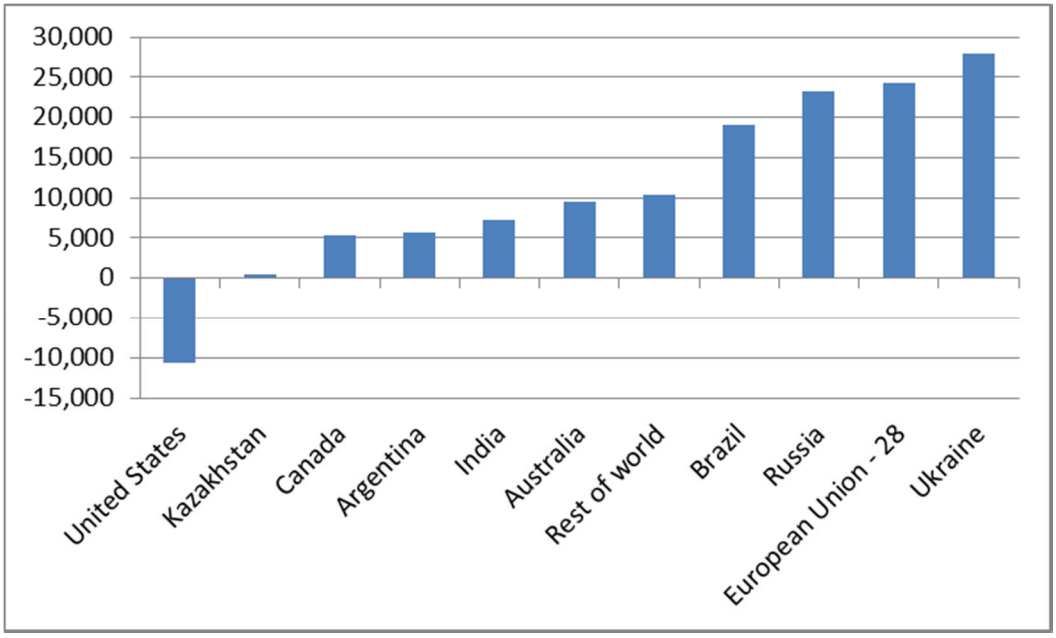
Source: PSD View, USDA, accessed August 29, 2016

Shifting patterns of grain trade

The shift in patterns of grain trade since the early 1980s has been dramatic. In 1987/88, more than 45 percent of grain exports originated in the USA, and in the last few years this share has been close to 20 percent. Meanwhile, the relatively new entrants to grain export, Ukraine, Russia, Kazakhstan, Brazil, Argentina and India, have seen their combines share rise to nearly 35 percent. The visuals would be even more dramatic if we looked at net exports instead of total exports, since Russia was a major net importer of grains before the mid 1990s and Brazil was a net importer for another 10 years after that. The growth of exports out of Russia and Ukraine in particular has been driven partly by production increases but more importantly by the post 1990 decline of animal numbers and the release of this feed use

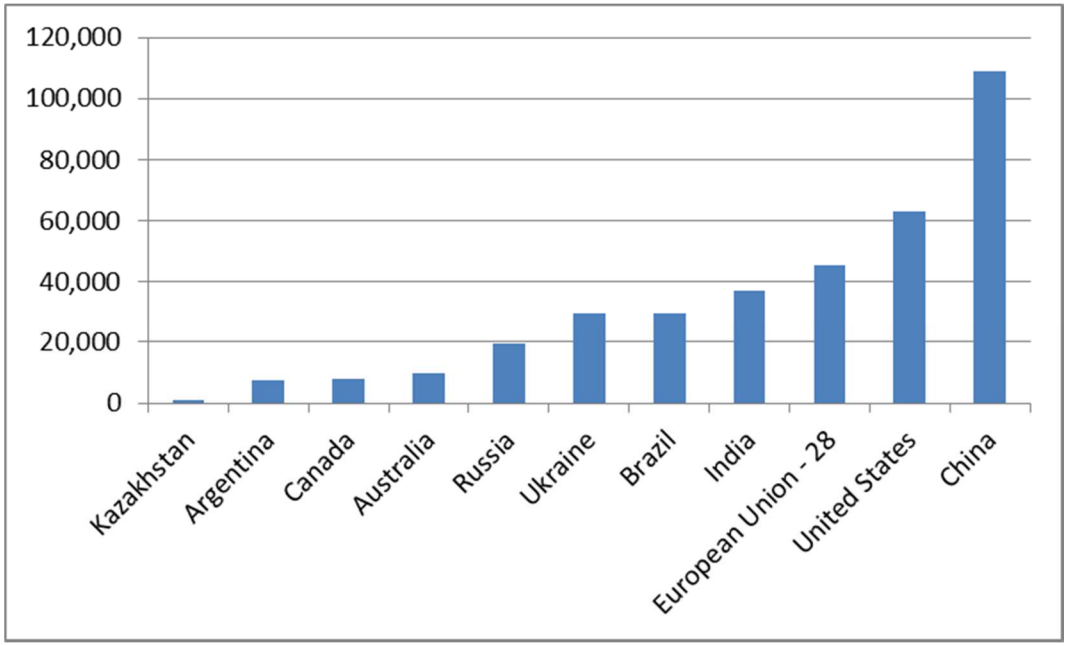
for export. By contrast, the decline of US grain exports since 2005 has been driven primarily by the increased domestic use of grains for domestic ethanol production. The largest increases in net exports in the last nine years have been from Ukraine, EU, Russia and Brazil (figure 5). At the same time the largest increases in grain production over the same period have been in China, US, and the EU (figure 6). So what does this suggest about the challenges of meeting global food needs of the future? For that we turn first to the issue of demand growth for the future.

Figure 5. Change in grain net exports 2005-07 to 2014-16e



Source: PSD View, USDA, accessed August 29, 2016

Figure 6. Change in grain production 2005-07 to 2013-15



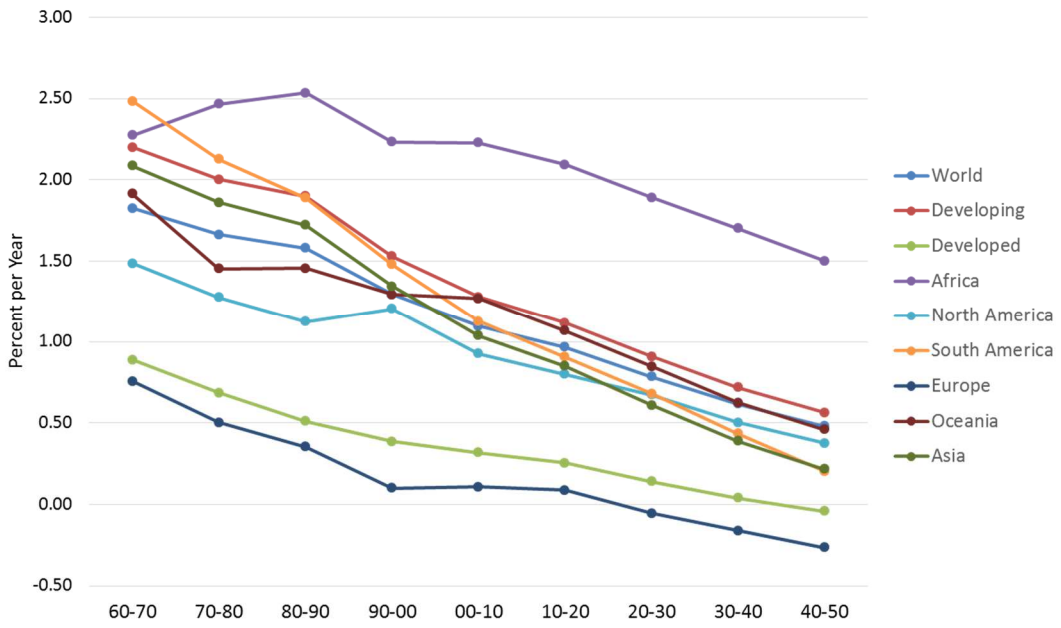
Source: PSD View, USDA, accessed August 29, 2016

Population Growth Dynamics and Food Demand

Given the recent progress in grain production, what are the implications for feeding the world in 2050? For this we will first look at projected population growth, then at what kind of production path would be adequate to supply growing populations and incomes.

The United States Census Bureau (2015) projects the world population to reach 9.38 billion persons by 2050, an approximate 36.5% increase over the population in 2010, while the United Nations projects 9.55 billion persons by 2050. While world population continues to increase, rates of population growth have been decreasing where incomes and education levels increase (figure 7). It is known that higher income and education levels increase the marriage age of women and reduce the number of children per family. This more than offsets increased life expectancy at birth and reduces population growth rates. In the projected aggregate of developed countries, population begins to decline beyond 2040, and for the European continent this decline is projected to commence in 2020. Europe's birth rate has been below the replacement level for many years; only immigration has kept Europe's population increasing. In China, with its one-child policy, the population growth rate is projected to go negative in 2033 and be below the developed country level by 2050. Thus the number of people added to the world population each year, peaked at 86.5 million in 1988 and has been declining ever since then. But as incomes rise, we also know that diets improve and increased agricultural production is needed for that as well.

Figure 7. Annual rates of population growth 1960-70 to 2040-50

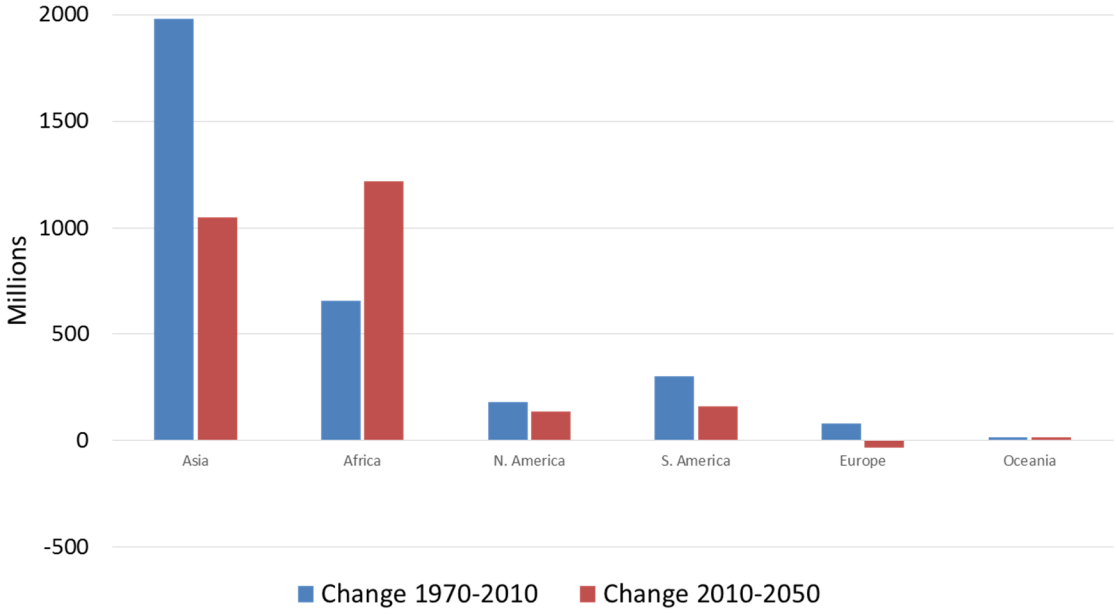


Source: US Census Bureau International Data Base, 2013 version

Another important aspect of global population growth is the evolution of regional distribution. From 1970 to 2010, 63% of the world population growth was in Asia and 21% in Africa (Figure 8). These numbers change dramatically between 2010 and 2050, when the total share of population growth will be about 42% in Asia and 48.5% in Africa. More than 1.2 billion people are projected to be added in Africa, which well exceeds the 1.0 billion projected for Asia. This dramatic shift in shares of population in Asia and Africa may have a significant impact on global food consumption patterns and food security because the most food insecure regions are growing the fastest. Meanwhile, Europe's population, which has been at essentially zero growth since 1990, is expected to decrease from 11% of the world population in 2010 to 7.5% in 2050. The shares of total population in North America

and South America are projected to be around 7% each in 2050. With the expected 2.67 billion additional people between 2010 and 2050 and nearly half of these in Africa, there will be future food security challenges.

Figure 8 Regional population changes over 40 year periods past and future



Source: International database. US Census Bureau (2015)

Following the food price crisis in 2007-8, there was concerted effort to study future food needs. The FAO estimate released in 2009 called for an increase in total food production of 70 percent and increase in cereals production of 50 percent from 2005/07 to 2050 (Bruinsma, 2009). This gave rise to the often repeated call to "double production by 2050". That is a handy slogan but was not an accurate reflection of the FAO estimates. More recently, FAO (Alexandratos & Bruinsma, 2012) updated these estimates and projected a 60 percent increase in agricultural production needed to provide an adequate food supply from 2006 to 2050. It is interesting to observe that world grain production has already increased 22 percent from 2005/07 to the present but that is hardly cause for satisfaction, because there are still nearly an estimated 800 million people in the world who are malnourished and/or undernourished. So increased area planted and yields in recent years have definitely moved us toward the production goal, and Europe and Central Asia has played an increasingly important role in that production and export growth. But this success has hardly made a dent in the persistent global food insecurity situation. By focusing on production, we should also not neglect the possible impacts of reducing food loss and waste, which in some locations could be a substitute for increasing production at the farm level. This is a relatively new and growing concern, and increasing information is emerging on its effects and the potential for action to reducing waste in ways that would improve food security. The questions of cost effectiveness of policies and how such actions could improve food security still need careful assessment.

A thoughtful recent study of alternative analyses and modeling approaches to projecting future food needs points to much research that remains to be done and alternative modeling approaches to be considered (Wise, 2013). He also highlights the post-2050 timeframe as being a much more challenging issue to analyze, especially because climate change impacts will be more pronounced. Likewise, the dominance of population growth in Africa beyond 2050 will also continue, so increasing challenges in the world's most food insecure region will be difficult.

Improving Access to Adequate Food

A central policy question for food-insecure regions around the world is to understand what drives changes in food security and how to incorporate this understanding into agricultural and food policy. When it comes to dealing with poverty and malnutrition, overall economic growth seems to be one of the most efficient remedies. Income redistribution and social safety net programs that target vulnerable populations are also efficient ways to address malnutrition.

A strong science and technology system contributes to innovation for equitable agricultural development and food security. Throughout human history, public agricultural research and technology adoption have enabled a growing populace to avoid mass starvation. If properly focused, agricultural innovations can also enhance nutritional value of our food; and this has been recognized this year by selection for the World Food Prize of four scientists who devoted their efforts to biofortification of staple foods.

Therefore, policy options boosting research and innovations in agriculture should be an intrinsic part of the national or regional food security strategies. However, the impact that public research can have on food and nutrition security is still limited when the scientific outputs, developed either in their own countries or elsewhere, are not easily or widely accessible to farmers. The performance of research and innovation systems can be enhanced with the help of agricultural knowledge systems to improve access to knowledge in a cost-effective way, improve the demand- and technologies uptake, more effective interface with international and national institutional partnerships and finally contribute to food and nutrition security.

Conclusion

Prior to the beginning of the twenty-first century, production and consumption growth rates have decelerated as growth rates of population have declined. Parallel declines in real food prices over a long period suggest that, except for short periods, demand pressure was not driving up prices in the food system. It does appear that meeting the growth in demand for food, feed, and biofuels to 2050 will not be a steep hill to climb, but there will need to be continued private and public investment in technology to induce increased production growth rates through productivity enhancements and increased purchased inputs. There will need to be continued attention to food loss and waste to determine where those measures can be equally or more efficient that production as means of improving food access.

The main food security challenge of the future, as in the present, is not insufficient production but rather increasing access and reducing vulnerability for food insecure households. The dominance of future population growth in the food insecure regions of Africa make this a significant challenge between now and 2050 and even more so in the years beyond 2050 when climate change effects on resource constraints will be more severe. These are also the regions where waste reduction could be a cost-effective alternative to increased production, but ideally both of these means to increase availability should be pursued simultaneously.

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PARALLEL PAPER SESSIONS

Farmers Market: Customer Relationship

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Abstract: This article is aimed at the relationship with customers at farmers' markets. Customer relations are one of the components of the Business Model Canvas. The main aim is to define and identify types of relationship that customers perceive to be established and maintained at the farmers' markets. And on the other side, which ones the vendors have already tried to establish? Primary data were collected in the period from May to July 2015 at urban farmer's markets located in cities with a population greater than 100,000 in the Czech Republic. Questionnaires were distributed personally to customers and also producers/vendors and involved also interactions between these groups at farmers' markets. The level of personal assistance, dedicated personal assistance, self-service, automated services, communities and co-creation were assessed. The results show that in the customer relations further possible improvements of Value Proposition of farmers' markets with the customer segment can be found. The results suggest that the most used type of customer relationship is personal assistance, but customers perceive the ability not only buying food from farmers at the market but also experience, which provides space for other types of customer relations: such as dedicated personal assistance, automated services and communities.

Key words: Customer Relationship, Farmer's market, Value Proposition, Personal Assistance, Communities.

JEL classification: L14, M31, Q13

1 Introduction

The issue of short food supply chains is currently quite discussed especially the difference between short supply chains and conventional industrial mode of food production (Renting, Marshall and Nam, 2003). The shortcut from producer to consumer are valuable particularly thanks to personal interaction (Renting, Marshall and Nam, 2003). Such face-to-face channels consist of farm shops farmers' markets, roadside sales, pick your own, box schemes and also home deliveries (Renting, Marshall and Nam, 2003; Migliore, Schifani and Cembalo, 2015). For the sustainable development of farmers' markets and for supporting of such farmers who are trying to distribute their production through this channel, it is crucial to know and understand consumers perceptions' of farmers' markets and their purchase behavior and decision-making (Pokorná, Pilař and Balcarová, 2015; Šrédl and Soukup, 2011).

By purchasing fresh, organic and local products at farmers' markets, consumers satisfy their current concerns for nutrition, health, well-being, while also supporting local farmers (Cassia et al, 2012). The research of Pokorná, Pilař and Balcarová (2015) identified functional, social and emotional factor within gains, jobs and pains of the customer that are typical for the Czech environment. In previous researches scholars stated, that customers' values of purchasing goods are more aimed at social issues, such as supporting local farmers, strengthening local food systems or other ethical, responsible or green values (Onianwa, Wheelock and Mojica, 2005; Cassia et al, 2012; Smith and Sharp, 2008). However, in the research of Pokorná, Pilař and Balcarová (2015), lower frequency of such social factors was identified in comparison with functional factors and those social factors tied to personal profit. The research also identified surprising absence of factors with wider social scope or ethical content that were identified by the researches of Brown et al (2009) and Dowd and Burke (2013).

Customers focus more on their own benefit and buying high quality goods in the first place as they demand food with a high added value (Pokorná, Pilař and Balcarová, 2015; Turčínková and Stávková; 2009). The customer is from the side of functional factors focused on the fresh, safe, healthy, organic and locally grown products (Pokorná, Pilař and Balcarová, 2015). In non-functional area, an important factor is also sellers' recommendations, which can be part of the social and emotional type of factors that supports the findings of the research conducted by Renting, Marshall and Nam (2003).

In general, research aimed at farmers' markets tends to be increasingly focused not only on their primary function within the short food supply chain and consumer preferences concerning products, but also on important issues like social relations between farmers/producers and consumers. Scholars state that it is possible to identify the central characteristic of farmers' markets and their capacity to reconnect producers and consumers and foster relationships of 'connectedness' (Venn et al, 2006). Producer-consumer relationships in farmers' markets may be understood in the context of social embeddedness. Embeddedness, in this sense of social connection, is often seen as the "hallmark" of direct agricultural markets (Hinrichs, 2000). The importance lays on the type of the relationship between the producer and the consumer at the farmer's market and also whether it has a role in the construction of the value and meaning of the product (Marsden et al, 2000). The dialogue and interactions between the customer and relevant actors can be seen as a co-creation process with the active participation of the customer that leads to new, reconfigured, and enhanced problem solving solutions for the customer (Rajah, Marshall and Nam, 2008). Co-created value is a derivative of a combination of the interactions, degree of personalization and customization created in the context of customers' problem solving situation (Rajah, Marshall and Nam, 2008).

Thanks to these references, we have decided in our multi-year study to combine the business model canvas and identification not only of the customer perspective of individual pains, gains and customer job´s, but also specifically the customer relationship aspects at farmers' markets. The business model canvas is a template developed for strategic management to document existing (new) business model (Barquet et al, 2011). According to Osterwalder (2004), the creator of the business model canvas, je business model: "*is a conceptual tool that contains a set of elements and their relationships and allows expressing a company's logic of earning money*." However, there are many definitions of the business model in the management sector (Afuah, 2003; Baden-Fuller and Morgan, 2010; Mullins & Komisar, 2009).

According to (Osterwalder and Pigneur, 2009), Customer relationship can be divided into the following six areas. (1) Personal Assistance: this form of customer relationship involves interaction between the vendor and the customer. This interaction can take place during or after sale. It is a standard relationship with customers (Slávik and Bednár, 2014). (2) Dedicated Personal Assistance: this relationship is based on a specific relationship between the vendor and customer. It exclusively concerns the offer of goods or services based on a predefined relationship, which depends for instance on the volume of purchase or personal acquaintance. (3) Self Service: this is a relationship without direct interaction between the vendor and buyer. It is essential self-service sale and can be conducted e.g. though an e-shop. This relationship is gaining relevance in recent years (Castro, Atkinson and Ezell, 2010), also assisted by modern communications technologies (Chen and Wang, 2016). (4) Automated Services: can identify individual customers and their preferences and thus is known as more personalized system similar to self-service. (5) Communities: Created community helps companies to interact directly with clients, to share knowledge and to solve problems between different clients. (6) Co-creation: Customer´s direct contribution to the creation of the company's products/services which is seen as a personal relationship.

This study combines the results of previous research in the field of Value Proposition of farmers' markets with the customer segment. The paper´s objective is to identify differences between customer´s perception of the customer relationship at the farmers' markets and vendor´s effort to evaluate whether there exist some contradictions or if they are fully in compliance. In this research we define following basic research questions: What types of relationship customers perceive to be established and maintained at the farmers' markets. And on the other side, which ones the vendors have already tried to establish?

2 Materials and Methods

The primary data are gathered using the questionnaires. The questionnaire is distributed in person and is intended for customers who have experience with shopping at the farmers' markets. The construction of questionnaire is based on the Business Model Canvas, or more specifically the Customer Value Proposition (Osterwalder et al, 2014). The questionnaire contains 6 core open questions in the area of the perception of the customer relationship and 3 identifying questions. Core questions are all open. The questionnaire is completed by a total of 217 customers who visited farmer's market at least once a year and by 86 vendors operating at farmers' markets both in the Czech Republic. Primary data were collected in time period of two months, from May to July 2015 at urban farmer's market located in cities with a population greater than 100,000. Selective statistical set of respondents (n = 217) is represented by the gender: female (64 %), male (36 %); by the age: 15 – 29 years (18 %), 30 – 44 years (39 %), 45 – 60 years (23 %), more than 60 years (20 %); by farmer's market shopping regularity: more than once a week (21 %), at least once a month (68 %), at least once a year (11 %). Vendors were chosen on the reviewed markets.

Qualitative data obtained on the basis of the questionnaire survey were categorised and coded into quantitative form based on category allocation, based on the division of customer relationship to Personal Assistance, Dedicated Personal Assistance, Self Service, Automated Services, Communities and Co-creation. (Osterwalder and Pigneur, 2009).

3 Results and Discussion

The results of the research present the identified differences between the perception of established customer relationships by customers and the customer relationships which vendors mention that they are trying to establish. Which customer relationships the customers perceive as established are set out in table 1.

Table 1. Customer relationship perceived by customers and established by vendors

	Customers		Vendors	
	Absolute	Relative	Absolute	Relative
Personal Assistance	217	100%	86	100%
Dedicated Personal Assistance	6	2,76%	56	65,12%
Self Service	24	11,06%	6	9,68%
Automated Services	2	0,92%	3	3,48%
Communities	36	16,59%	24	27,90%
Co-creation	0	0,00%	22	27,90%

Source: own survey, 2015

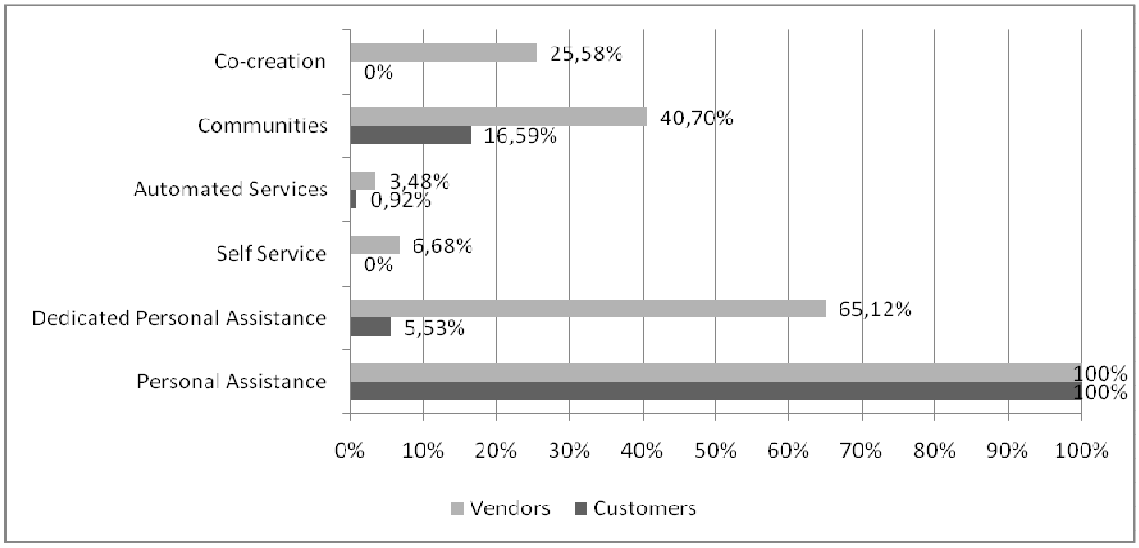
Based on customer perception, one established customer relationship is Personal Assistance. All 217 customers perceive this customer relationship when shopping at farmers' markets. The second most perceived customer relationship is Communities, in particular in the form of the possibility of creating communities on social networks. The third perceived established customer relationship exceeding the threshold of 10% is Automated Services, particularly in the form of purchasing farmers' market products through a e-shop. On the contrary,

customers do not perceive the option of Co-creation. Customer relationships in the form of Automated Services and Dedicated Personal Assistance reached less than 3%. Which customer relationships vendors are trying to establish on markers markets is set out in table 1.

100% of vendors are striving to establish Personal Assistance as a basic customer relationship at farmers' markets. In second place is Dedicated Personal Assistance in the form of establishing a closer relationship with the customer. In third place is the effort to create communities at farmers' markets with a value of 27.9%. Co-creation - where the customer's direct input is in the final outcome of the company's products/services, is being attempted by 25.58% of vendors. Only 6.98% of vendors establish Self Service, which is a relationship based primarily on e-shops, and only 3.48% of vendors at farmers' markets create Automated Services consisting of the creation of an offer based on the customer's profile.

Customers perceive the Personal Assistance as the most established customer relationship, in accordance with vendors who seek to establish this customer relationship as the basic customer relationship at farmers' markets. On the contrary, the greatest difference is in the area of Dedicated Personal Assistance, where only 5.53% of customers perceive this customer relationship, but 65.12% of vendors strive to create this customer relationship. The situation is similar in creating Communities, where this customer relationship is perceived only by 16.59% of customers, but 40.70% of vendors try to establish this customer relationship. In the area of Co-creation, the situation is such that none of the customers have perceived the possibility of this customer relationship, but one quarter of vendors are attempting to create this customer relationship. The results for Automated Services and Self Services are very low and barely perceived by customers and hardly used by vendors. A graphic depiction of the comparisons is set out in Figure 1.

Figure 1. Comparison of the customers' perception and the vendors´ endeavor



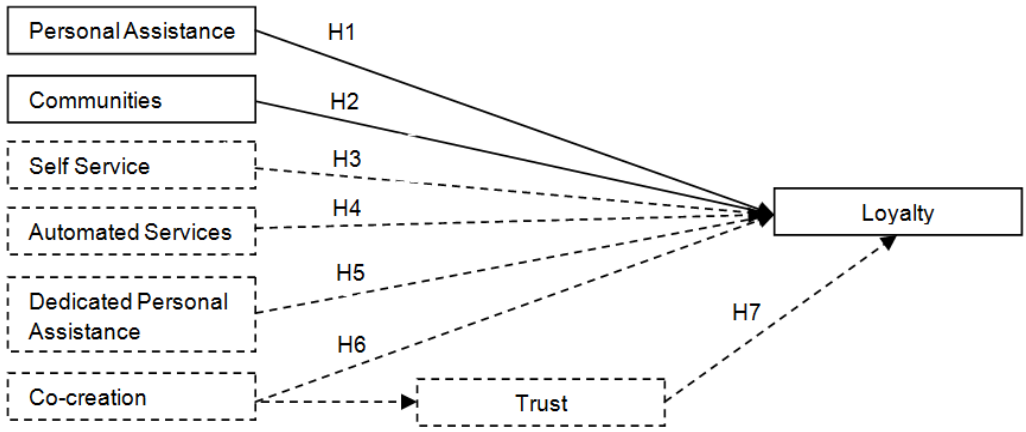
Source: own survey, 2015

Based on the found differences, it is possible to identify unused potential in exploiting all the customer relationships in the area of farmers' markets. The least perceived and used customer relationships were Automated Services and Self Services. This results in the non-exploitation of the potential of these customer relationships, because this relationship is gaining importance in recent years (Castro, Atkinson and Ezell, 2010), also assisted by modern communication technologies (Chen and Wang, 2016). In the area of Co-creation, the situation is such that one quarter of vendors are striving to establish this customer relationship, but customers do not perceive it. This can be identified as a weakness in the relationship between customers and vendors at farmers' markets. It is very important to create this relationship, because according to (Rajah, Marshall and Man, 2008) it increases

customer satisfaction, trust and loyalty. This is crucial, because according to (Renting, Marshall and Nam, 2003) the future development of food markets may be affected by strengthening and maintaining legitimacy and trust in the vendor. 40.70% of vendors are trying to establish Communities, but on the part of customers these are perceived by only 16.59%. This also constitutes unexploited potential in the area of customer relationships. If the support of local communities is one of the factors perceived by customers (Pokorná, Pilař and Balcarová, 2015), it is desirable for vendors and organisers to strengthen awareness of support of local communities and the associated benefits for market visitors, or find ways through suitable communication content within marketing communication. Farmers' markets are seen as an important economic benefit for the local communities. They bring visitors to the site of the farmers' markets who then take the opportunity to shop at nearby shops, thus supporting the community surrounding the marketplace (Abel, Thomson and Maretzky, 1999).

Based on this identified model, it is possible to create a research question and model (Figure 2), which could be evaluated using the method of structural modeling in future research, where 7 static hypotheses are created and an analysis proposed of the mediation effect of the trust factor on the link between the Co-creation customer relationship and Loyalty. Future research question: Which customer relationships have the greatest impact on customer loyalty?

Figure 2. Future research hypotheses model



Source: own survey, 2016

4 Conclusion

The results show that in the customer relations further possible improvements of Value Proposition of farmers' markets with the customer segment can be found. The results suggest that the most used type of customer relationship is Personal Assistance, but customers expect not only buying food from farmers at the market, which is a part of functional factors but also other social benefits of shopping at the market (Pokorná, Pilař and Balcarová, 2015), which provides space for other types of customer relations: such as dedicated Personal Assistance, automated services and communities. Both market participants, customers and vendors alike, agree in the perception of Personal Assistance as an established factor of farmers' markets. There is an interesting contradiction between the perception of dedicated Personal Assistance and vendors' efforts. Customers barely perceive them unlike vendors' efforts. This poses a question for future research to determine which factors affect the customer in this particular part of the customer relationship. Whether it is influenced by traditional, cultural customs or other personal factors. As stated above, Co-creation a Communities are important factors for the development of this short food supply chain channel itself. Vendors, farmers and market organisers are aware of this need, but the customer perceives these relations only

partly or not at all. Therefore, it is necessary to support awareness of these two parts of the customer relationship. Given technical-technological development, it is clear that options for automated service will development and the knowledge of customers in terms of its opportunities is going to rise. Another question is why, unlike surveys conducted in other countries (Chen and Wang, 2016; Castro, Atkinson and Ezell, 2010), both vendors and customers are sporadic in relation to self-service at farmers' markets, despite this being a customary feature of farmers' markets abroad. The discussed results of this research are an important reference for further progress of research within the multi-year study of the possibility of a business model canvas in the segment of farmers' markets.

Acknowledgements

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Farm Investment Support in the Slovak Republic

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Abstract: In the paper we assess the Slovak farm productivity and efficiency development and estimate the net effects of the farm investment support provided under the 2nd pillar of the CAP of the Rural Development Program (RDP) in Slovakia over 2007-2013. Efficiency and productivity were estimated by non-parametric Data Envelopment Analysis (DEA), using output-oriented CCR and BCC models. Total factor productivity changes were expressed by Malmquist indices and their decomposition. To estimate the net effects of the investment support we applied Conditional Difference in Differences (CDID) method. We constructed panel data of 631 Slovak farms, with 1375 ha of UAA on average. We found, that productivity of both beneficiaries and non-beneficiaries of the investment support slightly decreased over time. This decline could be mostly attributed to technological regress. The farms non-beneficiaries of investment support, were more technically efficient on average, than beneficiaries. Beneficiaries, specialized on crop production significantly improved their performance. We found mixed evidence of investment support net effects on farm performance indicators. Investment support in Slovakia should be redesign to target smaller farms with low capital endowment.

Key words: farm investment support, productivity, efficiency, net effects, CDID, Slovakia

JEL classification: C14, C49, C61, D04, Q18

1 Introduction

Farm investment support under the 2nd pillar of the CAP, provided through the Rural Development programme is a policy measure oriented on support of efficiency growth and enhancement of farm competitiveness. In the period 2007-2013, around 18% of the Slovak farms were beneficiaries of investment support (MoARD, 2015).

The studies assessing of RDP policies effects in the EU member states apply quantitative, qualitative or mixed methods approach. In the latest studies, econometric approaches, parametric, non-parametric methods, propensity Score Matching (PSM) were preferred. Effects of the farm investment support in the EU Member States estimated and discussed e.g. Beck and Dogot (2006), Bergschmidt (2009); Bernini and Pellegrini, (2011). To estimate effects of agro-environmental measures and LFA measures on farms in Germany, Pufahl and Weiss (2009) applied PSM. The farm investment support effects analysed Wigier et al. (2014). Ortner (2012) found positive effects of this support on gross value added, and farm private investments profitability in Austria. Michalek et al. (2013) assessed investment support effects with PSM and found deadweight losses of this support in dairy farms in Schlezwig and Holstein. Ratinger et al. (2014) analysed factors of the Czech farm participation in investment support scheme. They found significant positive effects of the investment support on gross value added and improvement of labour productivity. Kirchweger et al. (2015) analysed the effects of farm investment policy on structural changes of the Austrian farms. Investing farms significantly enlarge and intensify their production. Ciaian et al. (2015) estimated the extent to which farm investment is substituted by investment support policies granted under the EU RDP. They found crowding-out effect of the RDP close to 100%, implying that farms use public support to substitute for private investments. Michalek (2012) used econometric PSM approaches to investigate the investment support in Slovakia. The effects of the 2007–2013 RDP on the Czech agricultural holdings efficiency estimated Pechrova (2015) and found statistically significant

differences between beneficiaries and non-beneficiaries. Factors of the farm investment support in Slovakia using PSM and DID methods were analysed by Božík et al. (2013). According to them, investment in farms with strong capital endowment would be realized even without investment support.

The main objective of the paper was to analyse productivity and efficiency development and estimate effects of the 2007-2013 RDP farm investment support (FIS) on the Slovak farms. Despite of a negative effect of global crisis, we expect farm productivity and efficiency growth and positive net effects of the investment support on farm performance.

2 Materials and Methods

Farm efficiency and productivity is assessed by non-parametric DEA, output-oriented CCR and BCC and input-oriented models. Performance of the farms we expressed by total factor productivity (TFP) approach. As an estimator for the TFP change we use output oriented Malmquist index (Färe et al., 1994). The Malmquist TFP index is decomposed to technical efficiency change (TECH) and technological change (TCH). Malmquist index is based on the assumption that technology exhibits constant returns to scale (CRS). If the assumption on returns to scale is relaxed to allow variable returns to scale (VRS), then component of TECH (Färe et al., 1994), is further decomposed to scale efficiency change (SECH) and pure efficiency change (PECH). Software DEAP (CEPA, 2011) was used to estimate the measures of technical efficiency and productivity.

To assess of net effects of investment support on the Slovak farm performance we employ a combination of a non-parametric propensity score matching (PSM) estimator (Rosenbaum and Rubin, 1983; Heckman et al. 1998) and Difference in difference (DID) approach. The average effect of investment support is estimated using counterfactual, the outcome which would have been observed for the supported farm (Y_{i1}) if they had not been supported (Y_{i0}). We will construct a control group with similar distribution of characteristics as the treatment group. The multidimensionality of characteristics is solved by propensity score (Rosenbaum and Rubin, 1983). The value of propensity score is generated using logit model, where participation in the investment support serves as an endogenous variable. The estimated propensity score will then be used to create a counterfactual with the nearest-neighbour 1-to-1 matching method. All farms with very different characteristics are excluded from the sample. We used MatchIt package of the R software (Ho et al., 2011).

The effect of investment support is calculated as a difference of mean outcomes between the two groups $\tau_i = Y_{i1}-Y_{i0}$. Average treatment on treated (ATT) will then measure the effect of investment support on farm outcome, in comparison to what would happen if these farms did not receive investment support. The PSM estimator of net effects (Smith and Todd, 2005) is defined by Eq. 1.

$$\tau ATTPSM = \left(E\left[Y_{i1} \middle| P_i = 1, p(X_i)\right] - E\left[Y_{i0} \middle| P_i = 0, p(X_i)\right]\right) \quad \textbf{(1)}$$

Where X is a set of covariates, P is dummy variable of treatment.

The combination of PSM and DiD results in the Conditional Difference-In-Difference (CDID) estimation Eq. 2., which compares the conditional before-after outcomes of program participants with those of non-participants.

$$\begin{aligned} &E\left(Y_{i1t} - Y_{i0t'} \middle| P_i = 1, X_i\right) - E\left(Y_{i0t} - Y_{i0t'} \middle| P_i = 0, X_i\right) = \\ &E\left(Y_{i1t} - Y_{i0t'} \middle| P_i = 1\right) - E\left(Y_{i0t} - Y_{i0t'} \middle| P_i = 0\right) \end{aligned} \quad \textbf{(2)}$$

Where *t* a time period after the program start date; *t'* a time period before the program.

We constructed fully balanced panel of farm data (IL, MoARD SR 2014) from 2007 to 2013, of 631 farms; with the average UAA 1375 ha; 42 AWU; 592 LU. To estimate the net effects we used selected indicators of farm outcomes. Five input variables: consumption of materials and energy and other costs in EUR, the annual average number of employees, assets in EUR, utilized agricultural area LPIS; two outputs variables: revenues from sales of own products and services and other revenues were used in DEA.

3 Results and Discussion

Average technical efficiency of the livestock farms, both beneficiaries and non-beneficiary of investment support in 2007-2013 increased (Tab. 1).

Table 1. Average technical efficiency (TE CRS) of FIS beneficiaries, 2007-2013

Specialisation	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*
CP	0.684	0.620	0.588	0.638	0.638	0.744	0.675
LP	0.645	0.624	0.540	0.600	0.645	0.697	*0.664
MP	0.681	0.661	0.569	0.619	**0.637	*0.728	0.682
Average	0.668	0.631	0.565	0.619	**0.641	0.722	0.672

Notes: CP - crop production; LP- livestock production; MP – farms with mixed production; CRS - constant returns to scale; *0.1 significance level, **0.05 significance level, ***0.01 significance level in between beneficiaries and non-beneficiaries.

Source: own estimation

Farm productivity had been declining by approximately 0.7% yearly (Tab. 2). The average productivity fall down in both crop and livestock production specialised farms, regardless of investment support. A drop of average productivity was smaller in farms specialised on crop production. Components of productivity change allowed us to identify weaknesses of farm productivity development. Technical efficiency (TECH) of all but crop farms improved. This improvement however, had on average negligible effect on productivity. The highest technical efficiency improvement was observed in livestock farms, followed by farms with mixed production, both non-beneficiaries of the investment support (Tab. 2). It seems that the investment support in that period helped beneficiary farms to cope with strong competition in a short time.

Table 2. Average changes of total factor productivity components of FIS beneficiaries (Malmquist) (2007-2013)

Specialisation	TFP	TECH	TCH	PECH	SECH
CP	0.999	0.997	1.002	1.002	0.996
LP	0.983	**1.005	***0.979	**1.013	*0.992
MP	0.991	1.000	0.991	1.005	0.995
Average	0.991	1.001	0.990	1.007	0.994

Notes: TFP - total factor productivity, TECH – technical efficiency change, TCH-technological change, PECH – pure technical efficiency change, SECH – scale efficiency, CP – crop production, LP – livestock production, MP – farms with mixed production; *0.1 significance level, **0.05 significance level, ***0.01 significance level in between beneficiaries and non-beneficiaries.

Source: own estimation

Technological progress (TCH) refers to shift of the best practice frontier, capturing adoption of new agricultural technologies or innovations, or by a change in the economic policies or environmental and other regulations. Over the seven-year time period, the highest technological progress was gained by crop farms, regardless of investment support. Farms specialised on livestock production exhibited significant technological regress, which significantly affected development of their productivity.

Managerial efficiency (PECH), a component of a technical efficiency change (TECH) of all farm groups increased over time. Farm decision-making units' ability of to convert farm inputs into outputs were improving. Managerial efficiency change captures changes in efficiency under variable returns-to-scale (VRS) technology. High average value of efficiency of scale (SECH) indicates a use of factors of production in terms of the scale, was close to the optimum. Technical efficiency of farms specialised on livestock production, both beneficiaries and non-beneficiaries, could be significantly improved by changing their operational scale.

We found mixed evidence of estimated net effects of investment support on selected indicators of farm performance (Tab. 3). All farms, disregard of investment support, were on average profitable in 2007 and unprofitable in 2013 after matching. Investment support softened negative development of beneficiaries' profit. A positive effect of investment support on the profitability of the Czech farms found Medonos et al. (2012), Spicka and Krause (2013), Spicka et al. (2015).

Table 3. The net effects of FIS beneficiaries (2007-2013)

	Before matching		After matching			
	2007	2013	2007	2013		
	D(1-0)	D(1-0)	ATT_2007	ATT_2013	CDID	DWL(%)
GVA	166959	147596	13546	-16933	-30478	6
Profit	40393	-17066	24882	8356	-16527	119
Assets	836438	1385125	-60796	-6917	53879	93
UAA	556	527	23	-27	-50	38
GVA/AWU	2141	2415	-85	-704	-619	245
GVA/UAA	147	177	108	178	70	-252
Profit/AWU	-950	-1546	2136	378	-1758	223
Profit/UAA	64	91	93	106	13	386
Assets/AWU	5519	-9127	4284	1140	-3145	120
Assets/UAA	252	1031	114	980	866	47

Notes: AWU – annual work unit, IS – investment support, D(1-0) – difference of indicator B vs NB before matching; ATT – average treatment effect on treated (B), DID – difference-in-difference, DWL – deadweight loss, UAA –Utilised agricultural area

Source: own estimation

We found a positive effect of FIS on Value of Assets per farm, Gross value added per ha and value of assets pre ha of UAA. Investment support assisted farms to further growth of their assets. Nevertheless, the value of assets would grow even without investment support (DWL). There was a negative net effect of investment support on GVA per farm. Kaufmann, Henning et al. (2009) estimated similar effects of FIS on the Slovak farm performance already for the SAPARD programming period 2003-2005, based on the Slovak FADN data. Based on data from the later RDP SR programming period Božík et al. (2013) also detected deadweight losses due to investment support provision to large farms. A positive effect of farm investment support on gross value added estimated Ortner (2012) in Austria. Investment support net effects on production per farm and land productivity were positive. A growth of production due to farm investment support in Austria was observed by Kirchweger et al. (2015). The net effect of investment support on labour productivity of the Slovak farm beneficiaries was negative, while e.g. Ratinger et al. (2012), and Medonos et al. (2012) found improving labour productivity in the Czech farms, FIS beneficiaries.

4 Conclusion

In the period 2007-2013 the average technical efficiency of the Slovak livestock farms, both beneficiaries and non-beneficiary of FIS increased. The overall productivity of the Slovak farms on average, fall down mainly due to a technological regress. The least efficient were farms specialised on crop production, where however a technological progress was observed. Investment support assisted to farms specialised on livestock production to shift towards the best farms (catching up effect). Similar effect was found for the Czech farms by Spicka and Machek (2015). Managerial efficiency improvement contributed to this positive development of technical efficiency.

Similar results are also found in study of Austrian farms (Kirchweger et al. 2015) where farms participating in the Austrian farm investment programme increase their production significantly more than the non-participating farms.

We found mixed evidence of the provision of investment support net effects on the Slovak farm performance indicators. Investment support assisted to the large farms further growth of their capital endowment. Nevertheless, the most of the investment of the beneficiaries would occurred even without the investment support. Investment support softened a decline of some performance indicators, e.g. a fall of gross value added per farm. A positive effects of FIS was found on land productivity growth. Beneficiaries of farm investment support however reached significantly lower labour productivity. Our results shows that the overall productivity of farms, regardless of the specialization, has not changed in the observed period. Based on estimated net effects we can recommend to target the farm support investment in Slovakia to smaller farms with low capital equipment.

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Agriculture of the post-Soviet countries

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Abstract: The post-Soviet countries play a very important role in the world economy. However, their economic situation is influenced by their orientation on primary products which represent a substantial share of the value added. The aim of this paper is to verify whether the situation is the same in all the post-Soviet countries, and to find commonalities and differences between them. In order to fulfil the aim, standard statistical methods (correlation and variation coefficient) are used. In addition, cluster analysis is also used to identify similar countries. The analysed time period is 2005 - 2012. The research is based on the data from World Bank, FAOSTAT, UN and national sources. The countries in question can be divided into four different groups. The first consists of Russia and Belarus, the second of Ukraine and Moldova. Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan are included in the third group. The final group consists of Caucasian countries: Armenia, Azerbaijan, and Georgia and Kazakhstan. The primary sector commodities play a key role in creating a geopolitical relationship. The agricultural sector of the post-Soviet countries shows significant differences despite their common heritage.

Key words: post-Soviet countries, cluster analysis, primary sector, value added, arable land, rural population.

JEL classification: F02, Q00, F15

1 Introduction

Since the dissolution of the Soviet Union and disbandment of the Council for Mutual Economic Assistance, agriculture as well as the entire national economy of the post-Soviet countries have undergone economic transformation (Jörgensen, 2006; Svatoš and Smutka, 2009). In the majority of the countries, their initially centrally planned agriculture has been transformed into market-oriented agriculture reflecting the market and social needs (Koester, 2015). The transformation was connected with privatization (Lukin, 2009) as well as land reform which was necessary in order to successfully change the original collective method of farming. However, the problem was that there was no legislation related to dealing with soil (Lerman, Csaki, Feder, 2002). The governments' activities are aimed at regulation and support of agriculture. The necessity of receiving by agriculture a state support, including financial support, aimed at stimulation of its efficiency growth, is determined by the characteristics of the agrarian sector (Maitah et al., 2016).

The transformation of the agricultural sector initially brought about "creative destruction" of the rural sector, which was the result of mere survival of agricultural enterprises or even of their subsequent bankruptcy (Serova, 2007). In some cases, agricultural production reached the survival level for workers or owners. Furthermore, there were situations in which the majority of the rural population consumed food which they themselves produced (Rose, Tikhomirov, 1993). This had a negative impact on the increasing inequality in society (Peters, Sprout, Melzig, 2010). Arable land was also reduced due to a lack of seeds, mechanization and other essential inputs (Satybaldin, Dzhunisbekova, Bektayev, 2000), and at the same time the level of investments into agriculture decreased (Komarov, 2002). It might also be claimed that cooperation of individual producers was at a horizontal rather than at a vertical level (Ioffe and Nefedova, 2001).

Nevertheless, even after two decades the transfer to a market system of economy was incomplete in some countries (Wegren, 2005). Rau (2007) states that competitiveness of the agricultural sector of the post-Soviet republics is primarily dependent on the overall macro-economic situation and on the national currency rate. This manifested itself as early as in the period of economic decline in the 1990s (Serova, Braun and Wehrheim, 1999). However, since the beginning of this millennium, the situation has improved (Maitah and Smutka, 2016; Smutka, Zhuravleva, Pulkrábek, Benešová, Maitah, 2015; Maitah et al., 2016).

During the transformation period, the structure of agricultural production of individual countries changed significantly though (Gaisina, 2011; Liefert and Liefert, 2012; Miroslav Svatoš, Smutka, Ishchukova, 2014). The majority of the countries are striving to ensure food security (Wegren 2016) and therefore support agricultural production. However, during the 1990s, the majority of these countries (except for Tajikistan and Turkmenistan) applied for membership in WTO (Roberts and Wehrheim, 2001), which some of them also joined in the first decade of the 21st century (Sedik, Lerman, Uzun, 2013). As a result of their accession to WTO, however, they have been experiencing problems with the support of the agricultural sector (O'Neal, 2014; Rau, 2015). In the case of the Russian Federation, though, agriculture has been declared as an infant industry and its support within WTO is thus possible (Gerasimenko, 2012). However, at the same time (Rutherford and Tarr, 2008) comment that long-term membership in WTO will be beneficial to the majority of Russian population.

Currently, some of these countries are experiencing food security (Meskhia, 2016). (Kuhrt, 2014) claims that, in this regard, Russia is considered some kind of a guarantor of food security for other countries. The European food import ban also seems problematic (Allison, 2014). The problem might also be imperfect declaration of agro-holding production in the Russian Federation (Balashova, Šilerová, Melikhov, 2015) or low liquidity of agricultural enterprises (Špička and Kontsevaya, 2016).

2 Materials and Methods

According to the traditional theories the possible cooperation depends on the endowment of natural resources, technology or factors of production. Agriculture is closely related to production factors. Agricultural production is also viewed as a strategic "capital" that should be inaccessible by other countries in the framework of regional integration. At the same time, agriculture might represent one of the major assets in forming an integration group. The aim of this paper is to verify whether the situation in the agricultural sector is the same in all the post-Soviet countries, and to find commonalities and differences between them. Based on our result we can state whether there are opportunities for regional integration or not.

This paper focuses on evaluation of the situation in agriculture of the eleven post-Soviet countries (except Baltic States). Unfortunately, the data for Kazakhstan include many outliners and due to this Kazakhstan could not be included in our analysis. Otherwise the number of the final entering variables would be much lower.

The variables published by FAOSTAT were the input data for this paper. The original dataset consists of more than 40 variables. However, as the cluster analysis is sensitive to the missing cases and high correlation between variables, the final input variables included only 20 indicators related to agriculture. Another step was to use ANOVA to find the relevance of the variables during the clustering procedure. The final 10 variables were selected based on the ANOVA results.

Cluster analysis was used in order to evaluate and present the differences in agriculture in the post-Soviet countries and to divide them based on their commonalities / differences. Using its direct application, individual countries can be classified into groups (clusters) mainly in order for two countries from the same cluster to resemble each other more than two countries from different clusters (Řezánková et al, 2009).

Before applying the cluster analysis itself, it was necessary to pre-process the data set which meant evaluating whether the analysis should include all or only some variables (Meloun, Militký, 2004). At this stage, the correlation matrix was calculated and the degree of dependence was determined. When strong dependence was discovered between the indicators ($|r| > 0,7$), only one indicator was retained, always the one with higher variability (the decision was made based on the variation coefficient values). After selecting the variables, it was necessary to consider the types of individual variables and their importance for the analysis. After the evaluation of individual types of variables, it was necessary to transform (standardize) the data. Z-scores were used to transform the data. Only 10 variables were selected after this step.

First of all we us hierarchical clustering and the partitioning method that are the main clustering methods. Hierarchical clustering always starts with a certain number of clusters, in which each observation comprises a separate cluster and ends with a cluster which, conversely, contains all the observations. In each step, two closest observations or clusters are subsequently joined into a completely new cluster. This method is referred to as agglomerative (Hebák et al., 2005).

Clustering techniques are referred to as indirect knowledge acquisition tools. In case of a few (most frequently 2 or 3) dimensions, the clusters can be recognized visually, the higher their number, the more difficult it is to recognise the clusters visually. The higher the number of the dimensions, the greater is the importance of geometrical analyses. The reason for performing the cluster analysis is an assumption that the examined data sets contain meaningful natural data clustering (Berry, Linoff, 2004).

Ward's method, used in this paper, is the most frequently used hierarchical clustering method.

In order to identify the observed vectors which resemble each other and to cluster them subsequently, several techniques to determine the degree of similarity are used. Euclidean distance is the most common function of distance between two vectors x and y, which is also used in this paper (Lukasová, Šarmanová, 1985). The hierarchical methods help to decide about the number of clusters. It is a necessary precondition for the future non-hierarchical cluster method.

After hierarchical clustering method the non-hierarchical clustering method was applied which determines the cluster membership. K-mean clustering was used which is considered as more reliable.

3 Results and Discussion

During the 1990s, the agricultural sector of the majority of the post-Soviet republics underwent significant changes. One of the main objectives of the transformation was to create new forms of enterprises in the agricultural sector. However, this intention required large substantial investments in order to create fundamental agricultural infrastructure and a competitive agricultural sector.

Currently, the majority of the post-Soviet countries have overcome the main transformational problems and have reached relatively high levels of agriculture. Nevertheless, there are significant differences between individual countries in connection with their agricultural production.

Table 1. Cluster membership

Case Number	Country	Cluster	Distance
1	Uzbekistan	3	.990
2	Ukraine	2	1.383
3	Turkmenistan	3	1.618
4	Tajikistan	3	1.601
5	Russian Federation	1	.809
6	Moldova	2	1.383
7	Kyrgyz Republic	3	1.321
8	Georgia	4	1.677
9	Belarus	1	.809
10	Azerbaijan	4	1.483
11	Armenia	4	1.174

Note: Data for Kazakhstan are not available

Source: own calculation based on FAO

Based on the cluster analysis, the monitored countries can be divided into 4 basic groups (Table 1). The first comprises Belarus and the Russian Federation. These countries are located in the European part of Eurasia and have a high added value per employee in agriculture. Their distance from the centre is the same. The second group consists of Ukraine and Moldova. These are also European countries with a high share of arable land. The third group comprises Uzbekistan, Turkmenistan, Tajikistan and Kyrgyzstan. Uzbekistan is the closest to the centre, followed by Kyrgyzstan, and then Turkmenistan and Tajikistan which are quite similar. This group can be referred to as central Asian. The members of the last group are Georgia, Azerbaijan and Armenia. This group can be referred to as the Caucasian group of countries. In this regard, Armenia is the closest to the centre, followed by Azerbaijan and Georgia.

Table 2 indicates the importance of single variables entering the analysis. Even though the results can be used for descriptive purposes only, it might be stated that agriculture value added (% of GDP), arable land (% of land area), beef and buffalo meat, indigenous meat and permanent meadows and pastures, forest area (% of land area, rural population (% of total population), total area equipped for irrigation and total milk production moderately contribute to the cluster creation. The lowest contribution is connected with sheep and goat meat.

Table 2. ANOVA

	Cluster		Error		F	Sig.
	Mean Square	df	Mean Square	df		
Agriculture, value added (% of GDP)	2.687	3	.277	7	9.697	.000
Arable land (% of land area)	3.016	3	.136	7	22.191	.000
Beef and Buffalo Meat	3.229	3	.045	7	72.040	.000
Forest area (% of land area)	2.576	3	.325	7	7.936	.012
Meat indigenous, cattle and buffalo	3.229	3	.045	7	72.040	.000
Milk, Total	1.942	3	.454	7	4.281	.052
Permanent meadows and pastures (%)	3.209	3	.053	7	60.030	.000
Rural population (% of total population)	2.586	3	.320	7	8.077	.011
Sheep and Goat Meat	1.543	3	.731	7	2.109	.187
Total area equipped for irrigation	2.424	3	.390	7	6.216	.022

Note: 1) The F tests should be used only for descriptive purposes because the clusters have been chosen to maximize differences among cases in different clusters. The observed significance levels are not corrected for this and thus cannot be interpreted as tests of the hypothesis that the cluster means are equal.

2) Data for Kazakhstan are not available

Source: Own calculation based on FAO data

3.1 Characteristics of different groups

Table 3 contains basic characteristics of the different groups of countries. The first group, which could be referred to as a high-productivity group, shows the lowest contribution of agriculture value added to GDP – only 7.7%. It also demonstrates the lowest share of rural population (26.7%). These factors significantly influence the overall situation in Russia and Belarus.

Table 3. Characteristics of different groups (standardized data)

	Cluster			
	1	2	3	4
Agriculture, value added (% of GDP)	-0.98	-0.15	1.08	-0.68
Arable land (% of land area)	-0.09	1.88	-0.65	-0.33
Beef and Buffalo Meat	0.66	-0.35	0.87	-1.36
Forest area (% of land area)	1.63	-0.28	-0.75	0.1
Meat indigenous, cattle and buffalo	0.66	-0.35	0.87	-1.36
Milk, Total	1.5	0.01	-0.39	-0.49
Permanent meadows and pastures (%)	-0.73	-1.54	0.96	0.23
Rural population (% of total population)	-1.32	-0.27	0.99	-0.26
Sheep and Goat Meat	1.15	-0.93	0.12	-0.28
Total area equipped for irrigation	-1.2	-0.5	0	1.14

Note: Data for Kazakhstan are not available

Source: own calculation based on FAO

Compared to the second group of countries, it has the highest share of forest area (45.6%), high production of milk and sheep and goat meat. The high share of forest can be an opportunity for these countries not only to sell wood but also manufactured products based on wood, however, with higher value added. These countries can be considered as non-agricultural in relation to the remaining countries in the group. This is also emphasized by a relatively small area equipped for irrigation. The Russian Federation and Belarus have more effective agriculture and have already transformed agricultural production into sectors with high value added production. The problem is that Russia´s level of agriculture still has not reached the level of other European countries or USA. There is still potential for improvement. Another problem is the declining tendency in crop acreage especially in Russia.

The second group (Moldova, Ukraine) has the highest share of arable land (% of land area) – 55.8 %. This is the highest percentage of arable land out of all the analyzed countries. This indicator is closely connected to a lower share of permanent meadows and pastures. This means that these countries focus more on plant production than on animal husbandry. They also have suitable conditions for agriculture as they do not need as much irrigation in order to produce plants. The lower level of permanent meadows and pastures also indicates that their production is more intensive than extensive. Compared to the previous group of the countries, their agriculture value added is higher. This is especially true for Moldova. Rural population is also slightly higher in Moldova, which reflects an increased focus on agriculture. This is not surprising as Ukraine used to be considered "the granary of Europe" thanks to its suitable landscape and climatic conditions.

The central Asian group consists of Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. Agriculture is reasonably important in Asia, and the same applies to these countries. The share of agriculture value added is more than 24%. Turkmenistan has the lowest share of approximately 18% and Kyrgyzstan 27%. Rural population (% of the total population) is higher than in all the monitored countries – 63.5 % on average. Accordingly, the following indicators show high dependency on a rather extensive way of agriculture. These countries have a relatively high share of meadows and pastures (86%), and a rather low level of arable land (6.7%). This is influenced by these countries' ecosystem. The mountainous character of some of these countries (Kyrgyzstan and Tajikistan) as well as a high share of salt lakes in case of Turkmenistan and Uzbekistan ought to be taken into consideration. These countries focus on production of beef and buffalo meat as well as indigenous cattle and buffalo meat, which is connected to the steppe ecosystem.

Table 4: Average value of the indicator for different groups of countries

	Agriculture VA	Arable land (%)	Beef and Buffalo Meat	Forest area (%)	cattle and buffalo meat	Milk, Total	Meadows and pastures (%)	Rural population (%)	Sheep and Goat Meat	Irrigated area
1	7.7	17.5	1 732.4	45.6	1 732.4	33 354.1	39.4	26.7	193.5	1.7
2	14.3	55.8	1 401.9	13.8	1 401.9	17 033.1	17.0	43.3	153.3	7.6
3	24.1	6.7	1 801.8	6.0	1 801.8	12 632.0	86.2	63.5	174.1	11.7
4	10.1	12.9	1 070.8	20.2	1 070.8	5 836.7	65.9	43.6	166.4	21.3

Note: Data for Kazakhstan are not available

Source: own calculation based on FAO

The Caucasian group comprises Armenia, Azerbaijan and Georgia. Their contribution of agriculture to GDP is 10.1% on average, with the lowest share in Armenia and the highest in Georgia. The share of arable land is rather low – 12.9 %, which is influenced by the character of landscape in these countries. It is only Azerbaijan that has a relatively significant share of lowlands suitable for agriculture. This is also connected with irrigated

areas, the proportion of which is the highest in Azerbaijan. However, in this case, all the countries have more irrigated areas than is the average in all the post-Soviet countries. The share of rural population is similar to the second group (43%). These countries also show lower production levels of any kind of meat and milk.

3.2 The potential of cooperation

As it has already been mentioned above, there are substantial differences between the analysed countries. According to our analysis, it can be stated that the first group of countries has the highest productivity in agriculture compared to the other groups. This is partially influenced by an extensive use of fertilizers and machinery. Based on this, these countries should focus on production with a higher demand of using fertilizers and machinery. Agricultural raw materials exports (% of merchandise exports) is about 1.7%. Both of the countries are land abundant. Despite their land area and equipment, there are also some differences. Compared to Russia, Belarus has higher productivity even though the process of moving towards market economy and private ownership is slow. These two countries still rely on cooperatives. These two factors negatively influence their relatively high production. Provided that they are able to move towards market economy, we can expect even higher output and productivity.

The second group – Moldova and Ukraine – allowed the distribution of land to the workers of the former cooperatives. This triggered private ownership and increased the farmers' interest in improvement and increase of production. Ukraine and Moldova have shifted their orientation towards the European Union that might provide new markets to them. The farmers do not rely on the government to such an extent, however, the remaining problem is the low number of well-educated people in the agricultural and rural areas in general. This decreases the potential of the agricultural sector due to the low social and human capital (especially in Ukraine). (OECD, 2012) pointed out that this problem can be overcome by implementing different internship schemes. With its orientation to the European Union, these countries can represent a bridge between other post-Soviet republics and the EU. However, the political problems between Ukraine and Russia must be solved first.

The Central Asian group is connected with large farm and very little part of the land that is rented. The problem of this countries is high rural population growth with limited arable land. It should be mention that some of these countries have problem with soil quality (e.g. Tajikistan) that was caused by the loss of organic matters. First of all this country should improve the quality of land and then focus more on extensive way of farming.

The last group of countries Caucasus group has witnessed an inflow of labour into agriculture (Armenia and Georgia). Azerbaijan depends on other countries with agricultural production.

The problem is that the agricultural production is very similar. Most of them focus on potatoes, pulse crops or forage crops. The remaining question is if these countries are able to use its own agricultural potential?

The agricultural sector in the monitored countries differs significantly. There are substantial differences between different groups of countries. All of the countries have problems with agricultural production. In the case of Russia, it is decreasing in cultivated areas as stated by (Prishchepov, Müller, Dubinin, Baumann, & Radeloff, 2013). As mentioned in the previous sections, Russia has great potential for crop production, however, this potential is not exploited (Schierhorn, Müller, Prishchepov, Faramarzi, & Balmann, 2014). (Naumov, Angelstam, & Elbakidze, 2016) mentions the possibility for intensification of wood production in Russia which also reflects our findings. As has already been mentioned by (Weber, 2003), the position of different countries is unequal, and they are not exploiting their potential. (Mazmanyan, 2010)

4 Conclusion

Despite the common heritage of the above mentioned post-Soviet countries, their agriculture differs significantly. These countries can be divided into four main groups: 1) Russia and Belarus, 2) Ukraine and Moldova, 3) central Asian countries – Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan, and 4) Caucasian group – Armenia, Azerbaijan and Georgia.

The differences are influenced by climatic conditions as well as the character of the landscape. Consequently, their opportunities to cooperate are really great. They should focus on different types of production. However, sometimes the cooperation between these countries seems complicated due to a number of political factors. As an example, the situation in the Caucasian region with the dispute over Nagorno-Karabakh can be used.

Another problem connected with these countries is rather poor cooperation between individual countries. One-way cooperation is evident – the countries cooperate with Moscow but not with each other.

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Youth employment in rural Russia

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Abstract: On the rural labor market of Russia there is a significant imbalance between the demand for and supply of labor. Analyzing the factors of instability of employment of rural youth in Russia allows assess the potential for growth of the economic activeness of young people in rural areas. The objective of this study is to analyze the influence of the type of employment contract, employer's status and employment conditions on the stability of employment of rural youth aged 15-19 and 20-24 years. The information base of this study is the results of the Comprehensive monitoring of the living conditions of the population of Russia conducted by Rosstat in 2014 (Comprehensive monitoring of living conditions 2014). For the purposes of our study we made a subsample consisting of 1 017 young rural people. The study is carried out by analyzing the multivariate distributions of respondents' answers with the use of the software package SPSS 17.0.

It is shown that men are more likely to be employed on the basis of fixed-term employment contracts or without official registration than women. Indefinite-term employment contracts are more often preferred by employers with the status of legal entities. Employers – individuals more often provide employment under fixed-term employment contracts or without any official registration. Our findings suggest that fixed-term employment contracts, and especially employment without official registration, cause higher shares of those who are employed not as hired workers working for payment, but rather as apprentices, trainees or interns. In addition, it is shown that young people working under fixed-term contracts or without official registration are far more often employed overtime (working more than 41 hours a week and also on official holidays and weekends). We also find that the degree of mismatch between the working duties and the specialty acquired is high, especially in the 20-24 age group.

Our study empirically proves the existence of some elements of instability (vulnerability) of rural youth employment depending on the type of employment contract. Our findings indicate that the influence of the type of employment contract on the employment of rural youth is different for the age groups 15-19 and 20-24 years.

Keywords: agricultural, employment, contracts, skill mismatch, rural youth, Russia

JEL classification: J23, J41, J43

1 Introduction

The important task of the agrarian policy is to create conditions for effective employment of young rural people through technological modernization of the agri-food sector, development of the social, financial and information infrastructure and improving the competitiveness of young rural people on the labor market. In the Russian economy agriculture plays a very important role. Agricultural land occupies 13% of the territory, 26% of the population lives in rural areas of Russia. Labour productivity in the agricultural sector of the developed countries tend to be lower than in other sectors of the economy (Gollin et al, 2014). The labour productivity growth in Russia was accompanied by the reduction of the percentage of employed in agriculture, hunting and forestry from 11.2% (2005) to 9.2% (2015). At the same time the non-agricultural and non-farm employment has increased, which is similar to many other countries (Chmieliński and Karwat-Woźniak, 2015). Integration of the Russian agri-food sector in the world food market is accelerating (Svatoš, Smutka, and Ishchukova, 2014). Export of agricultural products is growing. In the domestic market

the demand for organic food is expanding which is in line with the global trends (Naglova and Vlasicova, 2016).

Agribusiness makes increasingly high demands on the professional education and qualifications of agricultural workers. The workers with vocational training in turn increase their requirements for remuneration. The average salary in agriculture is 57.5% of the average for the economy of the Russian Federation (2015). The vast majority of people employed in agriculture live in rural areas, where an excess of unskilled labor coexists in parallel with a lack of qualified personnel.

There is 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 the other sectors of the economy (Bellit, 2014). The most vulnerable category on the labor market today is the population of young people aged 15-24 years (Cahuc et al, 2013). The lack of work experience, vocational training and low level of skills, in addition to high demands and aspirations of recent graduates are the key problems affecting the rural labour market. The present-day rural labor market is featured by a shortage of vacant jobs, poor employment opportunities and seasonality of the core activities. As a consequence, the rates of youth employment in rural areas are lower, rural youth has to move to the city or other regions in search of vacant jobs, and the wages are lower when working duties mismatch the skills.

Most of the rural youth is employed by organizations with the state and municipal forms of ownership. Contractual provisions are an important feature of employment. Limited terms of employment contracts and non-transparent employment relationships make the employment more uncertain, the worker more socially insecure and restrict the access to benefits from employment. On the one hand fixed-term contracts are often considered as a transitional stage to a more steady employment for those whose competitive positions on the labor market are weak (Güell and Petrongolo, 2007; Baranowska, Gebel, and Kotowska, 2011; Bellit, 2014). Many young people “move from one fixed-term contract to the next without any improvement in their job situation” (Eichhorst and Neder, 2014).

In rural Russia most of employed young people aged 15-24 years are working on the basis of indefinite employment contracts. Our data indicates that the share of those working under indefinite employment contracts is growing with the age. To illustrate this, under indefinite employment contracts are working 52.0% of the respondents aged 15-19 years, while for those aged 20-24 years the figure is 76.1%. Fixed-term contracts are more typical for young people aged 15-19 years (17.0%) compared with those aged 20-24 years (10.8%). Our data also shows that without official registration of their employment, under verbal agreements (vulnerable employment), are working 30.0% and 11.8% of young people aged 15-19 and 20-24 years, respectively.

The objective of this study is to analyze the influence of the type of employment contract, employer’s status and employment conditions on the steadiness of employment of rural youth aged 15-24 years and assess the availability of vocational training for the current job and the degree of its matching the skills acquired, depending on the type of contract.

2 Materials and Methods

Our research based on the micro-data of the nationwide survey Comprehensive monitoring of living conditions of the population of RF, conducted in all regions of Russia (Comprehensive Monitoring…, 2014). To investigate the forms and conditions of youth rural employment (15-19 and 20-24 ages) we used the methodology of comparative research. The study is carried out by analyzing the multivariate distributions of respondents‘ answers with the use of the software package SPSS 17.0.

The sample comprising 113 138 people, 78 542 (69.4%) of which are urban and 34 596 (30.6%) rural residents. For the purposes of our study, we formed a subsample of 1 017 rural respondents aged 15-24 years, who, at the time of the survey, had paid employment or other gainful occupation. 106 of the respondents were aged 15-19 years (10.4%) and 911 (89.6%) – 20-24 years. The question about the type of employment contract was answered by 965 people (94.9%), of which 710 people (73.6%) were employed on the basis of indefinite employment contracts, 110 people – under fixed-term employment contracts and 132 people (13.7%) – under verbal agreements, i.e. without officially registering their employment. The remaining 13 people (1.3%) were employed under civil contracts or agreements of performing their duties at home or elsewhere distantly.

Since the share of the latter in the sample is insignificant, they were not included in the analysis. At the subsequent stage we analyzed the responses of the rural young people aged 15-24 years employed under fixed-term, indefinite employment contracts and without official registration of their employment. For the purposes of the study, we formed two groups: (1) persons aged 15-19 years and (2) persons aged 20-24 years.

3 Results and Discussion

3.1 Analysis of the impact of the employer's status on the stability of rural employment

Rural young people prefer to be employed by legal entities mostly because this kind of employment is more socially secure. A legal entity, according to the Russian legislation, is a duly established and registered organization with its own property, which is liable for its obligations with this property and responsible for the operations it performs. The status of a legal entity is the most widespread organizational and legal form among the economic entities in Russia.

Our data suggests that employers having the status of a legal entity much more often provide employment on the basis of indefinite employment contracts. For instance, 71.2% of the young people aged 15-19 years and 83.1% of those aged 20-24 years are employed under indefinite employment contracts and 52.9% of those aged 15-19 years and 72.0% of the young people aged 20-24 years are employed under fixed-term employment contracts (Table 1).

Table 1. Distribution of young rural respondents by employer's status depending on the type of employment contract (% of the respondents)

	Indefinite employment contract		Fixed-term employment contract		Without official registration	
	15-19	20-24	15-19	20-24	15-19	20-24
Legal entity	71.2	83.1	52.9	72.0	0.0	9.8
Individual	28.8	16.9	47.1	28.0	100	90.2

Source: own processing based on the results of the Comprehensive Monitoring…, 2014.

Individual entrepreneurs provide more flexible terms of employment though their employment is less socially secure. That is why the share of young people employed by individual entrepreneurs without officially registering their employment is high. Employed under fixed-term contracts are 47.1% and 28.0% of those aged 15-19 and 20-24 years, respectively, and 90.2% of those aged 20-24 years and all of the young people aged 15-19 years are employed by individual entrepreneurs without official registration.

Because of the wish to have a steady and secure employment, the share of young people working for enterprises and organizations of the state and municipal forms of ownership

is high. Private companies in public opinion of rural population are often associated with the risk of failure to comply with the labor legislation, violation of contractual provisions and reduced social security of the workers. More than a half of indefinite and fixed-term employment contracts are signed at enterprises of the state and/or municipal forms of ownership, while private employers more often employ young people without official registration (Table 2).

Table 2. Distribution of young rural respondents by form of ownership of enterprises and the type of employment contract (% of the respondents)

	Indefinite employment contract		Fixed-term employment contract		Without official registration	
	15-19	20-24	15-19	20-24	15-19	20-24
State or municipal	51.4	54.8	66.7	56.7	0.0	20.0
Private	43.2	41.5	22.2	41.8	0.0	60.0
Public	0.0	0.2	0.0	0.0	0.0	20.0
Other	5.4	3.5	11.1	1.5	0.0	0.0

Source: own processing based on the results of the Comprehensive Monitoring…, 2014.

Employment on the basis of indefinite employment contracts is more typical for young people employed as hired workers, while employment under fixed-term employment contracts and without official registration is more characteristic of those employed as apprentices, trainees or interns. For instance, the share of 15-19 year old apprentices and interns employed under indefinite employment contracts constitutes 10.9%, the proportion of those employed on the basis of fixed-term employment contracts is 25.0%, and the share of those employed without official registration reaches 30.0%.

Analyzing the gender composition of employed rural young people we see that unsteady employment is more typical of men than women. To illustrate this, employed on the basis of indefinite employment contracts are 53.8% of men and 46.2% of women aged 15-19 years and 58.1% of men and 41.9% of women aged 20-24 years. However, the share of 20-24 year old men employed under fixed-term employment contracts is higher than that of women of the same age (69.9% vs. 30.1%). At the same time, the share of men employed without officially registering their employment is higher than that of women in both our age groups (15-19 (60.0%) and 20-24 years (77.5%)).

3.2 Analysis of the impact of the working schedule on the stability of rural employment

The employees' working schedule is one of the important features of the youth rural employment. Part-time rural employment or a shorter working week is a sign of instability of the employment relationship and the risks of losing the skills or being fired. The employers may ask there employees to work extra hours (more than 40 hours per week) which means that the worker is unprotected from the employer's unlawful demands. For a fear of losing the job the employee has to accept the requests of there employers to work overtime. Our data indicates that the fixed contract workers and those working without the official registration often work either less than 20 hours or more than 40 hours a week, irrespective of age (Table 3).

Table 3. Distribution of young rural respondents by working schedule depending on the type of employment contract (% of the respondents)

	Indefinite employment contract		Fixed-term employment contract		Without official registration	
	15-19	20-24	15-19	20-24	15-19	20-24
Up to 20 hours	5.8	1.2	11.8	10.8	10.0	7.8
21-40 hours	75.0	71.9	58.8	58.1	60.0	46.1
More than 41 hours	19.2	26.9	29.4	31.2	30.0	46.1

Source: own processing based on the results of the Comprehensive Monitoring…, 2014.

The standard workweek of 40 hours is to a larger extent typical of those young people who are employed on the basis of indefinite employment contracts (75.0% and 71.9% of those aged 15-19 and 20-24 years, respectively). Working up to 40 hours per week are 58.8% of those aged 15-19 years and 58.1% of those aged 20-24 years employed under fixed-term employment contracts. Among the young people employed without official registration of their employment, working up to 40 hours per week are about 60.0% and 46.1% of those aged 15-19 and 20-24 years, respectively. The share of those working overtime (more than 41 hours per week) is higher among the persons employed on the basis of fixed-term employment contracts or without official registration. For instance, working overtime are 29.4% and 31.2% of those respectively aged 15-19 and 20-24 years employed under fixed-term employment contracts and 30.0% and 46.1% of those aged 15-19 and 20-24 years, respectively, employed without official registration of their employment. An important feature of the working schedule is employment on weekends and holidays.

In Russia the labor legislation establishes a 40-hour working week with two days off (Saturday and Sunday). The flexible working schedule is very common in the trade and catering industries. This type of a working schedule is typical of the sectors that attract a considerable part of the youth labor. The 46.7% of the young people aged 20-24 years and 67.3% of those aged 15-19 years are employed on the basis of indefinite employment contracts and have flexible working schedules. As for the young people employed under fixed-term employment contracts, working on weekends and holidays is a contractual obligation for 47.1% and 43.0% of those of 15-19 and 20-24 years of age, respectively. Young people employed on the basis of fixed-term contracts more often have to work on weekends and holidays for reasons not provided for in their contracts. To illustrate this, working on weekends and holidays for other reasons are 11.5% of those aged 15-19 years and 16.1% of those aged 20-24 years employed on the basis of indefinite employment contracts, while for the young people aged 15-19 and 20-24 years employed under fixed-term contracts the respective figures are 23.5% and 20.4%.

3.3 The degree of youth skills mismatch

In the OECD countries, a part of the young people is too skilled for their jobs or performs working duties that do not match the specialty they have acquired (OECD Employment …., 2014). As a result of this disparity, there exist considerable wage differences compared to those whose working duties do match their specialty (Promoting better..., 2014). The skills mismatch in the rural labour market is relevant for Russian regions. These mismatches are due to the low demand for the professions available on the local labor market or poor compatability between the candidates‘ professional or personal qualities and the employers‘ requirements. The young people’s employment and professional preferences often change during their studies or after graduation. It should be noted that the process of young people’s professional self-determination not necessarily ends with the graduation from a university or college.

Some young people realize that they have chosen a wrong profession already in the course of studying. The monitoring shows that the working duties more often fully match the skills of the young people aged 20-24 years employed on the basis of indefinite employment contracts (39.2%), while for the people of the same age employed under fixed-term employment contracts the figure is 29.0%. The share of those aged 15-19 years experiencing skills mismatch is even higher – 75.0% of the young people employed on the basis of indefinite employment contracts and 82.4% of those employed under fixed-term employment contracts (Table 4).

Table 4. Distribution of young rural respondents by the degree of skills match depending on the type of employment contract (% of the respondents)

	Indefinite employment contract		Fixed-term employment contract		Without official registration	
	15-19	20-24	15-19	20-24	15-19	20-24
Full match	21.2	39.2	11.8	19.0	20.0	3.9
Partial match	3.8	11.1	5.9	12.9	3.3	6.9
Mismatch	75.0	49.7	82.4	58.1	76.7	89.2

Source: own processing based on the results of the Comprehensive Monitoring…, 2014.

The problem of skills mismatch is not that acute in the age group 20-24 years, although facing every second (49.7%) of the young people employed on the basis of indefinite employment contracts and 58.1% of the young people employed under fixed-term employment contracts. The situation is even worse for those who do not officially register their employment. The absolute majority of these people have to experience skills mismatch, i.e. 76.7% and 89.2% of the young respondents respectively aged 15-19 and 20-24 years. These disparities between the skills acquired and the jobs mismatching them can be to some extent overcome through additional training for a new profession.

Thus, 33.3% of the young people employed under indefinite employment contracts and 35.2% of those employed on the basis of fixed-term contracts have undergone special training. In the age group 15-19 years, the share of those who have undergone special training is lower, especially among the young people employed on the basis of fixed-term employment contracts, the respective shares for those employed under indefinite and fixed-term contracts constituting 23.1% and just 14.3%. The shares of those who have undergone special training among the young people employed without official registration are insignificant, irrespective of the age (just 4.3% and 4.4% of those aged 15-19 and 20-24 years, respectively). Although employers are interested in staff development, not all of them wish to spend money on setting up corporate retraining systems, as the costs seem too high. For employers, the costs of hiring personnel not only include the costs of wages, but also the costs of training, retraining and special training of the personnel to meet the needs and profile of the company. However, employers are reluctant to provide such training for their young workers, as the latter tend to often change jobs.

4 Conclusion

Our findings suggest that young people have to accept part-time employment with late, shadow or in-kind wages because of the lack of working experience. Violation of contractual obligations and non-transparency of employment conditions are often a feature of youth employment. Young people of any age prefer to be employed by enterprises and organizations with the status of a legal entity, since they offer greater social security. However, in reality, some rural young people have to accept employment from individual entrepreneurs, assuming the risk of failure to comply with the labor legislation and violation of contractual provisions. It is alarming that every seventh person of 15-24 years of age is employed on the basis

of a verbal agreement, without any official registration. Most of the employed of 15-24 years of age are experiencing a skills mismatch, especially those employed under fixed-term employment contracts and to a larger extent those who are employed without official registration.

Diversifying the structure of rural employment through the development of non-agricultural economic activity will increase the number of jobs for young people with decent conditions and wages. The modern development requires a transition from a model of domination of agriculture in rural employment structure to the model of multifunctional and diversified rural economy. The improvement of the quality of human capital is an important factor in the growth of competitiveness of agri-food sector and the efficiency of employment.

Willingness to undergo additional training, which reflects the need for continuing education as a style of working life, is no less important for forming an efficient employment structure. Our findings suggest that there is a need for additional public employment policy instruments to provide new opportunities in the spheres of education and youth employment and to improve the access to high-tech jobs. These measures are expected to increase the participation of young people in the life of the regional community and contribute to the growth of mutual solidarity between the community and the young people.

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Impact of underlying psychometric attitudes on fish consumption: an exploratory research in Modern Metropolitan Lima, Peru

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Abstract: Even though Peruvian fishing industry is a key component of its economy, fish consumption is under the appropriate dietary intake levels. Given the current status, it is relevant to identify the factors that propitiate higher fish consumption levels. Thus, this research assessed the effects of underlying psychometric attitudes, such as fish consumption experience and taste preferences among others, over the probability of eating fish at the recommended level of twice a week in Modern Metropolitan Lima, Peru. A latent-variable-based instrument on validated 5 points Likert scales was applied to a stratified random sample of 159 Modern Metropolitan Lima fish consumers. An ordered logistic regression was used to analyze the marginal probabilities of Peruvian individuals that consume fish twice a week or less. The results showed that underlying psychometric variables as taste preferences and past experience contributed significantly to the probability of eating fish at a recommended level. Contrarily, it was found that perceived health benefits of eating fish, and demographic control variables did not have any impact on fish consumption frequency. Outcomes may have insightful implications on promotion, marketing and sales of fish in Peru, particularly to the "positive" fish consumers, who consume fish more frequently in Modern Metropolitan Lima.

Key words: consumer behavior; fish consumption; ordered logistic regression; Peru

JEL classification: C25, Q18, Q22

1 Introduction

Peru's fishing industry has historically been a key component of the country's economy (Evans and Tveteras, 2011). The total contribution of the marine fisheries sector to the Peruvian economy was estimated to be $32 billion USD for 2009- this being a conservative estimate- (Christensen et al, 2014). Furthermore, Peruvian marine fisheries generate economic and social benefits through processing, distribution and consumption (Christensen et al, 2014) positioning Peru as the second ranking fishing country in the world after China in terms of capture volumes (Sánchez Durand and Gallo Seminario, 2009). The Peruvian domestic market of fish is largely composed by fresh fish because of the coastal connectivity, covering around 30% of the national market (Del Carpio and Vila, 2010), and being the fresh sector representative of more than 50% of consumption compared to the processed one (Fréon et al, 2014).

Even though Lima is a coastal city, its fish consumption is low, as this phenomenon happens in other coastal cultures (Can et al, 2015). Actual Peruvian fish consumption generally not even comes close to the recommendations to eat fish twice a week (Birch, Lawley and Hamblin, 2012; Verbeke, Vermeir and Brunso, 2007). The annual per capita edible fish consumption in Peru was estimated to be 11.2 kg (up to 22.5 kg in whole fish equivalents) in 2011 (Avadí and Fréon, 2015) which is just above the average per capita European fish consumption of 20.5 kg (Verbeke and Vackier, 2005). The low frequency of fish consumption in Peru could be due to different barriers, for instance, supply related, as the lack of cold chain (FAO, 2007), logistical operations and optimal sanitary conditions (Freón et al, 2014). Additionally, demand related barriers such as lack of habit and difficulty of preparation

(Mitterer-Daltoé et al, 2013), beliefs of expensiveness (Verbeke and Vackier, 2005), and unpleasant physical properties (Olsen, 2004) may deter frequent fish consumption.

Different factors beyond sensorial characteristics have become fairly influencing in consumer's dietary and food choices (Carrillo et al, 2010) and their analysis have been directed to explain the consumer behavior towards fish (Mitterer-Daltoé et al, 2013; Verbeke and Vackier, 2005). Several authors have found that taste preferences and positive attitudes are related with higher levels of fish consumption (Drewnowski and Darmon, 2005; Olsen, 2003; Lennernäs et al, 1997). Furthermore, past-experience in consumption has been found directly related with fish consumption frequency or the intention to eat it (Mitterer-Daltoe et al, 2013; Verbeke and Vackier, 2005). Given the current low frequency of fish consumption and the importance of fish in the dietary habits, it is critical to identify the factors that propitiate adequate fish consumption levels. Thus, the primary objective of this research is to reveal if underlying psychometric variables as for instance taste and past experience of fish consumption among others, affect the probability of eating fish at the recommended level of twice a week in Modern Metropolitan Lima, Peru.

2 Materials and Methods

Metropolitan Lima was chosen as the study site of this research as is the fifth most populated city in Latin America and their individuals contribute around US$ 3,503 of per capita GDP (Del Carpio and Vila, 2010). Accordingly, the survey was taken in supermarkets and fish markets between August and October 2015 in the area of Modern Metropolitan Lima as it presents predominately A and B socio-economic levels (Ipsos Apoyo, 2011). A stratified sampling procedure was undertaken considering fish markets and fish shoppers. At the consumer's level, a systematic random sampling was applied. The sample consisted of 159 consumers who currently consume fish at any frequency. The associated error of the sample was 7.8%, considering p=q=0.5, a confidence interval of 95% and unknown fish consumers population size.

The structured questionnaire was administered with the support of students from the Universidad del Pacífico in Lima, Peru. The instrument presented three different sets of Likert scale items ranged from 1 (strongly disagree) to 5 (strongly agree). The papers from which the scales belong are presented at the first column in table 1. Additionally, frequency of fish consumption was measured on the scale "less than weekly", "weekly" and "twice or more times a week" based on the recommendation of fish consumption of Birch, Lawley and Hamblin (2012). Consumer characteristics such as age, sex and socio-economic level were also considered as the literature has found significant differences with respect to fish consumption frequencies (Can et al, 2015; Lennernäs et al, 1997). Lastly, consumers where asked to qualify their perception as positively or negatively towards fish.

The Likert scales were originally written in English and then translated to Spanish. In addition, two bilingual professionals, one in the linguistic field, and the other, expert on fish issues, cooperated for the back translation. Psychometric analysis such as construct validity, via Principal Components Analysis (PCA), and reliability of scales, via Cronbach's alpha, was assessed using SPSS 22.0. The factor scores were obtained using a non-refined method, averaging the items' score by factors (DiStefano et al, 2009). This approach was chosen because using regression based scores (e.g. Anderson-Rubin scores) "is inappropriate and can lead to faulty analysis and recommendations" (Zuccaro, 2007, pp. 511). An ordered logistical regression was used to assess the marginal probabilities of individuals to consume less than the usual and at the recommended level of fish consumption (twice a week). This model was chosen because the dependent variable has three ordered outcomes and it presented a non-calculable continuous latent variable that was measured through a categorical ordered variable. Thus, there were no assumptions about the distribution

of the independent variables (Borooah, 2001). The logistical link function was chosen in order to facilitate the interpretation of the coefficients as log-odds. To assess the goodness-of-fit of the model, the variables were introduced by steps and the variations of the Log-Likelihood were checked for significant changes using the χ^2 statistic. Additionally, the test of proportionality of odds across response categories was tested. Finally, the Variance-Inflation-Factor (VIF) was checked using the variables included in the model. The ordered logistical regression model was executed using STATA 13.

3 Results and Discussion

The constructs validity was assessed through a Principal Component Analysis with a Varimax rotation. The results showed that the test criteria reached fulfilling levels. The Kayser-Meyer-Olkin statistic was over 0.8 assuring an adequate sampling adequacy. The Bartlett's sphericity test was highly significant, which means that the correlation matrix of the items was different from the identity. Furthermore, the trace of the anti-image correlation matrix showed values greater than 0.7, which implied a good sampling adequacy of each item. Three components presented eigenvalues greater than 1, reason why they were retained. After the Varimax orthogonal rotation, the three components presented well differentiated loading for each factor and were greater than 0.6. All of the factors presented Cronbach's alphas greater than 0.7 indicating an adequate level of reliability. Moreover, all item-rest correlation were positive inside each construct. The following table (Table 1) summarized the previous analysis.

Table 1. Varimax rotated component matrix and reliability of scales

Origin of the items	Items in the instrument	Components		
		Past experience	Taste	Health
Verbeke and Vackier (2005)	I know many fish species to prepare	**0.90**	0.07	0.07
	I have reasonable knowledge about fish	**0.90**	0.07	0.15
	I am very informed about fish	**0.85**	0.15	0.15
	Fish preparations are familiar to me	**0.79**	0.32	0.11
Carrillo et al. (2011); Sveinsdóttir et al. (2009)	I have a positive attitude towards fish taste	0.15	**0.72**	0.03
	I'm very pleased with a meal that has fish	0.23	**0.71**	0.04
	I appreciate eating fish	-0.04	**0.68**	0.13
	I enjoy eating fish	0.22	**0.74**	0.21
Carrillo et al. (2011); Verbeke, Vermeir & Brunso (2007)	Eating fish reduces the risk of having cancer	0.03	0.08	**0.65**
	Eating fish stimulates bone development	0.17	0.06	**0.66**
	Eating fish contributes to cerebral development	0.05	0.05	**0.73**
	By eating fish, I extend my life expectancy	0.31	0	**0.73**
	Fish is good for my nails, teeth, skin, hair, etc.	-0.02	0.29	**0.67**
	Eigenvalues (Varimax rotated)	3.23	2.27	2.5
	% of variance explained	21.80%	16.70%	18.70%
	Cronbach's α	**0.91**	**0.72**	**0.74**

KMO: 0.827; Bartlett's test χ^2d.f.(78):822,6 (<0.001); Values in the trace of the anti-image correlation matrix >0.7

Own elaboration, 2015

Past experience is a substantive predictor of later behavior because past behavior was a reasoned action (Vermeir and Verbeke, 2008). Foxall, et. al. (1998) proved that taste is a main reason for purchasing fish. Finally, healthiness is also one of the key factors in consumer perceptions (Niva, 2007). These three latent variables were included in the ordered logistic regression model which presents the following structure:

$$Y^* = \sum_{k=1}^{k} \beta_k X_{ki} + \varepsilon_i = Z_i + \varepsilon_i \quad \textbf{(1)}$$

Where Y^* represents the continuous latent dependent variable, β_k the log-odds coefficients for each variable, X_{ki} represents the included variables in the model, and ε_i the random disturbance term with a standard logistic distribution with mean 0 and variance 3.29. The value of the observed Y categorical variable depends on the latent Y^* variable, which must surpass certain thresholds α_i:

$$Y = 1\ if\ Y^* \leq\ \alpha_1 \rightarrow P(Y = 1) = \frac{1}{1 - \exp(Z_i - \alpha_1)}$$
$$Y = 2\ if\ \alpha_1\ \leq\ Y^* \leq\ \alpha_2 \rightarrow \frac{1}{1 - \exp(Z_i - \alpha_2)} - \frac{1}{1 - \exp(Z_i - \alpha_1)} \quad \textbf{(2)}$$
$$Y = 3\ if\ Y^* \geq\ \alpha_2 \rightarrow P(Y = 3) = 1 - \frac{1}{1 - \exp(Z_i - \alpha_2)}$$

The frequency of fish consumption was used as a dependent categorical variable. The three latent variables were included to measure the individual impact of health attributes, taste preferences and past experience at eating fish. Then, two dummy variables which indicated if the usual place of consumption was at home or eating out, and also, if the individual has a positive or negative perception towards fish were also included in the model. It was expected, for instance, that income level, measured through the district, among other variables, would had an effect on fish consumption (Can et al, 2015). Thus, age, sex and high socioeconomic level were used as control variables. Table 2 showed the summary statistics of the variables included in the ordered logistic regression model. Later, table 3 showed the regression model results. The goodness-of-fit of the model was assessed through the Likelihood-Ratio χ^2 test which was highly significant (<0.001). The assumption of proportionality of odds across response categories was not significant (sig: 0.61) which ensures that the coefficients hold the same across categories and revealed that the model was correctly justified.

The reasons for particular food choices are complex and diverse in general, being food consumption influenced by many interrelating factors as for instance, food quality aspects (e.g. taste), characteristics of the individual (e.g., attitudes, perceptions, socio-economic characteristics, etc.), etc. (Batzios et al, 2005). Olsen (2004) stated that intention to purchase a fish product is mostly driven by health. Nonetheless, in our study we found that the health benefits did not significantly influence to a higher frequency on fish consumption in Modern Metropolitan consumers (p>0.10). Related to sensorial aspects, research by Lennernäs et al (1997) had highlighted the role of taste, while Drewnowski and Darmon (2005) considered the effects of taste on food choices (O´Neill, Hess and Campbell, 2014). We found that a higher positive attitude and perception on taste preferences of fish had a positive effect over eating fish at higher frequencies (p<0.10). Mitterer-Daltoé et. al (2013) determined that habit, as a variable measure of the past experience construct, was an important discriminating variable and a good explanatory factor in the consumption of fish. In our model, outcomes indicated that past experience variable (p<0.05) was significant and positively influential on the frequency of eating fish. Namely, when a person has experience over fish (past experience), the chances of increasing the frequency of consumption were higher. In addition, the possibility of eating fish at the recommended level increased when people had positive ideas related to fish, such as highly nutritious, availability, convenience, etc. which may account for substantial differences in fish consumption behavior (Pieniak et al, 2008). Regarding the usual place of consumption, people that were used to eat fish at home had higher probabilities of getting an adequate (higher) level of fish consumption. Finally, we found that the control variables (age, sex and socio-economic level) did not present a significant relationship with higher or lower fish consumption frequency (p>0.10).

Table 2. Statistics of the variables in the model

Variable	Min	Max	Mean (SD)
Frequency of fish consumption	1	3	2.0 (0.76)
1- Less than weekly (28%)			
2- Once a week (43%)			
3- Twice or more (29%)			
Independent variables			
Health	1	5	3.6 (0.67)
Taste	1.5	5	4.2 (0.66)
Past experience	1	5	3.2 (1.01)
Main consumption in house	0	1	0.6 (0.49)
Positive ideas towards fish	0	1	0.7 (0.44)
Control variables			
Age	19	84	43.8 (15.2)
Female	0	1	0.8 (0.37)
High socioeconomic level	0	1	0.5 (0.50)

Own elaboration, 2015

Table 3. Ordered logistic regression model

Fish consumption frequency (dependent)			
	B	(SE)	Sig.
Health	0.09	(0.28)	0.743
Taste	**0.56**	(0.31)	**0.071**$^{+}$
Past experience	**0.50**	(0.19)	**0.009****
Main consumption at home	**1.19**	(0.36)	**0.001****
Positive ideas towards fish	**0.89**	(0.41)	**0.032***
Age	0.02	(0.01)	0.124
Female	-0.29	(0.45)	0.523
High socioeconomic level	-0.26	(0.35)	0.463
Ancillary parameters			
α_1	4.80	(1.38)	
α_2	7.18	(1.46)	

LL: -127.14; LR $\chi^2(8)$: 46.14 (Sig. <0.001.)

Approx. LR test of proportionality of odds across response categories: $\chi^2(8)$: 6.36 (Sig. 0.61)

Mean VIF: 1.18; $^{+}$ p<0.1, *p<0.05 ,**p<0.01

Own elaboration, 2015

To clearly illustrate the results presented above, we used the ancillary parameters and the significantly different from zero parameters, to determine the probability of consumers to be classified into the category 1 (less than weekly), 2 (once a week) or 3 (twice or more). Thus, we depicted two arbitrary, but illustrative, types of consumers: First, consumer 1, who presented the highest ratings in taste preferences and past experience, usually consumed fish in-house and had a positive attitude and perception towards it. Second, consumer 2, who presented the lowest score on taste preferences and past experience. Moreover, the latter usually consume fish at restaurants and had a negative perception towards fish. Using equation (1) and (2) we found Z_i values, which showed the probability of belonging to each ordered category. Therefore, consumer 1, who had a "positive" attitude towards fish, had an approximate 7% of eating fish less than weekly, 38% chances of eating fish weekly, and an associated 55% probability of eating fish more than weekly. On the other hand, consumer 2, who had an overall "negative" attitude towards fish, had a 97% probability of eating fish less than weekly, 3% odds of eating weekly and, due to rounding, almost 0% chances of eating fish more than weekly. Thus, "positive" attitude fish consumer should be the target fish consumer in Modern Metropolitan Lima, as the probability of eating more than the recommended level is considerably higher than the "negative" attitude fish consumer.

Certainly, fish consumption traditions, ideas as tastefulness or convenience among others, and habits as past experience account for a higher frequency of fish intake (Pieniak et al, 2008). In this research, underlying variables as taste, past experience, fish consumption at home and having positive ideas towards fish showed a positive influence on the fish consumption frequency in Modern Metropolitan Lima. Particular emphasis should be on communicating benefits of consuming fish more than twice per week to the Modern Metropolitan Lima target population, mainly to the "positive" fish consumers, who consume fish more than the recommended level, to make information meaningful, useful and efficient. Trends and opportunities, such as the the actual Peruvian gastronomy boom, should be exploited to promote adequate levels of fish intake: renowned national chefs promoting fish consumption, radio and television campaings about fish ease of preparation and/or tastefullness, and billboards presenting families eating at home fish-based dishes. These promotion activities should be alligned with the objective of promoting positive

attitudes toward fish consumption. Further research may include the addition of other fish consumption factors, as for instance situational determinants among others. Furthermore, the study sample size should be expanded, not only to other districts within Metropolitan Lima but also to farther coastal areas, which may provide further insight of the Coastal Peruvian fish consumption as a whole.

4 Conclusion

Even though Peruvian fishing industry is a key component of its economy, fish consumption is very low. An ordered logistic regression was used to analyze the marginal probabilities of Peruvian individuals that consume fish twice a week or less. Underlying psychometric variables as taste, past experience, fish consumption at home and having positive ideas towards fish influence positively on the fish consumption frequency in Modern Metropolitan Lima. On the other hand, it was found that the perceived health benefits of eating fish, and also, the demographic control variables did not have any impact on fish consumption frequency. These results may have important implications on production decisions, sales and marketing for the promotion of fish in Lima, especially to the "positive" fish consumers, who consume the recommended twice per week level of fish consumption.

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The economic situation of organic farms (in relation to conventional farms) in Poland

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Abstract: The specificity of agricultural production is determined primarily by close relation to the natural environment. Policy measures for organic farming is implemented in order to increase environmental awareness and promote environmentally friendly agricultural production methods. After Poland's accession to the EU the number of organic farms in our country has grown over 11-fold. When analyzing the effectiveness of agricultural policy it is essential to assess the economic situation of organic farms in Poland. In order to analyze the economic position of analyzed farms, reference was made to the situation of conventional farms. A comparative analysis of organic and conventional farms shown that organic farms generated lower revenue than conventional farms. The results show that functioning of organic agriculture in Poland is closely linked to additional subsidies for organic farming and it is stimulated by CAP support. Organic production is strongly dependent on the system of additional payments provided by the agricultural policy.

Key words: organic agriculture, organic farms, agricultural production, Common Agricultural Policy, subsidies, Poland, FADN

JEL classification: O13, Q00, Q18

1 Introduction

Agriculture is the sector of the national economy, which basic function is to provide agricultural produce yielded by plant cultivation and animal rearing. The specificity of agricultural production is determined primarily by its close relation to the natural environment. The expansive model of world economies has disrupted the natural environmental order. Excessive, uncontrolled human interference in the natural ecosystems has led to a situation, in which they have lost their natural sustainability (Baum, 2011). Local disruption of the environmental balance caused by inappropriate agricultural practices (e.g. nutrient imbalance, wrong plant protection practices, neglected ground water protection measures, pollutant emissions) have led to global consequences such as the greenhouse effect and climate change. Long-standing observation of temperatures in Poland is confirming climate warming (Zegar, 2011). "The foundation for the concept of sustainable development is provided by sustainability of the natural capital, which when depleted may limit economic growth" (Łuczka-Bakuła, 2007). Technological progress, having revolutionary character, contributed for systematic shortening of the product life cycle (Baum, 2011). It is increasing starts and the waste of the food, is extorting changes in the farming, often about character of the intensification of the production. In view of these consequences in Europe faced with the quantitative ceiling of food production and environmental barriers to productivity, attempts have been made to reorient the direction of agriculture (Woś and Zegar, 2002). This changing management of agriculture has led to the development of a model of sustainable development, combining not only economic (material) and social (human), but also environmental (natural) aspects. Sustainable development must meet the current needs without compromising the ability of future generations to satisfy their own needs (Our Common Future, 1987). The environmental aspects are considered particularly in the case of organic production methods (Sadowski, 2012). Organic agriculture applies various methods and principles, specified in detail in separate acts and legal regulations.

Environmental protection is an inherent element of the farming principles, but economic aspects play a fundamental and crucial role. When combining the micro-economic goal (maximizing income as a main objective function for farmers) with social expectations (care for the natural environment managed by farmers) we face contradictory purposes. Such a situation requires the policy of intervention in the functioning of economic entities – agricultural farms in this case. Policy measures for organic farming are implemented in order to enhance environmental awareness and promote environmentally friendly agricultural production methods. The aim is also to increase employment in rural areas (since it provides new jobs and ensures an additional source of income for farmers) and positively affect the development of the market for organic products.

When analyzing the effectiveness of agricultural policy it is essential to assess the economic situation of organic farms in Poland. This study is to present and compare the economic situation of organic farms. In order to analyze the economic standing of those farms, reference was made to the situation of conventional farms.

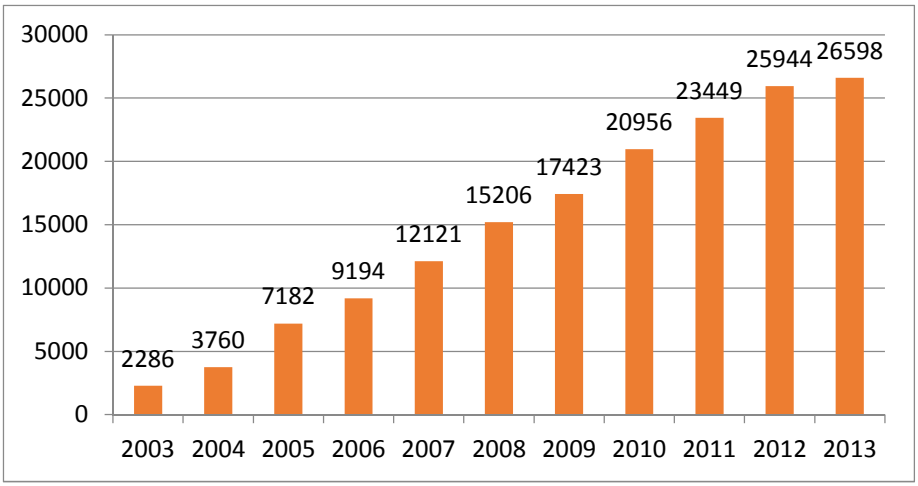
2 Materials and Methods

The survey was undertaken on the basis of the Farm Accountancy Data Network (a system for accountancy data collection from agricultural holdings) for organic and conventional farms in the years 2006 – 2012 (the latest available data). Farms were compared in terms of agricultural land area (6 groups). Values of total output and total input were put together in order to explain changes in family farm income. Then, the farm income was corrected by the value of environmental subsidies and converted to figures per labor input and utilized agricultural area. Finally the share of subsidies (total and environmental subsidies) in farm income was calculated. All the calculations were conducted following the methodology of the Polish FADN and presented as the results per farm (the only possible way for FADN data).

3 Results and Discussion

Organic farming production applies environmentally friendly management practices, promotes high biodiversity, is based on natural processes and ensures animal welfare (http://www.minrol.gov.pl). In this way a unique management system is formed for a production unit such as a farm. All guidelines which need to be required are specified in Polish (the Act of 25 June 2009 on organic agriculture) and EU regulations (Regulation of the European Council no. 834/2007 of 28 June 2007 and the Regulation of the Commission (EC) no. 889/2008 of 5 September 2008 on organic production and labelling of organic farming products in relation to organic production, labelling and control). Moreover, all agricultural producers are obliged to meet all requirements of every institution (in Poland there are 6) constituting the system of control and certification (Kociszewski, 2010). At the same time, producers receive special support, particularly in the form of subsidies financed within CAP as well as national funds. Since the very beginning of EU program implementation the modernization and restructuring of the food sector has focused not only on economic aspects, but on the environmental impact of the production process. The European market of the ecological food constitutes 54 per cent of the global market of organic production (Willer, 2009). As a result public awareness concerning organic agriculture in Poland has been growing and the number of farmers choosing organic production methods has been increasing. After Poland's accession to the EU the number of organic farms in our country has grown over 11-fold, from 2.3 thousand in 2003 to almost 26.6 thousand in 2013 (Fig. 1).

Figure 1. The number of organic farms



Source: www.minrol.gov.pl/Jakosc-zywnosci/Rolnictwo-ekologiczne/Rolnictwo-ekologiczne-w-Polsce – accessed on 8.02.2015

With the increasing number of farms the area of organically grown crops increased – from 61 thousand ha in 2003 to almost 670 thousand ha in 2013. The share of organic ally farmed areas was approx. 4% agriculturally utilized area in Poland (http://www.minrol.gov.pl/Jakosc-zywnosci/Rolnictwo-ekologiczne/Rolnictwo-ekologiczne-w-Polsce – accessed on 8.02.2015). Among other things, this increasing interest in organic agriculture was the reason for the verification of income levels in organic farms, which may have been the incentive for the transformation of conventional farms to organic production methods.

Table 1 presents information on the population included in this study. Farms were divided in terms of the size of their agriculturally utilized area. The dynamic changes in organic agriculture in Poland are reflected in the growing number of organic farms represented in FADN. In the tested FADN sample the largest number of organic farms is found for the range of 5 up to 20 ha utilized agricultural area. Still the mean size of organic farms was approx. 25 ha at the national mean of approx. 10 ha for conventional farms (Szeląg-Sikora and Cupiał 2014). This means that small farms account for a considerable proportion of these farms, while in the case of organic farms we may observe a certain aggregation of land in large farms. Kociszewski (2010) states that small farms represent a large potential for the development of organic farming, so fragmented agrarian structure is an advantage of the ecological agriculture production in Poland.

In view of legal requirements we may expect organic production to be connected with larger outlays of labor. Table 2 lists data on labor input (average per farm) in the investigated farms. It turns out that generally three are no differences in required labor outlays. Only in scarce case in individual size groups of farms greater labor outlays are recorded for organic farms. Typically in both production systems similar technological processes are used. While on organic farms there are fewer cultivation measures, since fertilizer application rates and certain procedures are limits, labor intensity of some processes is increased. It may generally be assumed that labor outlays are comparable in both systems.

Table 1. The population of farms in the Polish FADN in terms of their utilized agricultural area

Years	Utilized agricultural area (UAA)						
	Total	<5	5 - 10	10 - 20	20 - 30	30 - 50	>50
Organic farms							
2006	138	9	43	54	16	8	8
2007	195	11	58	73	22	12	19
2008	239	14	60	86	29	18	32
2009	253	9	54	95	29	25	41
2010	248	8	57	87	33	30	33
2011	270	5	59	94	36	36	40
2012	315	6	66	97	51	45	50
Conventional farms							
2006	11 825	675	1 758	3 653	2 198	1 939	1 602
2007	12 056	624	1 783	3 707	2 227	2 009	1 706
2008	12 305	598	1 621	3 616	2 282	2 183	2 005
2009	12 263	511	1 462	3 455	2 358	2 267	2 210
2010	11 004	424	1 275	3 068	2 137	2 106	1 994
2011	10 890	389	1 226	3 048	2 085	2 111	2 031
2012	10 909	371	1 157	3 032	2 082	2 157	2 110

Source: The author's study based on the standard results of the Polish FADN

Table 2. Labor input in analyzed farms (full-time paid employees per farm)

Years	Utilized agricultural area (UAA)						
	Total	<5	5 - 10	10 - 20	20 - 30	30 - 50	>50
Organic farms							
2006	1.6	-	1.8	2.0	1.8	-	-
2007	1.7	-	1.8	1.9	1.8	-	2.5
2008	1.9	-	1.9	2.0	1.9	1.8	2.3
2009	1.9	-	1.8	2.0	1.8	2.3	2.2
2010	1.9	-	1.6	1.9	1.7	2.0	2.5
2011	2.0	-	1.8	1.8	1.7	2.1	2.6
2012	1.9	-	1.7	1.8	1.7	2.4	2.4
Conventional farms							
2006	1.9	2.9	1.7	1.9	2.0	2.1	2.8
2007	2.0	2.8	1.7	1.8	2.0	2.1	2.8
2008	2.1	2.9	1.8	1.9	2.0	2.1	2.6
2009	2.0	2.9	1.8	1.8	2.0	2.1	2.5
2010	2.0	2.9	1.7	1.8	1.9	2.0	2.4
2011	2.0	3.1	1.7	1.9	1.9	2.1	2.5
2012	2.0	3.0	1.7	1.9	1.9	2.1	2.4

- data confidential due to statistical purposes

Source: The author's study based on the standard results of the Polish FADN

Apart from a comparison of labor costs total inputs in the analyzed farms were compared in the next stage of the study (tab. 3).

Table 3. Total inputs in analyzed farms

Years	Utilized agricultural area (UAA)						
	Total	<5	5 - 10	10 - 20	20 - 30	30 - 50	>50
Organic farms							
2006	38 261	-	28 880	44 067	43 877	-	-
2007	51 681	-	29 882	44 578	50 236	-	147 193
2008	64 402	-	31 365	48 978	56 469	72 033	170 696
2009	68 549	-	32 191	47 699	50 575	111 575	151 225
2010	75 330	-	29 342	43 179	51 647	104 897	236 332
2011	84 683	-	39 971	47 583	54 041	112 297	240 541
2012	95 681	-	36 925	49 262	56 351	119 897	281 614
Conventional farms							
2006	76 348	241 700	56 704	68 726	104 727	152 096	327 419
2007	133 849	268 547	62 437	74 797	118 447	175 162	356 906
2008	156 961	291 679	73 507	80 735	124 668	177 279	376 535
2009	160 343	289 650	81 028	77 909	123 629	176 597	364 186
2010	159 157	300 330	60 169	78 180	124 239	179 676	362 795
2011	240 368	401 881	86 156	116 678	183 590	271 424	545 091
2012	202 350	330 688	65 336	95 403	150 107	225 712	458 828

Source: The author's study based on the standard results of the Polish FADN

Conventional farms are characterized by markedly higher costs. In the compared farm size groups costs in conventional farms were higher by as much as 2.5 times. This results from the much greater range and higher application rates of means of production (fertilizers, pesticides, feed additives in animal nutrition). Organic production methods are costly, particularly in specialist production, but overall greater costs are generated by conventional production. This principle pertained to each size group of utilized agricultural area in each of the years of analysis. It may be observed that in the successive years the differences in costs are increasing. Despite the growing costs in organic farms the growth dynamics was greater in conventional farms. It may be assumed that financial support for farms provided by direct payments (growing in successive years after Poland's accession to the EU in accordance with the phasing-in principle) has facilitated capital-intensive increase in production, while it has been restricted by legal regulations in the case of organic production system.

The growing production intensity should be accompanied by the increasing value of production (tab. 4). This total value in the FADN system comprised the value of plant, animal and other production.

Table 4. Total output in analyzed farms

Years	Utilized agricultural area (UAA)						
	Total	<5	5 - 10	10 - 20	20 - 30	30 - 50	>50
Organic farms							
2006	49 808	-	36 028	60 059	52 243	-	-
2007	65 728	-	39 662	59 836	72 851	-	159 685
2008	69 677	-	39 288	56 434	57 010	80 144	167 842
2009	67 967	-	33 106	51 808	47 887	109 945	139 932
2010	83 723	-	33 003	54 191	58 239	105 771	254 625
2011	96 242	-	50 868	57 743	58 613	116 407	269 358
2012	115 911	-	43 507	60 962	57 072	126 801	368 302
Conventional farms							
2006	102 209	308 041	73 189	91 821	142 685	206 775	407 992
2007	183 498	342 020	82 405	100 360	161 819	239 789	498 105
2008	186 985	352 008	88 244	95 860	152 826	217 162	437 182
2009	183 087	373 871	98 005	88 893	143 688	205 726	405 442
2010	206 077	390 097	76 224	100 646	162 400	235 983	466 548
2011	240 368	401 881	86 156	116 678	183 590	271 424	545 091
2012	265 618	407 401	85 654	121 444	193 098	293 392	614 638

Source: The author's study based on the standard results of the Polish FADN

Very high outlays (reflected in total inputs) provide the total production value, which was much higher in conventional rather than organic farms. To a considerable extent this was the consequence of higher plant yields and higher animal productivity. Greater outlays, such as consumption of fertilizers, pesticides, fuel, feeds, etc., affected plant yields (e.g. nutrient supplementation, preventive pesticide application, greater resistance to weather conditions), improved health status of animals, reduced fattening time, greater milk yields. This disproportion is even greater when presented in terms of its dynamics. When referring the data from 2012 to those of 2006, generally the increase in production in organic farms was lower than in conventional farms. In terms of farm size measured in utilized agricultural area an exception was found for large (30-50 ha) and very large farms (over 50 ha). In the largest farms in the case of organic production system the value of production in 2012 in comparison to 2007 increased 2.5-fold, while in the analogous period in conventional farms this increase amounted to 20%. However, we need to remember in the last analyzed year the average production value in conventional arms was almost 2-fold bigger.

The most important element in comparative analysis of farms is connected with income from a family farm (tab. 5). Family farm income is composed of the value of total production minus indirect consumption, depreciation and costs of external production factors, while it is increased by the balance of direct payments and taxes on investments.

Table 5. Family farm income in analyzed farms (per farm)

Years	Utilized agricultural area (UAA)						
	Total	<5	5 - 10	10 - 20	20 - 30	30 - 50	>50
Organic farms							
2006	29482	-	19 396	35 089	37 666	-	-
2007	37756	-	20 213	30 548	49 156	-	105 804
2008	43494	-	21 405	28 677	37 783	56 370	122 665
2009	46344	-	13 878	26 010	33 962	57 818	137 982
2010	57825	-	18 161	36 911	46 443	61 021	189 946
2011	73817	-	34 692	38 541	52 480	72 274	235 016
2012	78492	-	21 632	38 255	37 900	75 333	275 851
Conventional farms							
2006	36 381	67 992	22 882	32 847	53 052	77 930	140 988
2007	66 836	74 591	25 166	33 899	55 954	82 429	196 160
2008	59 342	64 418	22 264	28 313	50 137	72 568	141 357
2009	57 646	89 573	25 523	25 069	44 035	64 165	137 661
2010	90 103	95 874	26 259	40 053	67 526	101 881	219 690
2011	102 243	82 176	27 828	46 077	74 770	115 482	245 897
2012	107 889	78 783	29 588	43 663	72 786	114 478	271 017

Source: The author's study based on the standard results of the Polish FADN

In view of the previously analyzed components we may see that the income from conventional farms was generally (overall) higher than that of organic farms. At the above-mentioned comparable labor outlays this means that profitability of labor was also lower.

In 2007 the income disparity (in absolute figures) between organic and conventional farming was almost 2-fold, while in recent years it stabilized at around 40%. When comparing income from conventional and organic farming in farms of different sizes we may observe a certain polarization. The smallest difference (although still to the disadvantage of organic farms) was recorded for small farms (approx. 10% higher income of conventional farms) and large farms (10%). In the case of medium-sized farms (20-50 ha) this difference reached 40%. This was the result of two previously analyzed factors. Medium-sized organic farms had much lower production values than comparable conventional farms, with the difference being almost 4-fold, while the difference in costs was smaller – approx. 2-fold. This means that the transformation of a medium-sized farm from the conventional to organic production system does not markedly reduce production costs, but it causes a decrease in production value.

Kacprzak and Maćkiewicz (2014) considered financial aid from EU funds is as the most important condition determining the development of organic farming. Kucińska et al (2008) conclude (but without proper prove) that "financial support for organic farming is necessary and extremely important". When analyzing FADN data we need to remember that income of a farm is composed of subsidies. This analysis showed that they are of key importance in the economics of organic farms (tab. 6). In all the years and for each of economic size group of farms their value was on average 60-80% greater. Generally in the years 2006-2012 the value of subsidies increased 2.5-fold for organic farms and 1.9-fold for conventional farms. This means that direct payments were becoming an increasingly important component of income particularly for organic farms. We may also observe a dependence proportional to farm size. The larger the farms, the higher the increase in subsidies. This may result from the fact that larger farms since the time of their transformation allocated an increasing proportion of farm area to the organic production system (in this way receiving increasingly

high financial support) or – encouraged by the first effects of payments expanded the scope of organic activity, e.g. transforming not only their plant, but also animal production.

Table 6. Total subsidies on current operations in analyzed farms (per farm)

Years	Utilized agricultural area (UAA)						
	Total	<5	5 - 10	10 - 20	20 - 30	30 - 50	>50
Organic farms							
2006	24 714	-	13 417	21 548	31 162	-	-
2007	26 687	-	11 985	17 800	25 763	-	107 081
2008	38 788	-	15 094	22 139	38 438	49 674	134 760
2009	48 507	-	14 433	23 320	39 977	62 735	159 750
2010	50 034	-	16 123	26 726	41 917	62 096	177 016
2011	61969	-	24 398	28 825	49 656	69 759	207 092
2012	58 856	-	16 009	28 066	39 814	70 030	191 575
Conventional farms							
2006	23 037	3 666	7 703	12 095	18 972	29 076	71 246
2007	19 318	2 629	6 566	9 699	14 485	21 076	63 892
2008	30 143	3 029	8 405	14 145	22 900	34 355	88 314
2009	35 515	3 143	9 290	15 131	25 099	36 953	101 852
2010	42 050	3 424	10 596	18 105	29 650	45 832	116 511
2011	44 550	3 064	10 809	19 827	31 747	48 632	118 869
2012	43 874	3 032	10 088	18 838	30 616	46 833	115 614

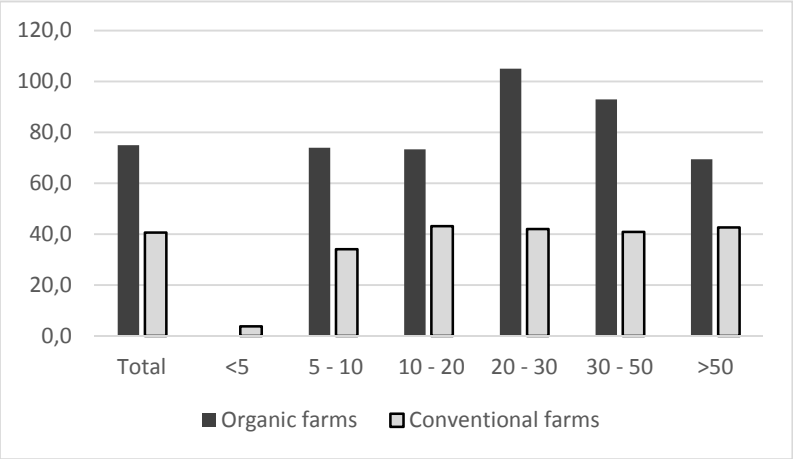
Source: The author's study based on the standard results of the Polish FADN

In view of the discussion concerning direct payments a key element in the assessment of the economic situation of organic farms is connected with the share of subsidies (support) in income (tables 5 and 6). While overall direct payments account for 50% income of farms in Poland, for organic farms it was almost 85%. In some years, e.g. 2009, all large farms (over 20 ha) were dependent on subsidies as providing their total income. Thus in the case of a decrease in production (whether the cause was a decrease in production volume or prices) subsidies to agriculture within the mechanisms of agricultural policy determine the financial standing of organic farms. The comprehensive analysis of the economic effects of farms (depending on the size of farms) shows that medium-sized farms of 20-50 ha by yielding lower production at a comparable level of costs as a consequence have lower income, of which almost 100% came in the form of direct payments.

Generally in the examined population the share of subsidies in farm income of organic farms was twice as bigger as in conventional farms (fig. 2).

Subsidies were a basic part of incomes of organic farms, irrespective of farm size. Compared to conventional farms in the relatively worst position were medium-sized farms (20-50 ha). In this case the income was generated almost entirely by subsidies. A positive aspect of policy support through subsidies is an income stabilization. However, that increases the risk of income variation due to changes in agricultural policy and higher dependence on the scale and forms of support.

Figure 2. The share of subsidies (on current operation) in farm income in 2012



Source: tables 5 and 6

4 Conclusion

The functioning of organic agriculture in Poland is closely linked to additional subsidies for organic farming and it is stimulated by CAP support. Organic production is strongly dependent on the system of additional payments provided by the agricultural policy (also Kociszewski (2010) confirm this result). Implementation of support for organic farming resulted, on the one hand, positive impact on the development of production, because of the growing number of households and the organic area. On the other hand, payments were one of the most important factors of development. In consequence organic farms are dependent on the sustainability and agricultural policy.

In Poland the transformation of a farm from the conventional system to agricultural production applying organic methods does not result in an improvement of economic effects. The value of production decreases and elimination of certain agricultural practices does not cause a reduction of total costs. As a consequence, income from conventional farms was higher in all the years in almost all groups of economic size (with only one exception: farms of 10-20 ha in 2007). For conventional production the worst economic situation was observed for medium-sized farms, i.e. those of 20-50 ha. Running organic production activity does not result in a marked reduction of production costs, while it decreased the value of production. As a result, productivity and profitability of organic farms in Poland were inferior to those of conventional farms. An important conclusion from this analysis is that subsidies are a major part in organic farms income. Despite the political support organic farmers are not better off in terms of farm household income.

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Social Responsibility in the Marketing Activities of Small and Medium Farms

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Abstract: The paper deals with the issue of social responsibility and its application within agricultural sector. Main goal of the paper is to reveal an evidence of social responsibility as specific marketing tool of small and medium enterprises (SMEs) in agricultural sector. Partial goals are: to identify key areas of social responsibility with regard to key stakeholders; to identify tools of social responsibility used in Czech agricultural firms. Primary data are collected via a qualitative exploratory research which is based on structured interview with representatives of SMEs. Preliminary outcomes shows that often manifestations of social responsibility belong to economic and social areas. Activities in environmental area do not exceed legal framework. Many of them emerge from nature of agricultural production. Social responsibility at SMEs is applied mostly as not actively planned activities. Moreover it was fined that these activities are not communicated to key stakeholders at all. As part of dealing with these issues, the following areas of research have been identified: 1. The expectations of stakeholders in agricultural firms; 2. Feasible approaches to Corporate Social Responsibility in the resort of agriculture, including methods of assessing social responsibility of agricultural firms; 3. The tools of social responsibility deployed by firms as a function of the firm's size, its production orientation and used farming method; 4. The position of the environmental pillar of social responsibility within the Triple Bottom Line; 5. Consumer's perception of concrete manifestations of social responsibility.

Key words: Corporate social responsibility, multifunctional agriculture, stakeholders, sustainable development, Triple Bottom Line, voluntariness

JEL classification: M14, O13, Q01

1 Introduction

Social responsibility is a current topic debated in all corners of our society. Since 1946, when the Fortune magazine conducted a simple poll among businessmen and managers, asking them whether they agreed or disagreed with the following statement (Bowen, 2013): *Businessmen were responsible for the consequences of their action in a sphere somewhat wider than that covered by their profit and loss statements*. In the very early stages, the emphasis was, besides the economic aspect, also on social dimension. Later on Caroll and Beiler (1975) included in their contemplations also other variables such as ethics, respecting laws and voluntariness. In the 1980s, a considerable influence on the development of social responsibility had the Freeman's (1980) publication *Strategic Management: A Stakeholder Approach*, in which the author expands the traditional perception of a shareholder i.e. someone whose only link to the firm is an economic interest, by entities such as employees, management and owners on the one hand, and suppliers, clients, close as well as more distant community, government authorities, political blocs and all kinds of business associations, but also competitors, on the other. Next turning point occurred in 1987 when the United Nations World Commission on Environment and Development published a study called *Our Common Future*, known as the Bruntland Report which among other things deals with the conditions of sustainable development in three major areas: economic, social and environmental (Mitchell, 1991). Elkington published in 1994 *Toward the Sustainable Corporation: Win-Win-Win Business Strategy for Sustainable Development*

(Elkington, 1994). In conjunction with the stakeholder theory has been created an approach known as the Triple Bottom Line (TBL), known as well as "3Ps" – Profit, People, Planet, which enables firms to focus on precisely defined activities in economic, social and environmental areas and more easily focus on concrete stakeholders. These activities usually go beyond the framework of legislative regulation. Intersection of "3Ps" is considered as a sustainability. The basic principles of Corporate Social Responsibility (CSR) are voluntariness, transparency, complexness, continuity and permanency. This approach corresponds to the conception of social responsibility as it is defined in the Green Paper (European Commission, 2001) and declared by various authors (Trnková, 2004; Dytrt et al., 2006; Kunz, 2012). The same attributes are basic pillars of sustainable agriculture as well (American Society of Agronomy, 1989; Moldan and Kolářová, 2003). Research studies dealing with sustainable development (Reid et al., 2005; Žalud, 2013; Frouz and Moldan, 2015) point out at the increasingly faster, more extensive and often irreversible changes in the ecosystems. A special attention is in these cases paid to the agricultural sector (so called agroecosystems) as a resort which has direct interaction with the environment. In the Czech conditions, the concept of sustainable agriculture with its multifunctional interpretation is under the umbrella of the European Union's Common Agricultural Policy (Adam et al., 2016). Current researches in the field are interested in finding of indicators which should be usable for assessment of CSR (Křístková and Ratinger, 2013; Hřebíček, Trenz and Vernerová, 2013). Other studies follow–up application of standards and methods for rating corporate responsibility e.g. GLOBALG.A.P, IDEA (Šánová, 2013; Konečná, 2014). Special social features of CSR at firms were investigated by Urbancová and Hlavsa (2014). Zagata (2014) provided the research on sustainable consumption. Not many researches up to now address awareness of CSR in agricultural sector. Also it is not mentioned link between CSR and firm`s marketing activities.

The paper deals with the issue of social responsibility and its application within the agricultural sector. Main goal of the paper is to reveal an evidence of social responsibility as specific marketing tool of small and medium enterprises in agricultural sector. Partial goals are: to identify key areas of social responsibility with regard to key stakeholders; to identify the tools of social responsibility used in Czech agricultural companies.

2 Materials and Methods

The paper has the character of a preliminary research, therefore the methodology generally emanates from the structure of an exploratory research. Key changes at CSR development were designated by analyzing of Czech and foreign scientific papers, expert studies, annual reports and websites. By comparing of sources mentioned above were set up main CSR aspects for primary research purposes.

Primary data were collected via a personal structured interview. Survey sheet consisted of eleven main questions. The questions used in questionnaire were open-ended, semi-closed and scaled. The purposive sampling technique was used to create a sample. Twenty five firm's representatives in total were interviewed. Recruited representatives come from firms with plant production, animal husbandry and combined production. According to size, companies belong to small (17) and medium (8) enterprises. According to manner of farming, conventional (20) and ecological (5) farms were included. The length of interview took up to one hour. The interview structure was based on the approach to three areas TBL. Specifically investigated were: the reasons for starting an agricultural business and the mission of entrepreneurship, transparency of the business, internal processes (relationship with employees, production and transfer of information), collaboration with stakeholders, and pros and cons of conventional and alternative agricultural production.

3 Results and Discussion

The presented results emerge from a content division of social responsibility – economic, social and environmental areas, whereby these activities go beyond the framework of legislative regulations, and their compliance is interlinked with parties having a stakeholders.

Economic pillar: Transparency in farming is achieved primarily through essential duties emanating from business and trade rules. In this case it is a legislative requirement and hence transparency is not a manifestation of social responsibility. This finding corresponds to earlier research works (Trnková, 2004). The activity constituting transparency in the CSR context is the implementation of internal control systems. It was found in medium enterprises mostly. As part of production processes has been most often mentioned compliance with the principles and rules of farming techniques, implementing the principles of welfare in animal breeding, saving resources, waste handling and determining the quantity of used fertilizers and pesticides. Underway are innovations in the use of technologies (reconstructions of production halls, farrowing pens – air cleaning technologies, rehabilitation of repopulation breeding, etc.). In respect of saving resources, it must be pointed out though that in the majority of cases this saving is perceived more as cost saving rather than in the sense of permanent sustainability of resources. An exception is in the factor soil, where the endeavour to prevent erosion is apparent (establishing groves).Waste handling in most cases does not breech the rules set forth by legislation. The use of fertilizers and pesticides is dictated by needs and often also by money restrictions, with only one firm saying that it used the services of an agro-chemist (cooperation of long-standing). Quality of production is accentuated by using labels like a “BIO – produkt ekologického zemědělství” as well as are used awards such as “Regionální potravina” and so on.

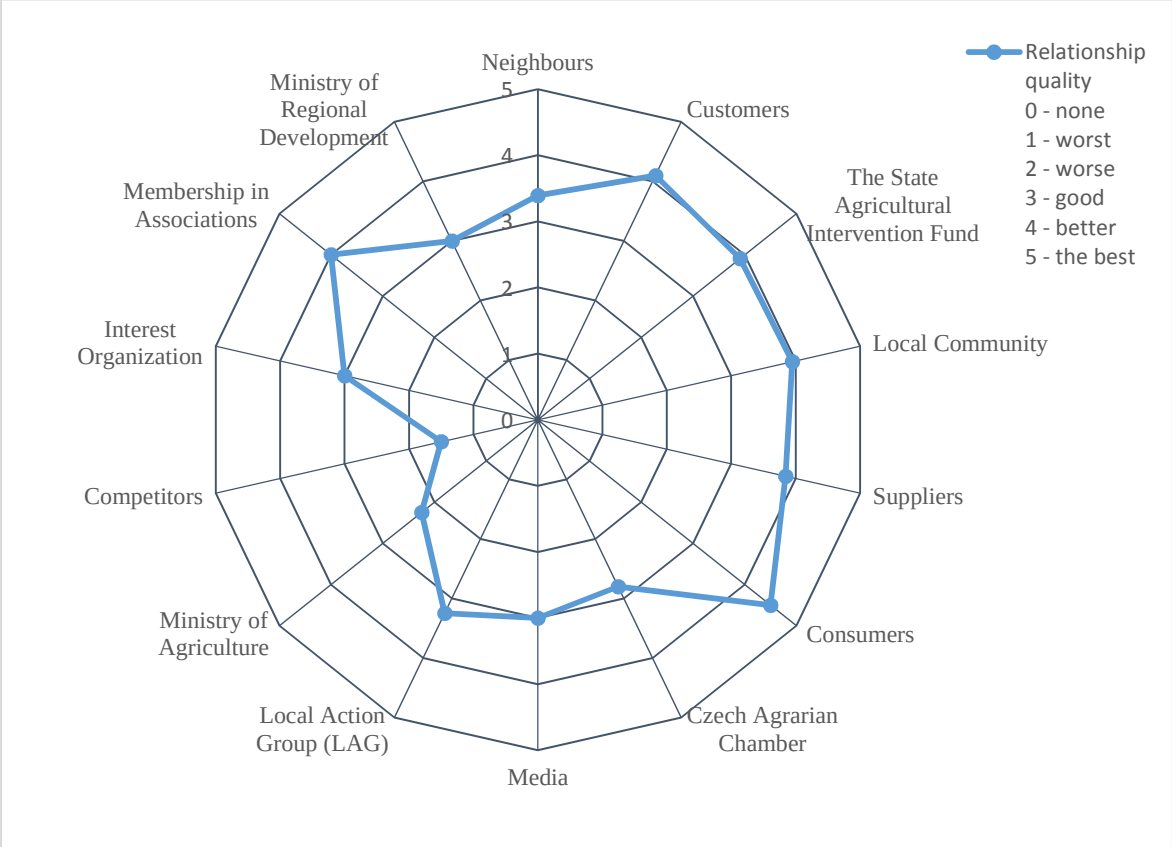
Social pillar: The link among the owners, managers and employees is mutual communication that has often an operational arrangement. As employee incentives are used benefits (working clothes, fringe benefits, provision of meals, transport home). On these tools can be claimed fulfilment of the social areas of social responsibility, but in many cases it is in fact an essential condition for securing production. Apparent here is the interlinking of the CSR social and economic pillars. Relationships with external stakeholders are miscellaneous. Eco-farmers stated that interested person from public were welcome to take a field trip to farm. In the case of small farms, regardless of farming methods, preferred is a direct contact with the consumer (products bought straight from the yard). Established has been a cooperation with technical agricultural schools (cooperating in research, organizing excursions for schools, giving lectures). Enterprises offered job careers to local inhabitants, including in auxiliary activities. Open days with an accompanying programme endorse the traditional character of the Czech rural countryside. Common manifestation is informing about the firm’s activities in local press, which confirms close links to the local community. For small and medium enterprises, operating locally is a typical phenomenon (Koubská, Hralová, 2006).

Environmental pillar: Approach to the environment has been described as responsible. This concerns for example the disposal of wastes in a way not to pollute the environment, making manure available for the use by other local farmers engaged in crop farming. A lot of attention is paid to the welfare of animals, while taking into account economic aspects. The notions of advantages and disadvantages of different farming methods are unequivocal in conventional farming (higher productivity vs. negative impacts on the environment) and ecological farming (lower burden upon the environment by fertilizers and pesticides vs. greater time demands and lower yields). Contradictory were responses concerning integrated farming (e.g. too many chemicals, unhealthy products, more

burden upon the environment, etc., vs. protection of the nature and human health), and hence an unanswered question remains the level of awareness about various forms of sustainable farming. Negatively were also commented more stringent requirements on environmental protection and reduced impacts on the environment, hence any activities beyond the requirements set by legislation cannot be expected. Even though, different scientific studies (Hřebíček, Trenz, and Vernerová, 2013; Zagata, 2014) have stated that agro-environmental provisions represent capability to gain consumer`s interest and possibility to improve economy of company.

Stakeholders: The relationship's quality is the reflection of cooperation with individual external stakeholders (Fig. 1).

Fig. 1 The quality of relationships with external stakeholders



Source: Own research, 2016

Respondents the most frequently stated as a key external stakeholders neighbors, costumers, the State Agricultural Intervention Fund, local community, suppliers and consumers. The important position in supplier-costumer relation corresponds with a stakeholder theory (Zonnenshain and Sheps, 2012). The cooperation with stakeholders mentioned above was evaluated as very good. Good relationships with suppliers and customers reflected long-term trade agreements. The pressure on implementing vertical social responsibility within the resort cannot be tracked down. According to the received responses, the monitored subjects did not meet specific requirements of their costumers even in a single TBL area, and they themselves did not demand the same from their suppliers, even though the CSR fundamentals expect it (BLF, 2008; Šánová, 2013). Small producers determined direct consumers as a key external stakeholder. It reflected a tendency to shorten distribution channel of "farmhouse made" products (products bought straight from the yard sale, farmers' markets, e-shop). From farmers' point of view the relationships with the local community and neighbors are very important. It can be interpreted as a consequence of the business subject`s local operation. Part of their relationship with the local community are technical

assistance in maintaining greenery, providing mechanization, etc. The State Agricultural Intervention Fund was appreciated as sources of information, consultancy and mediator of the subsidy policy. The Ministry of Agriculture and Czech Agrarian Chamber were mentioned as a less important sources of information. Nevertheless, inspections conducted by the Ministry of Agriculture are not viewed very positively. In relation to competitors, manifested is a rivalry in acquiring land due to the limited resources of this production factor.

In the issue concerning the farmer's motivation and mission is clearly manifested a relationship to both production and non-production functions of agriculture. From the point of view of the production function, stated is the production of food, although in some cases identified can be also the concept of securing food sufficiency. Among the non-production functions, most frequently mentioned is upkeep of the countryside, care of the soil and stabilization of rural areas. As is implied from the interviews, satisfied are also other functions such as cultural, recreational and touristic, or the development of settlements. The motives for engaging in agricultural business are retaining family traditions, self-realization in the rural environment, interest in the nature, etc. These motives also point out at the multifunction perception of agriculture (Act No. 252/1997, 2009; ÚZEI, 2011; Moudrý, Chovanec, Hudcová, 2015).

4 Conclusion

The conducted survey shows that the tools of social responsibility can be tracked down in agricultural firms too, but in the majority of cases these are not implemented as a concept. A number of the mentioned activities rise from the substance of agricultural activities itself, and from different farming techniques (e.g. ecological farming). We can talk about a similarity with the first stage of the development of CSR, when attention was paid mainly to economic and social issues, and when activities in the environmental area did not go beyond the limits set by legislation. Hence sustainability as an intersection of all three areas (TBL) is difficult to proof.

An unanswered question remains what is the real cause of using the tools of social responsibility (gradual standardization of CSR typical for matured societies, the method of differentiating oneself and achieving a competitive advantage, targeting specific consumer groups, internal conviction, etc.). As part of dealing with these issues, the following areas of research have been identified: 1. The expectations of stakeholders in agricultural firms; 2. Feasible approaches to CSR in the resort of agriculture, including methods of assessing social responsibility of agricultural firms; 3. The tools of social responsibility deployed by firms as a function of the firm's size, its production orientation and used farming method; 4. The position of the environmental pillar of social responsibility within the TBL; 5. Consumer's perception of concrete manifestations of social responsibility.

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Well-being indicators applied in local strategies

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Abstract: In the Czech Republic the initiative LEADER led to foundation of 180 Local Action Groups (LAG) which associate more than 6000 communities. The present goal of the LAGs is to create strategic development plans in compliance with the EU strategy 2020. Measuring disparities in the quality of life in the micro regions is important for the most effective allocation of both EU and national funding. The paper proposes the methodology describing implementation and exploitation of objective statistical data in the local strategies. The Czech Statistical Office (CZSO) provides a huge number of data that can be used for a definition of the well-being. The first problem solved was the reduction of the data which was followed by a calculation of 28 sub-indices and finally by the creation of three composite indicators (social, economic, and environmental) and one aggregate indicator. The paper confirms the possibility of using the composite indicators in combination with one-dimensional statistical analysis. The graphically expressed indicators in the software MONIQUA are combined with the exact values of the indicators and with other statistical data for discovery and interpretation of the local disparities.

Key words: Local Action Group, local strategy, well-being indicator, quality of life, disparities.

JEL classification: R11, D78, L38

1 Introduction

Politicians and regional decision makers need precise information on how people live and how they perceive their lives in order to enhance economic integration and promote social cohesion. Possible disparities in well-being evidenced among regions are currently entering a phase in which their quantification is increasingly important (Pukeliene and Starkauskiene, 2011; Maza and Villaverde, 2004; Ezcurra and Rodríguez-Pose, 2012; Ko and Choi, 2014).

Many of the micro-regional issues such as management of water resources would be better addressed through intervention at the regional level. The establishment of new regional policy is promoted by UN as well EU governments. Recent UN documents on the post-2015 and Sustainable Development Goal (SDG) agenda have identified regions as a key level of governance in ensuring the success of the new framework, and have started tracing the outline of the role regions could play (Maza and Villaverde, 2004; Petrakos, Rodríguez-Pose, and Rovolis, 2005; Hussain, 2014). Since 1990 the EU community initiatives LEADER and the LEADER approach have been commonly accepted as an innovative way for development of rural areas in the nations in European Union (Esparcia, Escribano, and Serrano, 2015; Beer 2014).

Looking for measures of quality of life a number of programs are being implemented in European countries. GDP has been the most widely used indicator of a region's economic performance but it is also highly criticized as a measure of people's well-being. GDP is a measure of production, but it ignores the quality of education, health care, the cultural and natural environment, social relations, personal safety, and decent housing (Moro et al, 2008; Ivaldi, Bonatti, and Soliani, 2014; Pittau, Zelli, and Gelman, 2010). Production of public goods connected with agriculture (Hálová et al, 2015) and availability of food (Hes et al, 2015) is also important.

Focusing on "Quality of Life" and "Well-being", the first term is mainly used when we speak at the level of individuals whilst the second one is more frequent when we deal with communities, localities, and societies. This research was focused on the Local Action Groups (LAG's).

There are many numbers of descriptive and objective indicators (data) stored in available databases for description and/or evaluation of the well-being of citizen living in LAG.

Long experience showed that not more than 10 or 15 variables can be included into interpretation. There is a need for a reduction of data without unacceptable reduction of the value of final information. That's why there is a need to create composite indicators having the sufficient informative level for inter-regional comparisons, being easy calculated and sufficiently intelligible to information users – even in case of evaluation of regional disparities

The well-being measures can discover the local disparities and thus, it should be included into the local strategies. Addressing the local disadvantages is a basis for proper allocation of sources and a foundation of a community led development.

Researchers working in the area of regional well-being measures (e.g. Cicerchia, 1996) distinguish three approaches to the development of indicators as indices of well-being, namely:

Top-Down: constructing a conceptual framework of some sort describing the understanding of well-being, including its constituents and determinants;

Bottom-Up: exploring the great variety of available data that might be relevant to most people's understanding of well-being;

Bidirectional: constructing and exploring somewhat simultaneously. One might characterize the Top-Down approach as theoretical, the Bottom-Up approach as empirical and the Bidirectional approach as pragmatic.

When creating the software MONIGUA we used the bidirectional approach. This software is able to provide graphical comparison and numerical data on the well-being in the local communities. The main outputs are three composite indicators (social, economical, and environmental) and one aggregate indicator (for more details see Dömeová and Jindrová, 2015).

The goal of this contribution is to demonstrate that the graphical and numerical outputs of the MONIQUA software give an overview of the local disparities in the framework of the LAG. It is possible and reasonable to combine the outputs of the MONIQUA software with other statistical data available on the community level. These statements are shown on a real example.

2 Materials and Methods

The composite indicators used in the MONIQUA software were developed in 4 stages. Each stage required specific decisions and choices of:

1. Analytical approach to verify the underlying dimensionality of selected basic indicators - dimensional analysis;
2. Weights to define the importance of each basic indicator to be aggregated – weighting criteria;
3. Aggregating technique to synthesize the aggregated indicators values into composite indicators – aggregating-over-indicators techniques;

4. Integration technique to synthesize composite indicators into one integral indicator - conceptual-over-indicators techniques.

The selection of variables has been carried out exploring the great deal of available data that might be relevant, in part through a careful analysis of the literature.

A great number of data affects the measurements and evaluation to a great extent. The problem can be solved by the use of the multiple correlation as a measure of how to predict a single variable using a linear function of a set of other variables.

The basic source of data for selection of basic indicators was statistics monitored by the Czech Statistical Office (CZSO) and regionally oriented databases CZSO, STEP MOS/MIS. The first selection identified 71 basic indicators which were published by CZSO in 2014 for the year 2013. The size of this statistical file ensures the relevance of the results and makes it possible to use multivariate statistical methods in processing and analysing the data.

The methodological approach is based on two statistical methods: Multiple correlation and Principal Component Analysis (for more details see Dömeová and Jindrová, 2015). The results of these methods are four types of the well-being indicators: economical, environmental, social, and total.

The indicators were exported into Excel. The comparison and depiction in graphs discovered the differences between the communities. Other statistical data were used for explanation of these differences.

3 Results and Discussion

The Local Action Group (LAG) Vyhlídky unites 40 communities. All the 4 indicators were calculated and depicted in the graph. The Table 1 contains data for 4 communities as an example.

The graph (Picture 1) and the values of the composite indicators (Table 1) show that there are remarkable differences between the communities. Not many communities reached the average value of 1; the values are usually around 0.5 and 1.5.

The standard deviation was calculated using data of all 40 communities – see Table 2.

The value for the total indicators for example says that the values in the interval

[1 + 0.23,1 – 0.23] can be taken as an approximate representative for 30% of the communities. In the formulation of the local strategy, it is necessary to focus on the places with significantly lower or higher values.

The similar process can be applied for the other composite indicators.

The values of indicators close to 2 or more should be tested from the point of the reliability of the input data. If the data are correct the values can be considered as extremes and can be left out or corrected.

Table 1. The composite indicators for 2013

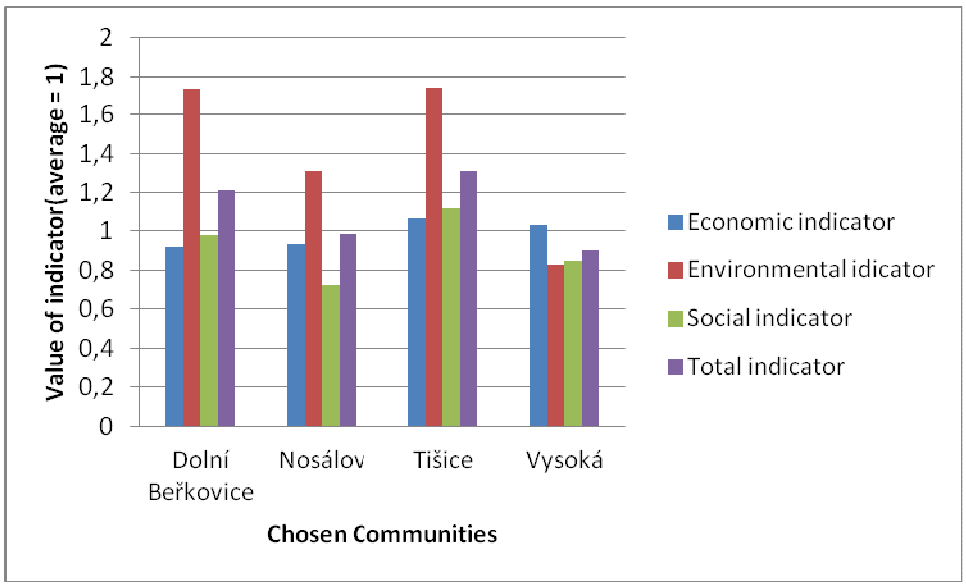
	Economic indicator	Environmental indicator	Social indicator	Total indicator
Dolní Beřkovice	0.923	1.738	0.978	1.213
Nosálov	0.934	1.309	0.723	0.989
Tišice	1.065	1.739	1.117	1.307
Vysoká	1.035	0.828	0.846	0.903

Source: own work, applied SW http://moniqua.pef.czu.cz/

The differences between the chosen communities are better seen in the graph (Fig. 1).The disparities have a reason and source.

The formal calculation using statistical methods discovered disparities in the primary data from CZSO. The same data should help to discover the reasons of the differences. The analytical work which discovers the reasons of the disparities is important for the local strategy formulation because it helps to formulate real, practical and adjusted goals.

Fig. 1. The composite indicators in graph



Source: own work, applied SW http://moniqua.pef.czu.cz/

Table 2. The standard deviation calculated for 40 communities of the LAG Vyhlídky

	Economic indicator	Environmental indicator	Social indicator	Total indicator
Standard deviation	0.18	0.26	0.23	0.47

Source: own work

All the communities in the example have positive evaluation. The value of the total indicator is between 0.9 and 1.3. The community Vysoká has lower value of the environmental indicator for the other three communities in the Table 1. What is the reason?

It arises from the statistical data that the area of arable land is remarkably higher and the emerging agriculture production is more intensive– see Table 3.

The presence of the agriculture production is connected with intensive transport and taxing of agriculture machines. Also the primary processing of agriculture commodities has bigger volume than in the other places in the comparison.

Table 3. The share of agriculture and arable land

	Total territory	Percentage of agriculture land	Percentage of arable land
Dolní Beřkovice	1251.8	59.1	63.4
Nosálov	1108.9	33.6	43.5
Tišice	1271.9	52.6	66.5
Vysoká	2842.6	66.0	73.9

Source: |CZSO, 2014

Very important reason of worse value of the environmental indicator is the missing sewerage and gas in the households see Table 4.

Table 4. The infrastructure in the communities

	Sewerage	Gas pipelines	Water pipelines
Dolní Beřkovice	1	1	1
Nosálov	1	1	1
Tišice	1	1	1
Vysoká	0	0	1

1 – exists 0 - missing

Source: Strategy of LAG Vyhlídky (2014)

The Local Strategy may propose to build the sewerage and the gas pipelines in the Vysoká. The priority may not be the highest because the other indicators are quite good and there might be communities with worse evaluation of the well-being. Nevertheless, the disparities should be detected (every year if possible) and the management of the LAG has to find the reasons and react. Searching for disparities and their causes should be repeated every year after the CSU published a new data. The SW Moniqua is able to recalculate the indicators and provide new overview. After a timeline is available it will be possible to evaluate the changes caused by strategic investments and other measures.

4 Conclusion

The evaluation of life on the level of the smallest communities is important for searching the disparities between the communities, groups of communities and regions. The practical importance is in discovering the negative factors which can be targets of the state, regional or other support. Because there is no exact way of evaluation of the quality of life and exact determination of local disparities, the article uses synthesis of several methods. The disparities were measured by multiple dimensional statistical methods that have led to construction of composite indicators. The composite indicators were combined with the statistical data from the CZSO and with the analysis originating from the real strategy of the chosen LAG.

The analysis points out the importance of considering synthetic well-being indicators alongside GDP statistics because these composite indicators show a high correlation and present the different trends in terms of regional convergence over time.

The decomposition analysis helps to identify the main drivers of regional inequalities in well-being, giving useful insights to policy makers.

The study was conducted for every year over the period 2013 –2015. Results convincingly show that the differences in well-being between villages are not necessarily in line with those based on GDP and stress a need to give more attention to quality-of-life features in public policy goals.

The research also highlighted the importance of spatial analysis carried out among three domains (economic, social, and environmental) as regional/local disparities demonstrate different values in the various well-being domains.

The analysis should help to identify the main drivers of local inequalities giving useful insights to policy makers to redesign public policies in order to achieve greater cohesion and more equitable standards of living in those ambits where local inequalities are wider.

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Impact of Large Scale Land Concessions on Small-holder Farmers and Indigenous Communities in Cambodia

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Abstract: The paper is a contribution to the ongoing discussion about effectiveness of large land deals in developing countries triggered by the 2008 economic and food price crises as well as ever-increasing global demand for biofuels. The aim of this paper is to evaluate the impact of large land deals on small-holder farmers and indigenous communities in Cambodia, a country that has become one of the most attractive countries in the global rush for land with estimated 65% of arable land granted as land concessions. The paper uses systematic review through meta-analysis to reexamine eight completed studies on 18 areas affected by land concessions. The results show that the impact of ELCs on small-holder farmers and indigenous communities – in short to medium term – is largely negative in terms of job opportunities, livelihoods and food security and unequivocal in terms of access to basic services.

Key words: land concessions, land grabbing, livelihoods, Cambodia.

JEL classification: Q15, R5, Q12, Q18

1 Introduction

The 2008 economic and food price crises as well as ever-increasing global demand for biofuels have triggered global rush for land by transnational corporations, international financial institutions, local business elites and other investors (De Schutter, 2011; Deininger, 2011; UNDESA; 2010). This paper is a contribution to the ongoing discussion about effectiveness of large land deals in developing countries and their impact on small-holder farmers and indigenous communities.

While there is an assumption of existence of idle, underutilized, fallow or vacant land in countries of large land deals, such land is often used by indigenous and other rural communities who do not possess land rights codified in 'modern' law and based on formal legal terms but rather on local customs and traditions (Borras and Franco, 2011; Schneider, 2011; Scoones et al., 2013; White et al., 2012; UNDESA, 2010).

Large scale investment in land often lacks transparency and adequate consultation process with affected farmers and communities; there is asymmetry in access to information and domestic legal framework is not always fully enforced and implemented (Cotula et al., 2009; Schneider, 2011; Subedi, 2014; UNHRC, 2012). These land concessions have potentially far-reaching and irreversible major consequences for both economies and livelihoods (Scoones et al., 2013); loss of land tenure deprives people of their livelihoods as a multidisciplinary World Bank team showed on 19 case studies from across the globe (Deininger, 2011). "The social and economic impacts on local communities could be disastrous, especially when combined with forced evictions, displacement without fair and just compensation or prior public consultation, involuntary resettlement or poorly planned relocation of people from their homes and farm lands" (Drbohlav and Hejkrlik, 2016). Major environmental problems, ranging from the destruction of rain forests with a severe impact on the biodiversity to the pollution of water resources, result from related land use changes (Ravanera and Gorra, 2011). At the same time, there is a range of empirical examples that when the land concessions are regulated to mitigate negative impacts and maximize

opportunities and projects are well-executed, they can generate large benefits which can be shared with local population (Borras et al., 2013; Deininger, 2011).

The focus of this paper is Cambodia, a country which has become one of the most attractive target countries for large-scale land investment with an estimated 65% of arable land given as land concessions and where 22% of the country's total area was in hand of private investors by the end of 2012 (Khiev, 2013; UNHRC, 2012). The aim of this paper is to evaluate the impact of such large land deals on small-holder farmers and indigenous communities. Two research questions were formulated: what is the short- to medium-term impact of Economic Land Concessions (ELCs) in Cambodia on 1) job opportunities, livelihoods and food security of small-holder farmers and indigenous communities and 2) their access to basic services? ELCs are a mechanism of the Cambodian government to grant state land for agricultural and industrial-agricultural exploitation (RGC, 2005).

2 Materials and Methods

While, number of ELCs in Cambodia has been studied and documented over the last decade, interpretation of findings in some of these studies might have been subject to personal or organizational biases. The paper uses systematic review through meta-analysis to reexamine eight completed studies on 18 areas affected by land concessions, subject them to statistical analysis (Aggregate Data approach, fixed effects model) and attempt to find commonalities.

These studies cover 15 districts in 10 provinces (out of total 25) from all parts of the country. Four studied ELCs were covered by two studies; for statistical analysis only one of the studies - the one with quantitative approach applied - was used, while the second one (or its respective part) was used for triangulation and discussion.

The studies include one original research conducted by the authors of this paper examining a rather infamous large-scale land concession in the Botum Sakor National Park in Cambodia´s Koh Kong province where the Royal Government of Cambodia (RGC) granted ELC of 45,100 hectares to the Chinese company Union Development Group (UDG). More than 1,400 families of 12 coastal communities were living on the land in question and most of them have been relocated to 10 new villages built inland, approximately 20 km from the coast (Drbohlav and Hejkrlik, 2016). The other papers considered for the systemic review have been known to the authors from the research work and related literature review conducted between September 2014 and January 2016.

In the Step 1 the papers were checked for their suitability for statistical analysis. Out of the eight papers only five were selected for further statistical analysis, while the remaining three (ADHOC, 2012; Haakansson et al., 2011; Borras and Franco, 2011), purely qualitative case studies, were used only for additional research synthesis and for discussion. The remaining four studies for the statistical analysis were:

- Economic Land Concession and its Impact on Local Livelihoods in Kampong Speu Province, Cambodia (Chev et al., 2011);
- Land Acquisition by Non-Local Actors and Consequences for Local Development: Impacts of Economic Land Concessions on the Livelihoods of Indigenous Communities in Northeast Provinces of Cambodia (Prachvuthy, 2011);
- Land Grabbing in Cambodia: Narratives, Mechanisms and Impacts (Neef and Touch, 2012) and
- What shall we do without our land? Land Grabs and Resistance in Rural Cambodia (Schneider, 2011).

In the Step 2, it was attempted to utilize aggregate data approach from the five papers which had data in total from 19 Focus Group Discussions (FGDs) with average 16 participants (only two studies consistently state breakdown by gender – 15 and 54% respectively), 71 key informant interviews (KIIs) with government officials and 314 in-depth household surveys which varied significantly in sampling methods. Unfortunately, not all the studies included evidence in their design that would cover all the research questions of this paper. The studies applied also additional methodologies for data collection such as village resources map, transect walk, time lines, seasonal calendar, community observations, geotagging, water testing, KIIs with NGO, academia and media representatives. These were used for additional non-statistical analysis in the Step 3 research synthesis.

The limitation of the applied methodology is that by comparing the findings of studies that used different methods, measurements, subjects, and designs, the results may be distorted. The paper is also working with the assumption of correctness of the data collected by these studies; assuming these were not altered if uncomfortable to the author but at most omitted.

3 Results and Discussion

The results indicate that the compensation to the affected small-holder farmers and indigenous communities for the land they lost vary significantly, usually depending on the type of the title/rights to the land. The monetary value of compensation was from 200 USD to 8,000 USD per ha depending on either documentation available or bargaining position (e.g. village chiefs receiving highest compensation). This is much higher than what was recorded by Borras and Franco (2011) in Omlaing commune of Kampong Speu province where "each household was given USD 25 disturbance compensation and dumped in a resettlement location lacking in both infrastructure and suitable farming potential… villagers… were offered USD 100 per hectare compensation for the irrigated rice lands." In case of Srae Ambel district the farmers were offered only 'a small compensation' to pay for the loss of crops and not the value of the land, since the farmers did not possess land titles (Haakansson et al., 2011). There were always some households which received no compensation - in four districts for which the corresponding data is available, the compensation was provided only to 74% of interviewed households with 80% in the South and only 16% in the North. "The government… claimed that it was their policy to provide fair compensation and cover the damages caused by evictions. However, there has usually been no agreement on the deals proposed by affected people, and they have been sent to remote relocation sites… with very little opportunities to earn a living" (ADHOC, 2012). Apart from the compensation in some cases evicted people received land - 2 ha to 3.5 ha, incl. a house. However, the land granted was in all cases without legal land titles and often not suitable for agriculture without significant initial investment as confirmed by FGDs, household surveys and KIIs for instance in Koh Kong by Drbohlav and Hejkrlik (2016).

Though one of the official goals of the ELC policy is to create employment opportunities (RGC, 2014), relatively low number of households found job with the concession company. While in Koh Kong, Mondulkiri and Ratanakiri provinces 20-30% households found job with the company where the remuneration was between 3 USD and 6.25 USD/day, in Kratie and Kampong Speu provinces, it was mere 2% and the remuneration as low as 1.5 USD/day. FGDs and respondents in household surveys were not sure about the long-term prospects of the employment. The work was usually seasonal and lasted only 2 to 4 months a year. The higher percentage was also likely during the initial stages of the land concession project when the land was cleared and the demand for labor higher. Interviewees were often reporting their unwillingness to work for a company which took their land.

The ELCs had negative affect on people`s livelihoods and income. The original sources of livelihoods - fishing in coastal areas of Koh Kong, collection of non-timber forest products and firewood and animal husbandry in all other surveyed areas - were not possible to be pursued anymore and if it would encompass long distances of even more than 20 km to travel. For the new, alternative livelihoods affected farmers and indigenous people reported to lack necessary skills, knowledge or capital for investment. This livelihoods impact has consequently a negative impact on their food security (in terms of availability of food) and nutrition status (in terms of quality of food). "Food insecurity has increased as farmers have lost valuable farmland, grazing land and access to the forest. Affected farmers can no longer grow enough food to sustain their families. Poverty has risen in the area because the farmers have no more or little land left to cultivate" (Haakansson et al., 2011). Schneider (2011) and Drbohlav and Hejkrlik (2016) recorded that affected people face severe food shortages during certain periods of the year, though no signs or symptoms related to malnutrition, such as stunting or wasting in children, were documented by the research team.

In general terms, after the ELC was granted the access to public infrastructure and basic services has improved in the indigenous areas of Mondulkiri and Ratanakiri provinces where "all respondents admitted that infrastructure, including roads, bridges, schools, health centres and transportation, had improved greatly" (Prachvuthy, 2011), while – with the exception of one village`s access to school – has worsened in Koh Kong where no new health care facilities were constructed, new roads have not withstood the rainy season and the access and quality of education has worsen as compared to pre-relocation situation (Drbohlav and Hejkrlik, 2016). Water access in relocation areas is inadequate and the water does not meet criteria for drinking water. Neef and Touch (2012) documented in Kratie province that toll booths were established on previously free-access roads making the travel on them impossible for the local people.

4 Conclusion

The results show that the impact of ELCs on small-holder farmers and indigenous communities – especially in short to medium term – is largely negative in terms of job opportunities, livelihoods and food security and equivocal in terms of access to basic services. The affected farmers usually receive no or insufficient compensation for the land they lose and can no longer continue with their original livelihoods to sustain their families. ELCs do not create job opportunities for the same number of people as affected by them. Moreover, the new jobs are either seasonal, without long-term perspective or not-well-paid.

The impact of ELCs on access of affected people to the basic services and infrastructure, such as health centers, schools and roads, is equivocal. While in most cases the access significantly worsens, there are number of instances that the access has improved.

It is important to note that some of the papers used as inputs for this research synthesis could be characterized in line with Scoones et al. (2013) as rather 'quick and dirty' research, involving fast fact finding missions and rapid assessments. In order to obtain more authoritative data and analysis longer term, in-depth academic research using quantitative methods, establishing baselines, counterfactuals, comparative frames and careful sampling would be needed especially with the focus on sustainable livelihoods.

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Financial Capital Analysis in Case of Small Scale Farmers of North Sumatra with Special Emphasis on Gender Issues

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Abstract: Despite many agricultural and socio-economic studies conducted in other parts of Indonesia, there is a scientific gap among researches focused on small scale farmers in North Sumatra. The article presented is based on the Sustainable livelihoods framework established in the 1990's by the Department for International Development (DFID) with special emphasis on financial capital. The main objective was to identify the state of the financial assets of small scale farmers in the Toba Samosir and Samosir regencies. Another aim of the study was to identify gender issues and related problems if relevant. We selected the Rapid Rural Appraisal (RRA) as an appropriate set of methods. Semi-structured questionnaires as part of RRA were used for primary data collection as well as observation and in depth interview. Eventually, data were statistically processed by SPSS/20. The applied statistical methods were the descriptive ones, as well as Bivariate Spearman´s correlation, Independent and Paired Samples T. Concerning financial capital, respondents in both regencies reported an imbalance in incomes and expenditures. People do not save money and are frequently indebted. Regarding possible gender issues, women have surprisingly quite a big decision making power and responsibility for most of activities. On the other way, men are often those who enjoy the economic benefits.

Key words: livelihood, livelihood strategies, livelihood assets, gender, North Sumatra.

JEL classification: Q1, O13

1 Introduction

The sustainable livelihood framework is rooted in a paradigmatic turn in rural development through the 1980's and 1990's towards human wellbeing and sustainability rather than towards economic growth (Foresti and Ludi, 2007). Sustainable livelihood approach was developed in the UK Department for International Development as one of the attempts to reduce poverty (Morse et al., 2009). The appeal for emphasis on sustainable livelihood was set out in the White Paper on International Development of 1997 (ODI, 1997). The development of these strategies has been led by the natural resources advisory group and includes the following key elements (Norton and Foster, 2001): A shift from an emphasis on natural resource issue to a people-centered approach as well as a shift in emphasis from seeking betterment in the form of agricultural production to looking at the whole diversity of strategies by which poor people in rural areas sustain a certain livelihood and seek ways to strengthen their volitions.

The word *livelihood* is defined as a set of activities which involve securing water, food, fodder for animals and shelter. It also includes an ability to obtain money, education, medical treatment and many other objectives for meeting requirements of the self and all households at a sustainable level with dignity. *"A livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable which can cope with recovering from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation, and which contributes net benefits to other livelihoods and global levels and in the short and long term"* (Chamber and Conway, 1991). In 1998, Institute of Development Studies published a working paper which provided a broader framework

for sustainable rural livelihoods. Conway's definition was enhanced by socioeconomic dimensions and a focus on history and policy setting (Scoones, 1998).

Livelihood framework is focused on interrelated influences which affect people's lives. It addresses the question how people create a livelihood for themselves and also for their households. The analysis centers on livelihood *assets* which consist of natural resources, the people's material property, skills, education, health, sources of income, expenditures, savings and also social support networks. Vulnerabilities are another important part of the analysis; these take into account also shocks such as financial crises, natural catastrophes, civil strikes or seasonality problems as unemployment, prices hikes, etc. Finally, it is the institutional and political environment which also influences people's decision making and opportunities (Obrist, Pffeifer and Henley, 2010). The framework can be applied at various scales from individual, to household, to village, to a region or even the whole nation (Scoones, 1998).

A given *livelihood strategy* forms the way in which people access and use these assets within the social, economic, political and environmental context. The range and variety of livelihood strategies can be enormous. An individual person may take on diverse activities to meet his/her needs, and many individuals may participate in activities that contribute to a collective livelihood strategy. On the other hand, according to Scoones (1998), three broad clusters of livelihood strategies can be identified, namely agricultural intensification or extensification, livelihood diversification and migration. Furthermore, livelihood strategies may be categorized in different ways. For example, Baquini (2006) identified three types of livelihood strategies: survival, consolidation and accumulation which will be used for our further analysis. These categories can be identified according to existence of savings, group membership, expenditures/income and or income diversification.

Livelihood framework includes identification of five livelihood assets/forms of capital. Namely social capital, human capital, natural capital, physical capital and financial capital. During our research, we are focused on the last mentioned with special emphasis on the gender issues if relevant.

Essentially, financial capital refers to people's financial resources. Emphasis is placed on income and expenditure, savings and sources of possible loans. Financial capital is the most universal one due to its convertibility into other types of capital. Financial capital can be improved by developing financial services organizations (savings, credit, insurance), marketing, expanding access to financial services or legal reform (FAO, 2013).

Regarding ownership, men usually have control over the productive assets like land. Limited access to land also means limited collateral for obtaining credit. Livelihood approach to gender involves understanding the different roles, needs and vulnerabilities of men and women. Gender analysis consists of better understanding the opportunities, constraints and priorities related to gender. Gender inequality means that women and men often do not have equal access to the assets they need to pursue or sustain their livelihoods and those of their families (Brown, Lambrou and Birner, 2008). Gender analysis consists of better understanding the opportunities, constraints and priorities related to gender.

Regarding Indonesia, diversity of culture entails various situations of women. Pursuant to ILO (2013), gender issues are often within the informal sector, in decision making either in public or private sectors, sexual harassment or low access to finance.

According to Villamor et al. (2014), rural women of Sumatra rarely participate in decision making. Some communities have a traditional matrilineal system where land is inherited in a matrilineal kinship system, leading to stronger land rights for women, egalitarian ethics and therefore relative absence of gender discrimination (Loeb, 1933). Nevertheless, our area

of interest has a strong patrilineal family system which is typical for the Batak Toba society (Ihromi, 1994). Therefore, we can expect some gender inequalities.

The main objective of the project was to identify the state of the financial capital of small scale farmers in the Toba Samosir and Samosir regencies with special emphasis on gender inequalities if relevant.

2 Materials and Methods

The field survey was conducted at regencies of Toba Samosir and Samosir with the cooperation of the Institut of Technology and Informatics DEL ("Politeknik Informatika Del") in Balige. The area of our interest is located on one of Indonesian islands – Sumatra. The survey was conducted in the surroundings of Lake Toba. The chosen exact places of interest were Toba Samosir Regency and Samosir Regency, which comprise territory of Samosir peninsula and cities of Balige, Laguboti and others. The population ethnically belongs to Batak tribes, mostly Toba, Karo and Pakpak Batak. As regards the religion, the majority is represented by Protestants, while Catholic and Muslim religion is in minority. More than a half of the population in both regencies depends on agriculture. The most cultivated crops are rice, corn, peanuts, chili peppers.

Rapid Rural Appraisal (RRA) was chosen as an appropriate set of methods. The most significant difference between RRA and other research methodologies is in its multidisciplinary approach and the particular combination of covered tools (FAO, 2013). The principle methods used in our research were semi-structured questionnaire, participatory observation and interview.

As an appropriate sampling method, the snow ball method was chosen. Before distribution of questionnaires itself, the pilot testing has been done in order to avoid possible misunderstanding. The sample of respondents reached 80 farmers in total (40 men, 40 women). The average age of respondents was 44 years ± SD12.48. In regards to education, the average schooling time was 11.05 ± SD 2.9 years. The process of filling in the questionnaires was carried out in Bahasa Indonesia. The target group of survey consisted of small scale farmers whose fields should not have exceed 5 ha. The collected data were summarized and statistically processed in software SPSS/20 as well as in MS Excel 2007. The applied statistical methods were the descriptive ones, as well as Bivariate Spearman´s correlation, Independent and Paired Samples T. Bivariate Spearman´s Correlation was used in order to find out how is financial income per month dependent on years of schooling. Independent Samples T-test was used for comparison of financial income per month with and without off-farm activities as well as between incomewith and without membership in farmers organizations. Paired Samples T-test was used in order to analyze difference between household income and expenditures per month.

It is necessary to mention certain limitations that occurred during the research. First of all, it was the language barrier. It was necessary to use local interpretator several times. It was necessary to use local interpreter several times. Translation from English to Indonesian language and back could cause some misinterpretations. The second limitation was the distrust of farmers who worried that data would be misused. The third one was the illiteracy of some farmers who were not able to fill in the questionnaires by themselves.

3 Results and Discussion

3.1 Household Income

On average, a household in the research earned a total income of around 1,370,316 IDR ± SD 738,203 (137 US$ ±SD 64 US$) per month originating primarily from agriculture but also

from a variety of other activities. Agriculture activities contributed 63% to this amount and the remaining 37% is covered by off-farm activities. The most important source of income is crop production, which covers 60% of the income, followed by services (21%), working on other farms (11%) and for small enterprises (4.6%). Livestock production (3%) and fishing (0.4%) has a low contribution. We conclude that in comparison of farm and off-farm activities the latter contribute to an overall income a quarter more. We could claim from these results that the households with off-farm activities have a higher income. The independent T-test proved that our hypothesis is valid as we can see from the Table 1 below. The mean income from off-farm activities is about 607,000 IDR (53 US$) higher that the income only from farm activities (Table 1).

Table 1. Comparison of income mean with and without off-farm activity

T-test for Equality of Means	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
	.216	3.82	75	.000	606525.2	922456.3
		3.65	54.194	.001	606525.2	939281.9

Source: Based on own data

Table 2. Comparison of income mean with and without off-farm activity

Off-farm activity	N	Mean (Income in IDR)	Std. Deviation	Std. Error Mean
Yes	31	1,756,677.4	775,179.4	1,392,226.3
No	46	1,153,152.1	612,955.8	90,375.4

Source: Based on own data

Statistical testing of the difference between a household with farm and off-farm activities and a household with only farm activities was carried out by the Independent Sample T test. The value of the significance is lower than 0.05. It proves on the level of significance 0.5, that the income between households with off-farm activity and households without off-farm activity differs. A study conducted with similar results was carried out by Batatunde and Quaim (2006) in Nigeria who analyzed the role of off-farm income diversification. They found out that households which participated in off-farm activities had higher income. Our results confirm this opinion.

In addition, we also analyzed the correlation between financial income per month and years of schooling (Table 3). Contrary to expectations, A Spearman correlation indicates that there is no tendency for income to either increase or decrease when years of schooling increase (Correlation Coefficient=0.067). With respect to Psacharopoulos (1994) study, it is quite unexpected result. His survey covers 62 African countries where he found clearly positive effect of additional education on income. Our result can be influenced by limited possibilities of income increment (unemployment, indebtedness, poor climate conditions etc.) In spite of the fact that we did not find any positive effect on income, we assume, that education improves the ability to make informed decisions about new inputs both in terms of machinery and fertilizers, therefore it plays important role for farmer's livelihood.

Table 3. Correlation between years of schooling and income

			Years of schooling	Income
Spearman´s rho	Years of schooling	Correlation Coeff.	1.000	.067
		Sig. (2-tailed)	.	.560
		N	80	79
	Income	Correlation Coeff.	.067	1.000
		Sig. (2-tailed)	.560	.
		N	79	79

Source: Based on own data

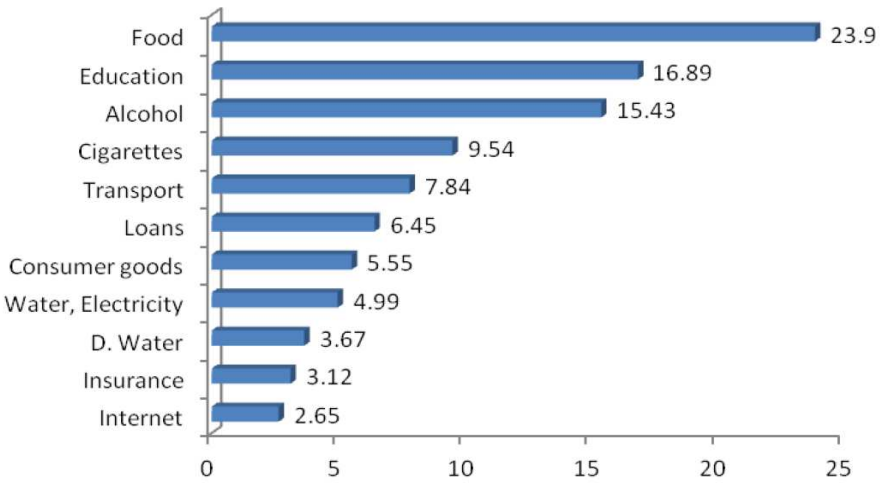
3.2 Household Expenditure

We focused on consumption pattern analysis of the target group in our survey. Households were asked about average daily cash and credit expenditure during the last month prior to the survey day.

According to official data, the monthly average expenditure of the rural population in North Sumatra consists of 62.44% for food expenditure and 37.56% for non-food expenditures (BPS, 2011). Our results are quite different. 42% of earnings go to food expenditures and 58% for non-food expenditures. Non-food expenditures consist of expenditures for energy, insurance, education, internet, loans, transport, health, consumer goods and alcohol and cigarettes. Surprisingly, the latter mentioned items cover a large part of spending. According to BPS (2013), people spend on average 39 516 IDR (3.5 US$) per month on these items. Our data indicates higher expenditures than the official average (Figure 1). Almost a quarter of income goes to cigarettes and alcohol (24.97%). It has to be pointed out that this number is an average result. In some cases the monthly expenditure for alcohol and cigarettes was about 40%. No meaningful differences between regencies were found; the situation was similar in both cases. If we take into account that 83.7% of respondents claimed that they have a lack of financial resources, it is a surprising result. According to an in-depth interview with Dr. Prima, alcoholism especially is becoming a fast growing problem for local people. They usually drink fermented palm/rice wine of their own production, which often causes health problems (blindness, death) due to the methanol content. Pursuant to our data, cigarettes and alcohol concern only men. For women, it is socially inappropriate to smoke or drink alcohol and they confirmed this fact also within our survey. On the other hand, our observation disclosed that some women smoke as well, but usually in privacy due to the moral values of society. This situation can affect not only the health of people but also divert investments from agriculture and the subsequent improvement of the financial situation of households.

Another big part of expenditures consists of children's education. On average it is 462,129 IDR (40 US$) per HH per month. Basic schools and junior high schools are free of charge in Indonesia, but higher degrees must be paid for. It follows from the Chapter about Human capital that a senior high school is the most common level of education. Therefore, a high numbers of households pay for education in both regencies (64%).

Fig. 1. Average expenditure distribution. N=71



Source: based on own data

In order to find out possible existing gender issues, responsibility for expenditure within the household was analyzed. Surprisingly, women control majority of household spending. There are two exceptions, namely alcohol and cigarettes. Besides those, the male

has also partial responsibility for transport expenses (34.3%). Anyway, it is still a lower percentage than by women (48.6%). It is obvious, that besides the patriarchal society, women have responsibility for most of HH costs.

Table 4. Responsibility about Expenditure Items according to Gender in %. N=77

Expenditure Items	Male (in %)	Women (in %)	Together (in %)
Food	6.6	88.5	4.9
Water	5.6	88.6	5.7
Alcohol	94.6	5.4	0.0
Cigarettes	92.9	7.1	0.0
Transport	34.3	48.6	17.1
Consumer Goods	5.6	92.6	1.9
Energy	5.6	92.6	1.9
Medicine	9.1	90.9	0.0
Education	18	60	22.6
Loans	16.7	88.3	0.0

Source: based on own data

The situation is similar regarding control over the distribution of household income among household members. It is women who decide about earned money in more than half the cases (57.5%). This fact confirms the women's opinion in financial decisions is of great importance. According to XiaohuiHou (2011) as well as Quisumbing (2003), in cases when women have more decision-making power, households tend to spend more on goods preferred by women such as education and children. In those families, particularly girls have higher school enrolment. This opinion can be proved by our results concerning education where a high percentage of HH (67%) pay for children's education and it is common to pay at least up to a senior high school degree for farmer's children.

If we compare household financial income per month and household expenditure/month, we find that 36.2% of households spend more than they earn. Therefore, they have to use supplementary sources of finance – loans. Respondents usually borrow money from family, friends or cooperatives. Banks are only their last choice. They have usually two options – they can pay part of their debt monthly or pay the whole amount after the harvest time. When the harvest is low, they have to borrow money again in order to pay their debts which can create cycle of poverty. The compared mean was analyzed (-299032.2 IDR) to find out difference between income and expenditures. On the significant level 0.5 was proved by Paired Samples Test that difference is significant (p=0).

4 Conclusion

Concerning financial capital, respondents in both regencies reported an imbalance in income and expenditures (36.2% of respondents). Expenditures are higher than income, which makes it impossible for people to save money and forces them into debt. However, a considerable portion of the expenditures is not essential for living. 24.97% of the total expenditures is spent on alcohol and cigarettes, more than on children’s education or even food. Especially alcoholism is becoming a frequent issue for local people. The analysis of gender roles and responsibilities revealed that, in spite of being a patriarchal society, women have quite a big decision making power. They have control over the major part of expenditures (except cigarettes and alcohol), they actively participate in decisions about their children’s education, household finance, as well as in decisions about crop production and livestock keeping. Regarding responsibilities, women are responsible for household, livestock as well as for crop production. They participate in more activities in comparison with men who often only enjoy the economic benefits. Men are those who have control over the productive assets like land, which reinforces women’s dependence on men.

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Model AGRO-2014 for simulation of strategic decision making in the area of agrarian complex

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Abstract: Model AGRO-2014 is a Leontieff's Input-Output type which calculates the volume production of agricultural and food commodities, which can be applied on the Czech food market. It is determination of the volume of products acceptable to the consumers in the Czech Republic with relations to the EU market. The obtained results show that the model is suitable for the simulations and analyses of solutions for problems in the whole agricultural complex.

Key words: agrarian sector, mathematical modeling, model AGRO-2014, Input-Output model, model simulation and prediction

JEL classification: Q18, Q15, Q51, C02, C31, C61

1 Introduction

Agrarian sector is an important part of the national economy which covers agriculture, food industry, retail with food products and food consumption by the population. To model the relations and structures of the whole system is difficult. One of the possible methods is to use CGE modelling, which enable to do various simulations for policy purposes. For example Křístková and Ratinger (2013) used CGE framework to assess the efficiency of agri-environmental payments to Czech agriculture. On the farm level, the models are more aimed at the decision making of the farmer about the amount and type of production. The area of the agricultural production planning concerned e.g. Cardín-Pedrosa and Alvarez-López (2012). The decision making processes on the farm are often supported by ICT tools, despite that their usage is still mild in the Czech Republic, (see for example study of Šilerová et al., 2015). Institute of Agricultural Economics and Information (IAEI) has developed its own model.

For modelling agrarian sector, there was created macroeconomic model AGRO-2014 which includes agricultural production (section ZEM), food processing (section POTR), sale of food in commercial networks (section OBCH) and the purchase of food products by households and other form of food consumption by inhabitants including self-sufficiency (section SPOT).

Model AGRO-2014 is a Leontieff's Input-Output type (Leontieff, 1941, 1986, Korda, 1967) allowing calculation of the balance in the Czech agrarian sector covering export and import activities and self-production of food by population in this sector, together with the calculation of the volume of financial means going through the agrarian sector.

Modeling of the agrarian sector (detailed structure of agricultural commodities and their transformation into food industry) in the Czechoslovak republic appeared for the first time in 1970 (Šternberg and Stárek, 1970). It was also a model Leontieff's I/O type and contained the overwhelming part of food industry. This work was followed in 2001 by creating a model AGRO-3 (Foltýn and Zedníčková, 2001, Božík, Foltýn and Zedníčková, 2001), who took over the structure of agriculture and food industry and supplementing a section food consumption by population (CZSO). Model AGRO-3 was used to estimate changes in the agricultural sector after the CR accession to the EU in the production and pricing

of government project RASES. Further, the model ZEPOS-1 (model agri-food based on the assessment of population nutrition in extreme - crisis situations) within the Project of Home Office (Štiková et al., 2013a, b). With the help of the model ZEPOS-1 and model VYZIVA-1there was solved minimum security (health-non-threatening) population nutrition only from domestic sources (agriculture and food industry). In the 2014-2016 there was creates model AGRO-2014 (generalization of ZEPOS-1) for a description of the standard functioning of the agrarian sector and for forecasting its development.

The aim of this paper is to show actual state of modelling the Czech agrarian sector which follows research of IAEI in the year 2015 and 2016. The improved version of the model was used for simulation of strategical speculations about real and optimal functioning of the Czech food market (Foltýn et al., 2016).

2 Materials and Methods

2.1 Structure of the model AGRO-2014

Section ZEM

Domestic production of the agricultural sector is in the model represented by commodities included in EAA (Economic Accounts for Agriculture): cereals, pulses, oilseeds, industrial crops, fodder crops, grassland, wine grapes, fruits and vegetables, cattle with milk production, cattle without milk production, pigs and poultry.

The section contains a dual model formulation for the fruits and vegetables:

a) aggregated form of "fruit total" and "vegetables total" (only 2 commodities)

b) dis-aggregated form of fruit (subsection OVO) and vegetables (subsection ZEL) where the fruit and vegetables are represented by individual sorts of Czech origin of fruit (apples, pears, apricots etc.), vegetables (cabbage, onion, carrot etc.) and imported fruit (oranges, lemons etc.).

The detailed structure of OVO and ZEL has particular relevance in terms of the assortment of food consumption and its nutritional assessment.

Each commodity in the section ZEM is represented by 3 variables: the amount of output, intensity unit (hectare yield / productivity) and size of commodity (hectare area / average annual state of the animals).

Section POTR

This section covers the processing of commodities, domestic and foreign agricultural production by the Czech food industry. The list of commodities in this section is based on data from the CZSO (Czech Statistical Office) "Production of selected food products" (CZ-NACE 10 and 11). Commodity breakdown corresponds to the branch structure of the food industry: meat production (branch 10.1), fish production (10.2), production of potatoes, vegetables and fruit (10.3), production of oils and fats (10.4), production of milk and milk products (10.5), manufacture of grain mill products (10.6), manufacture of bakery products (10.7), manufacture of sugar, chocolates and confectionery products and other foods ((10.8), feed production (10.9), production of beverages - beer, alcoholic and soft drinks (branch 11).

Every commodity is represented by the quantity and value of commodity production and the quantity and value of commodity sales.

Section OBCH a SPOT

Section retail (OBCH) and section of food consumption (SPOT) represents the sale of food in stores and food consumption by the population. This section has 5 subsections: SPOB1, OBCH1, SPOB2, OBCH2 and SPOB2.

Subsection SPOB1

Most important of the section is food consumption per capita (SPOB1) which is published by the Czech Statistical Office. SPOB1 illustrates the total quantity of food provided to the population by commercial networks and catering (restaurants, schools, etc.) and the estimated self-sufficiency.

SPOB1 includes the following foods and food groups: bakery products, dairy products, meat products, fish, milk and dairy products, oils and fats, fruits of Czech origin, south fruits, vegetables, legumes, potatoes, sugar and confectionery products and other food (tea, coffee) and beverages (mineral water, soft drinks and alcoholic beverages).

Every commodity of SPOB1 is represented in the model by the amount of consumable food on the average inhabitant per year.

Subsection OBCH1

Commodity structure in OBCH1 is the same as in the subsection SPOB1. Transforming food consumption from the subsection SPOB1 to OBCH1 is performed by using an indicator of the total population of the Czech Republic (with except of self-supply).

Every commodity in OBCH1 is represented in the model by the total amount of food that passes through business networks and is purchased by the population.

Subsection SPOB2

This subsection contains a structure of food consumption per capita and year form the point of view of nutritional evaluation (whose structure is different from the subsection SPOB1). The subsection SPOB2 follows model calculations of qualitative (nutritional) assessment of the population nutrition (incl. public catering and self-sufficiency).

Every commodity from SPOB2 is represented in the model by the amount of consumable food on the average inhabitant per year.

Subsection OBCH2

Commodity structure of OBCH2 is the same as SPOB2 which represents the total amount of food passing through the commercial networks and public catering to population.

Subsection SPOB3

Both types of the estimate of food consumption SPOB1 and SPOB2 have a common subsection SPOB3 where there is done a calculation of aggregate indicators of food consumption. In this subsection there are direct connections of the human food consumption to the need for agricultural and food production (section ZEM and POTR) through the subsection OBCH1 or OBCH2.

Section BIL

This section contains overall model balance equations across all sections of the model (e.g. balance of arable and agricultural land, the total volume of production and sales of individual sections etc.).

2.2 Mathematical description of the model AGRO-2014

Let us denote X(i) for i = 1, 2,...,n (n ≅ 1200) variables of the model AGRO-2014 with a square matrix A = A(i, j) of the n*n. Element A(i, j) represents the amount of a commodity i which is consumed for the production of commodity j.

Then the model can be described by an equation system:

(1) X(i) + IMP(i) + SELF(i) = sum (j=1,...,n, A(i,j)*X(j)) + EXP(i) + NEP(i) i = 1,...,n,

where IMP = import, SELF = self-sufficiency, EXP = export, NEP = non-food production (e.g., technical and other use of the commodity).

Solution of the model in EXCEL is done by the iterative manner:

Let us denote

X(i,0) to initial state of the solution X(i) for all i=1,…,n of the model and

X(i,k) of the k-th approximation of the solution X(i) for k = 1, 2, etc.

Then, for the k-th iteration the following relations hold:

(2) X(i,k+1) = sum (j=1,...,n, A(i,j)*X(j,k)) +EXP(i)+NEP(i)-IMP(i)-SELF(i) for i = 1,...,n.

The calculation takes place so long as X(i,k+1) ≠ X(i,k).

If the equality occurs, i.e.

(3) X(i,k+1) = X(i,k) for all i= 1,…,n and for some positive integer k,

then the calculation ends and X(i,k) is the solution of the model.

2.3 Prices in the model

Originally, it was supposed, that in the section ZEM there are used agricultural producer prices (CZV), in the section POTR food producer prices (CPV) and in the section OBCH and SPOT then consumer prices (SC) published regularly (monthly) by the CZSO.

But it was shown that CPV are officially monitored only for a small part of the food commodities. Therefore there were included in the model producer and sale prices derived from the monitoring of selected products in the Czech food industry (branches 10.1 – 10.9 and 11 of CZ NACE) published yearly by CZSO.

As to SC it was recognized that that the official assortment of food products is not fully adequate to the chosen commodities in subsections SPOB1 and SPOB2. For this reason there were consumer prices for the model derived by analytical procedures and aggregations based on the official CZSO data.

The model is supplemented by import and export prices of agricultural and food commodities (DC and VC, resp.) which were derived from the custom statistics of agrarian foreign trade (CS-AZO).

2.4 Margins in the model

An important part of analysis and research for using of the model AGRO-2014 were trading margins which were defined by the following equations:

(4) SC(i) = CPV(j) + MAR(i) for i∈OBCH1 with the origin of commodity i in section POTR,

(5) SC(i) = CZV(j) + MAR(i) for i∈OBCH1 with the origin of commodity i in section ZEM,

(6) SC(i) = DC(j) + MAR(i) for i∈OBCH1 with the origin of commodity i in import.

Trade margins are not usually available (business secrets), and they had therefore to be estimated by various analytical and statistical methods for the model AGRO-2014.

Research in this area follows results from 2014 (Štiková and Mrhálková, 2015).

In 2015, the research focused on the development of margins in 2007, 2009 and 2013. The calculations were based on the actual consumption of food, which has become a "weight" for calculations of the average margins in the consumer basket according to individual types of prices.

For SC was deducted VAT (Value Added Tax) for calculations in the given year.

CPV were used from the model AGRO-2014. For fruit, vegetables and potatoes there were used agricultural producer prices (mainly concerning unprocessed products).

For DC the data source was the CZ-AZO (Czech Agrarian Foreign Trade).

From model calculations there are then obvious trade margins if the whole "consumer basket" is filled with only domestic or imported products.

In the period 2007-2013 margins for the Czech and imported food products have been approaching. Margins for the Czech products were increased by 20%, while margins for imported products stagnated (change only 1%).

The difference between the domestic and imported margins in 2007 was 8.1%, while in 2013 only 1.4%.

Differences between margins during the reporting period decreased. Nevertheless, margins for domestic products (average of "consumer basket") are still lower than for imported products.

3 Results and Discussion

Creating a model AGRO-2014 was motivated by the need of generalization the model apparatus of the project of Home Office (Štiková et al., 2013a, b, Foltýn et al., 2013) for standard conditions of agrarian sector (taking into account the export and import of food products).

The biggest problem was creation of the commodity structure of the food industry (section POTR), which follows the nomenclature of the main agricultural commodities. For this purpose there was used a statistical survey of the CZSO "Production of selected products in the industry" in the time series 2007-2014, further analysis of Customs statistics on imports and exports of food commodities and annual monitoring and analysis of food consumption IAEI based on CZSO data.

To ensure the functionality of the model AGRO-2014 there were designed transformation coefficients of transfer of agricultural raw materials to adequate food production and subsequent their transformation to food consumption by population, IAEI has long-time experience (Štiková et al., 2012, 2013a, b). For economic purposes there were used prices derived from the above mentioned statistical survey.

For debugging functionality of the model were used statistical information for the Czech Republic with a total production of agricultural commodities, the total production of food commodities, and total information about exports and imports of food products.

The result of the research is the model AGRO-2014-version-2016, which is unique in the Czech Republic (according to available information and literature). The model allows simulations and predictions of agrarian sector and their estimated impact on the national economy and GDP (Gross Domestic Product).

Based on available information, there is no analogous model in other EU countries, with the exception of Slovakia, where the analogous model was developed in cooperation between IAEI Prague and Research Institute of Economics of Agriculture and Food Industry and on methodological basis of IAEI (Božík, 2016). In the next section there is given an overview of possible applications of the model AGRO-2014 to the current and future situation in the agrarian sector. Model applications are based on time series 2007-2014, which allows processing model dynamic coefficients based on key national economic indicators such as GDP, inflation and strategic information on developments in the global world markets for agricultural products and food and their influence export-import options of CR in this area.

3.1 Possibility of using the model AGRO-2014

1. The model allows coming out from the standard statistical monitoring of food consumption of CZSO and the food consumption for nutritional assessment.
2. The model allows calculating total sales of the agrarian sector.
3. The model allows calculating the market equilibrium in the agrarian sector with the calculation of all imports, exports, and self-sufficiency of the population.
4. The model allows simulating changes in the market equilibrium and domestic production by the input changes in exports and imports while maintaining food consumption of population.
5. The model allows calculating critical (minimum) size of the Czech agriculture in crisis situations, while maintaining minimum health non-threatening food consumption by the population.
6. The model allows estimate calculations of trade margins on domestic and imported food products in the Czech retail.

3.2 Assessment of covering of the agrarian sector by the model AGRO-2014

With the help of the model AGRO-2014 and model prices for the year 2014 (CZV, CPV and SC) there were calculated estimates:

a) total sales in the agrarian sector 712.8 bill. CZK

b) in section ZEM 119.6 bill. CZK (in EAA is 131 bill. CZK = 91.3%)

c) in section POTR 228.7 bill. CZK (according the CZSO is 244 bill. CZK = 93.4%)

d) in section OBCH 364.5 bill. CZK (estimate of the firm GfK is 432 bill. CZK =84.3%)

e) total expenditures of the population are 36 921 CZK per capita and year.

3.3 Estimation of importance of exports and imports in the Czech agrarian sector

Into the model AGRO-2014 there were implemented several hypothetical variants of exports and imports. By maintaining food consumption on the level 2013 we obtained the following simulation results:

Var. 0 (EXP = 100% and IMP = 100%): Model results simulate reality of 2013 which gives acceptable differences.

Var. 1 (EXP = 0 and IMP = 100%): Model results show that the Czech agrarian sector consumes almost 1.5 mil. ha for export production (about 43% of agricultural land). At the same time, while maintaining the import on 100% level, it could reduce the size of animal production by about 150 ths. heads of dairy cows and about 80 ths. heads of suckler cows, size of pig production by 4 mil. heads and poultry by 8 mil. heads.

Var. 2 (EXP = 0 and IMP = 0): This option shows the high dependence of the Czech agrarian sector on imports and illustrates the "crisis state" of the Czech economy without imports (eg. in case of economic catastrophe in the EU agriculture or in case "war situation"). Very strong deficit is in pork and poultry production. On the other hand, beef consumption is fully covered by domestic production.

Var. 3 (EXP = 100% and IMP = 0): The catastrophic, and therefore “unreal situation” shows a variant, which would be maintained exports while imports would be abolished. In all considered indicators would be significantly exceeded of reality. It is logical that these

disproportionate demands on the agrarian sector the Czech Republic would ultimately lead to the need for expansion of farmland by almost 1 mil. ha, which is not available.

Variants 4-6 (EXP = 0 and IMP = 80%, 60% and 40%): These three options simulate an effort to minimize the dependence of the Czech agrarian sector on imports. The critical factor is the pork consumption, which could be considered reducing by 30% (average of var. 4 and 5), while other indicators would be "kidnapped" reduction imports by 60%. In strategic thinking it would acceptable to consider alternatively about reducing pork consumption from the current level (approx. 40 kg per capita and year), by substitution of pork meat with other meat species, especially poultry meat.

4 Conclusions

Model AGRO-2014 is a tool for solving equilibrium in the agrarian sector (with the sections ZEM + POTR + OBCH and SPOT) was worked out into a matrix Excel system of Leontieff's I/O type (with a range of over 1,200 variables).

The model allows to simulate the security of food consumption population in a standardized structure (by CZSO) or in a modified structure for nutritional evaluation of population nutrition and its coverage of the production of the agrarian sector, taking into account the export and import opportunities for all segments.

Significant progress has been achieved especially in the analysis of the food industry with commodity structure downstream from one side to the trade and food consumption (customer relationships) from the second side to the agricultural sector as a source of material inputs for the food industry (supplier relations).

Calculating margins is very problematic. Trade margins are not officially monitored. There are at the disposal only margin calculated for each food product. That's why we chose to contribute to the methodological approach for calculating margins so that we reach as accurately as possible overtook average margin business. Based on the model of VYZIVA-1 in every year we have determined the actual consumption in a detailed breakdown. A selected range contains products which are comparable for both imported foodstuffs, as well as products produced in our country. It represents our first attempt to capture margin developments in the Czech Republic because we have no information about similar model calculations in other countries.

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The Agri-Environmental Program in the case of large-scale farms in Poland

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Abstract: Introduction: The aim of this paper is to analyze the economic situation of large-scale farms participating in the agri-environmental program in Poland. The program provides compensation for loss of income due to environmentally-friendly production. Also presented brief information on the implementation of this program at national level. In this study we omitted the analysis of soil, water and environmental indicators. Author analysed the impact of environmental payments on income and economics of the surveyed farms.
Data and methods: Author performed research of large-scale farms (> 100 ha UAA) and used the statistical analysis and ratio analysis in the field of economic and production situation of these farms. The technical efficiency of these farms was estimated by using the parametric method (Stochastic Frontier Analysis). Then its determinants were indicated by using the panel models.
Results: The greatest amount of realized agri-environment payments was observed in Zachodnio-pomorskie, Wielkopolskie and Warmińsko-mazurskie voivodeships (Polish name of regional units). In those provinces of Poland are the biggest farms. There is an area of the NATURA 2000, too. Farms with the largest area and the biggest scale of production can more easily overcome administrative barriers associated with obtaining environmental subsidies. In the rest of the country the program didn't use widely instrument of the CAP due to a number of formal requirements and transaction costs. The largest farms participated in many programs of support and the farmers wanted to maximize the amount of the subsidy. The average value of the subsidy was over 800 thousands zlotys. The amount of subsidies were so high that determined the economic results of the farms (liquidity, profitability or efficiency).
Conclusions: The main theoretical basis for environmental analysis is welfare economics, which is a subdiscipline within the framework of neoclassical economics. The main objective of agri-environmental program is to improve the natural environment and rural areas by reducing the negative impact of agricultural production. The biggest areas where agri-environmental program was implemented are mainly in the northern Poland. Beneficiaries of the program were mainly the biggest farms. This instrument of CAP had significant impact on economic indicators.

Key words: the agri-environmental payments, technical efficiency, large-scale farms

JEL classification: B21; C55; Q12; Q18

1 Introduction

Climate change, resource efficiency and territorial balance are priorities of the EU. All these issues are addressed by the rural development policy, especially by the 2nd pillar of the Common Agricultural Policy (CAP)[1]. The new policy continues along this reform path and it is moving from production support (coupled) to decoupled policy. This is a response to the challenges (economic - including food security and globalisation, 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; environmental - relating to resource efficiency, soil and water quality and threats to habitats and biodiversity and territorial - rural areas are faced with demographic, economic and social developments including depopulation and relocation of businesses[2]. The concept of sustainable development attempts to combine economic and environmental goals. Sustainable techniques

[1] http://ec.europa.eu/agriculture/policy-perspectives/policy-briefs/05_en.pdf (2.05.2016).
[2] http://ec.europa.eu/agriculture/policy-perspectives/index_en.htm (5.05.2016).

for agricultural production, energy use, natural resource management, and industrial production have significant potential. A sustainable global economy also implies limits on population and material consumption (Zegar, 2010).

Environmental performance has been lately one of the major global issues. There have been great efforts concentrated on the climate change over the last decades (Żylicz, 2004; Ziółkowska, 2009). The European Union (EU) has taken initiative in protecting common environment through the Environment Action Programmes since 1973. Since 1992, the application of agri-environmental programmes and measures have been implemented in all EU states under the framework of their rural development plans (European Commission, 2015). Envi-ronmental adaptation of European agriculture depends on the capacities of farming businesses across the Europe (Majewski, 2008; Turčeková, Svetlanská, Kollár, Záhorský, 2015).

Implementation of the agri-environmental support is one of the main objectives of agricultural policy, which is ensure conditions for the development of farms with respect for natural resources. Thus, the implementation can be regarded as an attempt to implement the agricultural practice of extensive farming methods and production lines. The promotion of sustainable agriculture is the main objective of the CAP, the EU horizontal policies and the Europe 2020 Strategy (Góral, 2014). In such intention was introduced last modification of the CAP (greening). Individual Member States have full discretion regarding the scope of the introduction of agri-environmental schemes. The most diverse program has Austria, where the package of subsidies corresponds to actions used by diversified production. Any activity is reflected in a separate, documented payments. The Austrian proposal is simple and updated each year (Niewęgłowska, 2005, 2009, 2011).

After accession of Poland to the EU, the funding of agri-environmental activities (sustainable agriculture, organic farming, extensive meadow farming, extensive pasture farming, ground and water protection, buffer zones, and protection of domestic farm animal species) based on the National Agri-Environmental Program (2004-2006). The main objectives of the program were: protection of natural resources, protection and conservation of biodiversity, and protection of cultural landscape in rural areas. The objectives of the program reflected environmental priorities with regard to natural conditions in many regions in Poland, especially in those characterized by a large number of nature protection areas (Pawlewicz, Bórawski, 2013).

According to the National Agri-Environmental Program in Poland the agri-environmental measures can be realized in two ways: on a horizontal level (in the whole country) or in 69 selected priority regions (characterized by specific environmental problems or by particular natural features). The activities such as sustainable agriculture, extensive meadow farming, and extensive pasture farming are executed in priority regions, which were selected by regional working groups on behalf of the Ministry for Agriculture and Rural Development. The other activities can be realized horizontally. A problematic issue in this context is the central financing of agri-environmental measures. The prerequisite for realizing the agri-environmental measures is the support permission from the Ministry. As natural conditions as well as farming conditions in different regions of the country are differentiated, so the priorities regarding environmental objectives in agriculture are different (Ziółkowska, 2013).

Agri-environmental program implemented in Poland under Rural Development Plan 2007-2013 was significantly different from the program, which could farmers participate in 2004-2006. First of all, farmers could realize all packages throughout the country. The number of packages had changed. The program (RDP 2007-2013) included 9 packages: sustainable agriculture, organic farming, extensive permanent grassland (linkage), protection of endangered bird species and natural habitats outside of Natura 2000 areas, behavior

endangered plant genetic resources in agriculture, preservation of endangered animal genetic resources in agriculture, soil and water protection, buffer zones. Within each package are agri-environmental variants, which contain sets of tasks that go beyond the applicable basic requirements, and which do not overlap with other instruments of the CAP. Farmers participating in agri-environmental payments must comply with the standards and requirements for cross compliance (Brodzińska, 2009; Brodziński, 2008).

The largest areas which were covered by agri-environmental payments were mainly in the provinces (voivodeships) of northern Poland: Warmińsko-Mazurskie (281,843 hectares in 2012), Zachodniopomorskie (274,353 hectares) and Kujawsko-Pomorskie (235,931 hectares). There dominate large and economically efficient farms. However, it should be noted that these areas are also characterized by a large share of protected areas and valuable landscapes. The greatest interest among the owners of farms in Poland, was a package of "Sustainable Agriculture", "Soil and water protection" and "Organic Farming". In the farm (of the same area) could be carried out several packages.

Environmental conditions affect the economics of farms. Farm in the areas of environmental constraints undoubtedly have worse environmental conditions for agricultural production, especially plants. Transfers from the Common Agricultural Policy, especially the LFA payments and agri-environmental conducive to equalizing economic conditions (Zegar, 2010, Czyżewski, Smędzik-Ambroży, 2015). In addition, regardless of the characteristics of the farm, the specific features of a given location (eg. soil structure, moisture levels), as well as the farmer's personal inclinations often play a greater role. The type of agricultural production (eg. crops, livestock) is also an important determinant of the type and nature of any environmental effects. The aim of this paper is to analyze the economic situation of large-scale farms participating in this program in Poland. It provides compensation for loss of income due to environmental friendly production.

2 Materials and Methods

2.1 Set of large-scale farms

According to data collected by GUS (the Central Statistic Office), a significant number of mid-size farms (5-10; 10-15 hectares) was consolidated into larger units. The number of large-sized farms (>100 ha of UAA) increased from 7,422 in 2002 to 9,822 in 2011 (by 33.1%). The reverse situation may be referred to the group of the smallest farms (1-2 hectares) whose number rapidly decreased (by 24.2%). This indicates a shift toward a more competitive market-oriented agriculture. In fact, the structural changes in Polish agriculture have accelerated.

The basic source of data was a random sample of large-scale agricultural farms (with an area of over 100 hectares) surveyed annually by Department of Economics of Farm Holdings at IAFE-NRI. Panel was built for the period of five years (2008-2011). This research period became the basis for further analysis and research. Empirical data was derived from surveys, compiled for many years by Department of Economics of Farm Holdings at IAFE-NRI. Questionnaires included questions concerning the structure of agricultural land, crop and livestock production, farm size, its location, as well as the balance sheet, profit and loss account and for additional information relating to the level and direction of education, use of fertilizers, possession limits and quotas and directions of credit and investment. Large-scale farms hold much larger area of agricultural land than individual farms. The panel consisted of both holding individuals and legal persons. Basic description was summarised in table 1.

Table 1. The characteristics of examined farms (average values)

Items	Average
Total employment (fulltime employees)	19.4
Profitability index of economic activity	0.8
Herfindahl-Hirschman index (HHI)	0.6
Equity to borrowed capital ratio	11.3
Percentage of beneficiares of leasing	18.3
Current liquidity	121.7
Fertilizer application (kg NPK per ha)	244.9
Percentage of farms with insurance of crop production	70.8
Percentage of farms with insurance of livestock production	17.5
Age of manager	53.2
Mechanization of work	854.9
Percentage of preferential loans in total debt	12.5
Total subsidies (thousands of PLN)	808.2
Direct payments (thousands of PLN)	580.4
Percentage of beneficiares of LFA in total panel	51.5
Average of LFA payment per beneficiary (thousands of PLN)	22.1
Percentage of beneficiares of II Pillar payments in total panel	48.5
Average payment from II pillar per beneficiary (thousands of PLN)	44.4
Share of beneficiares of agri-environmental program (AEP) in total panel	38.8
Average of agri-envoronmental payment per beneficiary	86.3

Source: own calculations.

2.2. Methodology

Technical efficiency (TE, productive efficiency) is used to identify the possibility of increasing production with the same quantity of inputs used (maximising effects at given inputs) or reducing inputs with the same level of effects maintained (minimising inputs at given effects). However, allocative (or price) efficiency allows for determining optimal proportions of inputs at their specific prices and production technology. These measures were originally input-oriented (oriented towards cutting unnecessary inputs). Their product can, in turn, be used to determine economic efficiency. The aim of the study was to analyse how agri-environmental grants influence the technical efficiency of large-scale farms.

The efficiency is examined in different ways which are classified into one of the four groups of methods: classical (e.g. using financial ratios); parametric (e.g. econometric models); non-parametric (e.g. the data envelope); semi-parametric.

The division into parametric and non-parametric methods is based on the criterion of necessity with a view to defining an analytical form of the function (of production, costs, etc.). According to this division, two efficiency measurement approaches based on efficiency curves can therefore be distinguished:

- non-parametric (Data Envelopment Analysis – DEA, Free Disposal Hull – FDH, and an indices-based approach),
- parametric (Stochastic Frontier Analysis – SFA, Distribution Free Approach – DFA, Thick Frontier Approach – TFA).

Stochastic Frontier Analysis is the most widely used parametric method to assess the efficiency of enterprises[3]. The literature provides a few variants of the method. Primary models by D.J. Aigner, C.A.K. Lovell and P. Schmidt (1977) as well as W. Meeusen and J. Van den Broeck (1977) were most commonly developed. A review of the literature reveals that, given nature of production in agriculture, the SFA approach is a better choice. Many publications prove that it is recommended to analyse the agricultural sector by using the parametric approach which is now a basis for efficiency studies. However, scientists are still looking for new solutions. Therefore, a methodological framework has been recently extended to include a semi-parametric approach in which the impact of explanatory variables is parametrised. For example, this approach was applied by a team of: A. Kazukauskas, C. Newman and J. Sauer (2014), whose studies proved that decoupled payments have a statistically significant positive impact on the level of productivity of farms in Ireland.

In the next step, technical efficiency results (TESFA) were used to panel model, where TESFA was a dependent variable (Y). Panel data (longitudinal or cross-sectional time-series data) is a dataset in which the behaviour of entities are observed across time. Panel models pose several estimation and inference problems, such as heteroscedasticity, autocorrelation, and cross-correlation in cross-sectional units at the same point in time. The fixed effects model (FEM) and the random effects model (REM), also known as the error components model (ECM), are commonly used methods to deal with one or more of these problems. In FEM, the intercept in the regression model is allowed to differ among individuals to reflect the unique feature of individual units.

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In REM we assume that the intercept value of an individual unit is a random drawing from a much larger population with a constant mean. REM is more economical than FEM in terms of the number of parameters estimated. REM is appropriate in situations where the (random) intercept of each cross-sectional unit is uncorrelated with the regressors. Random effects assume that the entity's error term is not correlated with the predictors which allows for time-invariant variables to play a role as explanatory variables. REM allows to generalize

[3] Vectors of variables, which were necessary for applying both the parametric and non-parametric method, were then determined:

a) for a variable characterising the effect on the value of agricultural production revenues ("revenues from sales and equivalent" plus "other operating revenues"),

b) inputs were expressed by using variables representing inputs of material factors of production as: (1) labour inputs (remuneration costs and their derivatives), (2) inputs of own and leased land (UAA expressed in equivalent hectares), (3) capital expenditures divided into: fixed capital (value of depreciation), working capital (expressed in costs of materials, energy and external services, excluding internal consumption).

the inferences beyond the sample used in the model. An advantage of random effects is that you can include time invariant variables (i.e. gender). In the fixed effects model these variables are absorbed by the intercept (Wooldridge 2002; Greene 2003; Baltagi 2008).

To decide between fixed or random effects is used a Hausman test where the null hypothesis is that the preferred model is random effects vs. the alternative the fixed effects (Greene 2008; Kufel 2011). It basically tests whether the unique errors (ui) are correlated with the regressors.

3 Results and Discussion

Panel of large-scale farms was divided into two groups: beneficiaries of agri-environmental program (AEP) and farms, that not participated in the AEP. The beneficiaries of the program were the biggest farms of the examined group of large-scale farms. The corn accounted for 60% of crops in both groups. A cover the liabilities of financial surplus was two times higher in farms that did not participate in the program. However, it should be noted that participation in the program does not impact on the reduction of doses of mineral fertilizers per hectare (about 250 kg per ha)[4]. A short profile of both group is presented in table 2.

Table 2. A description of examined groups

Items		2008	2009	2010	2011
Total of UAA (ha)	Beneficiaries of the AEP	1009.6	855.1	836.1	798.1
	Farms not participated in the program	600.1	639.7	641.6	649.8
Share of crop production in total sales revenue	Beneficiaries of the AEP	76.4	76.4	79.9	78.9
	Farms not participated in the program	66.8	70.2	67.2	70.1
Share of equity in borrowed capital	Beneficiaries of the AEP	4.8	6.1	5.2	5.1
	Farms not participated in the program	8.5	11.7	8.1	6.3
Current liquidity	Beneficiaries of the AEP	103.7	129.7	61.1	71.8
	Farms not participated in the program	161.1	150.3	98.9	155.1
Fertilizer usage (kg NPK per ha)	Beneficiaries of the AEP	252.1	232.3	229.5	242.9
	Farms not participated in the program	246.7	223.8	222.5	239.9
Work experience in this farm (in years)	Beneficiaries of the AEP	14.3	15.1	16.1	18.2
	Farms not participated in the program	17.1	19.1	20.7	21.1
Number of manager	Beneficiaries of the AEP	2.0	1.9	2.1	2.0
	Farms not participated in the program	1.7	1.8	1.9	1.9
Livestock units per 100 ha	Beneficiaries of the AEP	3.3	2.7	2.7	2.6
	Farms not participated in the program	1.7	1.8	1.5	1.6
Total employment	Beneficiaries of the AEP	20.8	19.1	19.3	17.8
	Farms not participated in the program	16.6	16.1	15.3	15.1
Percentage of AEP payments in farm income	Beneficiaries of the AEP	9.1	21.3	11.7	9.2
	Farms not participated in the program	0.0	0.0	0.0	0.0
Corn area per farm (ha)	Beneficiaries of the AEP	559.1	492.3	473.2	438.9
	Farms not participated in the program	331.2	372.5	353.1	349.9

[4] Beneficiaries of AEP had more livestock units per 100 ha than the rest. These farms used dung in bigger doses than the rest.

Crop of corn (dt)	Beneficiaries of the AEP	50.2	49.6	54.3	39.8
	Farms not participated in the program	46.7	48.7	48.7	31.3
Area of grassland (ha)	Beneficiaries of the AEP	48.3	52.4	45.9	39.8
	Farms not participated in the program	28.9	30.1	30.7	31.2
Profit (loss) on sales	Beneficiaries of the AEP	372.1	369.2	378.9	382.5
	Farms not participated in the program	280.7	263.6	270.5	268.3
Net profit (loss)	Beneficiaries of the AEP	1012.4	694.8	763.7	1020.9
	Farms not participated in the program	646.8	449.3	450.9	780.8
Capital spending (invest-ments,in thousands of PLN)	Beneficiaries of the AEP	460.4	462.6	349.4	367.2
	Farms not participated in the program	461.9	631.9	720.7	467.2
ROE	Beneficiaries of the AEP	23.8	24.8	38.2	28.1
	Farms not participated in the program	41.2	11.5	22.3	31.2
ROA	Beneficiaries of the AEP	13.4	7.2	8.1	13.3
	Farms not participated in the program	13.1	6.3	6.9	12.8
TE $_{SFA}$[5,6]	Beneficiaries of the AEP	0.5	0.6	0.7	0.7
	Farms not participated in the program	0.6	0.6	0.6	0.6

Source: own calculations

Beneficiaries of AEP were realised more risky financial strategies (had lower level of liquidity and share of equity in borrowed capital). They had more managers and higher level of total employment than the rest. The farms reached better financial results (net profits), but it was invested of lower sum of money.

Author used panel models (table 3) in the form of: fixed effects model (FEM) or random effects model (REM). Decomposition of random element may only take one factor (one-factor models) or two factors simultaneously (two-factor models) into account (Arellano 2003; Baltagi 2008; Mátyás, Sevestre 2008). Results that were presented in table 3 confirmed relation between technical efficiency and ari-environmental payments. Beneficiaries of AEP had better results in area of technical efficiency (TE SFA). It should be noted, that the set of beneficiaries (in table 3) was a group of the biggest farms in Poland.

Table 3. The results of the panel models (Y = TE SFA)

Items	FEM Model (1)	REM Model (2)	REM Model (3)
Constans	0.692***	0.727***	0.661***
	(0.061)	(0.062)	(0.050)
Subsidy rate I [A]	-0.549***		-0.793***
	(0.148)		(0.126)
Subsidy rate II [B]		-1.381***	
		(0.189)	
Participation in the agri-environmental program	**0.075****	**0.067****	**0.101*****

[5] TE $_{SFA}$ – technical efficiency (TE) was calculated by using Stochastic Frontier Analysis (SFA).

[6] The calculations were made by using Frontier (software).

(dummy variable)	**(0.036)**	**(0.031)**	**(0.031)**
Profitability index of economic activity	0.040***	0.033***	0.043***
	(0.012)	(0.011)	(0.011)
Soil valuation index	0.069**	0.054*	0.067**
	(0.034)	(0.029)	(0.029)
Using the leasing (dummy variable)	-0.054*		-0.058*
	(0.033)		(0.029)
Number of managers	-0.016*		
	(0.009)		
Herfindahl-Hirschman index [C]		-0.098*	
		(0.054)	
Region 16 [D] (Zachodniopomorskie voivodeship, dummy variable)		0.028***	0.253***
		(0.079)	(0.077)
Number of observations	312	312	312
R^2 or log-likelihood	0.750	52.634	54.673

Note: [A] – Ratio of all subsidies to operating revenues. [B] – Ratio of direct payments to operating revenues. [C] – Herfindahl-Hirschman index is defined as measure of production concentration. It is calculated by squaring the crops, livestock and other production share in total production of farm, and then summing the resulting numbers. [D] – notes for voivodeships in Poland: Region 1 – Dolnośląskie, 2 – Kujawsko-Pomorskie, 3 – Lubelskie, 4 – Lubuskie, 5 – Łódzkie, 6 – Małopolskie, 7 – Mazowieckie, 8 – Opolskie, 9 – Podkarpackie, 10 – Podlaskie, 11 – Pomorskie, 12 – Śląskie, 13 – Świętokrzyskie, 14 – Warmińsko-mazurskie, 15 – Wielkopolskie, 16 – Zachodniopomorskie.

Significance: *** 0.01 level of significance; ** 0.05 level of significance; * 0.10 level of significance.

Source: own calculations in Gretl[7]

Since the end of the 1980s, a large and growing literature was developed on the application of frontier techniques - particularly Data Envelopment Analysis (DEA) and Stochastic Frontier Analysis (SFA) - to measuring environmental efficiency applied to agriculture (Lakner, Breustedt, 2015). In the literature we can find publications confirming the relationship. An example of such publication is analysis of technical efficiency and its determinants prepared by a team: J. Bienkowski, J. Jankowiak, J. Marcinkowski, A. Sadowski (2005). They obtained results show the possibility of the existence of convergence analyzed their effectiveness (technical and environmental). It means that strategies for achieving higher technical efficiency and environmental performance were not opposed in case of large-scale farms with Wielkopolska voivodeship. Similar conclusions were also drawn by J.R. Franks in his article, entitled "Sustainable intensification: a UK perspective" (2014). The author devoted most attention to the phenomenon of sustainable intensification of agricultural production. The author proves that it is possible to combine economic and environmental objectives. However, sustainable intensification requires that pragmatic and innovative solutions under the CAP be developed. New tools of strategic management in relation to the environment and planning of spatial development of the landscape are needed here. While, L. Arata and P. Sckokai (2013) suggested a potential revision of the AEP in Spain in order to produce environmental benefits and to fairly compensate participating farmers. In Italy and France, while farm practices seem to become more environmentally friendly after

[7] Gretl is a free, user-friendly and sophisticated econometrics package (http://gretl.sourceforge.net/).

the AEP adoption, it would be interesting to evaluate the amount of AE payments in order to avoid under-compensation and to increase the uptake. Germany and the UK show positive environmental benefits after the adoption and a fair compensation for the potential income foregone. The analysis of Pufahl and Heinrich (2008) reveals a positive and significant effect of both farm programs on the area under cultivation, in particular on grassland, resulting in a decrease of cattle livestock density.

4 Conclusion

The main theoretical basis for environmental analysis is welfare economics which is a subdiscipline within the framework of neoclassical economics. Issues of externalities and public goods are the basis of modern environmental economics and natural resources. An important place in the modern welfare economics is cost-benefit analysis. Costs and payments in agri-environmental projects must be closely analyzed in conjunction with the burden resulting from compliance with the principles of cross-compliance and therefore as a consequence of direct payments. The level of commitments corresponding to the CC is identical to the application of the principle of "damaging pays" (polluter pays principle). Environmental liabilities exceeding the level of CC should be paid additionally according to the principle of "delivering gains" (the provider gets principle). The philosophy that is the premise of the use of agri-environmental payments. The costs of adaptation to the requirements of the CC apply to the whole farm. The same applies to fixed costs agri-environmental programs. The size of these costs falls when increasing the scale of its business farming. This explains why the largest farms in Poland usually participate in agri-environmental programs, despite the use of preferences for smaller farms in the form of modulation of agri-environmental payments (Kulawik, 2013).

The main objective of agri-environmental program is to improve the natural environment and rural areas by reducing the negative impact of agricultural production. Complete information on this subject can be obtained only after a long time, which is necessary to make positive changes could be made. The greening of direct payments is very important change in the form of environmental policy of EU. An attempt to restrict access to direct payments (only for the active farmers), which can eliminate farm owners, who are oriented to receive only payments (especially seen with the package Organic Farming).

In summary, the analysis of the current implementation of the agri-environmental program in Poland indicates the following trends: (1) area covered by the program in Poland increased by over 100% from 2004 and accounted for over 13% of the UAA, (2) the largest areas where this program was implemented, were mainly in northern Poland and there beneficiaries received the highest amount of the payment. The agri-environmental payments had a significant impact on the technical efficiency and economic indicators in case of Polish large-scale farms. Productivity and efficiency analysis can provide a complete overview on farm performance, going beyond the typical farm-success indicators (like profit) or partial productivity measures (like crop yield per hectare).

Only few papers show that it is possible to improve productivity/production efficiency and environmental performance at the same time in a certain interval of relationships of their complementarity (e.g. publications on “sustainable intensification”8, “climate-smart agriculture” or “space-saving agriculture”, i.e. concepts oriented towards increasing land productivity without harming the environment). Although the identification and quantification of com-ponents of the environment and environmental services lead to numerous problems,

[8] Sustainable intensification (SI) is a term that has increasingly been used to describe the agricultural production systems that will be needed to feed a growing global population whilst ensuring adequate ecosystem service provision.

their valorisation is undoubtedly the most difficult. The essence of static valorisation is to find the Total (Overall) Environmental Value. However, dynamic measurement, i.e. taking into account, among others, eco-innovation effects, represents a growing challenge.

Budgetary instruments, such as agri-environmental grants can be a set of explanatory (binary) variables in classical multiple regression, but it is better to analyse their impact by using more specialised tools, such as: matching estimators, difference-in-difference, regression discontinuity design or randomised control trials (Góral, 2016). Foreign studies increasingly emphasise the monotonicity of relationships between grants and technical efficiency. It is identified by using special regression discontinuity designs.

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Business Environment Diagnostics in Rural Areas: Social and Psychological Aspect

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Abstract: The article defines the role of business activities in stimulating the processes of socio-economic development of rural areas of Ukraine. The authors examine existing scientific and practical concepts in the field of entrepreneurship studies in rural areas. The authors carry out a systematic diagnostics of the business environment, which allows to identify its drawbacks, such as: the predominance of the role of informal over formal institutions; poor infrastructure and living conditions; monofunctional nature of the economic activities and existed structural disparities of agricultural production both in the industry and subject dimensions; the lack of effective mechanisms and social and psychological incentives to attract funds of migrant workers in the rural economy; lack of cooperative movement development; stagnant human capital. On grounds of a questionnaire survey among entrepreneurs in rural areas, the key problems are identified in establishing own business and the level of the destabilizing effect of obstacles on running the business. The article develops measures to improve the business environment in rural areas, including the modernization of social and economic infrastructure; combating corruption and criminogenic influences, improvement of material and technical base of business entities, formation of a favourable institutional and psychological basis, overcoming mental inertia of the rural population, facilitating access for business entities to financial sources.

Key words: rural areas, entrepreneurship, social and economic development, business environment, agriculture, infrastructure, human capital.

JEL classification: R11, Q10.

1 Introduction

Rural areas in Ukraine are characterized by the slow pace of social and economic development that leads to imbalances in the regional development of the state, hinders the process of establishing inter-regional horizontal and vertical integration ties, lowers the level of Ukraine's socio-economic security. The necessity to stimulate the development of rural areas arises not only from the pure economic, but also social aspects – because the Ukrainian village is the unique subject of preservation of historical heritage, customs, traditions, etc. Therefore, activation of the processes of socio-economic development of rural areas is a strategic objective at all hierarchical levels of management of the national economy. A significant spare resource for the development of rural areas is an intensification of the business activity of population, an increase in the scale and performance of business entities as a source of creation of new jobs, increased employment of rural people and their well-being, improvement of investment attractiveness of territories, increased revenues to local budgets, development of local initiatives, formation of the middle class and the development of social and economic infrastructure in rural areas.

Due to the socio-economic transformations that have taken place over the past two decades in Ukraine, a complex process of restructuring the basic sectors of the national economy was carried out, including economic, social and technological transformation. Not always successful reforms have led to decrease in production in the agricultural sector, the appearance of imbalances of its sectoral structure, the bankruptcy of agricultural enterprises, rising unemployment and poverty among the rural population. As a consequence,

these destabilizing trends aggravate depressive nature of the socio-economic development of rural areas and make them hardly suitable place to live and fully satisfy the personal needs of the rural population. This reinforces the need to study the theoretical and applied aspects of the formation of friendly environment for entrepreneurship in rural areas.

Theoretical and applied aspects of entrepreneurship development in rural areas are reflected in scientific works. G. Cherevko (2000) assigns the decisive role of entrepreneurship in matters to stimulate socio-economic development of rural areas. The scientist examines entrepreneurship as an initiative economic and commercial activities of certain individuals and entities, focused on making a profit and is the main engine of expanded reproduction in the rural areas. In his turn, J. Schumpeter (2007) assigns entrepreneurship the key role in supporting the processes of socio-economic development in regional dimension and the introduction of innovative solutions in the organization of economic relations between the subjects of social and economic exchange. S. Zlupko (2006) investigates the influence of ethnic and national characteristics on the development of entrepreneurship in rural areas. The scientist has described historical factors that influenced on the development of the economy management in the agricultural sector, identified the specifics of the organization of trade and economic relations in the rural areas, justified the ways to increase competitiveness of business entities in the rural areas. V. Yurchyshyn's works (2007) touch upon supporting the business with human capital in rural areas. According to the author, the tragedy of the current situation in rural areas appears in the extinction of the most valuable thing – rural human capital, its intelligent and intellectual component: the village loses at a faster pace its demographically-reproducible potential, culture, folk customs and other achievements. In his studies, V. Yakubiv (2011) defines the balanced development of entrepreneurship in the agricultural sector as the main prerequisite for ensuring agricultural growth in the regional dimension. N. Zhelezniak (2008) highlights the desolation and obsolescence of material and technical resources of agricultural enterprises among the reasons that hamper the development of entrepreneurship in rural areas, that contains their resource and production capacity development and prevents the formation of inverse processes of socio-economic development of rural areas. Scientists G. Grabak and A. Chopkovichova (2013) define the sectoral restructuring of business activities in the agricultural sector as a strategic tool to overcome the heterogeneity and regional disparities of socio-economic development of rural areas. Researchers G. Huylenbroeck and E. Mettepenningen (2011) study in their works the role of institutional mechanisms to spur business development in the provision of agricultural growth. Scientist I. Yatsiv (2013) highlights the competitiveness of agricultural enterprises among the main factors that enhance the social and economic growth of rural areas.

Despite numerous scientific and practical studies of the entrepreneurship development, scientists still haven't defined well enough the areas of concern of the diagnostics of the business environment in rural areas, connected with the identification of the influence of socio-psychological factors on the formation and development of entrepreneurship in rural areas. With this in mind, the main purpose of the study is to carry out a systematic diagnosis of the business environment in rural areas in the context of socio-psychological dimension and the development of adequate organizational and economic measures to overcome the destabilizing impact of obstacles on economic management in the rural areas.

2 Materials and Methods

The fundamental base for the study are the results of scientific work of Ukrainian and foreign researchers in the field of entrepreneurship development in rural areas. The information base for the study are the official data of the State Statistics Service of Ukraine, materials from Internet and the authors' own observations. To ensure the complex nature of scientific research, the authors use following scientific methods: 1) synthesis and analysis (to identify

the correlation and interdependencies between the business development and socio-economic growth of rural areas); 2) scientific comparison (to identify the trends in changes of output, industry structure and imbalances in agricultural production by categories of producers in dynamics); 3) questionnaire survey (to determine the opinions of entrepreneurs about the importance of the key problems in starting own business and the assessment of the destabilizing effect of obstacles on running the business in rural areas. 210 entrepreneurs were interviewed in the course of the survey. The list of respondents includes entrepreneurs who carry on their production and commercial operations in the Lviv region of Ukraine and are subject to statistical report form No. 50 s-g. (medium and large farm business). The survey was conducted by sending questionnaire form at the entrepreneur legal domicile with the proposal to answer the proposed questions. After that, a response was received in the form of a completed questionnaire, the results of which were properly processed, analyzed and systematized. The margin of sampling error does not exceed 3%). Formed information base and methodology has provided the systemic nature of the study provided and allowed to formulate the appropriate conclusions.

3 Result and Discussion

The conditions and functional parameters of the business environment in rural areas of Ukraine did not meet the real needs of the socio-economic relations. The existence of such disparities creates prerequisites for the formation of the threats of institutional nature, reduces the pace of socio-economic development, cause socio-economic conflicts of interest in the course of business activities, increasing transaction costs for economic entities. Business environment of entrepreneurship development in rural areas is imperfect. The businessmen can only get high-quality business support and services and improved access to resources and markets in the regional and district centres, and other major cities in the region. In rural areas there are no business incubators, business support centres, the territories of priority assistance to business entities development etc. A typical problem for the development of institutional support for the business environment is the predominance of the role of informal over formal institutes – the impact of personal incentives and interests in the decision-making prevails over the officially formalized rules and regulations, that strengthen the differentiation of attractiveness of the business environment for entrepreneurship in the rural areas.

Low level of the effectiveness of program documents regarding the entrepreneurship development in rural areas of Ukraine complicates the situation, due to their mainly declarative character, as well as they didn't take into account the specifics of the development of a particular rural area. The envisaged goals and targets of economic policy, regarding the stimulation of entrepreneurship development, are achieved mainly at the level of particular sample demonstrational pilot projects. Most of the strategies and the programs adopted are not backed by regulations of the lower level. Haphazard nature of policy documents is amplified in the absence of clearly stipulated mechanisms and sources of funding for the implementation of organizational and economic measures towards stimulating the development of entrepreneurship in rural areas.

3.1 The economic management imbalances in rural areas

Entrepreneurial activity in the rural areas of Ukraine has a mono-functional character and is mainly concentrated in the agricultural sector, making it difficult to diversify risks management in rural areas, increases anthropogenic load on natural ecosystems and impede the formation of a sufficient level of social and economic security of Ukraine. At present, the development of entrepreneurship in agriculture is characterized by systemic deficiencies, which leads to imbalances and irrationality in the process of agricultural production. Thus, the output of agricultural products is still lower than in 1990 (Gross output of agriculture,

2015). In particular, the index of production of gross agricultural output in 2015 (as percentage of 1990) amounted to 88.2% and livestock products – 53.7%. Also, there is a decrease in production volumes in the short term: in 2015 (in constant prices of 2010) there was produced UAH 239.5 bln of gross agricultural production (95.2% of 2014), including crop production – UAH 168.4 bln (94.8% of 2014), animal products – UAH 71.0 bln (96.3% of 2014). The efficiency of agricultural production output is characterized by negative trends. Thus, in 2015, if compared to 2014, the volume of gross agricultural output per 100 hectares of agricultural land decreased to UAH 674.2 thousand (95.2%), including crop production – UAH 474.2 thousand (94.7%), livestock production – UAH 200.0 thousand (96.3%) respectively. Production volumes of gross agricultural output per person also decreased to UAH 5589 (95.6% of 2014).

Sectoral structure of agricultural production is characterized by imbalances, due to the low level of investment attractiveness of individual sectors of agriculture. So, there is still a low share of the livestock industry in the structure of gross agricultural production, that amounted to only 29.7% in 2015. Such an imbalance not only creates a deficit at the market and stimulate the import of livestock products, but also negatively affect the efficient functioning of the agro-industrial complex and the use of natural resources, as it limits the volumes of organic fertilizers applied, that impedes the process of restoration of the natural fertility of the soil. Amid the insufficient volumes of livestock production, the share of industrial crops remains significant – it amounted to 21.0% (UAH 50.2 bln) in the structure of gross agricultural output in 2015, while fodder crops amounted to 1.6% (UAH 3.7 bln), which is due to high market attractiveness and the level of profitability of industrial crops. This imbalance leads to disruption of agricultural production technology, non-observance with science-based crop rotations, depletes the soil and reduces the humus level in it. The psychological and economic incentives to the transformation of personal peasant farms into farm holdings and small agricultural enterprises remain weak. Thus, the share of households is still high, it amounted to 44.9% in the total structure of production in 2015, and in the structure of livestock production – up to 54.5%.

3.2 Institutional and psychological basis of the business environment

The impact of the institutional and psychological factors on the development of enterprises in rural areas is characterised with a destructive nature. Depressive nature of the development of rural areas, the lack of jobs and the monofunctionality of rural economy cause the migration of rural population to the cities in search of work, and degradation of the human capital in rural areas. These trends reinforce the impact of the destabilizing effects of institutional and psychological factors on the development of entrepreneurship, formation of civil society, education, culture, family and local leadership. Deformation of the institutional and psychological incentives and the passivity of the rural population are enhanced in terms of their low level of trust in the representatives of local state administrations and local governments. This complicates the process of approval of the persons who are capable of self-organization and implementation of business initiatives, deepen the socio-economic disparities, impede the emergence of an effective owner in rural areas and increase the opportunistic behaviour of the rural population.

The socio-psychological incentives and mechanisms to raise funds of Ukrainian labour migrants in the development of entrepreneurship in rural areas are insufficient. Despite significant amounts of money transfers, that exceed even the amount of investments that come into the economy of rural areas of Ukraine, workers generally spend earned money on consumption (buying real estate, cars, durables) and tuition in schools. In turn, there are no effective mechanisms to help establish own business, mainly due to: the low level of public confidence in the public and private institutions, insufficient protection of the rights

of investors, the high risks of doing business in Ukraine comparing in the developed countries, especially in the EU countries, high transaction costs.

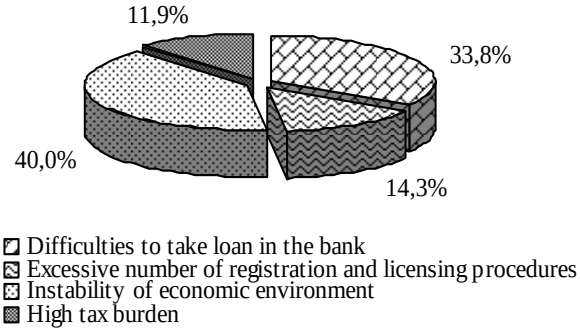
Quite common are cases, when business activities are carried out without proper legalization and registration, which hinders the development of legal business, as well as intensifies its shadowing. It also generates a negative public attitude towards doing business and lead to further deterioration of the investment attractiveness of business development in rural areas. A significant constraint to creating a favourable business environment in rural areas is the lack of development of cooperation among business entities, due to both objective (the existence of institutional barriers, lack of development of adequate financial and credit and investment support) and subjective (the CEOs of business entities aren't conscious of the advisability and the economic need for cooperation, as well as lack of psychological incentives for the joint cooperation, that is the result of the ethnic and cultural peculiarities of individual entrepreneurship of the rural population in Ukraine) factors. The development of co-operation is also hindered by the averseness of employers to take unnecessary risks, a prospect of occurrence uncontrolled processes, fear of losing a part of independence in the management and decision-making. This somewhat "distorted" perception of cooperation by the business entities is the result of a lack of information support of the cooperative movement development and promotion of its key principles and benefits.

3.3 Results of questionnaire

The method of questionnaire is widely used to identify the attitude of entrepreneurs to the conditions and parameters of doing business. For example, such studies have been conducted by I. Kostyrko and A. Burak (2013). In particular, scientists have identified the socio-psychological motives and incentives of entrepreneurs in agriculture regarding management based on the implementation of integration and cooperation processes. The problems of the identification psychological motives for doing business in the rural areas on the basis of the questionnaire were investigated A. Nesterovych (2011). Despite this, scientists have not identified the key challenges and obstacles that occur in the process of doing business in rural areas.

On the basis of a questionnaire survey of entrepreneurs in rural areas the authors managed to identify the key challenges the businessmen face when establishing their own businesses (Fig. 1). In particular, 40.0% of respondents said that the most notable problem was the instability of the economic environment, while 33.8% of respondents have met with difficulties when taking a bank loan for the purchase of necessary equipment and provide liquidity to their own business. Undoubtedly, the positive moment is that only 14.3% of respondents have had problems with the registration procedures and obtaining required permits. Also, a small percentage of respondents have faced with the problem of a high tax burden (11.9%). Such distribution of opinions of respondents regarding the main problems in establishing their own business gives reason to believe that the key to overcoming the lack of business activities in rural areas lies in the increasing availability of attracting free money resources and provision macroeconomic stability of the environment.

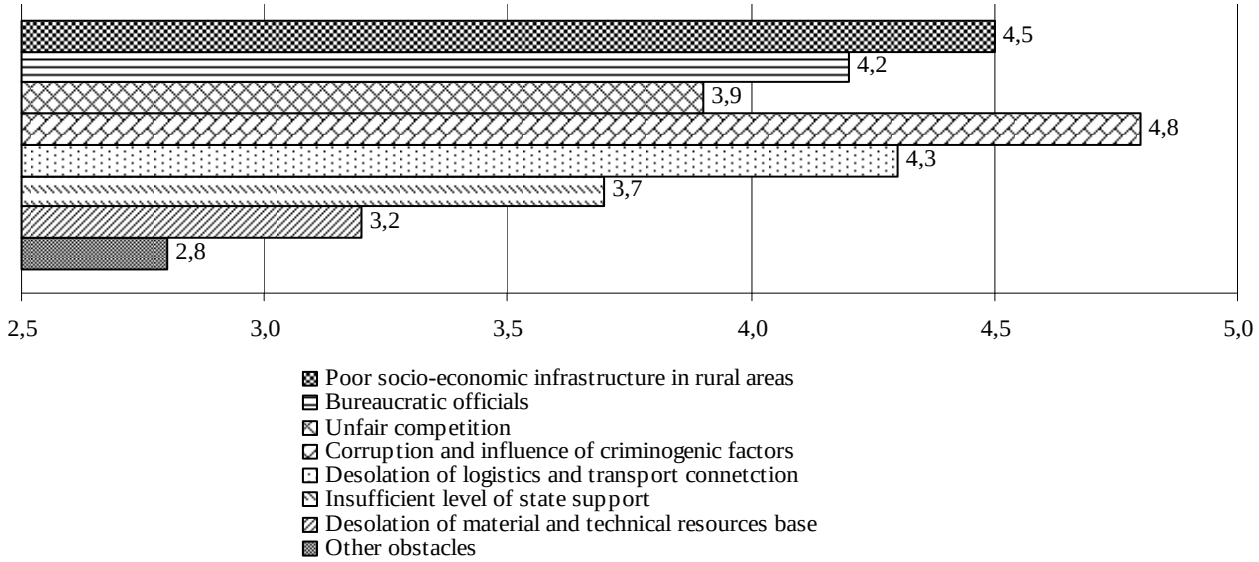
Fig. 1. Distribution of opinions of respondents regarding the main problems in establishing their own business



Source: based on the results of questionnaire survey

Increased macroeconomic instability conditions form a number of obstacles to doing business in rural areas that differentiate in order of destabilizing influence (Fig. 2).

Fig. 2. Estimation of the destabilization level of the dominant obstacles to running business in rural areas of Ukraine (from 0 to 5 where 0 – absolutely does not prevent, 5 points - a significant obstacle)



Source: based on the results of questionnaire survey

According to the estimation of the respondents the most destabilizing impact have such obstacles as corruption and criminogenic factors, poor socio-economic infrastructure in rural areas, desolation of logistics and transport connection, bureaucratic officials and unfair competition. The existence of these barriers requires the development of adequate organizational and economic tools to overcome their destabilizing impacts on the economic management.

4 Conclusion

Comprehensive diagnostics of the business environment in rural areas of Ukraine, taking into account the peculiarities of the socio-psychological attitude of entrepreneurs to the problems and obstacles to doing business in rural areas, allows to draw conclusions about the necessity for the immediate implementation of the following measures: 1) ensuring the development and modernization of the objects of the market, financial, social and domestic, transport, information and communication infrastructure in rural areas through the use of public-private partnership mechanisms of infrastructure projects' financing, strengthening cooperation

with civic and non-governmental organizations regarding the implementation of measures aimed at creating a favourable institutional and psychological basis in rural areas and overcoming the destructive effects of deviant behaviour of the rural population; 2) design urgent mechanisms to counter corruption and criminogenic impact on doing business by ensuring the transparency of relations between the public authorities and entrepreneurs, unshadowing the economic process, minimizing the control procedures and ensuring safe business environment; 3) developing programme support for the technical and technological re-equipment of business entities, especially small and medium-sized agricultural enterprises of the livestock industry, on the basis of innovation and the finance lease with the possibility of partial compensation of the cost of constructed livestock buildings, purchased equipment and machinery at the cost of state and local budgets, ensuring support for the economic and psychological incentives for the development of cooperatives in agribusiness; 4) creation of a network of institutions and initiating a program of financial and credit assistance to attract insurance business to reduce the risk level and provide funding for businessmen, creation of a network of municipal business incubators and venture capital funds, improvement of the institutional and legal support to expanding business opportunities to implement investment projects and innovative programs, expansion of the possibilities of the network of financial and investment business support subjects.

The implementation of the proposed measures will allow to create preconditions for overcoming the existing obstacles, ensure improvement of the business environment in rural areas and raise the effectiveness of doing business in agrarian sphere. The results of the study can be used by public authorities when developing the Strategy of socio-economic development of rural areas.

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Social exclusion in rural areas of the European Union - a comparative approach

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Abstract: Social marginalization has become an element in the functioning of any modern society as a result of the intensification of social inequalities. Social exclusion has become a dynamic and multi-dimensional phenomenon. These processes including poverty coincide with one another other creating cause and effect relationships. The aim of this paper is to present the problem of social exclusion in rural areas in the European Union, including the scale of the differentiation of this process in terms of individual national economies. In the research problem, the authors used literature analysis and the data available from Eurostat for EU Member States (NUTS-1). For the purpose of this research, a synthetic index was also prepared that constitutes the basis for the assessment of risk for the areas examined related with the social exclussion process. Furthermore, this index permitted a preparation of the hierarchy of areas analyzed in terms of the risk level of the marginalization and exclusion of local communities. The group with the lowest level of index includes the following countries: United Kingdom (6,0), Czech Republic (6,9), Germany (7,4) and Austria (7,4), but the group with the highest level (with the highest exclusion risk) includes the following countries: Spain (68,8), Greece (65,6), Bulgaria (56,3), Portugal (52,1). The characterization of the social exclusion of those living in rural areas of the EU was prepared be on the basis of objective factors, such as: the scale of poverty, unemployment and level of education.

Key words: social exclusion, rural areas, European Union, the scale of poverty, unemployment, level of education, the risk level

JEL classification: I24, I32, R23

1 Introduction

Social exclusion is a social and economic phenomenon, which arouses many controversies both as concerns the causes of its occurrence and the mechanisms of its formation. It is a dynamic and multi-dimensional process, which accumulates the negative phenomena and threats (Frąckiewicz 2005; Silver 1994). Exclusion is often equated with social exclusion. Berghmanem (2001) believes that in European Union countries, the term of social exclusion was introduced to the public debate because the governments of some of the states would resist to labeling the situations in their countries with the term of poverty. This is a process, which makes people be more exposed to (and afflicted by) poverty (Mastropietro 2000). Exclusion consists in a shortage of or a refused access to resources, rights, goods or services, and it affects the quality of both of an individual's life and the lives of the whole society (Levitas et al, 2007). Giddens (2004) perceives social exclusion as an impairment whose result is deprivation of an individual of the possibilities of full participation in society. This phenomenon can also be considered as the refusal of basic social rights that guarantee to citizens the positive freedom to participate in social and economic life (Gore, Figueiredo 2012). In connection with the diversity of the definitions of the social exclusion phenomenon, four conceptions of social exclusion are distinguished in the literature of the subject. They include the following (Chakravarty, Ambrosio, 2006; Akerlofow, 1997):

1. Problems with participation in social or communal life;
2. Problems with social rights (refusal, rights not used, problems exercising these rights);
3. Problems with access (limited, hindered) to resources, public goods, institutions and social systems;

4. Poverty and deprivation of needs.

Social exclusion concerns all social and economic groups; however, it concerns chiefly the residents of rural areas rather than the residents of towns. This is mainly the result of smaller awareness in relation to the need to increase human capital on the part of the residents of villages.

The issues of social exclusion are included in interests and activities aimed at combating poverty. Such activities were undertaken by the European Union as early as in the 1970s. The first poverty combating programme was launched in the years of 1975-1980. These activities were continued in the second and third programmes which were completed in the year 1994. Within the framework of combating social inequalities, the Amsterdam Treaty was accepted in the year 1997, and the Lisbon Strategy was accepted in the year 2002. The year 2010 was proclaimed by the Council of the European Union and European Parliament as the Year of Combating Poverty and Social Exclusion. In this year, the European Union accepted the new Europe 2020 strategy whose one of operational objectives includes support of social integration, especially by the limitation of poverty.

2 Materials and Methods

The purpose of the study is to present the problem of social exclusion in rural areas in the European Union taking into consideration in particular the scale of the diversity of the process examined in the perspective of individual national economies. The literature of the subject and secondary mass statistics data (Eurostat) was used implement the research task that was formulated in this manner. The characterization of the social exclusion of those residing in EU rural areas was based on objective factors, such as: the scale of poverty, unemployment rate and the level of education. Using statistical data on the NUTS 1 level, descriptive characterizations of the processes examined were prepared on the scale of the individual countries. In the empirical part, the synthetic index was used of social exclusion risk in EU rural areas, which was prepared for the needs of the foreseen research. In the article, the research material was subject to a numerical and descriptive analysis.

3 Result and Discussion

3.1 Determinants of social exclusion in rural areas in EU states

The characterization of social exclusion in selected EU areas can be made based on objective factors such as the scale of poverty, the level of education or the unemployment rate; or based on subjective factors, which include human capital (Raczkowska, 2012). The process of social exclusion can also be considered in relation to those factors that have an impact on exclusion; these include economic, health factors and residential environment (Majer, 2013).

The analysis carried out in the study in relation to the diversity of selected parameters that determine the level of social exclusion is aimed at indicating the diversification scale of this phenomenon in rural areas in the European Union. The selection of the variables analyzed was made on the grounds of a review of the proposals concerning the assessment methodology of the phenomenon examined, and which are presented in literature. Taking into consideration the availability of comparative data, diversity was analyzed in the spatial distribution of the following variables:

- Variable I - level of poverty measured by the participation of population with incomes below 60% of the equivalent income median;
- Variable II - unemployment rate measured by the participation of unemployed people aged 25-64 in the total number of people in this age range;

- Variable III - the level of education measured by the participation of people with less than primary, primary education and lower secondary education (levels 0-2) aged 25-64 in the total number of people in this age range;

Table 1 presents the basic results of the statistical descriptive characterization of social exclusion determinants that were accepted in the research in the perspective of EU rural areas. This was done by using the data available from the Eurostat database for EU member states (NUTS-1). This permitted an assessment of the degree of their diversification.

Table 1. Descriptive statistics of the factors of social exclusion in EU rural areas in the year 2014 [%]

EU Member States	Variable I	Variable II	Variable III
Average	6.7	7.1	27.4
Standard deviation	4.0	4.2	16.7
Interval	17.9	17.3	62.0
Min.	0.1	2.3	7.7
Max.	18.0	19.5	69.7
Q25	4.0	4.3	16.0
Mediana	6.5	5.5	23.6
Q75	9.8	9.7	35.4
Coefficient of variation	59.9%	58.9%	60.9%
N	28	28	28

Source: own study based on the data from Eurostat, http://ec.europa.eu/eurostat, Access: 22.05.2016

The results presented of the descriptive characterization point to a high diversification of the factors of social exclusion in the EU rural areas examined. The level of poverty measured by the participation of population with incomes below 60% of the equivalent income median fluctuated in the range from 0.1% (Malta) to 18.0% (Romania) of the total number of residents in the period examined. The participation index of the number of unemployed people in the total rural population is characterized by a high diversification. It accepts values from 2.3% (Austria) to 19.5% (Spain) of unemployed people in aged 25 – 64 per 100 people in this age group. The level of the social exclusion of rural areas is diversified due to the level of education. The participation of people aged of 25 – 64 with the lowest level of education (less than primary, primary and lower secondary education, levels 0-2 of the International Standard Classification of Education) fluctuated from 7.7% (Czech Republic) to 69.7% (Portugal).

3.2 Assessment of social exclusion risk in EU rural areas

To carry out the analysis concerning the assessment of social exclusion risk and to provide a hierarchy of social exclusion levels in the EU rural areas examined, a synthetic index was developed for the needs of the research. This index became the base for an assessment of the risk level of social exclusion in the areas examined. A classification of the rural areas examined was performed in connection with three factors, namely: the scale of poverty, unemployment rate and the level of education. For the needs of the research, their identical impact on the process examined was assumed[9]. The synthetic index that was developed for the purpose of the analysis constitutes the geometrical average of the selected partial indexes. This allowed the author to express the limited variability between the individual

[9] The scale of poverty, unemployment rate and the level of education may have different effects on the social exclusion. It is possible to study the correlation between these pairs, however, for the purposes of this article we assume the same impact on the test process.

dimensions of the process examined[10]. The formula describes the general form of the proposed measurement for a given country:

$$IsSE_i = \sqrt[3]{IpPR_i \times IpU_i \times IpLLE_i}, \qquad i = 1, 2, 3, ...n$$

where:

$IsSE_i$ – index of social exclusion for i-th country (synthetic index),

$IpPR_i$ - index of poverty risk for i-th country (partial index),

IpU_i - index of unemployment risk for i-th country (partial index),

$IpLLE_i$ - index of low level of education risk for i-th country (partial index).

The accepted form of the synthetic index takes into account data that is available and comparable for the areas examined which describes the phenomenon of social exclusion on the level of national economies. It also permits an analysis on other territorial levels, e.g. regions. The assessments of partial indexes for the countries examined was conducted using a distance formula in the following form:

$$Ip_i = 1 + 99 \times \frac{x_i - x_{min}}{x_{max} - x_{min}}, \qquad i = 1, 2, 3, ...n$$

where:

Ip_i – specific partial coefficient in i-th country,

x_{min}, x_{max}, - minimum and maximum values of the feature analysed which are observed in the group of countries examined.

From the perspective of the assessed synthetic index, all the examined features have an nature character of a stimulant. The abovementioned formula is sufficient to carry out research and to make the required analyses.

Table 2 presents partial indexes as well as the level of the synthetic index of social exclusion risk in the individual EU states. These results permitted prioritization of the areas analyzed with regard to the level of the marginalization and exclusion risk of local communities.

[10] Owing to the geometrical average, it is possible to assign higher weights to partial indexes with the lowest values, which consequently reflects more effectively the uneven distribution of the properties examined.

Table 2. Partial indexes and synthetic index of social exclusion risk as per EU countries

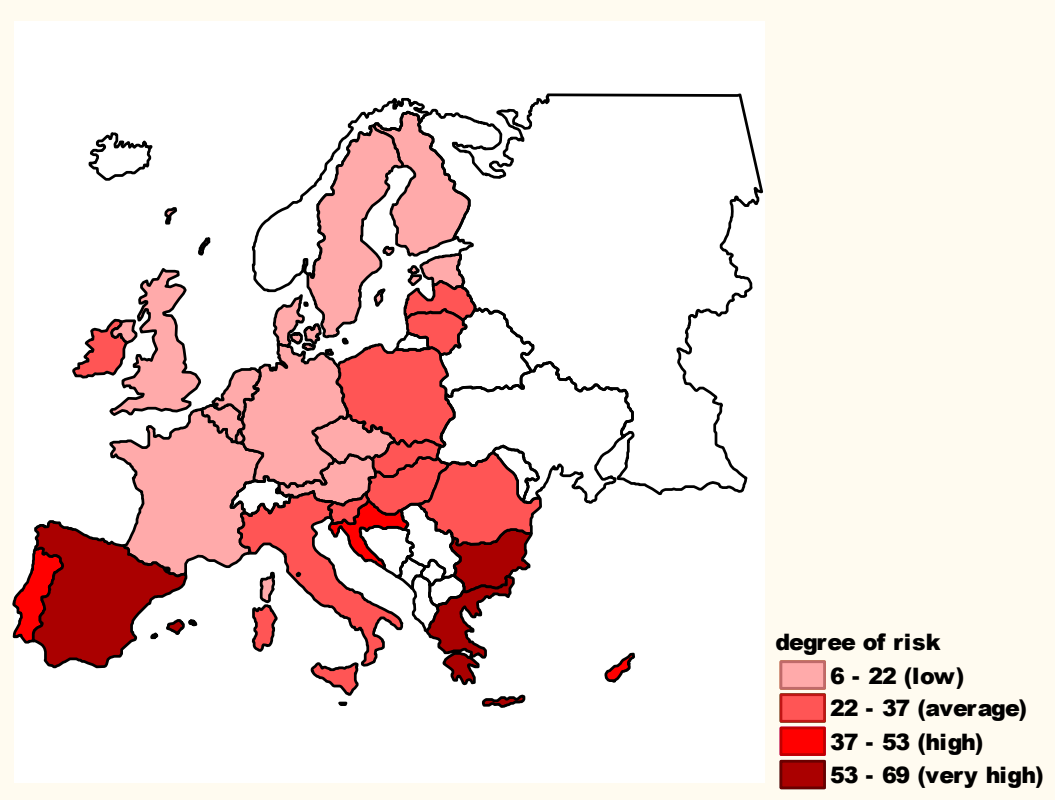
EU Member States	Partial index *			Synthetic index *	Position in the ranking
	$IpPR_i$	IpU_i	$IpLLE_i$	$IsSE_i$	
Belgium	14.8	12.7	28.0	17.4	22
Bulgaria	64.1	52.2	53.4	56.3	3
Czech Republic	22.6	14.3	1.0	6.9	27
Denmark	24.2	11.5	27.7	19.7	19
Germany	19.8	5.1	4.0	7.4	26
Estonia	53.5	19.3	9.3	21.3	17
Ireland	36.4	34.2	28.0	32.7	10
Greece	57.4	77.6	63.4	65.6	2
Spain	41.4	100.0	78.6	68.8	1
France	23.1	17.3	25.0	21.5	16
Croatia	64.1	50.6	31.7	46.8	5
Italy	22.0	31.5	61.7	35.0	7
Cyprus	25.3	58.1	42.5	39.7	6
Latvia	70.7	41.3	13.9	34.4	8
Lithuania	65.7	50.7	5.5	26.3	12
Luxembourg	38.1	10.5	19.2	19.7	18
Hungary	45.2	19.5	31.7	30.3	11
Malta	1.0	12.3	90.3	10.3	24
Netherlands	9.8	13.8	32.0	16.3	23
Austria	24.2	1.2	14.3	7.4	25
Poland	56.9	21.4	12.0	24.4	15
Portugal	36.4	38.8	100.0	52.1	4
Romania	100.0	6.2	60.9	33.6	9
Slovenia	40.3	26.8	14.7	25.2	14
Slovakia	37.5	51.2	8.5	25.4	13
Finland	22.6	16.6	14.3	17.5	21
Sweden	26.4	12.8	19.2	18.6	20
United Kingdom	11.5	1.0	19.2	6.0	28

* These indices may accept values from 1 to 100, where 1 is the minimum level and 100 is the maximum level of the feature.

Source: own study based on the data from Eurostat, http://ec.europa.eu/eurostat, Access: 22.05.2016

On the grounds of the results obtained, a division was made of the countries examined into four classes of social exclusion risk related to human capital in EU rural areas. Figure 1 presents the spatial distribution of the areas examined in relation to the risk level obtained.

Figure 1. Degree of the social exclusion of rural areas as per EU countries



Source: own study based on the data from Eurostat, http://ec.europa.eu/eurostat, Access: 22.05.2016

4 Conclusion

Social exclusion concerns all social and economic groups; however, it concerns chiefly the residents of rural areas rather than the residents of towns. Therefore the European Union takes action, which aim to reduce the problem of social exclusion, especially in rural areas. Aim of this article was to present the problem of social exclusion in rural areas in the countries European Union. For the needs of the foreseen analysis two groups (the "old" and "new") of states were distinguished from among the groups examined:

(1) states accepted to the EU by the year 2004 that represent highly developed economies with market traditions: Denmark, Germany, Spain, Italy, the Netherlands, Austria, Portugal, Finland, Sweden and the United Kingdom;
(2) countries accepted to the EU structures after the year 2004 that represent Middle and East European economies with the experiences of political transformations: the Czech Republic, Estonia, Hungary, Poland, Slovenia and Slovakia.

Analysis showed that the problem of social exclusion couldn't be considered from the point of view of the countries of the "old" and the "new" Union. The study demonstrates that the problem of exclusion and marginalization concerns to the southern countries European Union.

On the grounds of the results obtained, a division was made of the countries examined into four classes of social exclusion risk related to human capital in EU rural areas. The group with the lowest level of index includes the following countries: United Kingdom (6,0), Czech Republic (6,9), Germany (7,4) and Austria (7,4), but the group with the highest level (with the highest exclusion risk) includes the following countries: Spain (68,8), Greece (65,6), Portugal (52,1), Bulgaria (56,3) and Croatia (46,8).

The results confirm that there is still a need for conducting the policy of "equal opportunities" aimed at improving the situation of the rural population of Europe.

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IoT networks

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Abstract: The paper deals with the analysis of potential IoT networks use. IoT is an environment in which objects, animals or people are provided with unique identifiers with the ability to transfer data over the Internet network without the need for human interaction - human or human - computer. Based on research from Juniper Research was in 2015 connected to the Internet 13.4 billion IoT devices and by 2020 is expected to increase by more than 185% to 38.5 billion facility. IoT use of technology has application in all areas of modern society. Among the important areas include healthcare, Smart Cities, Smart Industry, Autonomous Vehicles, Smart Agriculture, Precision Agriculture, Smart Homes and others. There are currently building new wireless networks specifically designed for IoT usage.

The methodical approach consists of analysis of existing and newly developed wireless networks and technologies for wireless transmission suitable for the operation of IoT devices. The study will be based on a review and critical analysis of the scientific literature related to existing and newly developed IoT wireless networks. The research questions addressed in the research are such as: "What are the potential uses of IoT networks?".

Development of wireless networks specializing in the operation of IoT devices will revolutionize the use of these devices, mainly thanks to low energy consumption. Disadvantage of the IoT networks is small data bandwidth. The networks will be primarily used to harvest data from sensors generate small amounts of data.

Paper evaluates and compares the IoT networks and represents a new potential usage. The paper deals with issues of potential IoT networks use. The next related study would analyse the protocol used by IoT networks.

Key words: IoT, Internet of Things, networks,

JEL classification: L86, L96

1 Introduction

IoT is an environment in which objects; animals or people are provided with unique identifiers with the ability to transfer data via the Internet network without need of an interaction human - human or human – computer (Gluhak et al, 2011). In 2015, on the basis of Juniper Research (2015), 13.4 billion IoT devices was connected to the Internet and the increase of more than 185% up to 38.5 billion devices is expected by 2020. The utilization of IoT technologies is applied in all areas of modern society (Vermesan et al, 2013). The major areas include healthcare, Smart Cities, Telemetric tracking, Smart Industry (Industry 4.0), Transportation, Smart Agriculture, Smart Homes, Tourism and others (Jarolimek, et al, 2014 Shang et al, 2015; Silerova, Maneva, Hrebejkova, 2013).

IoT has a great potential and is currently a key issue for the future development of services on the Internet. Dominant IT (information technology) companies and the vast majority of countries around the world deal with this subject. Not only possibilities of utilization have been found but mainly an emphasis on standardization solutions (Jazayeri et al, 2015). The issue of IoT is a part of Digital agenda of Europe (European Commission, 2016). Within Horizon 2020 the European framework program for research and innovation program, 140mil. EUR will be invested in IoT technologies only in 2016 – 2017. In March 2015 European Commission initiated the formation of Alliance for Internet of Things Innovation

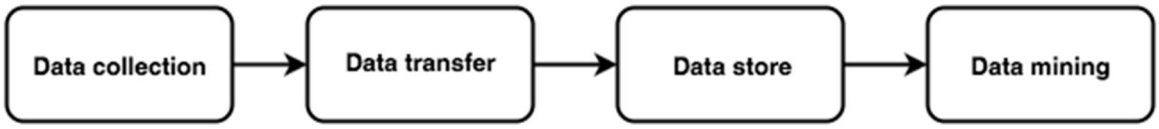
(AIOTI). The intent of this alliance is to establish close cooperation between the European Commission and stakeholders and IoT actors in the creation of IoT innovation and standardization (European Commission, 2016). In the Czech Republic (CR) there is no concept of dealing with the IoT at the government level. A significant problem today is mainly large fragmentation of platforms and communication protocols and thus caused incompatibility of individual IoT devices for different fields of application (Al-Fuquaha et al, 2015; Atzori et al, 2010). In the field of precision agriculture, the issue of IoT belongs to highly developed but proprietary solutions which create barriers to interconnection of individual devices (Ojha et al, 2015; Vermesan et al, 2013). It is needed to look for new models incorporating devices compatible with open standardized protocols and platforms. Currently, there is a lot of these devices on the market based on partly opened hardware (HW) with significantly lower cost compared to proprietary solutions (Fisher et al, 2015).

Lifecycle of IoT data can be divided into four processes (Fig 1):

- *Data collection* – data are obtained most commonly by various sensors or sensor networks.
- *Data transfer* – from sensors to Internet network.
- *Data store* – usually in various cloud data store. Data can be structured and unstructured. Small data store in clouds create so-called big data.
- Data mining – key process of lifecycle – analyse of data.

This paper deals with the possibility of transferring data from the sensors to the Internet network. The research questions addressed in the research are such as: "What are the potential uses of IoT networks?".

Fig. 1. IoT data transfer



Source: author

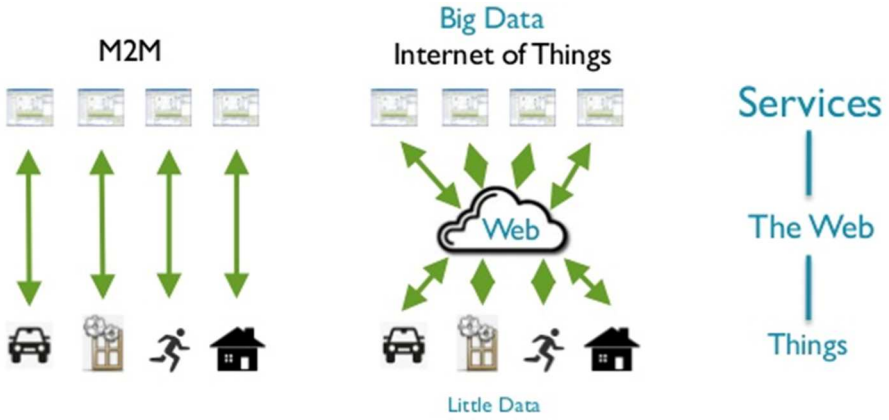
IoT is constantly evolving industry, Stamford (2016) define the next ten technological components that will be crucial for the development of IoT for 2017 and 2018

- IoT Security
- IoT Analytics
- IoT Device (Thing) Management
- Low-Power, Short-Range IoT Networks
- Low-Power, Wide-Area Networks
- IoT Processors
- IoT Operating Systems
- Event Stream Processing
- IoT Platforms
- IoT Standards and Ecosystems

2 Materials and Methods

M2M, IoT: Predecessor of IoT communication is communication between two machines Machine-to-Machine communication (M2M) (Fig 2.) (Alam, Nielsen and Prasad, 2013). M2M represents a communication of two devices using a proprietary protocol, resulting in a subsequent complicated connection of other devices in communication (limited integration options). The IoT data is sent to the repository connections of the Internet of which can be further used by standard protocols other devices.

Fig 2. Evolution from M2M to IoT



Source: http://www.slideshare.net/zdshelby/coap-tutorial

IoT devices: The IoT landscape is large and heterogeneous. In general you can categorize IoT use cases and applications into four areas, each with an increasing scope, from a single person to large entities: (Mapr, 2016)

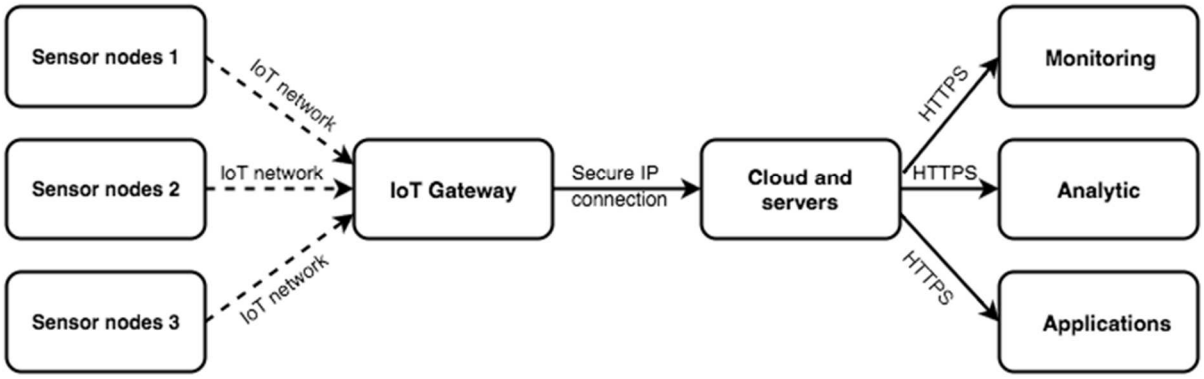
- Personal IoT: the scope is a single person, such as a smartphone equipped with GPS sensor or a fitness device that measures the heart rate. This is one of the fastest growing, consumer-oriented areas of IoT.
- Group IoT: the scope is a fairly small group of people, such as a family in a smart house, co-workers in a van or a group of tourists. This is one of the most challenging areas and is still in its early phase.
- Community IoT: the scope is a large group of people, potentially thousands and more; usually this is in a public infrastructure context, such as smart cities or smart roads. This is a young and potentially promising IoT area.
- Industrial IoT: the scope can be within an organization (smart factory) or between organizations (retailer supply chain). This is arguably the most established and mature part of IoT.

Generally, we can say that IoT devices are sensors that generate data. Devices send data wirelessly. IoT devices consist of three basic parts: a sensor, communication module and power supply.

IoT networks: Especially for the needs of IoT, new devices with low power wireless networking technology were created. These networks can be dividing to two groups. Wireless Personal area network (WPAN) and wireless wide area network (WWAN) subtype Low-Power Wide-Area Network (LPWAN).

Topologies of IoT LPWAN can be seen on Fig 3. IoT gateway collects data from sensors and via secure IP connection sent to the cloud. Data from cloud are analysed by other application.

Fig 3. IoT networks topology



Source: author

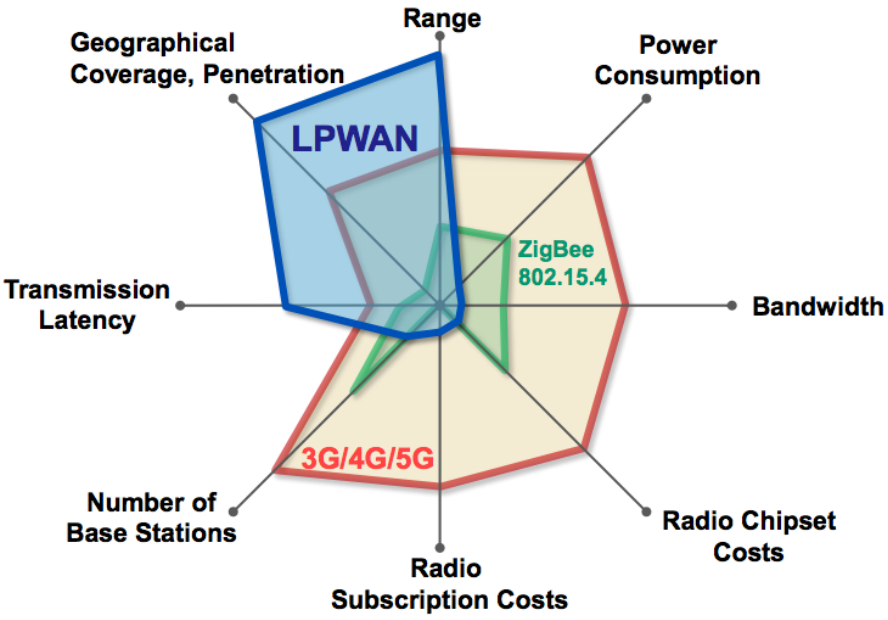
At present (April 2016) in the Czech Republic we built three global networks to serve specifically for IoT device, two on technology LoRaWAN (České Radiokomunikace a.s., Things.cz) and one technology on SIGFOX (SimpleCell). In the coming months can be expected commencement of construction of other networks.

3 Results and Discussion

IoT networks have utility in almost all activities of human activity. Critical property of IT network is its secure. It is also very important to secure the sensors it self. IoT security is only as strong as its weakest link (Airehrour et al, 2016; Espada et al, 2014).

Egli (2015) define main IoT networks characteristic. Fig. 4. Shows comparison of wireless networks applicable in IoT area. Chart shows main technological characteristics of IoT WPAN, LPWAN and cellular networks WLAN.

Fig 4. Wireless technologies characteristics



Source: http://www.indigoo.com/

WPAN

Examples of developing technologies are such as: Bluetooth Low Energy (BLE), Zigbee, Z-Wave, Wi-Fi HaLow. The range of this network is within 100 meters, there is small data rate, and low energy consumption. WPAN IoT networks are commonly use in area of smart industry or smart homes.

LPWAN

Main characteristic of LPWAN:

- Low cost hardware components
- Long range (5-40km)
- Low energy power (years on one battery)
- Support indoor and outdoor use
- Secure (transmission encrypted)
- Small data rate (kbps)

Example of developing technologies: LoRaWAN, SIGFOX, LTE-M, NWAVE, Ampere Wireless.

4 Conclusion

Based on the analysis, it was found that two most important issues of the Internet of things networks are security (encryption) and electric energy.

IoT new network can only be used to transfer small amounts of data. Sensors using IoT networks can operate on conventional batteries for several years. Best technologies for transmission of large amounts of data (images, video etc) are old technology such as cellular network or wi-fi. Sensors generate small amounts of data that are sent to cloud through an IoT gateway. The data from various sensors create big data.

IoT networks are designed with a great attention to encryption of data transmissions. Security risk in IoT mainly involves poorly secured sensor software.

Prices of LPWA hardware devices are very low which contributes to their rapid expansion. IoT devices consist of three basic parts: a sensor, communication module and power supply.

There is expectation of revolution in IT generated by the improving of IoT networks. Such as revolution generated by massive extension of cloud computing in past years.

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The impact of Food Trade Restrictions on the Russian Agriculture

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Abstract: In August 2014 Russia introduced food import embargo of some agricultural and food products from the USA, Canada, Norway, Australia and European Union due to the reasons of national security issues. The food trade restrictions influenced both Russian and European agricultural and consumer markets. The paper describes quantitative estimations of introducing food embargo by Russia on the base of partial equilibtium model. The results of modelling correspond to actual impact of Russian import ban on trade and markets. The influence of food embargo is proved by the actual trade and production data. The paper presents short-term impact of food embargo and notes the influence of Russian rouble devaluation on mutual trade between EU and Russia. In the nearest term the authors expect gradual increase in the agro food imports in Russia, due to the expired impact of food embargo and termination of Russian ruble devaluation. However, an effective demand reduction caused by the economic crisis will be deterrent for increasing of import to Russia.

Key words: food embargo, trade, agricultural and consumer markets, Russia, import ban

JEL classification: Q11, Q17, Q18

1 Introduction

The Russian Federation has traditionally been a net importer of agro-food products. The share of import of certain types of products in food consumption is significant. This refers primarily to meat and meat products, milk and dairy products, vegetables and fruits. We can consider Russia as net exporter only for grains, sunflower seeds and some other products.

Table 1. Consumption and import of food products in Russia in 2013

Agricultural and food products	Consumption (including for industrial purpose)	Import	Import from embargo list countries	Share of import from embargo list countries in total import	Share of import from embargo list countries in total consumption
	thousand tons	thousand tons	thousand tons	%	%
Meat and meat products (beef, pork, poultry)	10255	1908	869	46	8
Fish, fish products and seafood	3178	884	550	62	17
Milk and dairy products (milk equivalent)	39375	6432	2517	39	6
Potatoes and other vegetables	46091	3438	1092	32	2
Fruits	9761	6963	1730	25	18

Source: Own calculations on the base of Russian Statistical Agency and Russian Customs Agency data

The share of countries included into the embargo list of Russian food import is quite high. Especially it relates to such products as fish, meat and milk. Despite the small ("not critical")

share of the restricted countries in the structure of consumption, the embargo for import of the food products from these countries has a significant impact on prices, consumption and other economic indicators in Russia. So, it is also important to evaluate the structure of Russian food import (see Table 2).

Table 2. The structure of Russian food import in 2013, %

Country	Milk	Meat	Vegetables	Potato	Fruits
Belarus	34	11	4	3	2
Kazakhstan	0	0	0	0	0
Australia	4	1	0	0	0
USA	0	14	0	0	1
Canada	0	4	0	0	0
EU	35	26	32	27	24
Other CIS countries	6	4	12	17	8
Other non-CIS countries	21	39	51	52	65
Total	**100**	**100**	**100**	**100**	**100**

Source: Own calculations on the base of Russian Customs Agency data

The European Union, Belarus, other non-CIS countries (except EU, Australia, Canada, and USA) has the largest share of Russian food imports. The share of meat import from Australia, the USA and Canada in total import is not so high. Thus, the Russian food embargo will have a negative impact mainly on agriculture and consumer market of the European Union. The other non-CIS countries (like Serbia, Switzerland, etc.) as well as Belarus and other CIS countries will benefit from the import restriction. In terms of the food embargo it is important to evaluate the overall impact on the agricultural and consumer markets of the Russian Federation and the European Union.

There is lack of studies which examine the changes in Russian foreign trade of agricultural and food products in the current conditions. However, the research paper which contains the analysis of the Russian foreign trade in agricultural and food products according to the international competitiveness and country's trade balance (Ishchukova and Smutka, 2013) was of particular interest to the authors. The work that analyzes the influence of selected key variables (agricultural production, exchange rate, and world food price and government subsidies) on Russian agricultural trade (Svatoš et al., 2014) has served as a valuable background for this study.

The major research objectives determined by the authors: what is the quantitative impact of food embargo on prices, Russian import and export and some European countries? Is the import ban lead to 1) increase in consumer prices, 2) consumption decline and 3) growth of Russian agricultural production?

2 Materials and Methods

The quantitative estimates of food embargo impact was made using EPACIS model. EPACIS model was developed within the TACIS project by the experts from IAMO (Halle, Germany) and Nikonov All-Russian Institute of Agrarian Problems and Informatics (VIAPI) in the late 90s (Weingarten and Romashkin, 2001; Eiteljorge et al, 2000;. Fock et al, 2000). It is based on neoclassical principles. The basis of supply is the Symmetric Generalized McFadden profit function (SGMPF) (Diewert and Wales, 1987). The demand system is derived

from the Normalized Quadratic Expenditure Function (NQEF) (Ryan and Wales, 1999). The model itself is based on the so-called new trade theory with regard to international trade. The Armington approach (Armington, 1969) is used in this case. The 2013 data is used as a basic in the calculations. The agricultural products are divided into 11 groups. The model is also uses 7 types of material and technical resources.

The total import ban of a particular product from a particular country is not possible in the mathematical model, but it is possible to increase import duties. Therefore, authors tested several scenarios of duties growth, which in practice are equivalent to the market closing. For example, the following scenarios were tested: first – 90% increase in the import duty, the second - 199% increase, and the third - 299% increase. In this version of the model, import flows were allocated to 8 groups: Belarus, Kazakhstan, the USA, Canada, Australia, EU, and other CIS countries, and other non-CIS countries. Increased duties were applied to Australia, USA, Canada and the European Union.

It is significant that even the biggest increase in duties does not lead to a complete closure of the market. For example, in the first scenario, the import from restricted countries reduced on average by 55-65%, in the second scenario - by 70-80%, in the third - by 83-95%. And it corresponds with the real-life when the tariff restrictions lead to the illicit traffic. The open source data shows that there is: 1) reexport of some types of food products from the Republic of Belarus, 2) soaring increase in supply from Serbia and other countries, 3) smuggling of goods as a result of the embargo. Estimates have been made on the basis of the third scenario.

3 Results and Discussion

3.1 Results of modelling

The import prices growth caused by the embargo is estimated as 20-40% on average. This is reasonable, because with the increase of import duty the import price increases. Import from all the countries, including countries from the “embargo list” will reduce by 12.5-22.3%. Since the duties rise the import of goods decreases.

In the baseline scenario 383 thousand tons of pork is imported from the EU. While implementing the third scenario (an increase of duties on 299%), the import of pork from the EU will reduce to 37 thousand tons. In this case (in the third scenario) the model shows the significant pork import growth from other non-CIS countries in amount of 323 thousand tons. Also pork import growth is expected from Belarus, and insignificantly from other CIS countries.

In the baseline scenario 2282 thousand tons of milk is imported from the EU. In the third scenario, with the highest import duty the mil import from EU milk will reduce to 160 thousand tons. The increased imports from other non-CIS countries from 1365 thousand tones to 2309 thousand tons should compensate the reduction of milk import from the EU. The milk import from Belarus increases from 2156 thousand tons to 3647 thousand tone in the third scenario.

Also, the third scenario showed the reduction of poultry import from the US from 266 to 1 thousand tons, while pork import from Canada will be reduced from 79 to 8 thousand tons. Vegetable import from the EU countries will decrease from 938 thousand tons to 154 thousand tons. This will lead to increase in vegetables supply from 1497 to 1804 thousand tons from other non-CIS countries. Import of fruits from the EU countries decreases from 1661 thousand tons to 243 thousand tons leading to the increase in fruit import from other non-CIS countries from 4512 to 6709 thousand tons.

The results presented in Table 3 showed that import duty increase to 299% will lead to decrease of import from "embargo" countries to 85-95%. Also, we expect increased supply from the Customs Union member countries, other CIS countries and other non-CIS countries.

Table 3. Results of the third scenario (import duty increase to 299%).

Import growth compared to the base year, %

Country	Milk	Meat	Vegetables	Potato	Fruits
Belarus	69	73	20	17	49
Kazakhstan	70	100	20	0	50
Australia	-93	-96	0	0	-75
USA	0	-99	-86	-84	-86
Canada	0	-90	-84	0	-86
EU	-93	-92	-84	-84	-85
Other CIS countries	69	81	21	18	49
Other non-CIS countries	69	46	21	18	49
Total	**6**	**-14**	**-13**	**-10**	**15**

Source: Own calculations on the base of EPACIS model, Kiselev et al, 2015

However, it is not easy in the short term to compensate meat, vegetables and potatoes import from other countries, and therefore it will decrease by 10-14%, in general. The model predicts the growth of fruit import by 15% and milk and milk products by 6%.

Therefore, the most sensitive products in regard to import growth are milk and fruits. And in fact, there was an increase in fruit import from the North African countries, and dairy products import from Switzerland.

The authors' calculations showed the strong impact of embargo on agricultural and the consumer market of the Russian Federation. Agricultural producers prices is expected to grow by 15%. We need to note, that Ruble devaluation effect is not taken into consideration. Consumer prices will also rise. The significant growth is observed in fruit and pork prices - more than 20%. Milk price will rise to 16%. Poultry prices will increase up to 7%. And vegetable prices - no more than 10%. This will lead to decrease in consumption: 13% for pork, 11% for fruits, 4.5% for milk and 1.3% for vegetables.

Since agriculture is characterized by low elasticity of supply, the effect of sanctions, stimulating domestic production will be short term and insignificant. Domestic production will increase by 2% for wheat, other grains, pork, and milk. Wherein, production of vegetable oil, vegetables, potatoes and beef in the Russian Federation will reduce to 3%. This caused not only by the consumer demand decrease due to rising prices, but also the influence of the relatively cheaper and more competitive imports from other foreign countries.

3.2 The impact of food embargo on trade and markets

In general, the simulation results accurately reflected the reaction of trade and markets on food embargo. Agro-food export to Russia from abroad and certain countries of the European Union declined significantly (Belugin, 2015). At the same time, some countries of Eastern Europe (i.e., Serbia) benefitted. The Table 4 shows the comparison of volume of exports in terms of value for a period before and after the embargo in August 2014.

Poland and Lithuania significantly reduced theirs exports to Russia in the observed period. The European Union exports to the Russian Federation decreased by 54.3% on average taking into account the embargo period.

Table 4. Changes of export to Russia from EU and member countries, thousand US dollars (Harmonized System (HS) nomenclature 01-24 code numbers)

Country	September 2013-August 2014	September 2014-August 2015	September 2014-August 2015 to September 2013-August 2014 (%)
Latvia	187 667	89 826	47,9
Lithuania	365 483	94 256	25,8
Netherlands	1 904 971	849 472	44,6
Poland	1 536 186	448 205	29,2
EU	14 267 002	6 519 436	45,7
Serbia	283 750	360 702	127,1

Source: own calculations on the base of data from INTRACEN

At the same time the export of Serbian agricultural and food products increased by 27% in value terms. According to Eurostat data, the EU exports to Russia in 2015 compared to 2014 decreased by 39%, in annual terms.

For the specific products (i.e. cheese and curd), included in the "embargo list", the numbers are more representative (Table 5).

Table 5. Changes of export to Russia from EU member countries, thousand US dollars (Harmonized System (HS) nomenclature 0406 code number – **cheese and curd**)

Country	August 2013-December 2013	August 2014-December 2014	August 2015-December 2015
Germany	88 517	2 489	0
Poland	72 689	3 675	0
Latvia	43 177	3 903	0
Lithuania	10 702	264	0
Estonia	11 997	38	0
Serbia	9 604	14 924	11 948

Source: own calculations on the base of data from TRADEMAP

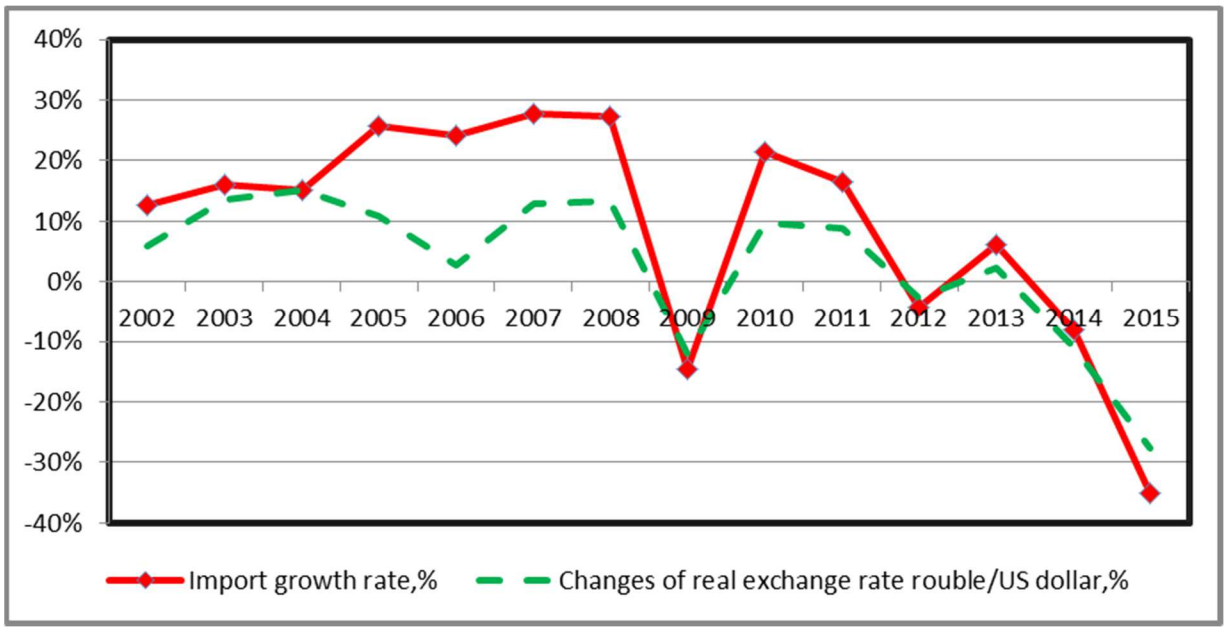
While the export of cheese and curd from European countries has been reduced to zero since the introduction of the food embargo countries in August 2014, the export of Serbia in the period August 2014 - December 2014 compared to the same period in 2013 increased to 55%. However, in the same period in 2015 exports of cheese from Serbia compared to 2014 decreased by 20%, as a result of the devaluation of the Russian ruble.

According to Eurostat data, the EU exports of cheese, powdered milk and fresh fruits declined significantly. The continued decline in exports to Russia is caused mainly by the devaluation of the Russian ruble. Also, there is simultaneous movement of the European agro food export to other markets.

Reduced exports to the Russian Federation led to a decrease in producer prices for many agricultural and food products and in the European Union. The price index significantly decreased in the third and fourth quarters of 2014. And this led to an agricultural producer's income reduction in many EU countries. But gradually European producers adapt to the loss of the Russian market.

The food embargo was imposed by devaluation of the Russian ruble started at the end of 2014. This was an additional factor of the reduction of imports. Effect of the devaluation is presented in the Figure 1.

Fig 1. The devaluation of the Russian ruble and dynamics of agro-food products imports to Russia



Source: Russian Statistical Agency and Central Bank of Russia

The Russian officials see opportunities to produce all the key food products locally in 5-7 years (RIA, 2015). These projections seem to us optimistic. Usually they should be linked to the increase in financial support to the agricultural sector. The Russian business representatives feel opportunities in becoming Russia a leading food exporter in 5-10 years (Danilenko, 2014). We believe that is unrealistic. Most scientists recognize challenges to increase production (Altukhov, 2015). At the same time they consider that import substitution should be one of the main directions of the government policy. We do not agree with such approach.

Food embargo has created incentives for the Russian agro food production growth in some cases. For example, the production of cheese and curd increased in the Russian Federation. The growth of cheese production is estimated as 17% and cheese as 7% in 2015 compared to 2014.

In our opinion, food embargo has short-term effect, as well as import substitution. The import of cheese increased by 30% in the first quarter of 2016 compared to the first quarter of 2015. Import growth was driven by supplies from Belarus, Serbia and Armenia. Therefore, policies should aim to increase of competitiveness of agricultural production, instead of import substitution. The embargo may be a factor reducing competitiveness under certain conditions.

In the nearest term the authors expect gradual increase in the agro food imports in Russia, due to the ending impact of food embargo and termination of Russian ruble devaluation. An additional contributing factor is an effective demand reduction caused by the economic crisis. Despite the termination of the Ruble devaluation it will restrain the increase of the Russian agro food imports.

4 Conclusion

The results of modelling show that in the short term food embargo became an important factor of the reduction in import for the selected types of agricultural and food products by almost 25% during the year. Trade restrictions will contribute to the consumer prices increase for more than 20 % in average. Simulation results assume reduction in pork consumption by 13%, in fruits by 11%, in milk and milk products by 4.5%, in vegetables by 1.3% in the next year after the import ban. Due to low elasticity of supply in agricultural sector domestic production will increase by 2% for wheat, other grains, pork, and milk. For some products it is expected decrease within 3%: vegetables, potatoes and beef.

The impact of food embargo is proved by the actual trade and production data. There has been increase in agricultural and food production in Russia after the import ban. However, Russian agricultural production has limited possibilities for growth in the short term due to the current capacities and level of competitiveness.

Russian ban influenced the internal market as well as the markets of exporters. The European Union agricultural market suffered from the rapid import decrease and declining prices which affected incomes of producers.

The impact of food embargo matched the devaluation of Russian rouble and decline of population income. All these factors strongly influenced the agro food production and foreign trade. Quantitative analysis of impact of those factors on the production and trade trends are very important for the future scientific research.

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Data model for working with seasonal data in webGIS

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Abstract: This paper deals with problems that occur when creating web GIS application that works with data that change in time. In last few years spatial and temporal data presentation, analysis and prediction became much more developed and used. GIS data that few years ago could be displayed and used only in specialized software can now be used and presented by web applications. But web applications conform to special requirements, especially in terms of storing data effectively in specialized data models and in terms of special structure of data needed when showing data to user via web interface. When working with data used in agriculture it's often needed to not only work with current spatial data, but we often want to work with history, more specifically seasonal data. We need to work with multiple data sets gathered in recurring time frames. This requires special type of data model that works effectively with not only data but also with metadata. Used data and methods include data modeling, relational modeling, normalization, UML, work with metadata according to Inspire Directive and ISO19115. Work with spatio-temporal data in relation database and KML format. This paper presents data model for storing seasonal data often used in agriculture. This model is optimized for use as base for web application and deals with problems that come with it, including optimalization for commonly used queries and storing and easy use of metadata. Resulting data model is presented in UML. This model can be generalized for use with other similar types of spatio-temporal data. Research presented in this paper describes problems occurring when designing data models for web GIS including problems specific for web environment and working with seasonal data and their metadata. Paper offers solution in form of optimized data model for simple spatio-temporal agricultural data and metadata, then can be further easily expanded and generalized to accommodate other similar types of data sets.

Key words: GIS, Spatio-temporal data, data modeling, temporal database, web GIS, metadata

JEL classification: Y91 C80 C88

1 Introduction

The integration of time and space into geographic information systems can be approached in two basic ways. In the first one - time considered only as an attribute of an object, placed in a spatial geographic information system. In the second one, time can be seen as another whole dimension of spatial object. Approach, where time is considered an attribute of the object in GIS, is based on the relational data model. It is because in practice it is much easier to implement, and it makes it very commonly used. Integration of time as an attribute can be divided into three different approaches. Each of them is more suitable for a different use case:

- relation-level - each change of entity creates a new instance of the whole relation – a significant disadvantage with data redundancy; when every little change is creating a whole new object;
- row-level (n-tuple) - every row has its own time stamp and when there is change, we create a new line for the appropriate time
- attribute level - every attribute has its own time stamp - the lowest level of redundancy, but the largest number and complexity of questions when working with databases (Ott and Swiaczny 2001)

Every one of these approaches is flawed in some way and it is subject to the shortcomings of relational modelling - too often creates data redundancy or data structure is too complex to work with restrictions of web applications.

The second approach to integration time considers time as another full-blown dimension. There is, however, an obstacle in the form of the complexity of the designing algorithm for working with multidimensional object and even more of a problem of using it to feed the data in acceptable time to existing web based geographic data viewers and systems for controlling and managing data on web. This method is still in academic research. These types of approaches allow for most efficient querying when using with types of data and applications that they were designed for. But on the other hand they have great drawback that they are not applicable for use with web GIS and need specialized programs. (Fan et al. 2010).

In conclusion it is either necessary to revise existing procedures or develop new approaches that will allow easy work with spatio-temporal data and aren't just using existing data models used for simple 2D data. (Fan et al. 2010). In short, it is necessary to explore and develop new data models, algorithms and tools that will really make it possible to quickly and efficiently handle a variety of data in both space and time. (Khatri, Ram and Snodgrass 2004; Pultar 2010; Fan 2011) Subject of spatio-temporal data, their use and efficient storage is also often discused at conferences concerning geographic information science and is more and more included as full section - eg. AGILE 2016 - section Spatio-temporal Data Aquisition, Modeling and Analysis.

Example of such a data model, that is optimized for spatio-temporal web GIS use, is described later in this article.

1.1 Metadata

In most of proposed data models for spatio-temporal data, there is no work done with metadata. In simple terms - metadata are data that describe data set of a data that we work with. This is typically the description of content, geographic scope, time scale, spatial reference, quality, representation. In other words, metadata describe the who, what, when, where, why and how about given geographic data (Charvát 2007). How to use metadata in geographic systems, how to structure and use them is covered in multiple different directives and standards. Most used ones are Dublin Core (ISO 15836), ISO19115/ISO19119 and INSPIRE Directive. The vast majority of data models for temporal data, deals only with the design of the data model for preservation of spatio-temporal data, but in these often highly complex data models, metadata is omitted. Even though these specialized data models often cant work with normally used big GIS server systems and are therefore missing tools and resources of these servers that allow the metadata to be implement. Additionally, if it is a dedicated spatio-temporal model some of metadata (for example time of validity of data) is already included in data model and there can be problem with data redundancy and makes it possible to make conflicting data.

Metadata describe a set of geographic data. If geographic information system operates with only one dataset, in principle, its not necessary when designing the data model and the database, to take into account metadata. However, at a time when we are working with spatio-temporal data, it is usual that the data are obtained from different sources, different people and in different ways. Data in typical spatio-temporal database are more often than not composed of many different geographic data sets and it is important to be able to tell which data is from what dataset. For example, it may happen that a given set of data is flawed and should be deleted, or it is need to check the data entered by a particular person.

1.2 Bitemporal databases

In later parts of this article there will be mentioned valid time several times. Valid time is time that sets validity of object in real time. It can have many forms - from single number to interval (in which case there are usually two columns in database - from, to). Apart from valid time there is transaction time that is the time that object was added / removed from database. Databases that contain both of these times are called bitemporal. Apart from these times there can be user time, that is basically any other time information that is not valid or transaction time (Ott and Swiaczny, 2001).

In bitemporal database one object can have multiple rows where each row is valid in timeframe set by valid time. If end of valid time is not specified then object still exists in current world with attribute values of that row. If row has end of valid time set, then object no longer exists in current world or some (or all) of its attributes were changed and there is more current row for that object (Ye, Peng and Guo, 2010) .

2 Materials and Methods

2.1 Time in relation database

Data model described in chapter three uses combination of row-level and attribute level of time integration approach. Due to uniqueness of seasonal data - many of attribute data change in same time we used row-level attribute approach as base, but build up on it by extending model to several levels to accommodate for additional attributes that can change in different times. This was based on research of Conceptual space-time data model, geo-atom (Goodchild, Yuan and Cova, 2007) and several other approaches (Combi, Keravnou-Papailiou and Shahar, 2010; Pequet and Duan 1995), notably EDGIS (Pultar et al, 2009; Pultar et al, 2010)

2.2 Web GIS, KML and Database queries

In reality there is a big difference between how data are stored and how they are supplied to application that shows them to user. Modern web GIS applications and desktop applications often do have many ways to work with data changing in time. Often the only possible way is to separate data into layers that we want to show to user where every layer corresponds to set timeframe. For example layer for every year. More advanced applications support work with temporal data in form of integrating time on the level of row. But only in most simple way. Programmer has to prepare flat table with all data where there is attribute with valid time (or two attributes in case of interval). Viewing application then offers some sort of slider to filter this table by time (for example user sets that he wants to view how map looks 1.1.2016) and shows data from this table for user. One of the most used queries for web GIS data model are queries that allow swiftly generate current map (map where valid time of object doesn't have upper interval set) and supply data to be converted one of the specified formats mentioned. Data model needs to be able to perform these queries fast even with additional filtering using other attributes than time. And also needs to be able to perform queries concerning history of one object, although usually not for display whole history in map but for work with data.

2.3 Methods used for designing data model

This paper presents data model for storing seasonal data often used in agriculture. This model is optimized for use as base for web application and deals with problems that come with it, including optimalization for commonly used queries and storing and easy use of metadata.

Methods and tools used for creating presented model include relational data modeling, relational normalization, work with metadata according to Dublin Core standard. Model was designed and is presented in UML. Web application for testing was developed using PHP, MySQL, HTML, Openlayers3. For viewing, map data are loaded from MySQL by scripting language (PHP), converted into compatible format (KML), that is then loaded and presented to user by OpenLayers3 javascript library. For testing, web application is run in rented webhosting (to make sure webhosting is considered normal for current standards application was tested on webhosting of three random providers and speed of processing scripts was found comparable between them).

Data for data model: Data model described in third chapter is designed to work with simple seasonal agricultural data. This specific example allows to keep records about fields, what is grown on them and what pesticide was applied and also keeps track about work done on these fields and by who. Model is currently still in testing, but currently holds partly example data generated by students as a part of their semester projects and from big part sets of automatically generated data.

3 Results and Discussion

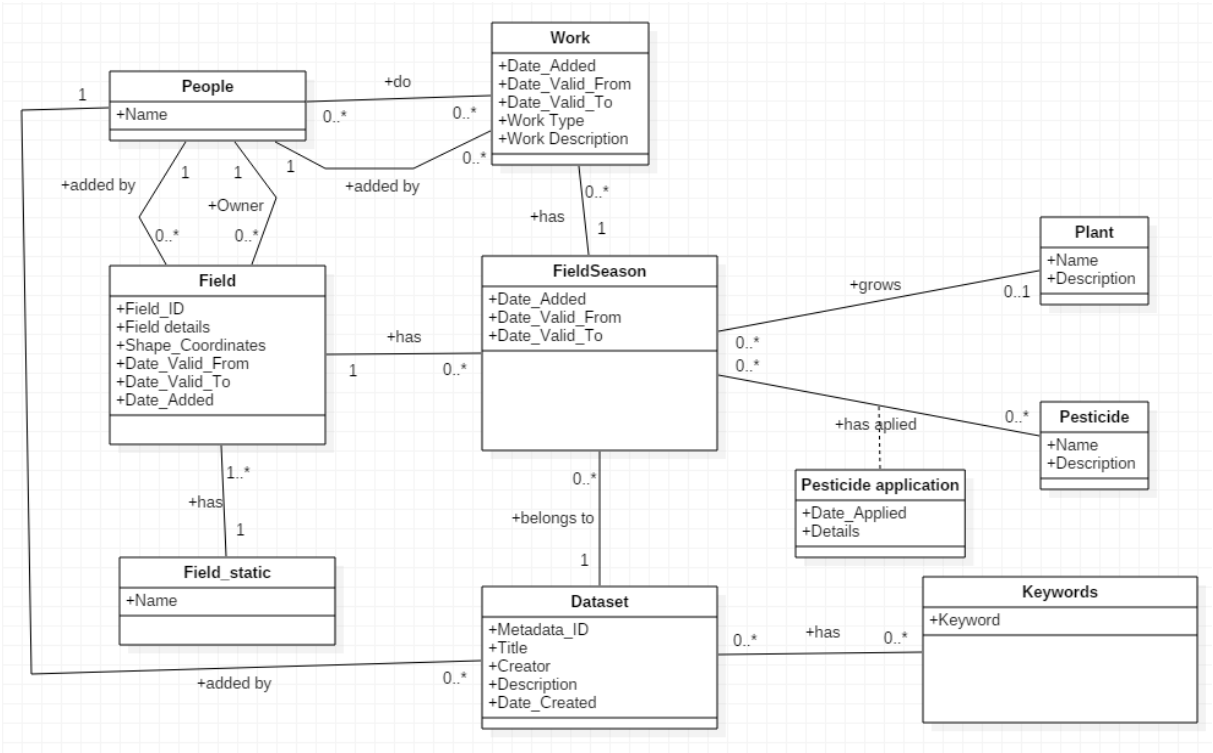
Our goal during our research was to create model for use in agricultural applications to show changing products and their yield on different fields. Much of temporal data needed in agriculture comes in batches - is seasonal data, which is very specific and gives room for optimalization of data model for storing this data.

During our research we studied and tested several different data models and approaches to storing spatio-temporal data models. Main thing that we tried to find in these approaches can be summarized to be compromise between these criteria:

- be usable and adaptable for as many different purposes as possible, but mainly for seasonal data used in agriculture
- be fast and allow usability in web services
- be easy to manage - reduce data redundancy as much as possible
- allow for integrated management of metadata.

As mentioned in previous chapters main problem is conflict between easy management and adaptability of model and fast responses. As a result our proposed data model is based on approach of integrating time in level of row (Ott and Swiaczny 2001). This is without doubt best approach in all criteria when all attributes of object are changing at the same time. If there is change often but only few attributes change, this approach generates much of redundant data. This approach is also close to what most map viewers for browsers need to generate view for a user, so its easy to get data by simple queries. Other approaches such as complex time integration on level of attributes (Fan et al. 2010), integrating time based on events (Pequet and Duan 1995) usually offer much better data management and lower redundancy, then classic time integration on level of rows. Especially when different parts of data change at different times, but they also have much higher demand on query processing time or they cant be applied in constrains of relation databases available in web environment, for example EDGIS (Pultar 2010). Even though our main focus are seasonal data, there are always some data that don't change seasonally, we expanded classic integration of time on level of row by grouping attributes into different groups by frequency and dependency of their change. Specifics of seasonal data in agriculture greatly supports this grouping. Common data of field will usually only change with new season and data are collected during that season are specific to that season and not to many seasons at once.

Fig. 1. Class diagram



Source: own processing

In our case study model (Fig. 1.), we have real field as object in class Field_static. In this class there are attributes concerning field that don't change in time. For every instance of Field_static there exists multiple instances of class Field - for every change in time one. Attributes of field contain characteristics of objects that can change but don't change as often as seasonal data. If they were put in same table as seasonal data, they would cause redundancy. These characteristics there can be details about field (what type of ground is there etc.). Of course as temporal table there are attributes with valid time and transaction time

In our case study in this table there is also attribute for shape coordinates. In our simple example all polygon coordinates are stored in single attribute, but in case we would need to perform advance GIS analysis data model can be easily expanded and they could be stored in special table one by one as for example described by Pultar et al, 2010. So it would be easy to perform special queries by location - for example what fields are adjacent to specific field.

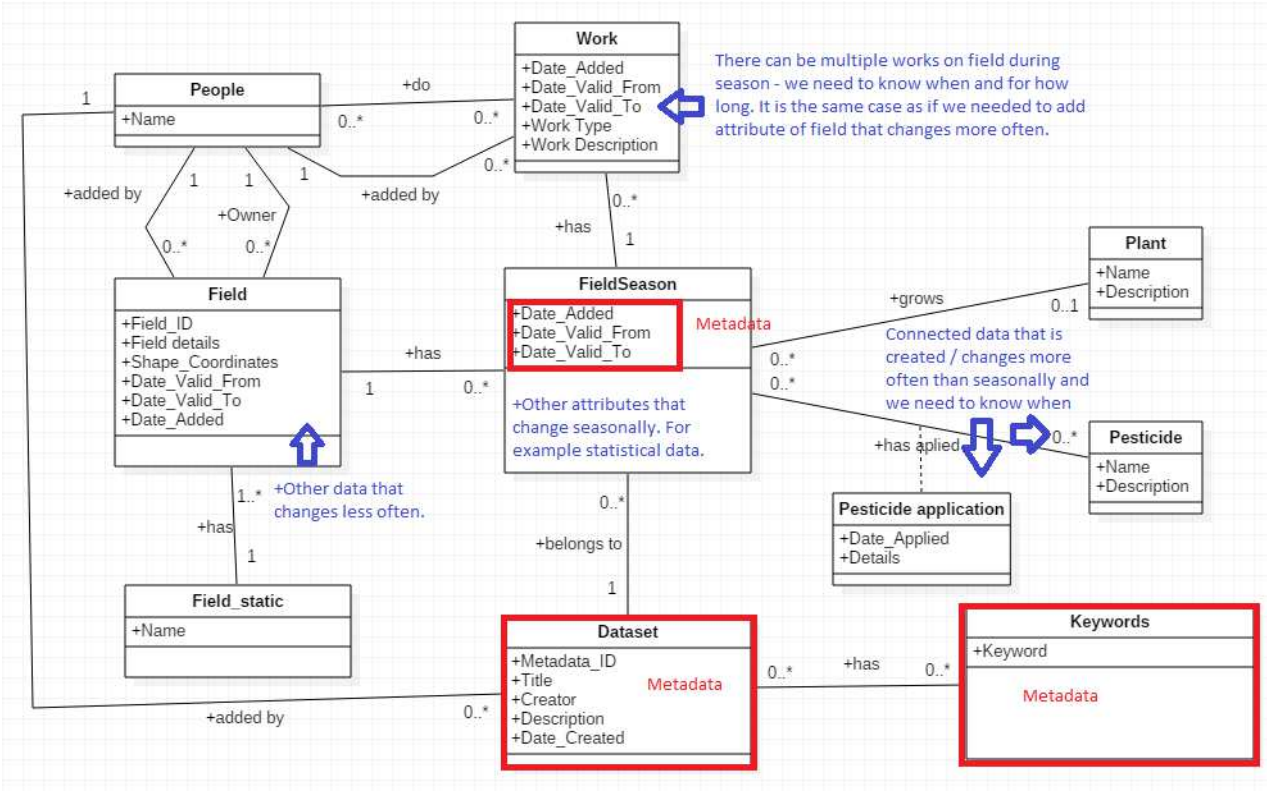
Instance of Field can be expanded by connecting 0 to N instances of FieldSeason where every Field season stores seasonal data about every Field. There can be problem about changing attribute of Field during season. If there are attributes that can change during season they have to be added to FieldSeason table not into Field, even though they would be redundant. Which means this data model is effective only when new version of Field is created between seasons (in our example Field can change owner in between seasons not during one).

Class FieldSeason can store every characteristic of field that changes every season. If characterizing changes less often as written above it may be better to add it to class Field, provided we are not interested when it changed during season but we document change when season changes. Seasonal data in class FieldSeason are expanded by connecting classes Plant, Pesticide and Work which each give example of one type of possible connected data (viz Fig. 2.).

Model works with importance put on seasonal data. For that information about different datasets, that are inputted into system are mainly dealing with them. Part of metadata can

be taken from attributes of FieldSeason class itself. But rest needs to have special class connected to seasonal data. Metadata used in this model are most used metadata from Dublin Core standard.

Fig. 2. Adding other characteristing and metadata



Source: own processing

4 Conclusion

Described data model allows for easy queries needed for web use. It expands on well known temporal and spatio-temporal data models and theories (Ott and Swiaczny, 2001; Ye, Peng and Guo 2010) and adapts them for use in limitations of web environment and optimizes them further for use with seasonal data by separating temporal data into several groups by frequency of their expected updates. This, thanks to specifics of seasonal data, allows for minimal redundancy and good processing speed for most used queries to mine spatio-temporal data. During testing so far with dataset with under 5 thousand entries for FieldSeason - dataset composed of cca 500 agricultural fields with data for 10 years - simple PHP web application combined with open layers GIS visualization script was able to generate and display GIS maps of data from different dates with good response time needed for normal web use (under 0,5s). Data model also works well with accessing and displaying data as time series. It also allows to group data as datasets and manage metadata. At this time we are preparing for testing with several different types of datasets, be it in composition of data or number of objects. And we are also preparing comparison against several different other models. Results of these tests should be available at presentation at the conference.

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Analysis of the Salary and Labour Productivity at the Enterprises of the Dairy Industry of Russia and Eastern Europe

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Abstract: The article presents results of empirical research of stability of dynamics of a salary and labor productivity at the enterprises of the dairy industry of Russia and Eastern Europe during 2011-2013, as well as the econometric assessment of interrelation of labor productivity and salary. The results of the carried-out analysis showed that the salary carries out the stimulating function regarding influence on the labor productivity increase not to full extent, and rates of change of labor productivity are situational results which aren't stable. Labor productivity at the enterprises of the dairy industry in Russia, in distinction from the enterprises of Eastern Europe, shows steady growth.

Key words: Milk processing, financial analysis, controlling, statistical analysis

JEL classification: C58, J31, Q12

1 Introduction

Labor productivity is an important criterion of production efficiency. In the frame of the agricultural industry and branches of processing industry it is difficult to give an objective assessment to productivity of the direct and embodied labour by zones and regions of the country by virtue of different climatic zones and prices of the raw materials. Therefore, as well as in a case with separate branches, it is expedient to estimate the efficiency by the growth (decrease) rates, or by the commercial effectiveness (Panin, 2012).

Acting as an integrated indicator at the macrolevel, labor productivity estimates not only efficiency of expenses of cumulative work, but also competitiveness of production (Ushachev, 2008; Steklá and Gryčová 2014).

The importance of carrying out its analysis at the branch level should be noted , it is necessary at showing up efficiency of technical and technological decisions, at the level of producers – regarding the choice of the production technology, forms of compensation and mechanisms of motivation, the analysis of efficiency of managing (Chirkov et.al., 2013; Horuzhiy et al., 2013; Novotna et al., 2015).

Milk, thanks to its most valuable properties, as a product belongs to socially significant group of goods, and the activity of the enterprises of the dairy industry is under close attention from the state as far as, in particular, health and material welfare of citizens depends on results of their activity.

The decree of the President of Russia No. 596 of May 7, 2012 "About long-term state economic policy" set the task to provide increase in labor productivity by 1,5 times to the 2018 respectively to the level of 2011. Today production efficiency increase, growth of labor productivity and decrease in expenses are fixed in plans of strategic development of the majority of industrial companies.

Salary quite naturally is considered as the major factor influencing labor productivity (Ovchinnikova et al., 2014; Fedchenko, 2007). From the point of view of an enterprise,

the salary is that lever on the efficiency of which the general level of its competitiveness depends. In this regard the fact that at present giving bonuses to a lot of heads of the state and private holdings and enterprises already depends on such indicator as labor productivity growth is quite logically.

Thus, in the course of the analysis of efficiency of use of manpower it is expedient to study the dynamics of labor productivity in interrelation with the dynamics of a salary.

The aim of the paper is to analyze assessment of correlation between labor productivity and salary, empirical research of stability of dynamics of salary and labor productivity at the enterprises of the dairy industry of Russia and Eastern Europe during 2011-2013.

2 Materials and Methods

The empirical base of research was made by the data on Operating revenue per employeeth EUR and an average Average cost of employeeth EUR for the period from 2011 to 2013 at the milk-processing enterprises of Russia and Eastern Europe. 641 enterprises underwent the research.

Data for the countries of Eastern Europe are submitted from the database Amadeus, Code C10.5. In total 141 enterprises from the countries of Eastern Europe (Czech Republic, Slovakia, Poland, Hungary) and 478 from Russian Federation. The Amadeus datanase contains few companies which provided data about average cost of employee. For this reason size of selection about Europe is small. There is no data about average cost of employee in Russia in the Amadeus database. Needed data has been taken from Federal State Statistics Service of the Russian Federation. Operation revenue per employee in Russia is taken from the Amadeus database.Selection of the enterprises was carried out on a cluster basis, by the statistical analysis of the cities, areas or other settlements of Russia and Eastern Europe.

Table 1. Sample size in operating revenue and number of companiesin 2013

	Operating revenue thou. EURO			Number of companies, pieces		
	Sample	Population	Share %	Sample	Population	Share %
Czech Republic	1348	1719	78,42	44	178	24,72
Poland	1264,4	7375,7	17,14	16	525	3,05
Slovak Republic	545,76	653,6	83,5	32	189	16,93
Hungary	902,82	948,1	95,22	49	106	46,23
Russia	9429,7	10751,4	87,71	478	1 192	40,1

Source: own calculation, Eurostat

The comparative analysis of selection shows that the example represents the small number of the enterprises, but they cover the most part of the operating revenue. It means that all big companies are involved in selection. It means that this article investigates the large companies, but not small processors of milk. In Hungary 46,23% of total number of milk processing enterprises take 95,22% from operating revenue. In Russia 40,1% of total number of milk processing enterprises take 95,22% from operating revenue. The least one is Poland because of lack of data.

The period 2011-2013 is representative for comparison of Europe and Russia as far as strong decline of rouble and therefore distortion of data was only in 2014.

As a basic method of research the regression analysis was chosen, as far as it was convincingly shown in (Davnis et.al., 2005; Ziroyan et.al., 2015), econometric modeling

unlike other ways of modeling provides adequacy which somewhat is statistical analog of objectivity.

Table 2. Results of econometric modeling by data of the milk-processing enterprises of Eastern Europe

Mission of model	Model	R	R^2	F-Criterion
Modeling of dynamics of a salary	$z_t^1 = 2{,}23 + 0{,}81z_{t-1}^1$ (5,45) (22,16)	0,79	0,63	7,2E-64
Modeling of dynamics of labor productivity	$p_t^1 = -8{,}82 + 1{,}16p_{t-1}^1$ (-1,90) (51,9)	0,95	0,90	5E-147
Modeling of dependence of labor productivity upon the salary	$p_t^1 = 7{,}93 + 0{,}01z_t^1$ (27,53) (10,90)	0,46	0,21	1,4E-24

Source: own calculation

Besides, as a result of the econometric analysis it is possible not only to estimate interrelation degree between labor productivity and salary, but to receive the answer to a question on the nature of dynamics of these interconnected indicators: "Whether stable development is observed in dynamics of labor productivity and a salary or it is necessary to expect the manifestation of bifurcation effect?". The detailed scheme of the analysis of stability of economic processes with use of results of econometric modeling is provided in the table (Davnis and Tinyakova, 2008).

Here the only main ideas of this analysis are presented and it should be mantioned that the analysis is based on cobweb model:

$$Y_t^d = b_0^d + b_1^d P_t, \qquad b_1^d < 0, \tag{1}$$

$$Y_t^s = b_0^s + b_1^s P_{t-1}, \qquad b_1^s > 0, \tag{2}$$

$$Y_t^d = Y_t^s, \tag{3}$$

Where Y_t^d – demand at the moment of time t;Y_t^s– offer at the moment of time t; P_t – price at the moment of time t;b_0^d, b_1^d, b_0^s, b_1^s – consequent coefficients of demand equiation and offer equiation.

Model (1)-(3) provides tracking of balance between demand and offer by means of price variation. The process of "finding" equilibrium price at $t \to \infty$. is of great interest. The finite difference nonhomogenious first-order equiation has the following view:

$$P_t = b_0 + b_1 P_{t-1}. \tag{4}$$

The key of analysis of convergency is specific solution of this equiation (4)

$$P^* = \frac{b_0}{1-b_1}, \tag{5}$$

obtained under balance conditions at the market.

The main cases of price behavior depending on value and sign of parameter $b_1$are the following:

1 If. $b_1 > 1$, then deviation of price from its equilibrium value under positive feedback is increasing unrestrictedly.

2. If $0 < b_1 < 1$, then deviation of price from its equilibrium value is damping.

3. If $-1 < b_1 < 0$, then price is hovering around its equilibrium value with damped amplitude for the reason of negative feedback.

4. If$b_1 < -1$, then price is hovering around $P^*$with increased amplitude for the reason of negtive feedback.

Consequently, to make analysis of salary steadiness, the following autoregressive equiation $z_t = a_0 + a_1 z_{t-1}$is needed and equilibrium value$z^* = \frac{a_0}{1-a_1}$ should be calculated. Analysis of labour productivity is performed with similar formulas: $v_t = c_0 + cv_{t-1}$, $v^* = \frac{c_0}{1-c_1}$.

Table 3. Results of econometric modeling by data of the milk-processing enterprises of Russia

Mission of model	Model	R	R^2	F- Criterion
Modeling of dynamics of a salary	$z_t^2 = 0{,}50 + 0{,}88 z_{t-1}^2$ (5,68) (53,25)	0,86	0,73	6,7E-294
Modeling of dynamics of labor productivity	$p_t^1 = 7{,}13 + 0{,}93 p_{t-1}^1$ (1,28) (85,01)	0,93	0,88	0
Modeling of dependence of labor productivity upon the salary	$p_t^1 = -79{,}59 + 30{,}94 z_t^1$ (-9,53) (19,83)	0,45	0,21	6,36E-78

Source: own calculation

All calculations were carried out with use of program tools of the tabular MS Excel processor. The results of econometric modeling by MS Excel are presented in tab. 2 and tab. 3. Note, that in brackets under estimation of the coefficients of models, a value of t- statistic is shown.The model is statistically significant. Besides, these tables also contain correlation coefficient (R), determination coefficient (R2) and Fisher dispersion relation (F). Values of these factors prove high quality of generated models. Randomnessassumptionisdone.

3 Results and Discussion

The analysis of dynamics of an average salary at the enterprises of Eastern Europe allows to make a conclusion that its level is close to an equilibrium state and continues to grow with the moderate fluctuations which aren't surpassing the average level of a salary. Calculation of an equilibrium state, determined by coefficients of the constructed regression model, 2,23/(1-0,81)=11,60, confirms the conclusions about nature of dynamics of salary. And, as coefficient at the late variable less than 1, the dynamics shows stability in the sense that, despite fluctuations, the average level steadily comes nearer to an equilibrium state. Judging by determination coefficient during the analyzed period, the dynamics of a present situation for 63% was explained by nature of dynamics of a salary of the previous period.

Absolutely other nature of dynamics shows labor productivity at the enterprises of the dairy industry of Eastern Europe. Its average value grows, without having limit value in the form of equilibrium level Coefficient at the late variable is more than 1, it is equal 1,17. From this follows that process of growth of labor productivity is bifurcation. At that the coefficient of determination of R^2=0,90 allows to draw a conclusion that more than 90% of bifurcation dynamics of the past are postponed to the future, it means that the moment of a change of nature of dynamics of labor productivity will come.

The constructed regression equation characterizing connection of labor productivity and a salary allows to draw a conclusion that influence of a salary on labor productivity though is statistically significant, but the extent of this influence is insufficiently high. The coefficient of determination shows that only in 21% of labor productivity change is explained by corresponding changes of a salary.

As for a situation on the Russian milk-processing enterprises, the average salary tends to decrease with insignificant fluctuations, in distinction from countries of Eastern Europe in which as it was noted above, growth is observed with insignificant fluctuations. Besides, the current values of an average salary in Russia are higher than its equilibrium value 0,50/(1-0,88)=4,14, and, therefore, the deviation from the equilibrium has to decrease, i.e. the decrease tendency, most likely, will remain for some time. And decrease is expected, in spite of the fact that an average salary in Russia is twice below an average salary

in Europe. Such low level of a salary in Russia, perhaps, is quite justified as labor productivity level in our country is also twice lower.

At the same time labor productivity at the enterprises of the dairy industry in Russia shows, in distinction from the enterprises of Eastern Europe, steady growth, equilibrium level is still not reached: 7,13/(1-0,93) =100,95.

We will notice that nature of connection of labor productivity and salary at the Russian enterprises is identical to connection at the enterprises of Eastern Europe.

Thus, the econometric assessment of interrelation of labor productivity and salary in Russia, and in countries of Eastern Europe, allowed to draw a conclusion that, first, the salary does not fully carry out the stimulating function regarding the influence on labor productivity increase, and secondly, rates of change of labor productivity are situational result which isn't steady.

Really all conclusions formulated by us are rather reliable as they are received on the basis of adequate models with statistically significant coefficients.

Salary obviously influences labor productivity in Central Europe, and this influence is statistically significant, but growth in researched period has not been detected. In Russia there is influence of salary on labor productivity and steady growth but equilibrium level of this growth has not been achieved yet.

In this article it is considered that salary influences labor productivity. The conception of "effective salary" and works of some authors (Shapiro and Stiglitz, 1984; Millea, 2002) prove motivational effect of salary on labor productivity. It is question for discussion. There is opposite point of view i.e. increased labor productivity results in growth of salary (Meager and Speckesser, 2011). However, an extent of dependence is different in some countries (Klein, 2012). The subject of dependence of salary from labor productivity may be elaborated on future researches in this field.

4 Conclusion

The analysis of scientific research and the experience of practical development in Russia and abroad according to the analysis of dynamics of labor productivity are shown by considerable dispersion of the points of view of authors. We consider it necessary to examine the salary of employees of the enterprises as the major factor, having an impact on it. In the course of the analysis of efficiency of use of manpower, dynamics of labor productivity in interrelation with dynamics of salary in the enterprises of the dairy industry during the period within 2011-2013 was studied. As a result of the conducted research the following conclusions were drawn:

- the analysis of dynamics of an average salary at the enterprises of Eastern Europe says that its level is close to an equilibrium state and continues to grow with the moderate fluctuations which aren't surpassing the average level of a salary,
- dynamics of a salary shows stability in the sense that, despite fluctuations, the average level steadily comes nearer to an equilibrium state,
- process of growth of labor productivity at the enterprises of the dairy industry of Eastern Europe is bifurcational,
- the influence of a salary on labor productivity at the enterprises of Eastern Europe though is statistically significant, however the extent of this influence is insufficiently high,
- labor productivity at the enterprises of the dairy industry in Russia shows, unlike from the enterprises of Eastern Europe, the steady growth, the equilibrium level is still not reached,

- the econometric assessment of interrelation of labor productivity and salary in Russia, and in countries of Eastern Europe showed that the salary does not fully carries out the stimulating function regarding the influence on labor productivity increase, and the rates of change of labor productivity are a situational result which isn't steady.

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Urban agriculture: innovative social movement or established food production?

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Abstract: Ancient cities were living from resources produced in their closest areas. However today cities exploit 75 % of Earth´s resources. Ways how to achieve higher sustainability of modern cities need to be connected also with food. The text addresses food growing practices of urban community gardens. Main aim of the paper is to find out how much are the community gardens only about food provision and how much they challenge established practices in the society (related to the concept of sustainability). The data answering research question are gathered through triangulation of interviews with the gardeners, participant observation in events and usual days in the gardens and instructed diary records that gardeners conducted. Interpreting findings through transition theory shows very ambiguous nature of urban community gardens. They are a sort of a new social movement with the tendencies of individualization. Such a new social movement is considered as an innovative element challenging established practices of food consumption and food production in the cities, however individualization suggest embeddedness in established practices.

Key words: community gardens, resilience, sustainability, urban agriculture

JEL classification: A14, O35, Q15

1 Introduction

The historical findings demonstrate that urban agriculture was always inseparable part of urban life. Archaeological records document food growing conducted by dwellers in cities of India, South-Asian Angkor, Mesopotamia, Egypt or Constantinople, as well as in cities of Maya and Aztecs (Isendahl and Smith, 2013). Such food provision formed a background for the existence of the ancient cities. It was supported by well managed infrastructure and good resource management. Such a composition of internal (local) food provision, infrastructure and resource management is a precursor of contemporary idea of sustainable cities.

Modern cities are, contrary, highly dependent on their external environment. They are not sustainable since they exploit other parts of the world. While covering only 2% of Earth surface they are using over 75% of Earth's resources. It means they are largely using resources existing behind their borders. To trace such utilization a concept of ecological footprint was developed. Over 50% ecological footprint of cities is created by food production and consumption. However, this fact is almost out of any political agenda (Wiskerke, 2015). Stell (Wiskerke, 2015: 4) argues that “feeding the cities has the biggest social and physical impact on our planet”.

Wiskerke (2015) considers the reason of such situation in rural urban dichotomy when the dominant discourse in food policy links agricultural production always with the rural while food consumption is linked with urban inhabitants. The questions of food production in the countryside and consumption in the cities are mostly ignored by the policy makers. However, there are initiatives of local citizen attempting to develop a more sustainable way of urban food system. The most prominent of such ways are alternative food networks (AFN). They are based on shortening distances between consumers and producers (which eliminates

rural – urban food dichotomy) and supporting organic and sustainable agriculture (Evers and Hodgson, 2011).

Some forms of AFN in the Czech Republic have been tracing here since 2008. Box schemes, farmers markets and community supporting agriculture were slowly introduced to Czech consumers. Some researchers also list urban community gardens between AFN. New initiatives of urban community gardens started in 2012 in Prague. Since then (just in 4 gardening seasons) the number of community gardens exceeded 20 in the whole Czech Republic. Urban inhabitants grow in such gardens vegetables, fruits, herbs and flowers on a small scale. In this case gardeners are not only producers or consumers but they are becoming prosumers (Zagata, 2012). As such they break free from rural-urban food dichotomy. All of these initiatives were launched as bottom-up or grass-root initiatives through active citizens.

Although food growing in cities in the form of allotment (auxiliary) gardens is already known in Czech Republic now for almost a century (Gibas, 2013) this paper will show the novelties in term of new ways of urban agriculture which were brought to urban food system through urban community gardens. In particular it investigates what makes the novelty of urban community gardens and what makes the links with already established practices of food provision. Therefore the main aim of the paper is to find out how much community gardens are only about food provision and how much they challenge established practices of food provision existing in the society (related to the concept of sustainability, for instance).

2 Materials and Methods

The data needed to answer research questions are collected through triangulation of various research methods. Quantitative data from weekly records of the gardeners are confronted with the hermeneutic analysis of the recorded interviews and with participant observation during several events in the gardens. Such a triangulation increases validity and reliability of research findings. In total 15 interviews in the gardening seasons of 2014 and 2015 were conducted with practitioners of urban gardening. In the same seasons participant observation took place in 8 Czech urban community gardens, always more observations in one garden. The gardens were visited during various occasions – community gatherings, work together activities, regular gardening days and events for public. The observations were recorded in written form and pictures were taken in order to collect data.

Data from interviews and observation are combined with structured weekly records on gardeners' activities in the area of urban agriculture. During the gardening season 2015 a number of ten gardeners recorded into their diaries information about gardening activities in term of how many hours a day were spent in the garden working, how much money they spent on the seeds, seedlings and other expenses related to gardening and how much they harvested.

Theoretical background of the text is embedded in transition theory. We are searching for innovative ways how to secure urban sustainability. To achieve it the reconfiguration of cultural discourses, production and consumption behaviours is needed (Geels, 2015; Turnheim et al 2015). Such reconfigured activities exist as innovative niches in the form of urban community gardens as well. Part of the research that is being done on the topic of sustainability transition focuses on the level of policies (Rauschmayer, Bauler and Schäpke, 2015). However, policy makers are not the only actors involved in transition. Also social movements, media, public opinion, advisory bodies, researches, and special-interest groups take part in these processes (Geels, 2015). Turnheim et al (2015) are suggesting "initiative-based learning" because only while paying attention to these actors the transition will be socially-robust and sustainable. We look at urban community gardens because without any exception they are developed from the bottom. They are considered

as innovative niches differing from and challenging socio-technical practices of the established regime in food production and food consumption. It is because the "opportunity window" for such type of gardening enabled them to start to be anchored into regime practices. Such "opportunity window" reflects consumer shift highlighted in food studies (Goodman, 2002) underlying long-term societal and technical trends.

3 Results and Discussion

Although urban community gardens claim to be "growing communities", the majority of gardeners prefer to grow on their own vegetable beds or bags as illustrated in example of community garden Kokoza. When they opened, the first year the plan of founders was to have a permaculture garden where everyone shares work and harvests according to their possibilities and desires. This plan failed. After the first year they had to change the concept to small individual beds. The reason why community gardeners prior own beds over common one is that they do not want to discuss the rules of community growing and harvesting.

An interesting finding is that one third of respondents use the garden only for gardening. They spent with gardening activities in an average of 2 hours a week. Regardless what they are doing in the gardens, all gardeners claim to have an interest in social activities in the garden. However, it needs to be organized events. Some gardens indeed offer a wide range of activities like the start of season festivities, gatherings over food or fire, educational workshops, sports etc. Anguelovski (2003) considers these cultural events as network creating events. Cultural events are supplemented by various educational workshops and lectures. They are not only about growing food or composting but also about beekeeping, food cooking and preserving. Two gardens have a special oven for making bread and gather regularly for baking. One garden is even building a community kitchen.

Contrary to general situation there are a few gardens that are exceptions from the individual growing system: namely two urban community gardens that are organized in the system of "common gardening" and a few urban gardens that are experimenting with both systems of "common gardening" and individual beds. In these cases high level of organization is a key to success. Gardens must have rules about taking care of the garden, weeding, watering, and harvesting otherwise everything fails. These rules are usually agreed during the first meeting at the garden where all gardeners take part and all can contribute to the decision making process. After long discussions both gardens with "common gardening" system agreed on "everyone can harvest what s/he wants". But this system of harvest was very unsuccessful. Although from the beginning gardeners were afraid that someone will harvest all yields and nothing will be left for others (a sort of "tragedy of commons"), the opposite result was true. The main gardener in Kuchyňka complained about a lot of vegetables being spoiled. She said: "People are not harvesting. They are afraid that someone will need it more than they need". The same problem is found in another urban community garden in Plzeň. They also have common growing system. It shows that a system with too much liberty does not work and rules must be set up in any case. Another example from Zebra shows that when an approach of liassez-faire type is used the problems are faced. They have a common herbal garden but because they lack the rules, it is not prospering well and no one is harvesting from the garden. An example of prosperous practice can be found in Liberec. Founders here know how important are the rules governing their activities. One of them said: "They [meaning gardeners] have some good ideas and they expect us to do it, but this is our garden and we will organize it in our way." At the same time they emphasize the fact that it is interesting (even enjoyable) for them to manage the urban community garden and see how it prospers.

Findings suggest that although community gardens are claiming to create a community, it is not a community in Tönniesian understanding of association (Gemeinschaft). Community gardens rather strengthen social networks among urban dwellers and echo Tönnesian society

(Gesellschaft). It is supported by attempts of people pursuing to get to know each other. “We live in the same building but we have never met before. Only after meeting here in the garden we talk and share our daily stories when we meet on the street or in the bus,” said one gardener from Kokoza.

People also help each other and share experiences, seeds and harvests. Often there is someone more experienced with growing. “There is a woman who knows a lot about herbs, how to grow them and how to use them, therefore she is always giving us advices.” So they share their good experiences and failures in growing. It is what Okvat and Zautra (2011) emphasise as important element to create stronger tights between gardeners. In all of the gardens it is common to water each other individual beds when somebody sees that it is dry.

Gardeners motivated of having an experience of growing vegetables often emphasized relation to children. “I wanted the garden, so we have a place to go with my kids,” a gardener from Zebra says. Many gardeners are therefore emphasize the impact of experiencing the act of growing vegetable or flowers for their children. They see where food actually comes from and how nature works. As a result they also change their habits: “The kid eats the veg he did not like before but knowing it is from here he then actually liked it.” (gardener from Kuchyňka).

Some of the gardeners originally come from a village or small town and in a community garden they seek a piece of land they want to be related to. They are unable to get big harvests from a small bed. One informant said: “A small bed means a small amount, but with a true taste and happiness.” Often herbs for tea and spices for cooking are grown. “I have a passion for Vietnamese kitchen so I grow all these exotic herbs that are hard to find in a shop” (gardener from Kokoza). Strawberries, cucumbers, tomatoes, zucchinis or pumpkins are also often grown. More than 50% of the yields is used right away and the rest is stored for later or shared with friends, families and fellow gardeners. “A woman brought us a cake with zucchini from the garden to try”, said one Prazelenina gardener.

Diaries with weekly records showed that direct costs of having a garden are usually two or three times higher than the estimated value of the harvest. When time is counted as a cost too it clearly shows that having a bed in community garden makes absolutely no sense from economic perspective.

Nevertheless gardeners claim to change their vegetable shopping during the growing season. Research by Sovová (2014) showed that allotment gardeners in Brno are able to produce 46% of their fruit and vegetable needs. While researching Dutch community gardens and the special position of prosumer (producer and consumer in one person) that gardeners have, Esther Veen (2015) found out that while in Assen they are able to produce enough to cover 5 meals a week for a family in a season, in Zupthen they grow much less. Also they spend much less time taking care of the garden. The garden in Zuphten seems to be more similar to the Czech gardens. After the experience of growing their food in a community garden gardeners prefer to shop local products (sometimes in organic quality). Urban gardening changed their previous shopping habits: “It made me to think how it is to live as a farmer“ (gardener from Kuchyňka). As a result vast majority of investigated Czech urban gardeners would appreciate the opportunity to join food production and consumption. The garden is for them community supported agriculture.

4 Conclusion

The findings explained through transition theory show very ambiguous nature of community gardens because reconfiguration of cultural discourses, production and consumption behaviours (as already cited Geels, 2015; Turnheim et al 2015) is happening there. Most probably community gardens are an early stage of innovations which has not anchored into

dominant food production-consumption regime yet in any way. Nevertheless community gardens play an important role in urban food system usually not through the amount of harvest but through experience of growing food itself. Based on this experience the actor of urban gardening prefer local food when buying. They also appreciate the work of farmers much more since they have an experience with activities with soil. Although typical community character is not present in the urban community gardens, common activities such as common work days in the garden, fire and food gatherings, workshops and lectures contribute to strengthen social networks among urban gardeners compared to other urban dwellers. The activities of these people demonstrate features of a new social movement. Such a new social movement is considered as an innovative element challenging established practices in the cities. It means urban community gardens have definitely the potential of starting the transition towards more sustainable cities.

Acknowledgements

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Trends in the EU Trade of Dairy Products

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Abstract: The article 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 2004 to 2015. The analyses show that imports of milk and milk products (not butter and cheeses) within the internal EU market (intra-EU) are seasonal, import volumes increased especially between April and July. Regarding 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, even though the price of exports falls. There is also increase in volume of milk and milk products imports and exports within the EU. Especially countries of EU-12 increased imports of raw milk and exported dairy products with higher added value.

Key words: Milk, dairy products, foreign trade, EU, seasonality, export, import.

JEL classification: Q12, D24

1 Introduction

The EU abolished in spring 2015 milk quotas which had been in force since the 80s of the last century. So farmers can now produce milk at their pleasure. Nevertheless, together with the Russian embargo on imports of dairy products from European countries and the decline in demand from other parts of the world, it led to a significant drop in prices in the EU member states. Current Russian government policy is focused on protecting its agricultural market and supporting primarily domestic production growth (Maitah and Smutka, 2016). Global dairy markets continue to struggle in the face of weak import demand and excess supplies in 2016. Milk production during 2015 among major suppliers expanded by 1% over the previous year what was a sharp correction from the high 4 percent growth registered in 2014 (USDA, 2015).

Before the Russian embargo in 2014, there were quite significant trade flows with milk and milk products between the European Union and the Russian Federation. Import to export ratio of Russian foreign trade with milk and milk products decreased from 47.6 % to 8 % between 1991 and 2001. Then, it increased to 29.2 % in 2011 (Svatoš et al., 2014). Russia has been a net importer of milk and milk products from the EU.

Bojnec and Ferto (2014) analysed the export competitiveness of dairy products of the European Union (EU) countries (EU-27) on intra-EU, extra-EU, and global markets, using the revealed comparative advantage index over the 2000–2011 period. Their results indicated that about half of the EU-27 countries have had competitive exports in a certain segment of dairy products. The results differed by level of milk processing and for intra-EU and extra-EU markets, and did so over the analysed years. The question is, if the EU producers could be competitive even in time of milk crisis, which press the dairy prices down. The export subsidies will be no more solution as the EU made a proposal for the Nairobi Ministerial Council meeting in December 2015 which would, inter alia, set an end date for export subsidies at the end of 2018 (WTO, 2015).

Weber et al. (2013) noted that seasonality is becoming increasingly important for international prices due to higher shares of grassland based milk production. It can also be shown that the time lags in which price changes are passed on between the different levels differ.

Thus, within the supply chain of milk and milk products there exist price asymmetries. And kind of negative trend or event related to EU market can affect the structure and value of the EU trade. Too high level of dependency on the EU-market does not provide enough stimuli for its inter-regional development (Smutka et al., 2015).

The main objective of this article is to find out whether the dairy exports within and outside the EU are really increasing, which factors affect it and which countries contribute to changes in dairy foreign trade. The authors also want to address the problem of seasonality in dairy trade as well as the problem of obstructions to international trade.

2 Materials and Methods

This article 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 2004 to 2015. The database of Eurostat by Standard International Trade Classification (SITC) was used. Main 3 groups of dairy products were analysed:

1. Group 022 – Milk and cream and milk products other than butter or cheese
2. Group 023 – Butter and other fats and oils derived from milk
3. Group 024 – Cheese and curd

The analysis focuses on the decomposition of the time series for the individual components of the movement of time, namely the description of the trend and periodic fluctuations. If the time series contains a periodic variation, then there is mostly a seasonal component. Seasonal fluctuations largely hide the main direction of development, so seasonal adjustment is subsequently calculated, the aim of which is to eliminate the seasonal component of the analysed time series.

The interval time series can be summarised using the arithmetic mean. The seasonal fluctuation can be confirmed from the graphic display in the series and it has a constant character (i.e. with the change of main trend development stays its size essentially unchanged).

The graphic way is represented by the box plot charts. A box plot is a graphical summary of data that is based on the computation of the median and the quartiles, Q1 and Q3. The boxes (full rectangles) are drawn with the ends of the box located at the first (bottom side) and third (top side) quartiles. A horizontal line is drawn in the box at the location of the median, a diamond in the box represents the arithmetic mean. The “whiskers” are drawn from the ends of box to the smallest and largest values inside the limits, which are computed as 1.5 multiple of interquartile range (IQR= Q3 – Q1). Finally, data outside these limits are considered outliers, which are shown with the symbol of small circle.

For each month, it is possible to determine the values of arithmetic means, which may be different from each other. Likewise, it can be assumed that the means for particular years may differ from each other, which would mean that a given time series has a trend which can be subsequently expressed by a trend function. For the assessment of conformity or differences in mean values can be used a multi-selective test, namely analysis of variance, which is aimed at verifying of conformity or statistically significant differences in the mean values.

In the case of assessing the impact of several factors, there is used multi-factor models of analysis of variance (Seger and Hindls, 1995). Null hypothesis, which is verified, states that all means in particular series are identical, i.e. H0: $\mu 1 = \mu 2 = \mu 3 = \ldots = \mu k$. Then alternative hypothesis assumes that there is at least one pair of means, which are not equal each other. Null hypothesis can also be interpreted as the effect of sorting factor was not

demonstrated. The entire test procedure is usually written into a table that clearly 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 statistic "F" has the form:

$$F = \frac{\text{variance between classes}}{\text{residual variance}}. \quad \textbf{(1)}$$

Statistics F has, with validity of the null hypothesis, 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. If the null hypothesis is rejected, it is necessary to decide, which samples are significantly different from each other and which are not. This is done by multiple comparison methods differing conditions of use, the rate of risk control of the first kind error and strength of test. The most commonly performed are paired comparisons, i.e. the comparisons of pairs of mean values. These are also widely represented in statistical programs. Among the best known method of paired comparisons belongs Tukey HSD test. Tukey HSD test is modified for the case of unbalanced sorting. It has been proven that applies these equations (Andel, 2007):

$$P\left\{\left|y_{i.}-y_{j.}\right| < sq_{k,n-k,\alpha}\sqrt{\frac{1}{2}\left(\frac{1}{n_i}+\frac{1}{n_j}\right)} \quad for\ all \quad i,j\right\} \geq 1-\alpha. \quad \textbf{(2)}$$

If there is obtained

$$\left|y_{i.}-y_{j.}\right| > sq_{k,n-k,\alpha}\sqrt{\frac{1}{2}\left(\frac{1}{n_i}+\frac{1}{n_j}\right)}, \quad \textbf{(3)}$$

the hypothesis of equality $\mu i = \mu j$ can be rejected.

The statistical program "SAS" was used for data processing.

3 Results and Discussion

The seasonality and the difference in the volumes of imports and exports within each month were analysed and changes in these variables both between the month and from year to year were identified using analysis of variance. The null hypothesis of identical means in the months and years was rejected (see tables 1 and 2). Variability of the model (first row in the tables 1 and 2) represents the combined effect of annual and monthly impacts on the value of indicator. The second row (residual variance) represents the effects of random influences.

Table 1. Results of analysis of variance for milk (022) import at the intra-EU market (in 100 kg)

Variability (import)	DF*	Sum of Squares	Mean Square	F Value	Pr > F
Model	22	3.0085936E14	1.3675425E13	70.37	<.0001
Residual variance	121	2.351618E13	194348595147		
Decomposition of model					
month	11	4.2198504E13	3.8362276E12	19.74	<.0001
year	11	2.5866086E14	2.3514623E13	120.99	<.0001

Source: own calculation using Eurostat data; * degree of freedom

In the tables 1 and 2 are also assigned the decompositions of model variabilities according to particular factors i.e., it specifies the influence of the month (month row) and the influence of annual changes (year row). From the results in the tables, it can be derived that the seasonal components are statistically significant as determined level of significance (Pr or p-value) is less than $\alpha = 0.05$.

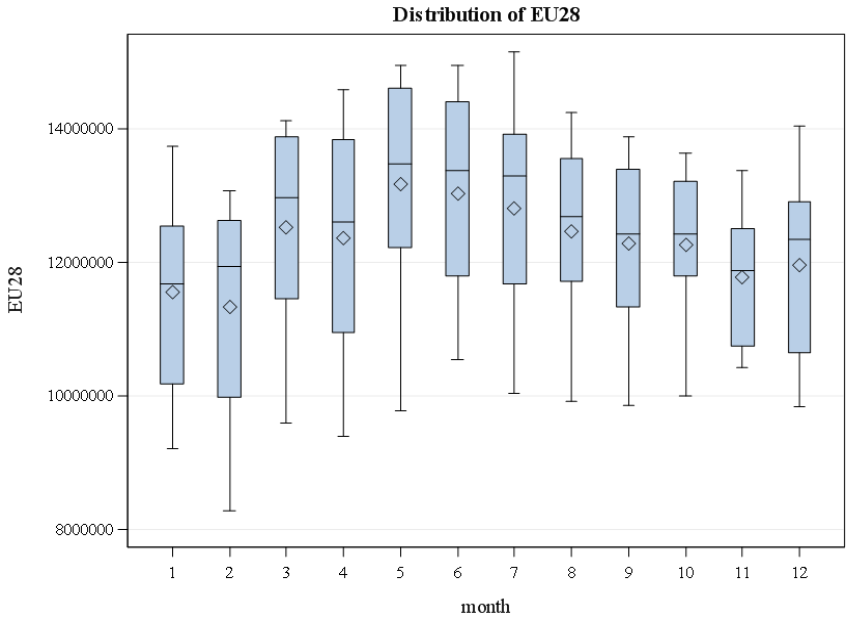
Table 2. Results of analysis of variance for milk (022) export at the intra-EU market (in 100 kg)

Variability (export)	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	22	2.6190285E14	1.1904675E13	66.67	<.0001
Residual variance	121	2.1605973E13	178561760130		
Decomposition of model					
month	11	4.4731366E13	4.0664879E12	22.77	<.0001
year	11	2.1717148E14	1.9742862E13	110.57	<.0001

Source: own calculation using Eurostat data

The analyses show that imports of milk and milk products (not butter and cheeses) within the internal EU market (intra-EU) are seasonal, import volumes increased especially between April and July (see Figure 1).

Fig. 1. Seasonality of milk (022) imports intra-EU (in 100 kg)



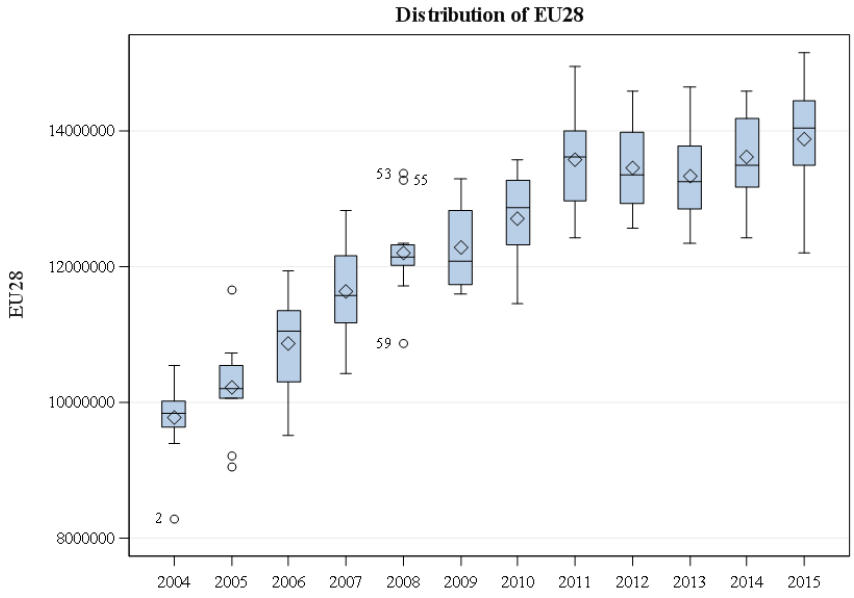
Source: own calculation using Eurostat data

For exports of milk in the EU28 (intra-EU) has also been observed seasonality, but not so strong. The reason may be that some EU-countries import more than export to the European market (net importers).

Authors also calculated the seasonality for data in euro (€) value. The course of seasonality in both cases (import and export) was almost identical as the results for seasonality in mass value (kg).

Regarding the entire EU28, from 2004 to 2011 the annual values of intra-imports increase, from 2012 to 2014 stagnate and regrowth occurred in 2015 (see Figure 2).

Fig. 2. Development of milk (022) imports intra-EU in analysed period (in 100 kg)

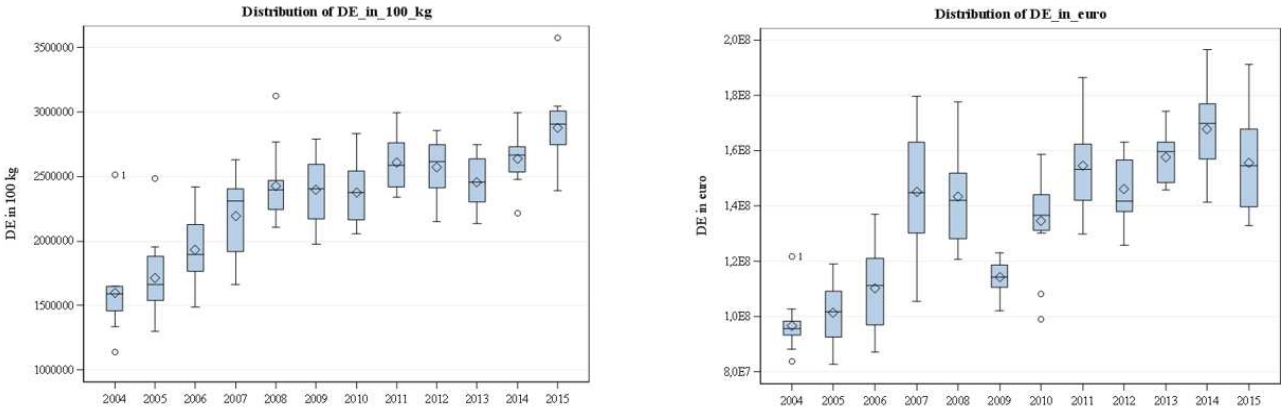


Source: own calculation using Eurostat data

One of the most important players at the EU milk market is Germany. It is also an important partner in foreign trade for the Czech Republic. Regarding German foreign trade, it is clearly seen that, especially in 2014 and 2015, import of milk as raw material from other member states was increasing. An increase of 7.39% in 2014 was recorded compared to 2013 and in 2015 an increase of 11.9% compared to 2014 (264 and 287 mil. kg per year respectively) was seen (see Figure 3). In contrast, the exports (intra EU) of products with higher added value, such as butter, significantly increased (11.5 mil. kg in 2014 and 11.8 mil. kg in 2015; see table 3).

It corresponds with the data of Czech dairy foreign trade. Exports of Czech milk as raw material have increased, rather than dairy products with higher added value. These contrary, are increasingly imported. Czech farmers sold part of their milk production abroad, because there received a higher price. But foreign dairies brought a part of the milk in the form of products back to the CR (see table 4). The resulting balance of agrarian Czech foreign trade of dairy products (after deduction of raw milk) is from 2009 negative, but had once been positive (e.g. in 2000 of CZK 4 billions).

Fig. 3. Imports (intra-EU) of milk (022) to Germany (in 100 kg and €)



Source: own calculation using Eurostat data

Table 3. Value of butter (023) exports (intra-EU) from Germany (in 100 kg and €)

	in 100 kg		in euro (€)	
Year	**Mean**	**Std. Dev**	**Mean**	**Std. Dev**
2004	51915.167	13918.9800	15582374.1	4094925.99
2005	52329.333	10658.3967	15540623.5	3154462.94
2006	52437.417	9391.1902	14764158.0	2553563.69
2007	63102.250	14460.1924	20907733.4	6827015.47
2008	74340.500	19170.6829	23312525.6	6154085.32
2009	65476.750	11030.2393	17994170.4	3567134.26
2010	86356.333	27738.5273	28759827.0	6958682.32
2011	79870.500	11943.4621	32790753.4	4432772.23
2012	91110.083	16113.0210	31014993.9	6603764.44
2013	110138.333	12145.0513	41620811.2	3343287.89
2014	114948.083	11729.5717	42124491.7	5643371.49
2015	117748.833	15100.1214	38798928.5	4814587.87

Source: own calculation using Eurostat data

For example, nowadays farmers from the Pilsen region (west Bohemia) are supplying at least a quarter of milk production to the Bavarian dairies, which are regarded as rescue. They have contracts with them for five to seven years, which are automatically extended, buyers pay accurately and fulfil all their promises. Moreover, they offer the same prices in Bavaria as in the Czech Republic or slightly higher, deliveries are not compromised yet, even if there is the milk surplus in Europe.

Table 4. Imports of dairy products into the CR (kg):

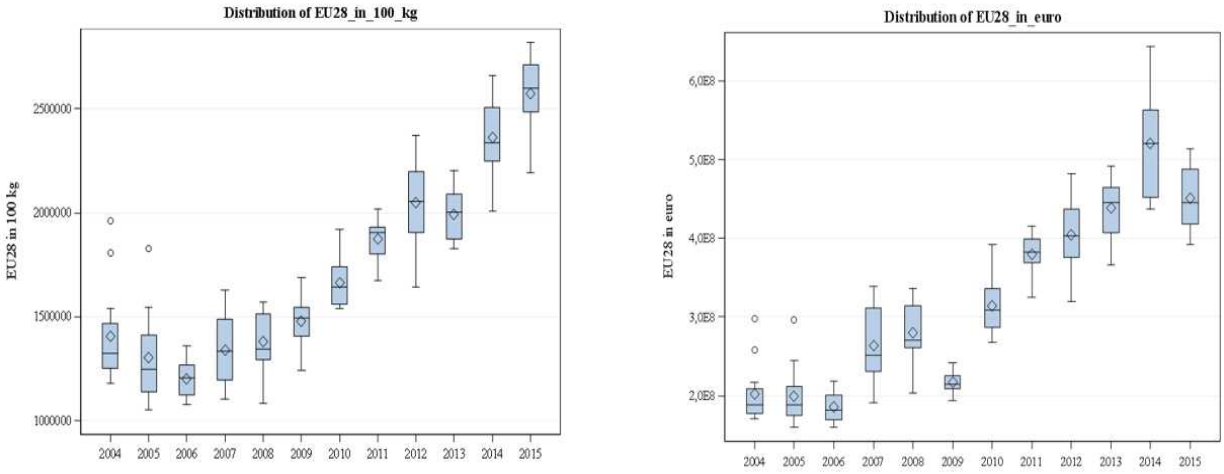
Item	1. quarter 2015	1. quarter 2016	Difference	Growth (%)
Milk … (022)	18.12 mil.	20.70 mil.	2.58 mil.	14.2
Butter (023)	5.34 mil.	6.68 mil.	1.34 mil.	25.0
Cheese (024)	21.30 mil.	23.25 mil.	1.95 mil.	9.2

Source: Czech Statistical Office, 2016

In the case of the Netherlands, restricted imports of milk (022) within the internal EU market took place between 2011 and 2013 significantly, it was a decrease by 10.45% on an average, but in 2015, on the contrary, the volume of milk imports increased by 2.49%.

A more significant increase in milk import volumes was observed e.g. in Poland, which in 2013 grew imports by 51.26% (from 21.13 mil. kg to 31.96 mil. kg). Since then, imports moved at an average level of 36.5 mil. kg. Conversely, Slovakia has a slightly increasing trend especially when the volume of milk imports on average annually increased by 1.53%.

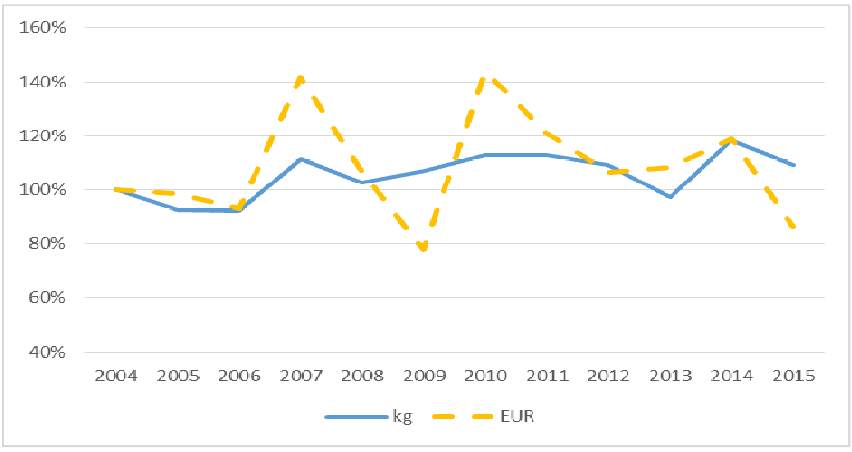
Fig. 4. Export of milk and milk products (group 022) outside the EU (in 100 kg and €)



Source: own calculation using Eurostat data

Despite the embargo on the export of milk and milk products into Russia, the export of milk and dairy products is growing, even though the price of exports falls (see Figure 4 and 5).

Fig. 5. Growth coefficients of milk and milk products (group 022) export outside the EU (extra-EU)



Source: own calculation using Eurostat data

In 2015, the volume of exported milk and milk products (022) increased by 9% compared to 2014, while the price fell by 13.4% over the previous year (see Figure 5). The reason is probably connected with a problem of milk overproduction placement on foreign markets outside the EU.

There is an interesting situation in group 024 - cheeses, where in 2014 was an annual decrease of exports in kg by 8.4%, which may be explained by the embargo on food imports into Russia. The situation stabilized in 2015 and the volume of exports of cheese remained at the level of 2014, while the price per kg of cheese exports outside the EU decreased of 3.3%. Butter exports outside the EU (group 023) is one of the ways how to get rid of the excess of milk fat. Significant increases in exports are obvious in Denmark (30% in 2015), Ireland (66% in 2014 and 129.5% strength growth in 2015), the Netherlands (105% increase in 2015) and G.B. (44.5% growth in 2015). Slight increase in exports outside the EU can be observed in Germany, although in this case it is only about one tenth of the amount that is exported into the EU internal market (intra-EU). Conversely, in case of France, Poland and Finland the reduction of butter volume for exports outside the EU was seen in 2015 (see table 5).

Table 5. Export volumes (in tons) of butter (group 023) for external markets (extra-EU)

Country	2010	2011	2012	2013	2014	2015
Czech Rep.	68,68	86,05	60,82	51,57	33,83	11,33
Denmark	821,96	1036,02	1067,90	1152,83	1102,73	1432,28
Finland	1484,22	1317,08	1480,33	1491,31	1253,88	616,38
France	2185,88	2322,09	2576,79	2861,85	3087,75	3051,95
Germany	1786,01	976,09	847,09	798,24	966,24	1041,88
Great Britain	252,68	227,12	249,67	124,18	312,73	452,05
Ireland	678,37	522,82	608,51	491,59	818,22	1878,02
Italy	18,27	19,15	17,23	22,03	28,53	43,54
Lithuania	54,42	18,21	53,59	168,42	635,74	410,09
Netherlands	3514,20	2389,30	2116,23	1679,29	2135,45	4384,33
Poland	254,22	322,28	249,70	247,68	267,23	210,56
Sweden	53,33	21,20	67,34	4,32	19,88	0,24
Slovakia	-	21,50	1,30	0,50	5,05	5,08

Source: Eurostat

It corresponds to results of Bojnec and Fertö (2014) who state that Belgium, Denmark, France, Ireland, and the Netherlands are old EU-15 countries with competitive dairy exports (from the lowest to the highest according to the level of milk processing). The majority of the new EU-12 countries have faced difficulties in maintaining their level of export competitiveness, at least for some dairy products and market segments. The more competitive EU-12 countries in dairy exports were the Baltic States (Estonia, Latvia, and Lithuania) and Poland. The duration of export competitiveness differed across the dairy groups of products according to the level of milk processing, indicating the importance of dairy chain product differentiation for export competitiveness and specialization. The export competitiveness of the higher level of processed milk products for final consumption can be significant for export dairy chain competitiveness on global markets.

Also Špička (2013) states that the competitive environment within the Czech dairy industry is slightly concentrated with greatly heightened competitive relations. The vertical business relationships within dairy supply chain can be considered as the weakness of the Czech dairy industry. The results of Čechura et al. (2015) shows that in the period from 2003 to 2012 was the European milk-processing market characterized by some degree of market failure or abuse of market power. Focusing on the differences among EU countries they could specify a group of countries with high oligopoly market power: Austria, Hungary, Finland and Portugal. The mark-up of dairies increased in Austria, the Czech Republic, Germany, Finland, Hungary, the Netherlands, Poland, Romania, Sweden, Slovenia and Slovakia in the analysed time period. The development of relative mark-up was connected with the development of the market situation. In particular, they could find similarities between the development of relative mark-up and technical efficiency, which could be associated with the use of milk processor capacities. Moreover, the development of relative mark-up power was influenced by government instruments such as milk quotas. Specifically, the mark-up increased in the years of strong release of the quota.

4 Conclusion

The EU exports about 12% of its milk production in the form of various dairy products. Authors of this article think that this share will increase further as EU production grows faster than domestic consumption. Hence, improved market access in third countries is crucial

for this sector, which is now affected by CAP changes, WTO negotiations and global reduced demand.

Results show that foreign dairy market for the EU28, whether within or outside the EU, is quite significantly influenced by seasonality. Regarding 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, even though the price of exports falls. There is also increase in volume of milk and milk products imports and exports within the EU. Especially countries of EU-12 increased imports of raw milk and exported dairy products with higher added value.

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THE ROLE OF AGRICULTURE IN ECONOMIC DEVELOPMENT OF UZBEKISTAN

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Abstract: Uzbekistan has huge opportunities, offering a potential for a considerable economic development. Among the other sectors, agriculture plays a specific role in economic development because of its significant share in total employment and GDP. The aim of this paper is to analyze main sectoral changes in GDP (agricultural, industrial and services sector) that occurred during last two decades, and to investigate the relationship between GDP and agricultural growth in relation to the value added in agriculture. The special attention is devoted to the position of agricultural sector that may positive influence to support economic development and food security in the region. The results indicate main trends in economic development, and point that agriculture still dominates in terms of employment. Moreover, a significant reduction of agriculture's share in GDP is to be expected in the future, while the shares of industry and services increase.

Key words: agriculture, economic growth, structural changes, Uzbekistan

JEL classification: Q01, O11, O13

1 Introduction

Agriculture was the main economic sector in Uzbekistan employing 43% of the total population with the share of 36% of gross domestic product (GDP) in 1991. Currently, 27% of the population are employed in agriculture and related field, and its contribution to GDP is only 17% (Figures 1). GDP in Uzbekistan, as well as the production of agricultural products, is increasing year by year in a stable manner, as a result, the economy is meeting sustainable growth during the last ten years.

However, remain some issues concerning agricultural productivity and growth. Scientists tried to answer questions like "What is the relationship between agriculture and economic growth? "What are the main constraints for the development of agriculture sector?".

Following the classical analyses (Kuznets, 1961; Tomšík et al., 2015), several contributions of agriculture to overall economic growth and development are usually acknowledged. There is, of course, the direct contribution that an increase in agricultural value added GDP, which, once expressed in growth rate, is proportional to the sector's share of the economy; however, this accounting relationship does not imply causality as agriculture value added and GDP evolve simultaneously.

The generation of a surplus, i.e., resources that can be exported from agriculture to the rest of the economy to support the process of development, seems much more important to explain a potential causality from agricultural to general economic growth (Svatoš et al, 2014). It follows that agricultural growth can form a precondition for the release of labor from agriculture to the rest of the economy.

Growth in output of tradable farm commodities can contribute by either substituting food imports or increase exports. Finally, agriculture is a source of raw materials for several

industrial subsectors that can therefore potentially benefit from agricultural growth. This argument appears most important for countries at early stages of development, because the textile, food processing and other agriculturally based industries require little technology and physical capital but are relatively labor intensive, and hence "fit" the resource endowment of these countries particularly well. In addition, development of agricultural trade may cause to the development of local producers. The increasing opportunities for the agro-trade increase the competition for domestic producers (Qineti et al., 2009).

Another reason why agriculture might benefit from nonfarm growth is that agricultural growth depends largely on the provision of "modern" inputs and technology from the industrial sector (Hwa, 1988). Consequently, growth generating technological change in the manufacturing sector can spill over to agriculture and hence cause growth in that sector (Gemmell et al., 2000).

In terms of income gap between agriculture and other sectors of the economy studied through the agriculture index value of Eurasian countries (contribution of agriculture to GDP, the share of employment in agriculture, agriculture value added per worker and the share of rural population) and low GDP per capita (Benešová et al., 2016).

There is also another issue, labor force in agriculture, which plays an important role in the development of the economy. Increasing of the labor force may bring self-employment in rural areas. However, it may decrease. Decline in labor force within agriculture is considered as a side effect of the continuous restructuring of the agricultural sector (Buchta, 2011). The future perspectives of agrarian employment will depend on the rate of the sector modernization, the enhancement of human capital and the diversified utilization of the internal development potential of the rural economy.

2 Materials and Methods

The data is analyzed over the 1991-2014 period. From 1991-2004 the general tendency of economies has fluctuated. From 2004, agricultural system in Uzbekistan changed to new stage, with acceptance of the Law of the Republic of Uzbekistan on the farming. Therefore, some analyses are done for 2005-2014, that have a general tendency of growth. As a data, it's used specified issues provided by the World Bank, UN COMTRADE, FAOSTAT, State Committee on Statistics of the Republic of Uzbekistan and other international organizations. Numbers are described in US dollar current prices and some figures in US dollar constant 2010.

In order to analyze the contribution agriculture for economic growth, we first observe the relative contribution agriculture for economic growth in Uzbekistan. Here, it is observed the share of agriculture in GDP, and annual growth this sector in it. We also use the comparative analysis to find out the coefficient between agriculture and economic development. This method is supported descriptive statistics analysis.

3 Results and discussion

3.1 Agricultural Development in Uzbekistan

Uzbekistan is one of the major countries in the Central Asian region in producing agricultural products. Particularly, the leadership of the country in the gross collection of fruits and vegetables is clearly marked: its share in total volume of fruits collection makes about 4/5 of total production in the region.

GDP in Uzbekistan, as well as the production of agricultural products, is increasing year by year in a stable manner as a result of economic reforms being carried out by the government.

During the short period of independent development, major reforms were implemented, allowing almost entirely diversifying agricultural sector and providing the population with main food crops, as well as establishing large volumes of production.

The comprehensive measures helping to steadily increase the export potential of the sector. In recent years, Uzbekistan has become a major exporter of high quality and competitive fruit and vegetable products. Over the past 10 years, the volume of processing of vegetables and grapes increased by 3.5 times, including the canned fruits and vegetables by 2.5 times, dried fruits – 4 times, natural juices – 7 times. More than 16% of total production of vegetables and grapes are processing. Currently, more than 180 types of fresh and processed fruit and vegetable products are exporting. Its share in the structure of exports constitutes more than 73% (MFA, Uzbekistan 2015).

The main driving factors of the economic growth were the high rates of economic activity, which have been largely explained by liberalization to foreign economic activity, and faster development of export capacity, large-scale investments into the economy, and gradual improvement of its composition.

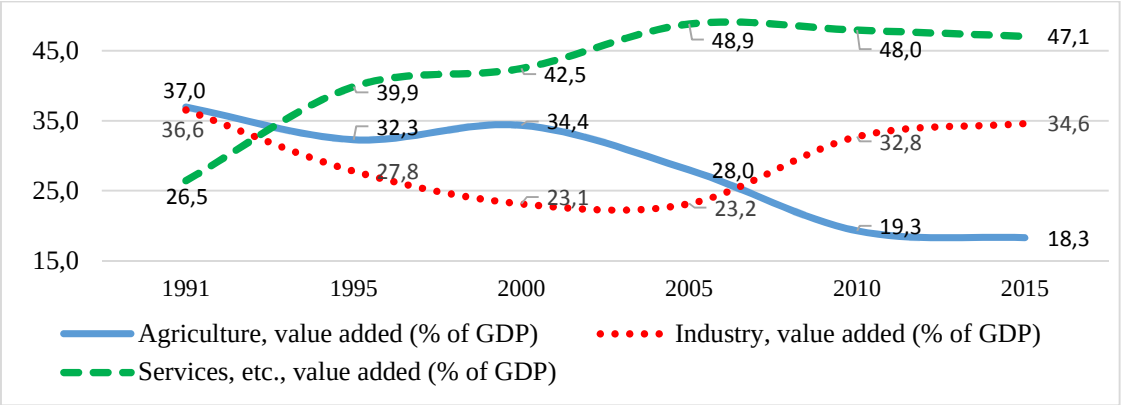
Another important driving factor behind economic growth is external demand (Olimov & Fayzullaev, 2011). During the years of independence (1991-2014) years, GDP increased by 4.5 times, while exports grew by four times, while the population increased 1,5 time. The growth of exports was facilitated primarily by increasing the exports of non-commodity goods and products with high value-added (i.e., cars and transportation services), which in turn allowed for a current account surplus.

Furthermore, a number of agricultural issues we have to mention. Land remains still low level of productivity. About 49 percent of irrigated lands have different levels of salinity, which plays an important resource in agriculture of the country. More than 23 percent of the cropped area is included in the category of low quality land. Still are not widely using energy-saving technologies and modern irrigation systems suitable for the local climatic conditions. As a result, and productivity remains low (except grain).

3.2 Structural changes and factors of agricultural development

In terms of developments over the time, the share of agriculture in GDP has been declining from 36% to 18%, showing a definite downward trend, while the industry and service sectors grew much faster than agriculture, and the country is going for industrialization. However, volume of agricultural products increased twice during this period (Figure 1).

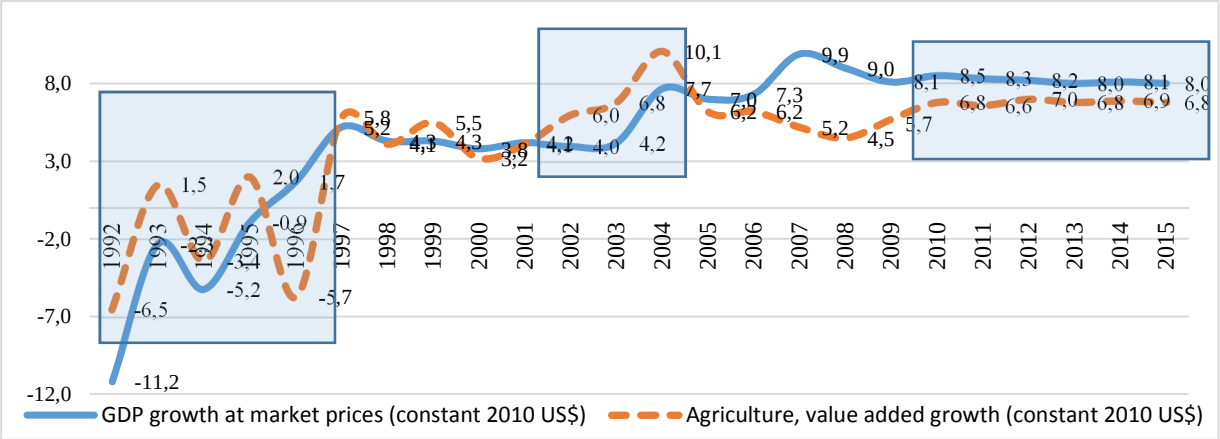
Figure 1. Share of sectors in GDP of Uzbekistan (%)



Source: World Bank, 2016

If we look to structure of GDP of Uzbekistan, so far agricultural sector was dominating in the sphere of real production in Uzbekistan. However, due to implementation of structural reforms during 1991-2014, the share of agricultural sector in GDP declined from 36% to 18% while the share of service increased from 26% to 47%. Industry is fluctuating during 1991-2010 due to macroeconomic policy, but it remains around 33%.

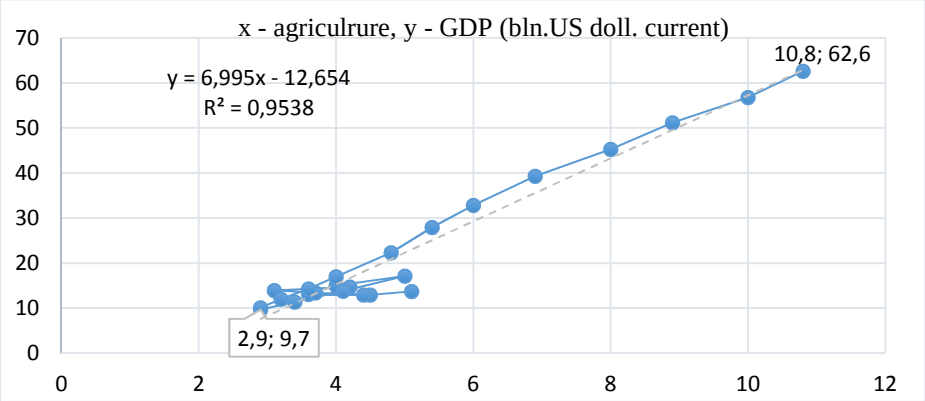
Figure 2. Agricultural and GDP growth in Uzbekistan (%)



Source: World Bank, 2016

In figure 2, it is shown that there is a close relationship between GDP growth and growth of agriculture value added in Uzbekistan. From 1991 to 1997, GDP growth was depended on agriculture. During this time, agricultural and GDP growth fluctuated between -11 to 5% growth. In the early years, GDP and agricultural growth fluctuated. That means when the price of agricultural productions changed in the world market, it affected to the national economy. In this period there was low demand for agricultural commodities, while the sectors of industry and service risen sharply. In the last years, beginning from 2009 GDP and agricultural growth are steady and still have a close connection (Figure 3).

Figure 3. Correlation between agriculture value added and GDP in Uzbekistan



Source: World Bank, 2015

The results show that there was a close relationship between GDP and agricultural value added in Uzbekistan during the last two decades. Even simple coefficient of correlation shows a very high relationship between GDP and agriculture, reaching 0,97.

Interestingly, during the financial crisis, starting 2008 the volume GDP and of agriculture rose rapidly. Almost value of agriculture increased its capacity over the previous years to 5,4 bln. USD in 2008, while GDP rose to 27,9 bln. USD at the same period.

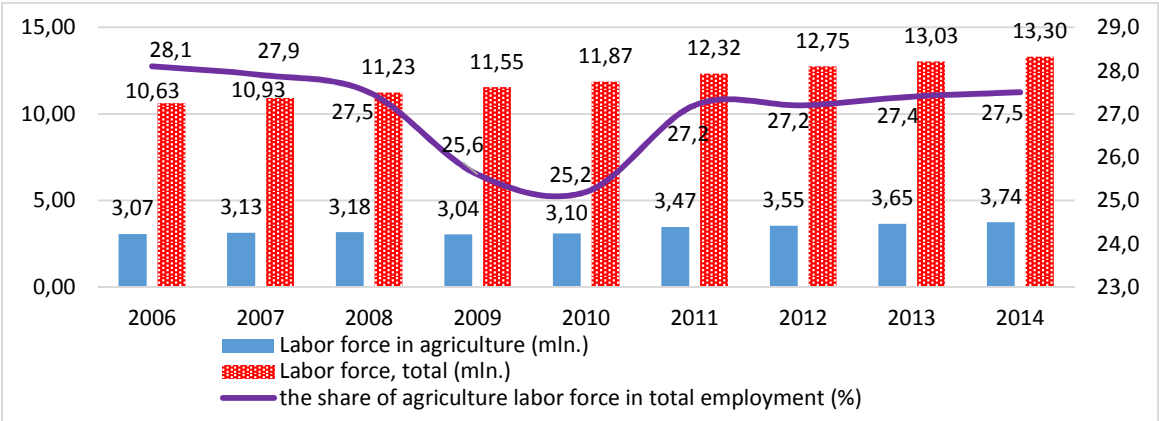
3.3 Peculiarities of agricultural labor development in Uzbekistan

Agricultural and rural development are integral and necessary components of sustainable development. Increased farmers' incomes and higher agricultural workers' wages create increased demand for basic non-farm products and services in rural areas. These include: tools, carpentry, clothes, processed food bought from roadside kiosks. These goods and services are often difficult to trade over long distances. They tend to be produced and provided locally, usually with labor-intensive methods, and so have great potential to create employment and alleviate poverty.

From figure 4, it can be seen that labor force in Uzbekistan is increasing. Among the types of economic activities in employment agriculture is leading with the share - 27.0%, then industry - 13.6%, trade - 10.4%, construction - 9.4%, education 8.4% and others in 2015 (SCS, 2015).

Usually, agricultural employment kept steady around 40% until 2008, but the situation changes from 2008, and the opposing trends sharply dropping down from 38% to 27% in 2009. In the past a few years, the number is slightly decreasing.

Figure 4. Agriculture labor force in Uzbekistan



Source: World Bank (2015), Committee of Statistics of Uzbekistan (2015)

During 2008 and 2012, agriculture employee rising quickly from 3.18 million to 3.55 million, but the percentage of agriculture employee descended from 27,5% to 25,2% as the job generation in the other sectors grew much faster than agriculture labor force.

There are 3 phases of the growth rate trend of labor force in agriculture during 2005-2014. The first phase from 2005 to 2008, the labor force growth rate decreased from -3% in 2005 to -1% in 2008. The second phase from 2008 to 2011, the growth rate of the labor force in Agriculture is fluctuated from -7% in 2009 to 8% in 2011. The third phase from 2012 to 2014, the labor force growth rate is more stabilized around o and 1%.

The rise of share of agricultural labor force is explained with the quickly increase of rural population (Shukurov, 2015). More paid employment opportunities were available for women in the relatively industrialized regions of Uzbekistan. Moreover, the new adopted law in 2012 on Family business has given the opportunity to arrange family members to become an official worker. Also, it is positively affected the housing construction program in rural areas.

A particularly important issue, which the Government draws attention, is to increase employment in rural areas through the creation of new jobs, additional handling, and processing, storage of horticultural products, the expansion of services.

Consistently the welfare of farmers and rural residents improved by diversifying production, growing more crops more efficient that leads to higher yields of agricultural producers. In this regard, there are some positive results, which should be strengthened and further developed.

Table 1. Trends in GDP per capita and agriculture value added per worker in Uzbekistan (constant 2010 US$)

Years	1992	1994	1996	1998	2000	2002	2004	2006	2008	2010	2012	2014	2015
GDP per capita	843	748	727	770	813	860	943	1057	1228	1377	1548	1749	1857
Agriculture value added per worker	1316	1309	1256	1355	1453	1596	1869	2090	2268	2561	2949	3426	3697

Source: World Bank, 2016

From table 1, it can be seen that agriculture value added per worker (AVAPW) is always higher than GDP per capita (GDPPC) in Uzbekistan. That means agriculture is sill has big contribution to income creation in Uzbekistan. When the proportion of between AVAPW and GDPPC was 1,56 in 1992, then it arisen to almost 2 in 2015. This means growth rate of AVAPW was higher during this period. Interestingly is negative effects of financial crisis did not affected to growth rate of AVAPW beginning from 2009, while growth rate of GDPPC declined to 1-2% annually.

Generally, connection of AVAPW and GDPPC can be studied dividing into four part. During 1992-1996 years, both AVAPW (from -6% to -2%) and GDPPC (from -13% to 0%) had negative growth rate. From 1996 to 2003, average growth rate of AVAPW (3-5%) and GDPPC (2-3%) were normally. Beginning from 2004 until 2008 growth rate of GDPPC (6-8%) was higher than AVAPW (4-6%). However, during 2009-2015 growth of AVAPW (6-8%) overcame growth of GDPPC (5-7%).

4 Conclusion

During the study, it is found that economic growth has a positive connection with agricultural growth in Uzbekistan. The share of agriculture in GDP decreased almost for two times, while agriculture value added doubled.

The structure of the gross agricultural product is changed. It occurred especially due to the rapid growth of food products and declining the share of cotton. Major reforms were implemented, allowing almost entirely diversifying agricultural sector with adopting new farmers system and providing the population with main food crops, as well as establishing large volumes of production.

During the financial crisis agricultural production has not suffered, almost value of agriculture increased its capacity over the previous years, while GDP growth rate declined up to 1-2% annually. It is concluded that agricultural production in this period was more sustainable than economy in general in Uzbekistan. It is connected with highly demand for agricultural productions in the region and growth of the country's population.

During this period agriculture employee rising quickly, which one of the factor of economic development. However, growth rate of labor force in agriculture is still unsustainable. Agriculture value added per worker is always higher than GDP per capita in Uzbekistan. That means agriculture is sill has a big contribution to income creation in Uzbekistan.

However, still remain problems overall technical and technological lag in updating the fixed assets and technological equipment, poor implementation of information and communication technologies in this field and low level of productivity of land due to salinity in the some regions.

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Greenhouse gas emissions in the Czech livestock sector

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Abstract: The presented paper is focused on an analysis of greenhouse gas emissions in livestock production in the Czech Republic. The primary objective of the paper is to quantify the amount of greenhouse gas emissions produced in beef cattle breeding (dairy and meat breeds), pig breeding and poultry breeding. A secondary objective of this paper is to compare greenhouse gas emission production volumes across individual sectors of livestock production and to evaluate the development of the emission volumes produced, including determination of the contribution of livestock production to the total amount of emissions produced in Czech agriculture. The data set is derived from publicly accessible databases provided by the Czech Statistical Office and the Ministry of Agriculture of the Czech Republic. The methodology will be based on the conceptual model known as MITERRA-Europe, which is partly based on two models, namely the CAPRI (Common Agricultural Policy Regionalised Impact) model and the GAINS (Greenhouse Gas and Air Pollution Interactions and Synergies) model. Based on the above mentioned models, indicators of feed conversion are designed and the development trends of utility directions of concerned sectors are ascertained. Finally, the area load, as a measure of the degree of concentration, is determined, in order to take into consideration the different types of breeding, especially intensive and extensive methods. Based on the available database, the greenhouse gas emissions are quantified, taking into account specifications of individual breeds in the Czech Republic. The results allow comparison of greenhouse gas emission production volumes among different breeds in the main sectors of livestock production. At the same time, quantification of the share of greenhouse gas emissions of livestock production in the overall greenhouse gas emission volumes of the Czech agricultural sector is carried out. The results show certain degree of responsibility and resulting moral aspects in implementation of the environmental policy, as a necessary part of the EU Common Agricultural Policy adjustment, which is a future challenge of intelligent and sustainable food production. The results of the presented paper show the effects of the CAP implementation at the level of livestock production in the Czech Republic and associated production of negative public goods. The subsequent assessment is a precursor for modification of the future agricultural policy in the form of an environmentally responsible agricultural policy.

Key words: Greenhouse gas, emissions, livestock, emission factor, conversion ratio, agriculture

JEL classification: Q15, Q53

1 Introduction

Production of greenhouse gases is, or surely in a short time or long-term horizon will become, a very serious challenge with which people will have to cope. The total production has been rising in an enormous way on a long term basis, and according to the Intergovernmental Panel on Climate Change (IPCC, 2006) it is just greenhouse gases that are responsible, in a major part, for climatic changes on the planet, and an interesting fact is the structure of origin of the global production of these gases. In general it is possible to state that the transport sector bears primary responsibility for production of greenhouse gases, nevertheless a significant part of this volume is produced also in the agricultural sector, where animal production is the main producer. The paper is subsequently focused on an analysis of production of greenhouse gases (mainly CO_2, methane and oxides of nitrogen) just in the sector of animal production of the Czech Republic, the primary objective being to quantify the quantity of greenhouse gases generated within the framework of the breeding of both meat and dairy cattle, pig breeding and poultry breeding. A secondary objective

is comparison of gas production among individual sectors and evaluation of the development of the volume of emissions produced by animal production, including determination of the contribution of animal production to the total emissions of the agricultural sector of the Czech Republic.

2 Materials and Methods

Achievement of the objective set out is conditioned by acquisition of background data, which represents, in a given case, sectoral indicators for individual sectors of animal production in the Czech Republic and this data set consists of aggregated indicators of animal production (numbers of animals, slaughter quantity figures, slaughter weight, etc.) in the form of time series with a yearly periodicity from 1998 (occasionally only from 2000) to 2014. The total scope of the background data includes 245 observations. The data set is generated from the publicly available database provided by the Czech Statistical Office and the Ministry of Agriculture of the Czech Republic, and the solution will be subsequently based on the concept model MITERRA-Europe, which is partly based on models CAPRI (Common Agricultural Policy Regionalised Impact) and GAINS (Greenhouse Gas and Air Pollution Interactions and Synergies). (Lesschen et al, 2011). The above mentioned approach is applied to construction of fodder conversion indicators; it is used for specification of useful directions of the concerned branches, and last but not least for determination of indicators of the area-wide load as an indicator of the rate of concentration for considering various types of breeding, especially in the dividing into two groups - intensive and extensive. The above described approach serves also as the base for subsequent quantification of the "conversion ratio", serving for expression of the so-called emission factor, which is decisive for production of given gas at a particular category of animal production. The methodology characterised was used in similar studies, see e.g. (Lesschen et al, 2011), (Monteny, 2006), etc. The deriving of the emission factor can be demonstrated by using an example according to the equation (1), (IPCC, 2006), nevertheless it is appropriate to point out that thanks to the necessary inclusion of a specific constant the derived relation is only valid for derivation of the emission factor at methane. For nitrogen and carbon oxides it is necessary to transform the specific constant in an adequate manner.

$$EF_i = VS_i \times 365 \times B_i \times 0{,}67 \times \sum_{jk} CF_{jk} \times MS_{jk} \quad \textbf{(1)}$$

Where:

EF_i annual emission factor (kg) for animal type *i*

VS_i daily VS - volatile solids[11] excreted (kg) for animal type *i*

B_i maximum gas production capacity (m^3/kg of *VS*) for manure produced, by animal type *i*

CF_{jk} conversion factors for each manure management system *j*, by climate region *k*

MS_{jk} fraction (%) of animal type *i*'s manure handled using manure system *j* in climate region *k*

[11] Volatile solids are the organic fraction of total solids in manure that will oxidize and be driven off gas at a temperature of 600°C.

The above equation (1) further serves, with a simple adjustment, see equation (2), for the deriving of the total production of the investigated gas in a given year for the specific category of animal production.

$$E = \frac{EF \times P}{10^6} \quad (2)$$

Where:
E Emissions (Gg^{12}/yr.)
EF Emission Factor (kg/head/yr.)
P Population (head), alternatively animal production (kg)

With regard to possible adjustment of the emission factor or its units, also the overall emission of gases is quantifiable in a number of alternative forms. The most frequently used indicators include gas emission "per animal head", but many studies (e.g. (Herd et al, 2015), (Solilová and Nerudová, 2015) or (Turčeková et al, 2015)) use probably more exact calculations which work most often with conversion per final production unit, where it is, however, necessary to perform further corrections, in particular for the category of beef, pork and poultry meat, consisting in conversion of production of the slaughter-processed meat to "edible meat" with the help of a fixed coefficient, see e.g. Lesschen et al (2006). The same procedure shall be applied also within the framework of the contribution drawn up. The above mentioned correction does not concern production of milk and eggs.

3 Results and Discussion

With regard to the above mentioned methodology, at first the values of emission factors accounting for a significant share in resulting values of emissions in categories of animal production were subject to derivation, see Table 1.

Table 1. Emission factors

Emission	Beef	Cows (milk)	Pork	Poultry	Eggs	
CH_4	57.50	101.25	3.03	0.26	0.14	kg/animal/year
CO_2	22.60	1.30	3.50	1.60	1.70	kg/kg of production
N_20	50.00	70.00	20.00	0.60	0.66	g/kg of production

Source: Author's own calculation by Cederberg et al (2009), IPCC (2006), Monteny et al (2006), Jelínek and Plíva (2003)

This was followed, on the basis of results of Table 1 and quantified values of net production and its possible conversion to edible meat production, by quantification of the values of emissions for monitored greenhouse gases, and the results are presented, in a summary way, in Table 2-4.

Table 2 provides an overview of development of methane production in individual categories of animal production for the period of 1998-2014.

From the results achieved it is clear that the largest share in methane emissions in the sector of animal production in the Czech Republic is generated by the cattle sector (mainly in the breeding of milk cows), producing more than 88 % of methane emissions of the entire animal production sector. The remaining categories are, compared to cattle, a markedly lower polluter, pig breeding accounts for approx. 7 %, meat poultry breeding accounts for less than 4 % and the sector of egg production does not exceed 1 %. It is also interesting to compare

[12] Gg = Gigagrams

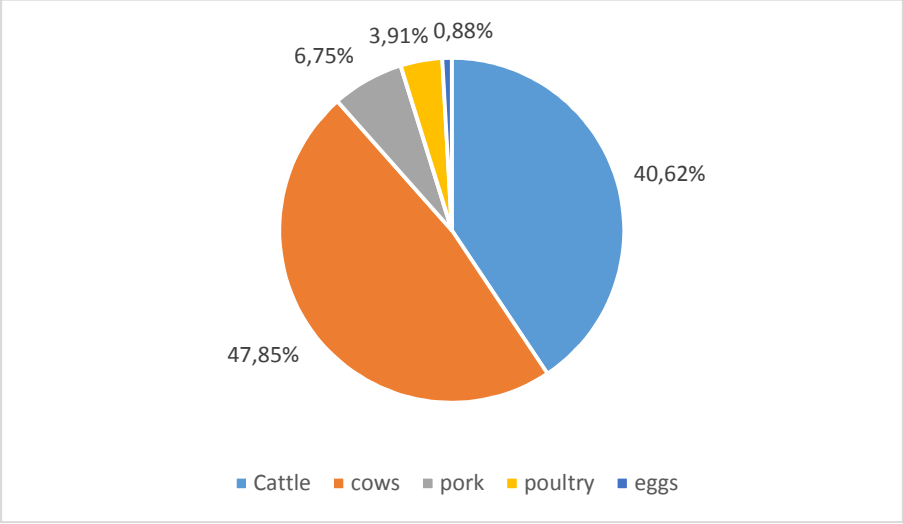
development of emissions in the period monitored, when except for the poultry sector it is possible to register a drop in methane production, especially thanks to the significant drop of the number of animals bred. In the sector of poultry meat production it is possible to identify a number of specific aspects. Since the emission of gases is explicitly related to production which directly depends on the number of animals, also here in the context of the drop of numbers of animals it is possible to see the adequate direction of the development of emissions, but as the unit intensity of the "conversion ratio" is very low, then the resulting change in emissions is not proportional to the change in conditions. The following Chart 1 is attached for a structured representation of the shares of individual sectors in methane emissions.

Table 2. Emission of methane

	Emission CH4 (t/year)					
Year	**Cattle**	**Cows (milk)**	**Pork**	**Poultry**	**Eggs**	**Total**
1998	60602.18	65492.35	12139.15	4356.43	1719.19	144309.31
1999	58380.38	65005.13	12102.18	4763.35	1666.22	141917.27
2000	55127.72	62247.18	11156.10	4951.77	1643.49	135126.26
2001	55809.27	61907.39	10870.99	5295.29	1634.77	135517.71
2002	53120.86	60374.87	10408.80	6008.37	957.28	130870.18
2003	50801.60	59770.10	10172.47	5155.54	986.22	126885.93
2004	49187.92	58004.81	9457.78	4965.78	895.22	122511.50
2005	47356.08	58089.56	8702.42	5052.15	831.74	120031.95
2006	46570.52	57076.95	8592.13	5049.30	884.19	118173.09
2007	47535.65	57174.46	8562.01	4759.12	880.29	118911.53
2008	47892.44	57580.37	7359.78	5462.14	883.21	119177.94
2009	46196.08	56680.05	5963.54	5207.03	904.93	114951.63
2010	45887.36	55813.56	5775.43	4841.87	870.22	113188.43
2011	45548.63	55843.02	5291.00	3929.29	859.25	111471.19
2012	46141.45	55811.53	4775.95	3987.55	749.64	111466.12
2013	46051.64	55882.31	4799.55	4165.89	1013.98	111913.35
2014	46551.83	57101.25	4891.61	3824.16	945.77	113314.62
Ø (%)	**40.62%**	**47.85%**	**6.75%**	**3.91%**	**0.88%**	**100%**

Source: Author's own calculation

Chart 1. Share of categories of livestock production in methane emissions



Source: Author's own calculation

Another parameter monitored was emission of oxides of nitrogen, and special attention in this area will be paid mainly to nitrogen monoxide which currently represents the largest problem for the ozone layer, since its adverse impacts are many times stronger, thanks to an easy reaction with ozone than it is the case of methane or oxides of carbon, see e.g. Araujo et al.

(2006). On the basis of the equations no. (1) and (2) it was possible to quantify emissions of N_2O associated with animal production in the Czech Republic, see Table 3.

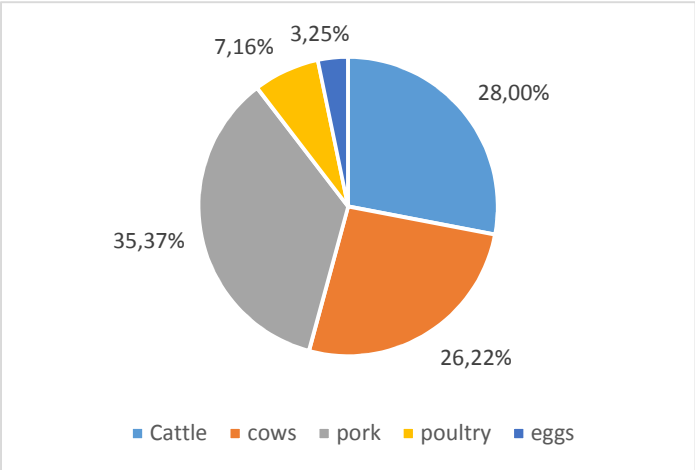
Table 3. Emissions of nitrogen

	Emissions of N_2O (t/year)					
Year	**Cattle**	**Cows (milk)**	**Pork**	**Poultry**	**Eggs**	**Total**
1998	52697.55	45278.66	80258.86	10053.30	8043.37	196331.74
1999	50765.55	44941.82	80014.40	10992.35	7795.55	194509.67
2000	47937.15	43035.09	73759.34	11427.15	7689.16	183847.89
2001	48529.80	42800.17	71874.34	12219.90	7648.39	183072.60
2002	46192.05	41740.65	68818.50	13865.47	4478.72	175095.38
2003	44175.30	41322.54	67256.02	11897.39	4614.10	169265.35
2004	42772.10	40102.09	62530.78	11459.49	4188.34	161052.80
2005	41179.20	40160.68	57536.68	11658.82	3891.34	154426.71
2006	40496.10	39460.61	56807.50	11652.24	4136.72	152553.17
2007	41335.35	39528.02	56608.30	10982.59	4118.49	152572.75
2008	41645.60	39808.65	48659.68	12604.95	4132.14	146851.02
2009	40170.50	39186.21	39428.34	12016.23	4233.79	135035.07
2010	39902.05	38587.15	38184.64	11173.56	4071.38	131918.77
2011	39607.50	38607.52	34981.84	9067.60	4020.05	126284.51
2012	40123.00	38585.75	31576.54	9202.04	3507.25	122994.58
2013	40044.90	38634.68	31732.54	9613.58	4743.98	124769.68
2014	40479.85	39477.41	32341.22	8824.99	4424.85	125548.32
Ø (%)	**28.00%**	**26.22%**	**35.37%**	**7.16%**	**3.25%**	**100%**

Source: Author's own calculation

The outputs of Table 3 indicate that the largest share during general division into the sectors of animal production accounts for the sector of cattle breeding, but during its further division into partial sectors of meat and dairy cattle the largest emitter (approx. 35 %) of nitrogen monoxide is pig breeding, followed by meat cattle breeding (28 %), milk cow breeding (26 %) and after a large gap it is followed by meat poultry breeding (7 %) and egg poultry breeding (approx. 3 %). The above mentioned facts and comparison with the other research work results indicate the danger implying from pig breeding. Emissions of oxides of nitrogen are markedly more intensive at their adverse impacts on the ozone layer, and therefore even a total emission which is lower in terms of magnitudes (compared to other greenhouse gases) may have strong impacts on climatic changes. A positive result is development of the estimated total emission for animal production in the Czech Republic, which is decreasing as a result of a significant drop of the numbers on the period monitored. The shares of individual sectors are specified in the following Chart 2.

Chart 2. Share of categories of livestock production in the nitrogen production



Source: Author's own calculation

The last analysed characteristic was CO2 emission which is currently the most frequently and most intensively discussed topic in the area of greenhouse gases. Table 4 provides for results of the estimation of emissions for individual sectors of animal production as well as their shares in the total emission volume.

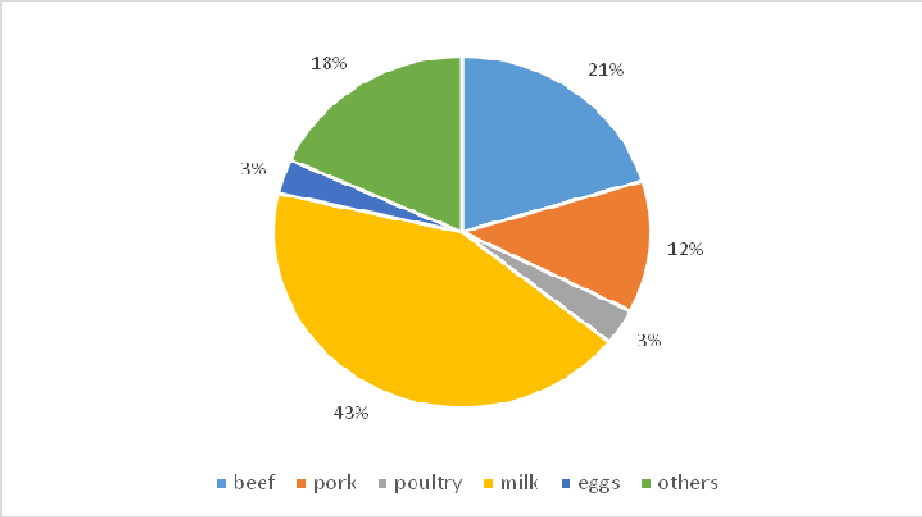
Table 4. Emission CO2

	Emission CO_2 (t/year)											
Year	Beef	Share in total	Pork	Share in total	Poultry	Share in total	Milk	Share in total	Eggs	Share in total	Total sum	Total emissions of CZ agriculture
2000	2199974.40	0.24	1247737.05	0.14	285778.08	0.03	3626131.60	0.40	356439.00	0.04	7716060.94	9094860.00
2001	2156955.30	0.23	1261719.90	0.14	298992.96	0.03	3652833.60	0.40	326070.20	0.04	7696572.76	9220880.00
2002	2227128.30	0.25	1293720.75	0.14	319275.36	0.04	3615450.80	0.40	302110.40	0.03	7757686.44	8955860.00
2003	2199262.50	0.26	1295261.10	0.16	305425.44	0.04	3607440.20	0.43	314534.00	0.04	7721924.13	8314940.00
2004	1966064.40	0.22	1186677.45	0.14	313456.32	0.04	3642152.80	0.42	288996.60	0.03	7397348.38	8750490.00
2005	1648170.54	0.20	1069850.25	0.13	326537.28	0.04	3532674.60	0.42	280122.60	0.03	6857356.05	8385030.00
2006	1610663.58	0.20	1048997.25	0.13	311199.84	0.04	3473930.20	0.42	261585.80	0.03	6706377.45	8249770.00
2007	1613531.52	0.19	1073718.45	0.13	296389.44	0.04	3656838.90	0.44	239795.20	0.03	6880274.30	8403040.00
2008	1627606.80	0.19	998502.75	0.12	290437.92	0.03	3596759.40	0.42	244133.60	0.03	6757441.23	8583060.00
2009	1566708.84	0.19	896401.80	0.11	279722.88	0.03	3583408.40	0.44	253993.60	0.03	6580236.30	8134290.00
2010	1510428.06	0.19	869100.75	0.11	270974.88	0.03	3642152.80	0.46	260994.20	0.03	6553651.48	7964570.00
2011	1467019.45	0.18	828273.97	0.10	244921.23	0.03	3615450.80	0.45	254782.40	0.03	6410448.61	8064840.00
2012	1336602.42	0.17	755221.95	0.09	219762.72	0.03	3487281.20	0.43	209525.00	0.03	6008394.01	8019420.00
2013	1318540.50	0.16	737959.95	0.09	213370.56	0.03	3556283.17	0.44	213784.82	0.03	6039939.73	8008490.00
2014	1332859.86	0.17	743371.65	0.09	215150.40	0.03	3659083.20	0.46	197331.53	0.02	6147797.39	8002780.00
Ø (%)		**20.33%**		**12.07%**		**3.32%**		**42.85%**		**3.16%**		

Source: Author's own calculation

On the basis of derived outputs it is possible to determine the share of individual sectors of animal production in total emissions of CO_2, and relative representation is subsequently illustrated in Chart 3. From this point of view, the dairy (milk) sector is the largest emitter and it accounts for approx. 43 % of the total emissions produced by agriculture in the Czech Republic. The second largest polluter is the sector of meat cattle (beef) breeding (approximately 20 %), followed by the pig sector (12 %), poultry sector, which is evenly divided into the meat branch (3 %), as well as egg production branch (3 %). The paper further compares production of analysed sectors with a total emission of CO_2 for agriculture of the Czech Republic, and it was found out that the above specified sectors account for a large share in the total volume of emissions – approx. at a level of 82 %, i.e. the sole 18 % of CO_2 production is generated by the remaining categories of animal production and plant production.

Chart 3. Share of categories of livestock production in the total CO2 production from agriculture



Source: Author's own calculation

4 Conclusion

From the results presented it is possible to derive a number of partial conclusions. In general it is possible to state that the largest emitter of greenhouse gases for agriculture is the cattle breeding sector, and for methane it achieves a share of almost 90 %, for oxides of nitrogen approx. 54 % and for oxides of carbon approx. 63 %. At a more detailed view and in division into meat and dairy sectors it is very interesting to realise that the largest share in production of CO_2 is connected with milk cows breeding (which accounts for even 43 % of the total production for agriculture), and in a similar way, even though with a smaller difference, the milk cows breeding accounts for the largest share in methane production. Only for oxides of nitrogen, the breeding of meat cattle is a higher emitter in comparison with milk cows. At comparison of the volume of emission of the gases investigated for individual sectors of animal production, another important conclusion is the high (in the sectoral comparison even the highest) share (approximately 36 %) of pig breeding in production of oxides of nitrogen which is considered, as it has already been stated, to be an enormous future threat, because its adverse impacts are many times more intensive. And finally it is also possible to state that in agriculture of the Czech Republic the investigated sectors of animal production account for more than 80 % of production of carbon dioxide which is the most frequented greenhouse gas in terms of volume, and these sectors are therefore an enormous producer of greenhouse gases, to which adequate attention should be paid both within the framework of the Environmental Policy of the Czech Republic and at the designing of concepts of instruments of the Common Agricultural Policy in the context of moral responsibility associated with production of necessary goods such as essential foodstufs.

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Rural Areas in Bulgaria – Identification and Main Characteristics

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Abstract: Rural municipalities in Bulgaria make up 81% of the country's territory (about 90 thousands km^2) and (as of 31 December 2015) are occupied by 38.77% of the population. Towards the end of 2015, the population density within the rural regions was 30.9 people per km^2, approximately twice as low as the country's average (64.5 people/km^2). The population in the rural areas is concentrated in their administrative centres. Compared to EU rural regions, they reveal specific characteristics, inherent to the local economy and community. The aim of the study is to determine the effects of national growth on the economic results of rural regions with different socio-economic parameters. The results of the study are used for defining some of the reasons for the serious socio-economic disproportions of the country.

Key words: rural areas, rural development, regional disparities, economic crisis

JEL classification: R11

1 Introduction

Over 77% of the EU's territory is classified as rural (47% is farm land and 30% forest) and is home to around half its population (farming communities and other residents) (European Commisison, 2013). Diversity is one of the main characteristic of rural areas, both on European and Bulgarian level. One of the features of Bulgarian rural areas is the gap between typical rural territories and so called industrialized rural municipalities (LAU 1). The problem is coming from the national definition of rural areas, which is based only on the number of the population: "Rural areas include the municipalities, in which the largest populated area has a population of up to 30000 people" (Rural Development Programme 2014-2020 – Bulgaria). It is a fact that the recent crisis has deepen the existing problems in rural areas – depopulation, aging, increasing unemployment, social exclusion, poverty, etc.

Lots of researches considered the problem of rural areas in different countries such as Grigoryeva (2012) for youth unemployment in Czech Republic, Rosenzweig (1988) for family's income in rural areas, Chambers (1983) for complex rural development, Whitener and McGranahan (2003) for development of rural areas in United States, Du Plessis et al. (2002) for definition of rural development, Majerová and Krepl (2007) for some models of rural development.

Some authors have studied the variety of impacts of recent crises on different areas (Trivelli et al., 2009). The analysis of Zografacis and Karanikolas (2012) also has elucidated the distinct patterns of adjustment pertaining to various types of areas and asymmetric effects of crisis on various types of areas .

Abraham (2011) argue that the convergence process at the national level are accompanied by unbalanced regional development. It binds local specialization with the level of economic development.

The quetsion that the authors address is how the different types of rural areas in Bulgaria are affected by the dynamics of the national economic growth.

In 2015, the Bulgarian's GDP amounted to EUR 44127.6 million (Eurostat, 2016), which accounted for 0.3% of the GDP of the EU-28. The real GDP per capita is EUR 5700, with this value being EUR 26300 for the EU-28. The GDP per capital parameter in purchasing power standards for 2014 was 47% of its value for EU-28. After 2010, the economy is recovering slowly and GDP growth is low - between 0.4% and 1.8%.

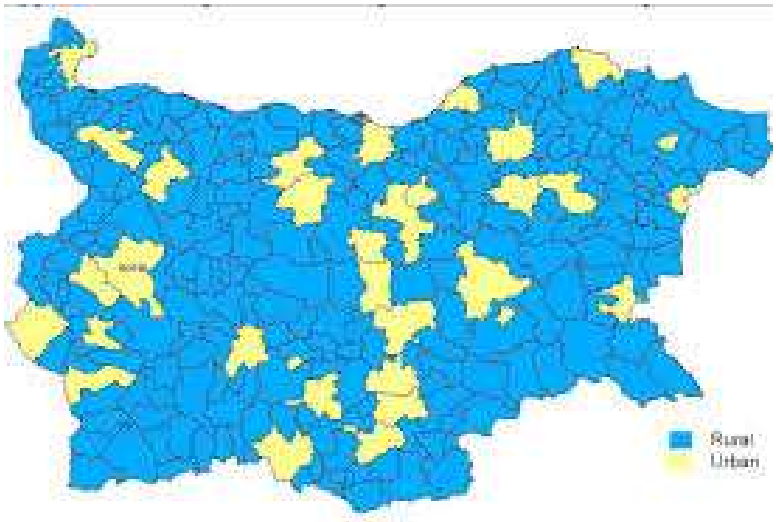
The growth rate varies in accordance to the type of the region, incl. type of rural area. Large differences in the economic development of rural and urban areas are observed in Bulgaria, caused mostly by to the lower economic activity in rural areas and the related lower employment rates, lower productivity and reduced growth. What is important is that a great disparity exist between typical rural areas and so called "inustrialised" rural municipalities.

In accordance with the nomenclature of territorial units for statistics (NUTS) by Eurostat (EC, Eurostat, NUTS, 2015), Bulgaria's territory is divided into two statistical zones. They are formed from the 6 statistical regions, which correspond to level NUTS 2. Statistical regions are formed from the 28 districts, which correspond to the NUTS 3 level. At the LAU 1 level, there are 265 administrative-territorial units (municipalities).

The national definition for rural areas of the Republic of Bulgaria categorises the territories at the municipality level (LAU 1), unlike the European definition, which is at the district level (NUTS 3). With the national definition, the primary criterion is the population size at the largest populated area within the municipality – unlike the European one, where the main criterion is population density.

Rural municipalities make up 81% of the country's territory (about 90 thousands km^2) and (as of 31 December 2015) are occupied by 38.77% of the population. Towards the end of 2015, the population density within the rural regions was 30.9 people per km^2, approximately twice as low as the country's average (64.5 people/km^2). The population in the rural areas is concentrated in their administrative centres. According to the criteria established by the national definition, 232 municipalities are identified as rural, or 87.6% of their total number in the country (Image 1).

Image 1. Structure of municipalities in Bulgaria, according to the National definition



Source: Ministry of Agriculture and Food

The age structure of the population of rural areas, as well as in Bulgaria as a whole, is unfavourable. According to the NSI's data for 2015, the share of the population below working age in rural areas was low – 14.99%, while the population above active working age was 27.00%. The labour-capable population of rural areas has a relative share of 58.01%, while in urban areas it is 62.56%.

2 Materials and Methods

Considering the beginning of a period in which the economic crisis and its effects are diminished, the present study aims to determine the effects of national growth on the economic results of rural regions with different socio-economic parameters.

The object of study are the rural municipalities of Stara Zagora district. According to the acting national definition, the Stara Zagora district includes 2 urban (Stara Zagora and Kazanlak) and 9 rural (Bratya Daskalovi, Gurkovo, Galabovo, Maglizh, Nikolaevo, Opan, Pavel banya, Radnevo and Chirpan) municipalities.

Annual data (2008-2014) by the National Statistical Institute of the Republic of Bulgaria at the NUTS 3 and LAU 1 levels have been used.

The common scientific methods for systemic and comparative analysis were applied, as well as a specific index analysis of dynamics and structural analysis. The data were processed with the SPSS statistical software.

The emphasis of our study was the finding of some possible influences of common national processes on the economic development of the municipalities in the district. The test was performed on the urban, as well as the rural municipalities, in order to establish plausible hypotheses regarding the modelling of social-economic and public processes. Formulating the methodology as an influencing factor, the volume of the goods and services produced on a national level was defined, while the net revenue of sales were evaluated as a dependent variable, representing a measure of the economic base and activity's volume within the specific municipality.

3 Results and Discussion

We used a simple model for linear regression:

$$Y = a + bX \quad \textbf{(1)}$$

Where: the indicator Y measures local economic activity, represented by the net revenue of sales (in thousands BGN); the indicator X measures the volume of the national economy, represented by the GDP (in thousands BGN); and the regression coefficients a and b assess the impact.

The hypothesis used to select this impact is that the overall development of the national economy directly affects the development of the rural municipalities. The test was conducted with a confidence interval of 95%, with additional clarification in all cases, where the model did not meet this requirement. The data from the calculations is presented in Table 1.

The results indicated strong regional differences in the socio-economic development of the rural areas, depending on their economic typology. A high value of variation spread was found between the industrialised rural municipalities and those with predominant agricultural and processing production (EC, Eurostat, NACE, Rev.2, 2008).

A thorough analysis of the model's initial information produced the following categorization regarding the type and features of the separate municipalities (the municipalities of Stara Zagora and Kazanlak were excluded from the analysis).

Table 1. Effect of the national economy (measured through GDP per current prices) on the local economic activity (measured through net revenue of sales)

Municipality	R	R^2	Information significance of the model at confidence interval of 95%	Coefficient (evaluation) of the regressor
Bratya Daskalovi	0.986	0.972	Yes	3.064
Gurkovo	0.883	0.780	Yes	2.393
Galabovo	0.819	0.670	Yes	58.828
Kazanlak	0.904	0.818	Yes	28.996
Maglizh	0.879	0.772	Yes	1.731
Nikolaevo	0.847	0.717	Yes	1.198
Opan	0.533	0.284	No	0.999
Pavel banya	0.974	0.948	Yes	5.883
Radnevo	0.300	0.090	No	9.754
Stara Zagora	0.338	0.114	No	15.152
Chirpan	0.880	0.774	Yes	3.514

Source: Data processed via SPSS, provided by the NSI

- Municipalities with typical socio-economic characteristics: Bratya Daskalovi, Maglizh, Pavel banya, Chirpan, Gurkovo and Nikolaevo. These municipalities have a low potential for intensive development, due to the lack of a reliable base of production factors. Investments into them are insufficient, and the demographic situation requires attention and serious assessment. The regressor coefficients vary from 1 to 3.5, which is evidence that the trends in the national economy have a direct impact, but to a moderate and low extent. Despite these characteristics, the rural municipalities develop economic activity primarily in the fields of agriculture and the service sector. The potential of tourism ranges from low to average (e.g. in the municipality of Pavel banya).

- Municipalities with untypical socio-economic characteristics – the municipalities of Radnevo and Galabovo, categorized as industrialized rural municipalities. Due to the specific profile of the local economy, a significant relation between the reviewed variables was either impossible to distinguish (municipality of Radnevo), or the relation was significant and strong, yet the influence coefficients were very high (municipality of Galabovo – Coeff. = 58.828). There are considerable large-scale investments in these municipalities in the field of resource gathering and heat energy production. Neither the investment activities, nor the demographic situation exhibit any similarities with the other rural municipalities in the district. The potential for tourism is low and agriculture has a complementary importance for the regional economy.

- Municipalities with typical socio-economic characteristics and exceptionally low potential for development – Their representative is the municipality of Opan. It is not accidental that we cannot measure any relaible impact of the national economy in this case. The combination of production factors has deteriorated so much within this municipality that national growth has to exhibit exceptionally high rates, in order to have any positive effect on the local level. The potential for tourism is negligible, the quality of public services is unsatisfactory, and agriculture is the primary segment of the local economy. Logically, the question arises whether this municipality should exist as an independent administrative unit, or it should be merged with another municipality with a greater potential for socio-economic development.

4 Conclusion

The conclusions of quoted authors have been confirmed concerning the variation of the effect of national growth rate on different type of regions. Futhermore, this paper stresses on the fact that the structure of the economy of rural areas determines different elasticity in ralation „national growth – local economic activity".

On the basis of the conducted study, the following conclusions can be drawn, which could be used to determine some of the reasons for the major disparities in Bulgaria's rural development.

Rural municipalities need a revised identification and definitition. Identification solely on the grounds of population cannot be a reliable indicator for setting them apart into a separate group for directed influence;

A precise and differential approach of rural development policy is needed. Due to the variable nature of the municipalities, deciding upon the range of necessary influences requires great care and attention. For example, the same policies cannot be taken in the field of public services because the municipalities have diverse needs and preferences;

A reconsideration of the administrative distribution of state authority is needed. Although few in number, there are rural municipalities with such deteriorated socio-economic complex, that their independence should be reconsidered, and subsequently, possible actions for speeding up their development should be discussed.

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Prototype of a Content Creation and Updating Application Module for Agrarian Sector and Regional Development

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Abstract: The paper describes the development process of designing an application module prototype. Its objective is to provide an easy way to create and update information content. The paper summarizes data from several researches. Semi-structured interviews were conducted in order to determine the most important needs of target users. Analysis of the most used open source Content management systems provides an overview of the existing tools. Methods of Rapid (Throw away) prototyping were used in a design process. The paper identifies key problem areas of content creation and updating in World Wide Web environment. Taking the results into consideration, we developed a prototype application. A completely new WYSIWYG approach for the content creation and updating process was introduced.

Key words: WWW, CMS, WYSIWYG, HTML, JSON, information content, prototyping

JEL classification: Q13, L86, M15

1 Introduction

Internet and the World Wide Web (WWW) environment have rapidly spread over the population during past years. Number of web pages and portals is still growing. The past decade has seen the rapid departure from classical printed media, therefore the importance of digital content is growing at the same time. Users without knowledge of web technologies should be able to manage the online content (Brown, 2014). Regarding the sector of regional development and agriculture where ICT technologies penetration and knowledge of required technologies is not at a high level (Tyrychtr et al 2015), the importance of this research topic is more significant.

Due to the development of internet technologies, especially Content Management Systems (CMS), even users without knowledge of web technologies (HTML, CSS) can manage the online content. This usually means creation of information content like articles, news, interviews, etc. The main part of the content creation utilizes WYSIWYG (What You See Is What You Get) editors. This tools help users to work with the content without knowledge of the desired technologies the same way most text processors do. However, this suffers from many limitations. One of the most significant problems is the inconsistent HTML output (Spiesser and Kitchen, 2004). Additionally, the mentioned editors are often considered as security threads (Javed and Schwenk, 2015)

Contemporary information content should focus not only on the appearance of the result shown in browser but the content also needs to be accessible for humans as well as for machines (Minin et al 2015). Website quality is also one of the crucial areas in the regional development (Šilerová et. al, 2013). Moreover, the content is accessed from various devices. Besides desktop web browsers, there are mobile browsers and applications (Šimek, Stočes and Vaněk, 2014). On the whole, information content in WWW environment needs to be well structured and semantic. There are many modern technologies for content sharing, searching and classification such as metadata description (e.g. AGROVOC) and sharing (e.g. OAI-PMH) which need to be considered (Šimek et. al, 2012). Khalili and Auer (2012; 2015) introduced a WYSIWYM (What You See Is What You

Mean) concept. It shows a way to implement modern semantics for information content in unstructured content.

Department of Information Technologies of CULS Prague works on a project that deals with methodology for creation, updates, storage and presentation of information content in the WWW environment. The research targets the following problems coming from practical usage of CMS:

- Migrating content to upgraded or different CMS
- Problems when using WYSIWYG editors
- Transformation of content for use across various devices (smartphones, tablets,…)
- Content authoring of unexperienced users

The objectives of the paper are to provide results obtained during the research process, to develop the prototype application for the methodology development and verification, and to identify key requirements for the further research.

2 Materials and Methods

Methodology of the research consists of several investigations and a long-term research done by Department of Information Technologies.

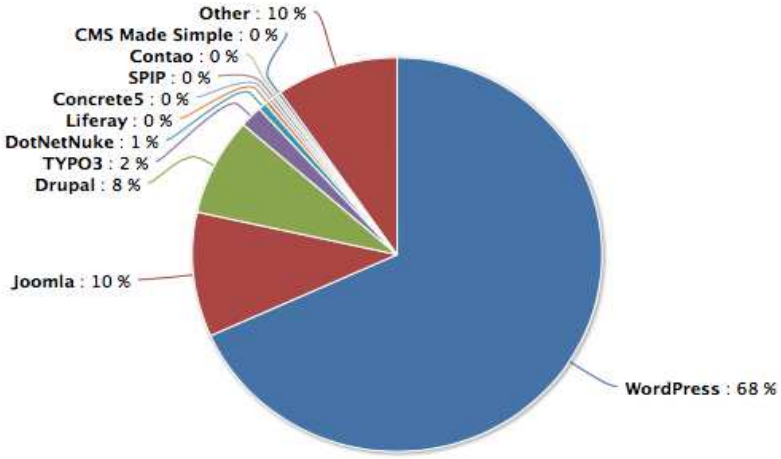
Several semi-structured interviews among target user groups were performed. The focus was on the first crucial area of interest – Creation and updating of the content. The interview guide covers several main topics. The most important questions are the following:

- Do you use any CMS? Which one?
- Do you use WYSIWYG editor?
- Do you compose the content from blocks?
- How is your content structured?
- What are the most difficult parts in content creation process?

Within the subject area, the open source software is highly exploited. Therefore, we focused our research on the freely available CMS application. According to current market share and the interviews we analysed the main available open source systems. Among the most important ones are Wordpress, Joomla, and Drupal. The current market share shown in the Figure 1.

The analysis aimed primarily at tools provided for content creation and updating. Applicable available modules of the systems were installed and explored. We focused on the information content management, namely content definition and composition, storage, and a usability for the users.

Fig. 1. Open source CMS Market share

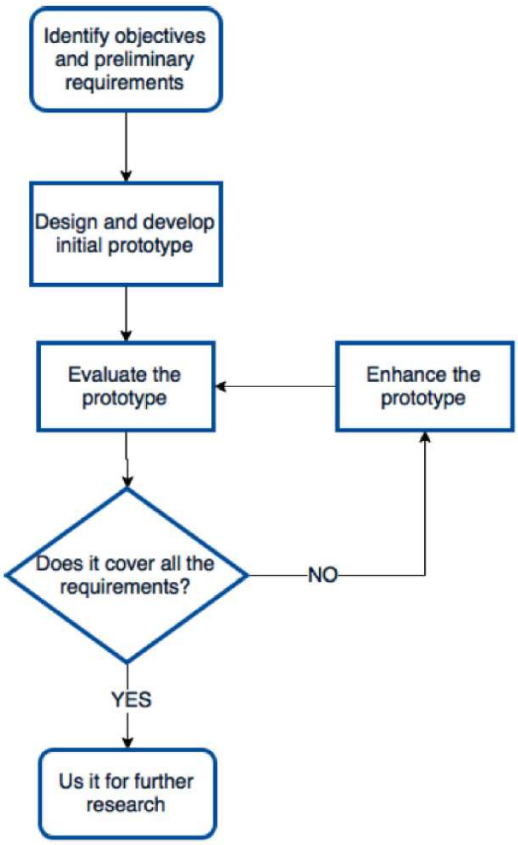


Source: opensourcecms.com, 2016

2.1 Prototype development

Based on the results from the interviews and analyses (see Results and Discussion chapter for details) we designed the prototype application. Methods of Rapid (Throw away) prototyping were used. The design process consisted of several stages as shown in the Figure 2.

Fig. 2. Design process of the application prototype



Source: own procesing

During the development, modern prototyping applications (e.g. Justinmind. Invision, Marvel, Axure, etc.) transpired to be insufficient for this case. The lack of interactivity was a key factor. Instead, we have decided to develop a conventional application prototype.

Consequently, we chose to employ some frontend JavaScript frameworks. They allow a fast and effective development of user interface with rich interactivity.

Ember.js is one of the most used frameworks among professional developers. Together with Ember-CLI it supports fast development by avoiding a lot of boilerplate work (Ember.js 2016). It is based on MVC pattern and its strength is in high focus on an application structure and coding style. Therefore, the developed prototype can be more easily exploitable for final applications.

To avoid an unnecessary programming of backend, a cloud based database solution was used, more specifically a Google's Firebase was used. It offers a simple tool for real time storage data in JSON-like structures (Firebase Features, 2016). Furthermore, there is a library for Ember.js available which simplifies the synchronisation of application models with the database.

Altogether, we used the Ember.js JavaScript framework in connection with several other tools and libraries such as Bootstrap, Sass and jQuery and others. The Firebase service serves as a simple backend and database solution.

3 Results and Discussion

3.1 Interviews

Analysing the results form interviews, several findings can be reached. We could identify several conformable aspects and problems. The most important information acquired are summarised in the following list:

- Most of interviewees create the content in MS Word or similar applications, and then transform it to the CMS
- The work with the CMS regarding the content authoring is not very user friendly (bad user experience)
- WYSIWYG editors serve the major part of content creation
- The result - the final presentation is not always as expected

Regarding the content creation and updating in CMS using mostly WYSIWYG, we identified problematic areas for the users. Generally, more advanced features of editors can be difficult to use, especially when it needs some re-edition. The key problem areas can be classified as follows:

- Tables containing pictures
- Floating objects (elements)
- Insertion of automated content parts (from CMS)
- Galleries
- Movement of complex content parts (blocks) inside editor (tables etc.)

3.2 Analysis of the existing tools and CMS

We analysed the three most widely spread CMS available. The main focus was on advanced features of content construction. All of them are supporting various content composition from blocks. Drupal supports this feature in its core. Alongside, WordPress contains this functionality only partly in the form of API for extension developers. In Joomla, the whole solution is offered by extensions only. To sum up all the findings, several results can be reached:

- Each CMS has a different approach to content composition
- A number of features is still left on WYSIWYG editors, causing bad user experience
- The blocks are set for each content type using a fixed template
- The blocks are stored in database tables or table attributes
- Fixed database schemas limit the flexibility in content composition
- The approach to content storage is different for all systems and even extensions

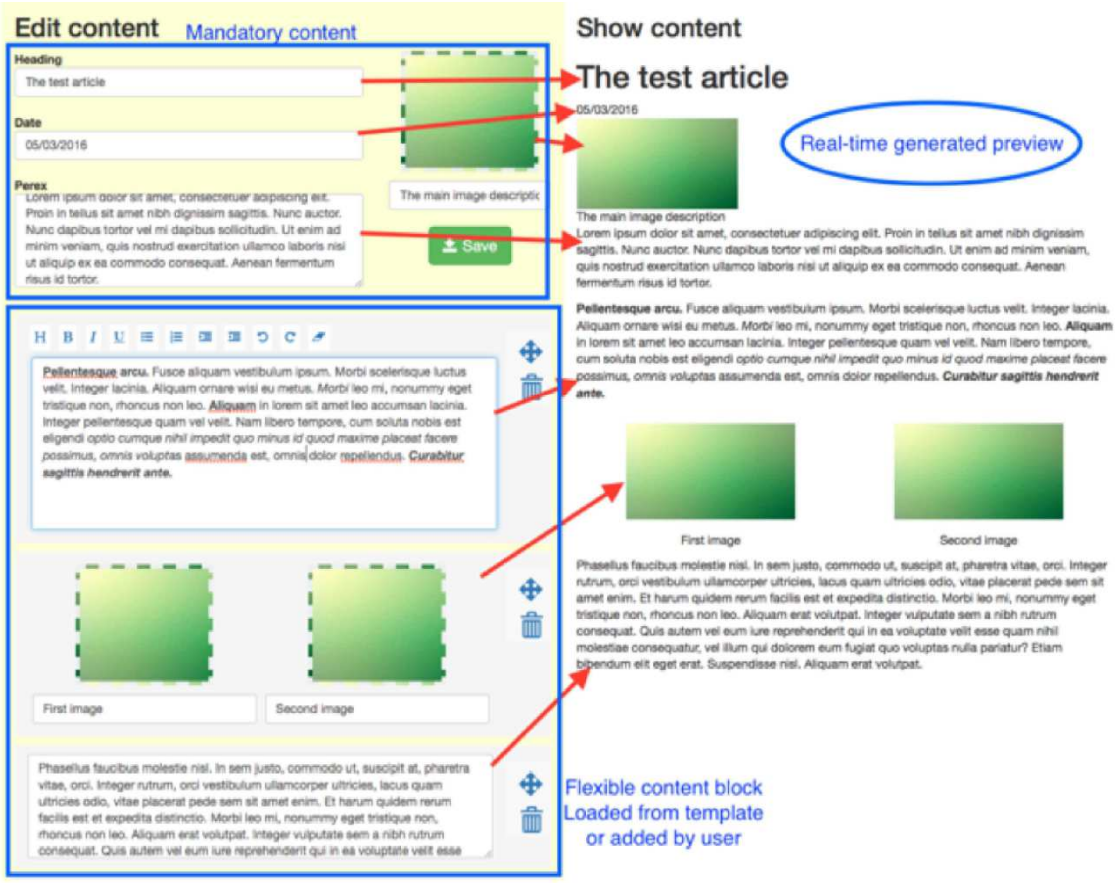
3.3 Prototype development

Taken previous results into consideration, the prototype was developed. It employs some approaches from the existing tools. Apart from that, the new ideas and methods are constituted. The resulting prototype is focused on the user experience and minimization of input errors. Taking extensive portion of application logic to client side is necessary (Vuorimaa et. al, 2016).

The core concept is a content composition from blocks taken from the contemporary CMS tools such as Paragraphs module in Drupal 8 (Nikolic, 2016). The very important attribute is the ability to dynamically change order of the blocks. Compared to existing tools, there is no fixed template. The blocks can be moved inside each content instance. However, there is still a necessity of certain parts placement inevitable. Articles ordinarily have title, lead paragraph and a lead picture which is shown in the listings. Therefore, a concept of fixed set of blocks complemented by a flexible template is introduced.

The concept of What You See Is What You Get is employed in a rather different manner. Instead of employing the conventional complex WYSIWYG editors, which have many limitations and security vulnerabilities (Javed and Schwenk, 2015), the whole editing environment is projected to the real result. The transformations which are done by the CMS application are applied in real time. Consequently, the result is shown immediately to the user on the other side of the screen (or at the bottom, based on the screen size). The behaviour designed by the prototype is shown on the Figure 3. Additionally, this new approach enables to facilitate the use of metadata descriptions, semantics and concepts of WYSIWYM as introduced by Khalili et. Al (2012).

Fig. 3. Application prototype – content composition and real-time visualization



Source: own processing

Comparing the results to other authors, Nikolic and Silc (2016) shows a good way of managing fields during the authoring process by their implementation in Drupal CMS. Khalili et. al (2012) introduced a concept of WYSIWYM, which can complement the future methodology.

4 Conclusion

The paper identifies key problem areas of content creation and updating in World Wide Web environment. Taking the results mentioned in chapters 3.1 and 3.2 into consideration we developed a prototype application. A completely new approach for the content creation and updating process was introduced. It utilizes new technologies in the current state of art and answers future challenges.

The prototype application revealed several issues that lead to improvement suggestions. The second crucial area of interest is the storage of content. The conventional relational database model transpired to be insufficient for the purpose. The fixed database schema is limiting for the flexibility of templates. Modern NoSQL databases solve these issues but open source CMS mostly use MySQL databases. Since the primary target users are editors of regional or agricultural portals, where open source CMS are usually employed, the methodology should take that fact into notice. Therefore, we propose to store the content in JSON. Newest versions (5.7) of MySQL supports the JSON as a data type.

Additionally, a standardisation of the storage format would bring many advantages such as better content portability, sharing, transformability to different forms of presentation (e.g. mobile devices, printing), easier upgrade or transition to a new CMS application, etc.

In conclusion, the paper covers the first and partly second crucial area of the information content management presented in the Introduction. The consequent research is going to use the prototype primarily for the methodology development and verification. The existing tools and CMS applications have to be taken into consideration. The methodology should be applicable to extend them.

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Cooperative farming and food security within rural Bangladesh

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Abstract: Cooperative farming has been essential in establishing food security within rural Bangladesh. Although cooperative movement has weakened over the past few decades and many farmer organizations have become inactive, cooperative spirit is still very much alive. Adequate government support coupled with identified high interest for cooperative farming and already existing community-supported cooperative practices, could revive cooperative movement, resulting in semi-mechanized and efficient farms and food secure rural areas. The paper focuses on Kurigram Sadar rice farmers and employs simple linear and stepwise multiple regression analyses to contrast aggregated values for different categories such as land and equipment ownership, adoption of high yielding varieties and household size. The results revealed only marginal relations between tested independent variables and household income, with land ownership leading the way as the strongest predictor. The main reason behind variable disconnect lies within surveyed households under or over reporting their incomes, expenditures and savings. Since Kurigram Sadar rice farming practices are similar to those in other parts of Bangladesh, conclusions could be adapted and implemented nationwide.

Key words: rice farming, smallholder cooperatives, food security

JEL classification: Q01, Q15, Q18, J11

1 Introduction

Bangladesh smallholder rice farmers may benefit from joining local agricultural cooperatives and sharing their farming resources with other rice growers. Agricultural service cooperatives and agricultural production cooperatives, as the two most common forms of agricultural cooperative (Cobia, 1989), support their members, help them buy inputs, market their outputs and achieve higher profits (Barton, 2000). Cooperatives are established on a voluntary basis, unlike Russian kolkhozy (Maitah et al, 2016; Smutka et al, 2015), to allow their members to share expenses and profits and manage production risks (McLeod, 2006; Wanyama, 2014). Often times, cooperative elements are already present, as in case of surveyed Kurigram Sadar villages, where farmers share their seeds, equipment, labor and even lend and borrow funds to one another. Such informal functions could support more formal forms of cooperative farming and bring about cost and time savings to participants.

Bangladesh is, in all of its aspects, an agricultural country with about a third of its population living below national poverty line (WB, 2014). Unlike Indian agricultural cooperatives, Bangladesh cooperative movement was not nearly as successful in achieving the goal of poverty reduction, leaving majority of rice-farming households reliant on traditional farming methods. Landlessness and growing population have made the transition from labor intensive to mechanized production even more difficult, resulting in low yields and production inefficiencies (NIPRT, 2013); With a modernized production capability and a series of governmental reforms, the country could become more competitive (Maitah and Smutka, 2016).

Cooperative potential, however, may still be observed on the example of Bangladesh's largest milk community which helps landless households, otherwise not admitted by cooperatives, to purchase cattle and sell milk, resulting in up to ten-fold increase in earnings (ILO, 2003).

Although Bangladeshi cooperative movement has commenced more than a century ago and has had its very own test phase in form of Comilla model, it is today considered largely inefficient and non-functioning.

The paper's centre of interest thus are Kurigram Sadar rice farmers, located in one of the country's most impoverished rural areas. The study makes use of 232 surveys collected within the region and focuses on rice production as the country's cheapest sources of calories (Hossain et al, 2012), providing the population with over 60% of their daily calorie intake (BRRI, 2015) and taking up to 75 percent of available agricultural land (GAIN, 2013).

The purpose of the paper is to identify important patterns across different categories such as land and equipment ownership, land proximity and fragmentation, household size and household income, amongst others. This involves identifying determinants of household income using survey indicators (via regression analysis) and also looking for patterns amongst additional predictors such as household spending.

2 Materials and Methods

Surveys were administered within each of Kurigram Sadar's eight unions. The region is home to 72 thousand households, three quarters of which are considered rural (Islam et al, 2003). It is known for high prevalence of poverty and illiteracy (BBS, 2014), extreme flooding and substantial rice yield gaps (Sattar, 2000), all acting as obstacles to farming and food security attempts.

Face-to-face interviews using 41 questions were conducted with residents aged 18 and above. Household selection criteria involved owning at least 0.01 acres of land and growing rice at least once over the past five years. Landless households were excluded as they had nothing but their labor to contribute to local cooperatives.

Simple random sampling was used to randomly select a single village within each of the eight unions (Yates et al, 2008). As an average Bangladeshi village is composed of 232 households (Islam et al, 2003), half of whom are landless (NIPRT, 2013), the pool of potential surveyees was 928 (232 households × 8 villages × 50% landless = 928). The figure was narrowed down to 464 as systematic sampling was used to select every other household within the villages. Interviews were conducted in November 2015 and yielded 232 samples.

Narrow sampling area and limited household availability were amongst the most prominent limitations to the study, as reflected in results. These can be avoided in future research through better staff training and higher resource base.

Collected samples were analyzed using six predictor variables derived from 41 survey questions. Shortlisted indicators were tested using simple linear regression to identify any significant correlation and noteworthy patterns amongst variables. Only Pearson correlation, ANOVA and Beta significance levels were reported, all significant at .05 level (Table 1).

Additional variables including household spending and number of household members were included and tested separately.

Pearson correlation, as one of the measures, tracks linear correlation between variables, returning values between +1 (positive correlation) and -1 (negative correlation), with 0 implying no correlation (Stigler and Stephen, 1989). ANOVA, on the other hand, tests whether means of several groups are equal (Rutherford, 2001). Lastly, Beta coefficients are used to compare relative strength of predictors within a model and are the most valuable output of an analysis.

Table 1. List of tested variables

Variable	N	Unit of measure	Regression significance	Source
Household income	232	Local currency	<.05	Author
Household spending	232	Local currency	<.05	Author
Household members	232	Number of people	<.05	Author
Land ownership	232	Acres	<.05	Author
Tool ownership	232	Yes/No	>.05	Author
Cattle ownership	232	Number of cattle	>.05	Author
Land proximity	232	Kilometer	>.05	Author
Land fragmentation	232	Number of parcels	<.05	Author
High yielding varieties	232	Yes/No	<.05	Author

Source: FAO, 2016

Simple linear regression results are shown first. In the general regression equation (1), y is the response variable, x is the explanatory variable, β_1 the intercept, β_0 is the slope and u_i is the residual (random error component) that is being minimized. The aforementioned Betas are 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.

$$y = \beta_0 + \beta_1 x + u_i \quad \textbf{(1)}$$

All six predictors of household income within Kurigram Sadar were then used in a stepwise multiple regression analysis. Stepwise regression is a semi-automated process of creating a model by consecutively adding or excluding variables, according to t-statistics of their estimated coefficients. The aim of the analysis is to include as few variables as possible, since any additional regressor decreases the precision of estimated coefficients and predicted values (NCSS, 2015).

In a multiple linear regression equation (2), y is the value of dependent variable, x_1, x_2, x_3, …, x_k are independent variables, β_0 is the slope, β_1, β_2, β_3, …, β_k are regression coefficients analogous to the slope in linear regression equation, while u_i is the residual and assumed to be zero (CSU, 2015):

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k + u_i \quad \textbf{(2)}$$

Due to nature of collected cross-sectional data, normality and heteroskedasticity were tested. Normality was assessed using skewness and kurtosis z-values (should be between -1.96 and +1.96) (Cramer, 1998; Cramer and Howitt, 2004) and Spahiro-Wilk p-value test (should be >.05) (Shapiro and Wilk, 1965; Razali and Wah, 2011). Homoskedasticity, on the other hand, describes a situation in which an error term remains roughly the same across all values of predictor variable. Heteroscedasticity within data was therefore tested, as a violation of homoscedasticity, existing when error term size varies across values of a predictor variable (Kaufman, 2013).

Shapiro-Wilk's test showed that Household income was approximately normally distributed for majority of categories for Land ownership data but not for Land fragmentation and High yielding varieties data, with skewness and kurtosis z-values being within suggested range for majority of categories for both Land ownership and Land fragmentation indicators but not for High yielding varieties. Heteroskedasticity tests, on the other hand, showed that Income, Land ownership and Land fragmentation data are all homoskedastic, whereas High yielding variety data proved heteroskedastic and as such a possible issue in analysis.

Lastly, rice demand forecast within Bangladesh was calculated using projected population growth until 2050 and assuming no changes in rice consumption occur (2013 is taken as a base year). Forecast used FAO (2016) data and was calculated by multiplying the expected number of people to live in Bangladesh for each of the years by the per capita rice consumption from the base year.

3 Results and Discussion

Results are laid down starting with simple linear regression output for selected independent variables (Table 2). As implied in the previous section, all presented variables are statistically significant at .05 level and use data set of 232 samples.

Table 2. Simple linear regression output for Household income as a dependent variable

Independent variable	N	Pearson correlation	Adjusted R square	ANOVA F	B	95% confidence interval for B
Land ownership	232	.403	.159	44.717	2.356	1.662 - 3.050
Land fragmentation	232	.189	.032	8.558	.321	.105 - .537
High yielding varieties	232	.204	.037	9.965	3.226	1.213 - 5.240

Source: own work

Land ownership showed the highest correlation with household income, however, the model explained only 16% of variation in the dependent variable. The Beta suggests that with every 1 acre increase in land ownership, the monthly income increases by 2,356 Bangladeshi Taka (BDT) or about 27 Euros. Even though such an increase may seem marginal, once an average income of surveyed group (8,600 BDT or 98 Euros) is taken into account, the improvement is a drastic one. Confidence interval for Beta, however, reveals a great deal of uncertainty, ranging between 1.66 and 3.05.

Similar conclusions may be derived for Land fragmentation and the use of High yielding varieties (HYV) as predictors. Both indicators show significantly lower correlations with dependent variable and almost negligible Adjusted R square values. The disconnect between the two independent variables and household income may also be inferred from their Betas. In case of Land fragmentation, the model suggests that an increase in land fragmentation by an additional parcel (further splitting the land) leads to an increase in income by roughly 300 BDT, quite a counterintuitive prediction. In case of HYV indicator, Beta interpretation is a bit different. It essentially reads that with all other factors held constant, switching from a non-HYV to HYV farming would mean an increase in monthly income of 3,226 BDT.

Low correlation and Adjusted R square could be explained with under- or over-reported monthly incomes. The root cause may be within the way interviews were conducted – outdoors, with surveyees surrounded by friends and family. The embarrassment of revealing the true state of poverty or perhaps the fear from disclosing high incomes may have compelled surveyees to provide misleading numbers.

Remaining three independent variables (Tool ownership, Cattle ownership and Land proximity) were not listed in the table as they proved to be statistically insignificant (>.05).

Stepwise multiple regressing is presented next (Table 3), starting with all six independent variables and consecutively reducing them to, in this case, a single variable. It could be inferred that Land ownership is the most important determinant of household income within Kurigram Sadar's surveyed households.

Table 3. Stepwise multiple linear regression output for Household income as a dependent variable

Independent variable	N	Pearson correlation	Adjusted R square	ANOVA F	B	95% confidence interval for B
Land ownership	232	.403	.159	44.717	2.356	1.662 - 3.050

Source: own work

This is especially true considering country's dependence on agriculture and rapidly shrinking arable land (most of Bangladesh's court cases relate to land disputes) (Fig. 1).

Figure 1. Available arable land per capita 1965-2050 (*m2*)

Source: FAO, 2016

Another set of indicators presented within Table 4 shows relations between a number of household members and Household income and Household spending, respectively.

Both predictors show moderate-to-low correlations and extremely low explanatory power (Adjusted R square values). Even with the lack of accuracy in reported household incomes, it can be still inferred that each additional household member leads to an additional 934 BDT in income and additional 970 BDT in spending. This means an additional family member would certainly mean more income but also higher spending. If the figures are to be trusted, in the long run, this could impoverish families even further and make food security efforts and implementation of cooperative farming less likely.

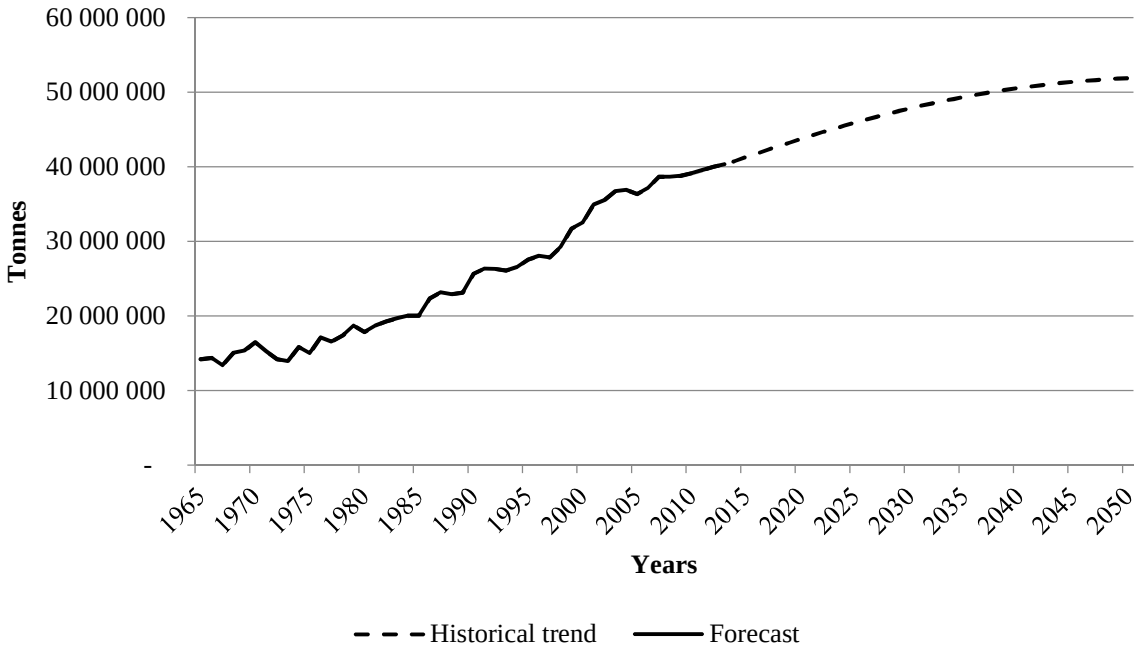
Table 4. Simple linear regression output for number of household members as independent variable

Independent variable	N	Pearson correlation	Adjusted R square	ANOVA F	B	95% confidence interval for B
Household income	232	.259	.063	16.524	.934	.481 - 1.387
Household spending	232	.328	.104	27.699	.970	.607 - 1.334

Source: own work

The seriousness of population growth and arable land shrinkage is depicted within Figure 1, revealing an increase in rice demand within Bangladesh from current 40.8 million tonnes of paddy rice (2013) to 51.9 million tonnes in 2050, assuming no changes in rice consumption occur from 2013 level (roughly 8% higher than the past 50-year average). Within the same time frame (2013-2050), the 29 percent increase in rice consumption corresponds to proportional growth of population, from 157 million to about 202 million, requiring an increase in agricultural land needed to keep up with such level of growth. The trend, however, is quite the opposite (Fig. 2), with less than 500 m^2 of available agricultural land per capita in 2013 and declining.

Figure 2. Bangladesh rice production 1965-2050 (*tonnes*)



Source: FAO, 2016

Even though very few variables prooved to be statistically significant, it can be derived that increasing land ownership and switching over to high yielding varieties could potentially lead to increased incomes and more secure future. Such endavour is preciselly what cooperative faming could offer, along with other benefits.

4 Conclusion

In order to entice development of cooperative farming within Bangladesh, research was conducted in northern region of the country, resulting in 232 survey samples. Simple linear and stepwise multiple regression analyses were performed on collected data, aiming at identifying major determinants of income within Kurigram Sadar. The results revealed land ownership as the most important predictor, with the use of high yielding varieties coming in second. The main obstacles in performing analysis were related to under- and over-reporting by surveyed households, leading to relatively wide confidence intervals for respective Betas and inconsistent results in some cases (land fragmentation). Nevertheless, results pointed out to areas which could possibly be improved through cooperative farming and lead to increased income for a broad group of smallholder farmers within the region and across the country.

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State of Ditches and their Maintenance in the Context of EU Support in Lithuania

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Abstract: Agricultural drainage ditches are essential for the removal of surface and ground water to allow for crop production in poorly drained agricultural landscapes. There are 63 000 km of drainage ditches in Lithuania and 54 % of them are in bad state. The state of ditches is worsening every year because of insufficient maintenance and lack of provided financing. The aim of the study - to review state of ditches in the different counties of Lithuania, spread of the assimilation of EU support intended for the maintenance of ditches and to determine the main reasons impeding participation of farmers in the measure "Non-profit investments" of Lithuanian Rural Development Programme 2007-2013. Most agricultural producers improve the drainage on their land for better traffic ability, to enhance field conditions, to facilitate timely planting and harvesting operations, and to help decrease crop damage from saturated soil and standing water during the growing season. The main reason impeding from participation in non-profit investment support programme named by the farmers (31 %) is fear for additional obligations for further 5 years.

Key words: drainage, ditches, farm, maintenance, EU support.

JEL classification: Q15, R51

1 Introduction

With more than 50 percent of the European population (EU-24) living in rural areas and a renewed focus on stimulating smart, sustainable and socially inclusive growth, Rural Development Programmes are an important instrument for economic, social and environmental policies (Smit et al., 2015). The specific character of farming was perceived since the beginning of the creation of the European Community. Initiation and systematic evolution of Common Agricultural Policy aim at harmonious development farmstead (Janowicz-Lomott and Łyskawa, 2014). The EU has set up a common rural development policy, also known as the 'second pillar' of the common agricultural policy. The policy is implemented through multiannual programming periods. The period runs from 2007 to 2013 and payments must be completed by 2015. The policy is based on the co-financing principle: EU funds are complemented by national funding, and also by on project implementation phase (Caruso et al., 2015). On average, 44 % of total water abstraction in Europe is used for agriculture. From 1 January 2010, Member States shall provide in their rural development programs, in accordance with their specific needs, the following priorities: climate change, renewable energy, water management, biodiversity and dairy restructuring are crucial challenges for Europe's rural areas, agriculture and forestry (Carlier et al., 2010). The growing EU support on the one side brings a positive effect on the economic situation of farmers, while on the other side this brings negative changes in production structure and in the relationship of agriculture towards natural resources (Prášilová and Procházková (2015). Traditional nationwide agri-environmental policy measures are not always efficient to ensure the provision of environmental services that would match peoples' preferences (Grammatikopoulou et al., 2013). Agriculture in Lithuania is one of the priority sectors playing an important economic, social and environmental role. This Rural Development Programme for Lithuania for the period 2007–2013 has been prepared following the provisions of the Council Regulation EC No 1698/2005 on support

for rural development by the European Agricultural Fund for Rural Development and further the Commission Regulation No 1974/2006 laying down detailed rules for the application of this Council Regulation (Rural Development…, 2007). In Lithuania, artificial drainage is a common agricultural practice. The total drained land area occupies 47% of the country's land area (Povilaitis et al., 2015). In the territory of Lithuania there are 3.4 million hectares of too wet land or about 86 % of total agricultural area, which may be used extensively and productively only after draining (Lukianas et al., 2009). Agricultural drainage ditches are essential for the removal of surface and ground water to allow for crop production in poorly drained agricultural landscapes (Needelman et al, 2007). From year 2006, the state began providing support from the nation budget to owners of improved lands for the melioration buildings and repair of drainage systems. Also the support of Europe Union is used for the management of melioration systems. Farmers were invited to use support of Lithuanian Rural Development Programme of the 2nd Direction "Improvement of environment and landscape" for year 2007-2013, intended for the management of drainage ditches and, respectively, farmers were presented applications according to the measure of this programme "Non-profit investments" **(**Dėl Lietuvos..., 2012). The aim of the study – to review state of ditches in the different counties of Lithuania, spread of the assimilation of EU support intended for the maintenance of ditches and to determine the main reasons impeding participation of farmers in the direction "Improvement of environment and landscape" measure "Non-profit investments" of Lithuanian Rural Development Programme for year 2007-2013. Practical benefits of the article: to increase EU support for the countries, where farmers make use ES support poor in order to improve agricultural land and employment.

2 Materials and Methods

Analysis of ditches' state in the different counties of Lithuania, the main reasons of deteriorations are determined according to the data of Ministry of Agriculture (Dėl Melioruotos... 2007). Analysis of financing extent by EU support for 2nd Direction "Improvement of environment and landscape" of Rural Development Programme 2007-2013, of non-profit investment programme (valid only 2012-2013), intended for the drainage ditches state improvement, was performed according to the data of National Paying Agency under the Ministry of Agriculture (Bendra Lietuvos..., 2015). For evaluation results was used statistical methods. Dependence of number of the presented applications on the different factors (number of ditches, number of farmers in the counties and etc.), reliability of the results was evaluated according to correlation analysis R. Its numerical value ranges from +1.0 to -1.0. It gives us an indication of the strength of relationship. Closer the coefficients are to +1.0 and -1.0 greater is the strength of the relationship between the variables. The obtained data were analysed using descriptive statistics and using the least significant difference test at the level of 95 % probability. Fisher's LSD method is used in ANOVA to create confidence intervals for all pairwise differences between factor level means while controlling the individual error rate to a significance level 0.05 (LSD_{05}, p-0.05). In order to determine the main reasons impeding the participation of farmers in the 2nd Direction "Improvement of environment and landscape" of non-profit investment programme, that is covering 100 percent of costs of the implemented projects, a survey was performed by survey method, using the questionnaire. The respondents (n=50) was selected the typical Lithuania agricultural farmers was represented, with the more as 1 km ditches and who do not use EU support. Type of survey: face to face. The questionnaire included of questions concerning the following themes: maintenance of ditches, reasons do not attend a support program, about near future plans to apply for land reclamation EU support, to indicate the reasons for not planning to apply, and what drives for applications.

3 Results and Discussion

Different deformations of the ditches occur and slopes are covered with bushes and trees because of effect of the climate conditions and lack of sufficient resources for the maintenance of ditches. Different deformations decrease permeability of the ditch, banks mouth, wash passes and also creates undesirable soaking of the areas. There are 63.000 km of drainage ditches in Lithuania, 50.817 km of main ditches and 54% of them are in bad state (27.257 km). The worst state of bad state melioration ditches is in Utena and Telšiai counties (table 1).

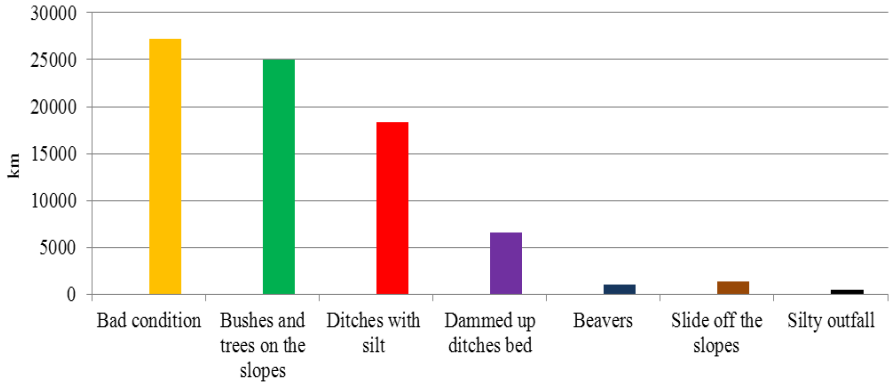
Balance value of drainage systems in Lithuania reaches 938.15 million EUR and 397.60 million EUR of it is made by the main ditches. Wear and tear level of the drainage systems equals 63.93%, meanwhile wear and tear level of the main ditches reaches even 75.30%. The main deterioration reasons of the main ditches under ownership of state are following: choking up of the ditches with silt (67%) and growth of bushes and trees on the slopes of ditches (92%) (fig. 1).

Table 1. The main ditches under ownership of state

Counties of Lithuania	Total ditches, km	Bad state ditches, km	Bad state ditches, %
Alytus	2464.46	1257.93	51
Kaunas	6088.29	2572.51	42
Klaipėda	4859.1	1580.78	33
Marijampolė	3972.85	1616.85	41
Panevėžys	7946.00	4980.68	63
Šiauliai.	8282.43	4588.63	55
Tauragė	3694.27	1363.24	37
Telšiai	3889.67	2877.86	74
Utena	4010.68	3103.62	77
Vilnius	5609.78	3315.84	59
Total:	50817.53	27257.94	54

Source: Dėl Melioruotos..., 2007

Fig. 1. The main reasons of ditches deterioration



Source: Dėl Melioruotos…, 2007

The Ministry of Agriculture of the Republic of Lithuania were invited the farmers to use support provided for the management of drainage ditches under of Lithuanian Rural Development Programme for year 2007-2013, and to present applications according to the 2nd Direction "Improvement of environment and landscape" (total 9.85 million EUR**)** measure of this programme "Non-profit investments" (total 3.96 million EUR) in 2012-2013 (table 2).

As it can be seen from the table 2, the biggest amount of support approved in Tauragė and Panevėžys counties and the smallest – in Utena counties.

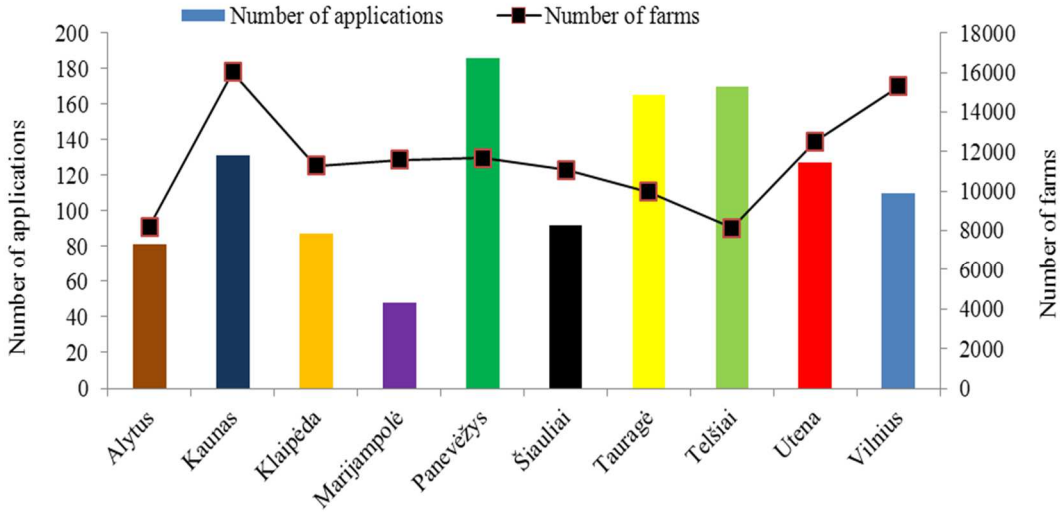
Farmers were encouraged to participate in the activity "Management of drainage ditches" and for this purpose receive support of the state. 1197 applications were collected, 950 applications were signed according this programme (Bendra Lietuvos..., 2015). As it can be seen from the 3 fig., the most active farmers in this program were in Panevėžys, Telšiai and Tauragė counties and the least number of applications was received from Marijampolė, Alytus and Klaipėda counties. But the biggest numbers of farm are in Kaunas and Vilnius counties, and the smallest – in Telšiai and Alytus.

Table 2. Statistics of the applications under measure "Non-profit investments. Management of drainage ditches" of Lithuanian Rural Development Programme for year 2007-2013

Counties of Lithuania	Number of collected applications	Approved applications	The requested amount of support, EUR	Approved amount of support, EUR
Alytus	81	74	27.619	23.464
Kaunas	131	92	66.110	56.286
Klaipėda	87	69	31.106	24.092
Marijampolė	48	37	27.420	24.707
Panevėžys	186	133	73.522	59.324
Šiauliai	92	64	40.509	32.296
Tauragė	165	158	78.826	68.760
Telšiai	170	146	61.342	53.300
Utena	127	80	23.639	17.992
Vilnius	110	97	41.885	36.301
Total:	1197	950	471.978	396.522

Source: Bendra Lietuvos..., 2015

Fig. 2. Statistics of the applications under measure "Management of drainage ditches" of Lithuanian Rural Development Programmer 2007-2013 for year 2012-2013



Source: Bendra Lietuvos …, 2015; Ūkių, įregistruotų..., 2016

The largest counties are Kaunas and Šiauliai (total land area and agriculture land) and the smallest - Alytus and Klaipėda (table 3).

While analysis of the number of farms in the counties, the average farm in Lithuania is quite small - about 9.37 ha. The biggest number of farms have 3-5 ha, but the biggest amount on land area have farms from 10 to 20 ha (table 4). Significant increase of land covers fragmentation due to growth of the shrubby and swampy territories both in the forested

territories and in the agrarian fields. The average area of land use plot decreased almost twice until 1986 (Jankauskaitė and Veteikis, 2013).

Table 3. The number of farm, registered 'Farmers farm register', and their land

Counties	Number of farms	Land area, total, ha	The average farm area,ha	Agriculture, ha	Forest, ha	Water, ha
Alytus	9294	68518.82	7.37	50939.62	9004.89	843.38
Kaunas	16710	152002.72	9.10	126322.37	9375.19	1785.20
Klaipėda	11437	87117.61	7.62	75332.74	6813.57	684.19
Marijampolė	11955	113463.07	9.49	104368.94	2925.25	538.99
Panevėžys	11897	137466.07	11.55	119011.36	11161.71	803.51
Šiauliai	11645	146281.72	12.56	123696.79	9023.33	626.25
Tauragė	10874	110353.06	10.15	87802.39	7373.09	569.31
Telšiai	8635	106205.53	12.30	95614.47	12875.25	822.29
Utena	13191	126062.85	9.56	94307.46	17464.11	844.75
Vilnius	16698	98679.12	5.91	81162.79	11092.13	734.40
Total	122336	1146150.57	9.37	958558.93	97108.52	8252.27

Source: Ūkių, įregistruotų..., 2016

Table 4. The number of farms by farm land area

Interval, ha	Number of farms	Amount of land area, ha
0-1	11 861	6036.14
1-3	36757	76106.74
3-5	22477	83441.77
5-10	25787	184009.99
10 - 20	16490	227926.87
20 - 30	4782	115209.33
30 - 50	2596	97847.18
50 - 100	1156	76511.89
100 - 500	416	72163.31
> 500	14	19305.71

Source: Ūkių skaičius…, 2016

When analysing the reasons of this unequal distribution of the support sum it is applied for, it was determined, that the number of applications depends significantly on length of ditches, length of ditches that are in bad state (correlation relation is moderate, R=0.44, R=0.53). The second important factor is own lands, total area of land and area of agriculture land. The weakest factor is land rent by the farmer and number of farmer (table 5).

Table 5. Statistical analysis

	Total area of land	Agriculture land	Land rent by the farmer	Own lands	Number of farms	Length of ditches	Length of bad ditches
Number of applications, R	0.27	0.25	0.03	0.38	-0.02	0.44*	0.53*

Evaluating the impact of rural development programmes is, however, complicated due to the widely varying policy targets of RDPs as well as their substantial heterogeneity across rural areas **(**Smit et al., 2015). Most agricultural producers improve the drainage on their land for better traffic ability, to enhance field conditions, to facilitate timely planting and harvesting operations, and to help decrease crop damage from saturated soil and standing water during the growing season. Agricultural drainage improvement also decreases year-to-year variability in crop yield, ensuring consistent production (Strock et al., 2010). The essential function of ditches is to prevent flooding through the rapid removal of surface water during storm and snowmelt events and to lower the water table during and between

events to prevent crop stress and to allow field soils to dry such that they may be driven upon and worked with agronomic equipment (Needelman et al, 2007).

In order to determine the main reasons impeding the participation of farmers in the 2nd Direction "Improvement of environment and landscape" of non-profit investment programme, that is covering 100% of costs of the implemented projects, a survey was performed. The main reason impeding from participation in Non-profit investment support programme named by the farmers (31%) is fear for additional obligations for further 5 years was founded. Other reason – lack of enginery (19%). Gorton et al. (2008) found that farmers felt highly positively about all forms of payments. However, some interesting variation was observed: except for Lithuania, farmers in all countries are more positive towards subsides for environmental goods than towards other forms of payments.

4 Conclusion

The poor state drainage ditches reaches 54% of all drainage ditches in Lithuania. The main damage has occurred because of silts and intensive vegetation of bushes and trees on the slopes of ditches. The farmers don't use intensively the support intended for the management of ditches provided by EU. In year 2012-2013 were presented 950 applications for the management of ditches under the 2nd Direction "Improvement of environment and landscape" of non-profit investment programme that is covering 100 percent of costs of the implemented projects. The majority of respondents who participated in the survey (31 %) aren't willing to take additional obligations, even for the yearly support that equal 150 EUR for one hectare. The number of applications depends significantly on length of ditches and length of ditches that are in bad state (correlation relation is moderate, R=0.44, R=0.53).The farmers avoid taking responsibility as in their opinion works of drainage ditches' management are complex, besides they think that ditches are owned by the state therefore the state should take care of them. The farmers overlook the fact that bad state of the ditches causes undesirable soaking of the area. In order to improve state of the ditches, the farmers must be more informed about possible results, they must be encouraged to contribute to management of the ditches and to use the support provided by EU.

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Survey of consumer habits of food supplement users from the perspective of food safety

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Abstract: The topicality of the subject has been shown by the fact that the number of food supplements has been increasing. These products are different from the traditional food products and the risks associated with them may also differ from the traditional food risks. The aim of this research is to examine the consumption patterns and the most important factors of the decision making process among adult food supplement users. The other research question is how determinants of food safety - such as quality, availability of information and risks - influence consumption patterns in the market and to what extent customers take these factors into consideration during purchasing process.

Within the framework of primary research, [1] focus group interviews were conducted in order to understand how people hold certain beliefs about food supplements and [2] a survey was also used to measure the consumers' attitudes towards these products as well as food safety. In data processing, factor- and cluster analysis were used to segment consumers based upon how they consider the use of food supplements.

From the results, it can be seen that 42% of customers consume food supplements seasonally. The main motivation in the consumption of food supplements is 'vitamin supplementation', followed by 'health protection'. In the case of food-supplements, a difference has also been shown between genders' consumption habits. Furthermore, four homogenous groups were identified among the respondents: comfortable, skeptics, careful users, conscious health-protectors.

I conclude that use of food supplements are judged differently by the respondents. Segmentation can help businesses to tailor the marketing mix for specific target markets. Findings can also improve the innovation of new products that suit better to customers' unique needs.

Key words: consumer behavior, segmentation, quality, information, risk

JEL classification: Q13, M31, L66

1 Introduction

In the last few decades there has been a significant change in the use of health care products. The interest towards natural things has increased. Besides, alternative medical trends, methods of treatment have started to strengthen. It turned out, that herbs, animal and mineral materials are important, not only because they contain necessary nutrients, but also because they have special effects that can be used in disease prevention. Due to this, different types of non-medicine products have appeared all over the world and they have become known as phytoteraphic products, functional food or food supplements.

The definition of food supplements according to EC Regulations No. 2002/46/EC is: "as an addition to a normal diet, food business operators market food supplements, which are concentrated sources of nutrients (or other substances) with a nutritional or physiological effect. Such food supplements can be marketed in "dose" form, such as pills, tablets, capsules, liquids in measured doses, etc."

In earlier literature, the research techniques of consumer behavior have spreaded to most in functional food researches (Gilbert, 1997; Menrad, 2003; Verbeke, 2005). Recent studies have reported a raising awareness and interest of consumers in health matters and functional food (Szakály et al, 2012; Filipović and Stojanović, 2013; Caracciolo et al, 2016; Khoury

et al, 2016). According to the study of Filipović and Stojanović (2013) the main influencing agents for this trend: the recognition of the role of the food in the preservation of health, increase in life expactancy and increasing cost of healthcare. Szakály et al (2012) revealed the relationship between lifestyle, health behavior and the consumption of functional food on the basis of Grunert's food-related lifestyle model.

The objective of this present study is the consumption pattern of food supplements in Hungary, searching for the answers to the following questions: What is the opinion of consumers about health and healthy lifestyle and what do they do in order to achieve it? Which factors can influence consumer behavior in food supplement purchase? Which risks are customers afraid of when using food supplements and what do they do in order to avoid it? (in qualitative research).

What are the main motivations behind food supplement consumption? How often do consumers use these products and how do they obtain the necessary information? To what extent do factors influencing decision making process affect customers? (in quantitative research).

2 Materials and Methods

To base my research, I used focus group interviews as a qualitative method. The group discussion was conducted twice to identify trends and patterns in perceptions. The results provide clues and insights as to how a product is perceived by the group (Table 1).

Table 1. Demographic composition of participants in focus group interviews, person

Educational level	Age				
	18–29	30–39	40–49	50–59	60 yrs +
Basic level	0	0	0	0	2
Intermediate level	1	2	0	1	2
Higher level	1	2	1	0	0

Source: Own research, 2014

Criteria for participation in the group: the age of 18 or above and earlier experience in the use of food supplements. 3 men and 9 women have been interviewed. In the quantitative research, online survey was used as the main primer method. 280 survey were sent by email and 104 were successfully completed and returned. A standardized questionnaire was applied as an instrument. The 17 questions were grouped around 4 main topics: (1) attitudes toward health and healthy lifestyle (2) consumer judgment of the use of food supplements (3) consumption patterns of food supplements (4) factors influencing purchase decision; especially quality, information and risks. The applied sampling is convenience sampling, thus it may limits generalizability. The response rate in adult men and women was 37,14% in the research. Among respondents, 52% were females, while 48% were males. Age distribution was as follows: 8% of respondents were 18-29 years old, 27% were 30-39 years old, 27% were 40-49 years old, 24% were 50-59 years old and 14% were 60 years old and above. Most respondents had a university/college degree (51%) and were residing in Budapest and the surrounding cities. The survey was carried out in August-September 2014, in Hungary. SPSS 21.0 statistical software was used for data processing and MS EXCEL for presenting the results. As for statistical method, descriptive statistics were used to describe the features of the data in my study (frequency distribution, mean, standard deviation, etc.), as well as cross tabulation and chi-square analysis to compare relationship between two variables. Factor analysis was used for data reduction and hierarchical cluster analysis (Ward's method) was applied to segment customers based upon how they judge the use of food supplements.

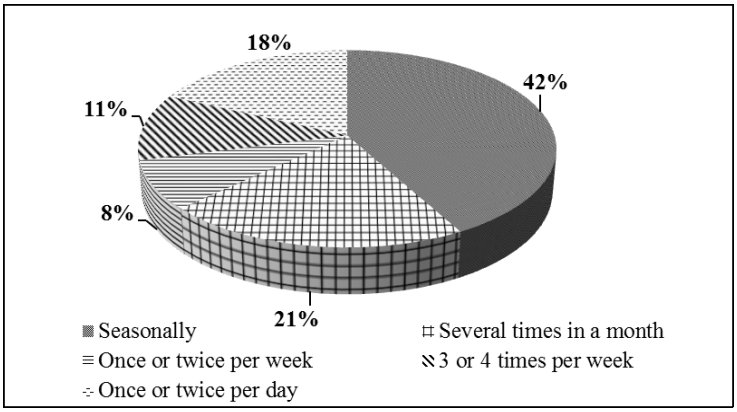
3 Results and Discussion

3.1 Attitudes, motivation and frequency of food supplement consumption

Participants in focus group interviews shared similar opinion about health and healthy lifestyle. From the factors that can determine healthy lifestyle, participants emphasized the importance of healthy nutrition. They agreed that in healthy nutrition diversity is the key. Participants also agreed that there can be different situation in life when the use of food supplements is unavoidable.

Data from the survey results show that the most frequent reason of consumption is vitamin supplement, followed by health protection and then attractive appearance. Treatment of diseases and pregnancy were chose less by the respondents. As for the consumption patterns of food supplements, most of the respondents use food supplements seasonally (42%), followed by the customers who consume such kind of products several times in a month (21%). 18% of respondents use the products daily and 11% consume food supplements relatively frequently (3 or four times in a week). Finally, 8% of customers use them once or twice in a week (Fig. 1).

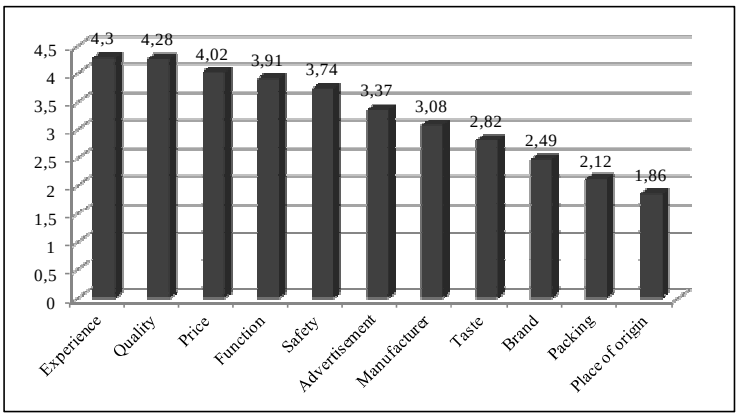
Fig. 1. Frequency of consumption of food supplements, percent



Source: Own research, 2014

Among factors that influence customer decision making, experience in earlier food supplement consumption received the highest value (4,30), followed by quality (4,28) and price (4,02). Other influencing factors, such as function, manufacturer, safety, taste or brand affect consumer behavior less (Fig.2.)

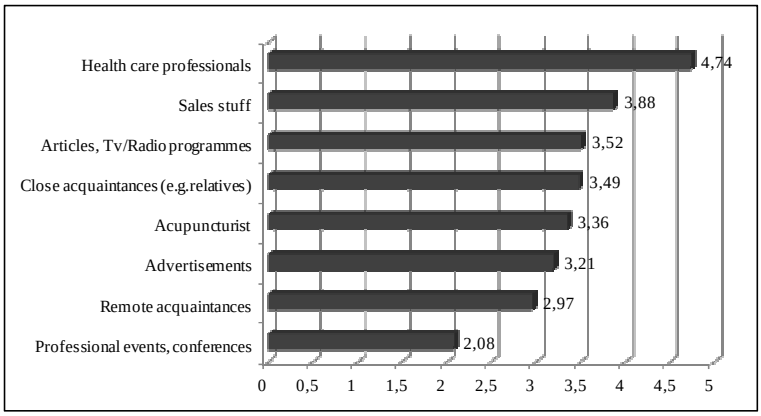
Fig. 2. Factors influencing food supplement consumption on 1-5 range scale, based on the average of the answers



Source: Own research, 2014

Fig.3. shows the most important sources of information. Respondents believe that the opinion of healthcare professionals (doctors, pharmacists) is the most authentic, followed by sales persons, and then articles and TV/radio programs connected to the topic. Customers obtain information from the acquaintances moderately. Examining the question on basis of gender, 94% of women and 56% of men listen to health care professionals completely. Whereas 44% of men and only 3% of women mostly accept doctor's and pharmacist's advice.

Fig. 3. The most important sources of information in the case of food supplements, based on the average of the answers



Source: Own research, 2014

In my research I examined how customers judge the characteristics of food supplements. To measure respondents' attitude I applied a five point Likert scale, where "1" means customers strongly disagree with the particular statement and "5" means they strongly agree with the statement.

Table 2. Name and contents of the factors, Rotated Component Matrix

Name of factor	Factor statement	Component				
		1	2	3	4	5
F1 – consideration of health protection	K5_1. Food supplements supply improper diet.	0,77	–0,10	–0,02	–0,04	0,03
	K5_2. They play an important role in prevention of diseases.	0,72	0,29	0,17	0,04	0,14
	K5_4. They can be purchased without a prescription.	0,56	0,18	0,45	0,00	–0,05
F2 – factors of uncertainty	K5_7. You need a lot of information for their use.	–0,21	0,75	–0,06	–0,19	0,20
	K5_8. There is no need for a permission for their distribution.	0,15	0,74	0,29	0,11	–0,03
	K5_12. Their unnecessary use can be dangerous.	0,32	0,68	0,04	0,09	–0,23
F3 – knowledge of ingredients	K5_5. They might interact with other medicines.	0,00	0,01	0,84	–0,11	–0,24
	K5_6. They contain natural ingredients only.	0,32	0,28	0,61	0,25	0,37
F4 – importance of dosage	K5_9. They can be used without a doctor's supervision.	0,06	–0,12	–0,08	0,74	0,35
	K5_11. They have to be used in specific doses.	0,40	0,42	–0,10	0,63	–0,26
	K5_10. Food supplements are costly.	–0,42	0,00	0,12	0,60	–0,06
F5 – perception of necessity	K5_3. Everybody needs these products.	0,08	–0,02	–0,12	0,07	0,85

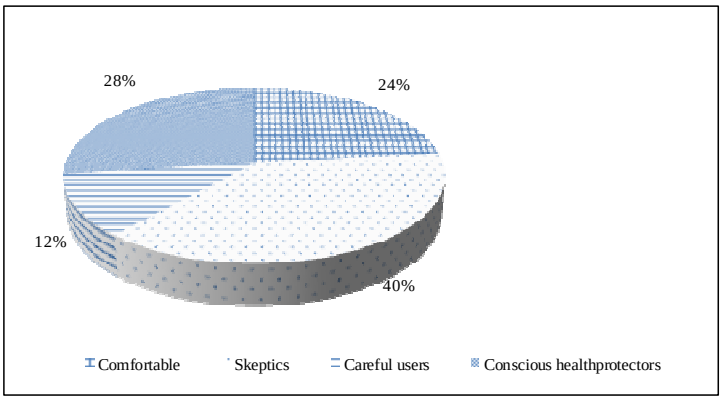
Source: Own research, 2014

Statements that have received the highest rates are as follows: Food supplements can be purchased without a prescription (4,63), They play an important role in disease prevention (4,59), They must be applied in specific doses (4,50), They supply improper diet (4,34). Since respondents had to assess 12 possible answers at this question, in data processing my aim was to reduce the number of statements for easier legibility (Table 2.)

3.2 Cluster analysis

I have classified the respondents in homogenous groups by the help of variables that were generated during factor analysis. 104 cases could be included in the analysis. Clusters contain 24, 40, 12, 28 elements respectively in a 4-cluster-solution (Fig. 4).

Fig. 4. Distribution of respondents in the four cluster, percent



Source: Own research, 2014

The clusters were characterized by the analysis of cluster centroids, i.e. I defined the average of the factor within each group and I have drawn my conclusions to the specific group. I have characterized the generated groups by demographic variables as well. Based on chi-square test, I studied the relationship between cluster membership and the following variables:

- gender (p=0,004): significant
- age (p=0,11): no significant
- qualification (p=0,0): significant
- location (p=0,281): no significant
- marital status (p=0,173): no significant relationship.

In the case of each segment, I also identified the elements of marketing-mix. In summary, the four segments can be described as follows:

Cluster 1 – the segment of Comfortable customers consider health protection very important, but are tend to do less in order to protect it. On the other hand, they are willingly use alternative health products. Customers of this group believe that everybody needs to consume food supplements. Most of them are women (80%); mainly from the young age groups. The main motivation for them is health preservation and attractive appearance. In the consumption of food supplements, they are afraid the most that the product is not of a proper quality and they might overuse them. In order to avoid the risks, they usually choose those products that have already been tried by themselves or by their relatives and friends. Cluster 2 – Customers, belonging to the segments of Skeptics, think that their health is important, but - unlike Comfortable customers - they live a more active life; however they tend to use alternative therapies less. Skeptic customers answered negatively to the questions regarding to health protection as well as safety. They considered the importance of necessity of food supplements negatively. Customers of the segment are afraid that food supplements might cause allergy.

Cluster 3 – the members of Careful users seem to be rather careful in the use of food supplements. It is very important for them to use these products carefully: they read the instructions and dosage thoroughly. They take it into account that food supplements might interact with medicines. Their knowledge of ingredients is high. Cluster 4 – Conscious Health Protectors attach high importance to health protection: among all groups, they are most willing to act for the favor of their health: they do sports regularly; they pay attention to their own and their family members' health and they tend to use alternative health products more than the consumers of the other groups. These are the customers who are less afraid of the risks associated with the usage of food supplements, than the members of other segments and also, they are most willing to spend money in order to protect their health.

3.3 Discussion

This finding is consistent with other surveys conducted in Europe. Studies mentioned in the chapter of Introduction have also shown that young, females, individuals in high socioeconomic categories (Filipović and Stojanović, 2013; Caracciolo et al, 2016,) as well as health conscious consumers (Szakály et al, 2012) are likely to use food supplements more often than other counterparts. The difference between my results and similar studies (Khoury et al, 2016) is that the main motive in food supplement consumption is vitamin supplementation, followed by health preservation and attractive appearance according to my primary research. As for food safety, in Hungary consumers are mostly afraid of food allergy, overdose and drug interaction. However, consumers try to avoid these risks with the followings: they usually purchase those products they had used before or they read the instructions carefully or they ask for health care professionals' advice.

4 Conclusion

On the health market (and on the food supplement market) it can be observed that customers becoming more health-conscious and they choose carefully the food that they eat. This observation is supported by literature review and the results of my primary research as well.

4.1 Practical implication

Based on the characteristics of the clusters and taking the elements of marketing-mix into account, my suggestions are the following considering each group:

Comfortable customers: at this segment it is advisable to draw customers' attention how important it is to take part actively in the protection of their health. Skeptics: marketing strategy should convince customers - even with the help of a health care professional, such as doctors and pharmacists - about how food supplements can contribute to their health and the prevention of diseases. Careful users: companies must win the trust of these customers and have to give more detailed information on the products: either by developing proper instructions, either by the training of health care professionals. Regarding to the fact that members of this group can be influenced by advertisements and customers often obtain information from magazine articles and TV programs connected to the topic, companies should use these tools to send their messages to the customers. In marketing communication messages should emphasize safety. On the other hand, members of this group are price-sensitive and this means that discounts also could draw customers' attention to the products. Conscious health protectors: have got a wide range of knowledge on health care topics and they believe it is important to be active in order to protect their health. For these customers, quality is extremely important, thus the main aim in defining the right marketing strategy could be developing products with high quality. High quality should be emphasize in communication. Since, members obtain high educational level and income, their expectation toward food supplements may be high as well. Therefore, it is advisable

to pay attention to other characteristics of the products: such as packing. With the extension of selection (producing different tastes) companies could increase their turnover in this segment.

4.2. Recommendation for future

I conclude that - although the sample is not representative - the results can still give a good base for the conduction of a further, advanced level of research. Findings can also improve the innovation of new products that suit better to customers' unique needs. Segmentation can help businesses to define the right marketing strategy in order to succeed among the strong competition relations of food supplement market.

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Risk areas of the financial health assessment in agriculture

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Abstract: In the field of agriculture, there are a lot of specifics reflected in the value of items in financial statements, and thus in the results of financial health assessment of a company through bankruptcy and credibility models. This assessment, which can be partly influenced by the company itself, does not provide the information necessary for investors, owners and the public. This article focuses on the assessment of financial health of agricultural enterprises in the Czech Republic. It determines the most and the least controllable parameters included in financial health assessment. The reliability of the selected models was also evaluated. The selected models include IN 05, Gurčík model, CH-index and the Řezbová OP model for the Operational Programme Rural Development. This reliability was tested on data from 200 enterprises which were in bankruptcy or liquidation at the time of the assessment. The data were taken from the Albertina Gold database. The third part includes a regression analysis of these four models to determine which indicators, both individual and mutual, are statistically significant for the outcome of the model and which of them influence the level of the assessment to the greatest extent. These two analyses were carried out on nearly 10,000 data entries from the Albertina Gold database. The values of assets and profit seem to be the most easily influenced. These values can be influenced by the choice of a depreciation method, creation of provisions and adjustments, but also by specific valuation that is largely done through calculations in agriculture. The most important indicators are profit and a group of indicators related to the enterprise's debt, such as interest payable, current liabilities and total debt.

Keywords: financial health assessment, risk areas, agriculture, bankruptcy and credibility models.

JEL classification: M4, M41, Q14

1 Introduction

Agriculture, which is a very specific field of business, offers more space for choosing various accounting methods, which can actually influence the results of financial health assessment. The specifics also reveal a space which some businesses may purposely use to influence this assessment. For example, Kouřilová (Kouřilová, 2010, Kouřilová, Pšenčík, Kopta, 2009), Dvořáková D. (2012) Dvořáková K. (2015, I., II.) deal with the specifics of agriculture in their work. Valuation at cost, accounting of subsidies, inclusion of animals in fixed assets and valuation in general are problematic areas of financial health assessment in agricultural enterprises. The valuation of assets at cost can lead to differences in the valuation of the same asset in different companies due to the selection of the calculation formula in each accounting unit (Kouřilová and Drábková, 2009). Accounting of investment subsidies under the Czech accounting legislation, which leads to reducing the value of the acquired assets, distorts the value of assets. The actual value of the acquired assets is recorded on off-balance sheet accounts, which are not part of the disclosed information. (Dvořáková K., 2015 II.). In case of animals, the entity also determines the value limit from which the asset is posted as fixed (Dvořáková D., 2012). This again affects the value of fixed and current assets. Problematic areas common to all fields of business include the choice of depreciation methods, the possibility of creation of provisions and adjustments. Along with the depreciation method, the enterprise also chooses the depreciation rate and period. This choice may lead to different levels of annual depreciation and thus to differences in the profit of the company (Dvořáková K., 2015 I.). The creation of provisions and adjustments has the same consequences. The entity has space for its own decision on whether or not it would create them.

Financial health assessment through bankruptcy and credibility models is a widely-used method and has many advantages. As a principal advantage, it offers complexity, focus on several areas of assessment of the enterprise's financial standing, easy applicability and evaluation. This article evaluates the reliability of the selected models in recognizing enterprises that are in trouble. The second part establishes significant indicators and their impact on the outcome of financial health assessment using these models. For example Kopta (2009), Maňasová (2008), Vlašicová and Náglová (2015) or Sušický (2011 I., II.) deal with the evaluation of the reliability of credibility and bankruptcy models. Kopta (2009) evaluated the reliability and the strengths and weaknesses of the models using data from agricultural enterprises. He focussed on financial problems caused by two factors: profitability and cash flow. In his analysis of the prediction of problems due to profitability, 'Řezbová OP model' for the Operational Programme Rural Development and the Gurčík index came out the best. The CH-index and IN95 responded best to threats arising from cash flow. These indexes were shown to have a correlation between the calculated value of the index and the value of future economic performance, although the values of the indexes did not match the specifics of agricultural enterprises. Maňasová (2008) first evaluated the success rate of bankruptcy prediction models on enterprises that actually got into trouble in the following years. With no distinction between sectors, the IN05 index was the best. She also dealt with the same evaluation depending on specific sectors, namely agriculture, food, textile and construction. In the field of agriculture, the ZETA and Z-Score models generated the best results. The IN models of the Neumaiers also achieved very good results. Sušický (2011) also evaluated the sector of agriculture separately in his work. Z-Score, ZETA and IN99 turned out to be the best models for this sector in his analysis. The worst was the IN01 index.

The aim of this article is to identify risk areas of the selected models which could influence current and future investors' judgment, to define the reliability of models for recognizing companies with problems and to identify statistically significant indicators of the individual models.

2 Materials and data

The first part includes an analysis of the reliability of the selected models in predicting problems. It used 200 data records from 58 agricultural enterprises in the Czech Republic that were in bankruptcy or liquidation between 2009 and 2014. The second part analysed the most important indicators that have the biggest impact on the outcome of the financial health assessment of the enterprise using the given models. This analysis was based on the existing data from 3843 agricultural enterprises from the entire Czech Republic regardless of their financial standing over the same period. The data were obtained from the Albertina Gold database. The companies were sorted by sector using the CZ-NACE methodology. Where the number of employees was zero or was not specified, the company was not included in the sample. There are included companies from all 14 regions, the most prominent are region Jihomoravský, Středočeský a Jihočeský. 70.4% of financial statements are fully, in its entirety. The number of employees is ranging from 11 to 44. The most represented is the number 12 with almost 31%.

The analysis examined four selected models of financial health assessment, namely: IN05, Gurčík model, CH-index and Řezbová OP model for the Operational Programme Rural Development. These models were chosen because they were created within the context of the Czech Republic and Slovakia (which is very similar) and because they were intended for the assessment of enterprises in agriculture. Only the IN05 model is not designed for agricultural enterprises. However, it is the latest model created by the Neumaiers in the Czech Republic.

2.1 IN05

This model was created by the Neumaiers in the Czech Republic in 2005. It also takes into account the viewpoint of the owner.

The index equation is as follows:

IN05 = 0.13 * Assets / Liabilities + 0.04 * EBIT / Interest payable + 3.97 * EBIT / Assets + 0.21 * Revenue / Assets + 0.09 * Current assets / Current liabilities

According to the resulting value, companies are classified as follows:

1.6 < IN05	enterprise creates value
0.9 < IN05 < 1.6	grey zone
IN05 < 0.9	enterprise does not create value (Lososová & Zdeněk, 2014)

2.2 Gurčík model

The Gurčík model was created by Professor Gurčík in Slovakia and is designed to assess the financial health of Slovak agricultural enterprises. This is a credibility-property index that classifies businesses as thriving or ailing.

G = 3,412 * RE/A + 2,226*P/A + 3,277*P/REV + 3,149*CF/A – 2,063*INV/REV

Where:	A	assets
	RE	retained earnings
	P	profit
	REV	revenues
	CF	cash flow
	INV	inventories

According to the resulting value of the Gurčík index, enterprises are classified as follows:

1.8 < G	thriving enterprises
-0.6 < G < 1.8	grey zone
G < -0.6	enterprises going bankrupt (Gurčík, 2002)

2.3 CH-index

The CH-index (Chrastinová index) is a bankruptcy model. It was created by Zuzana Chrastinová for Slovak agricultural enterprises in 1998. The equation is as follows:

CH = 0.37 * P / A + 0.25 * P / REV + 0.21 * CA / CL - 0.1 * CL / REV - 0.07 * FC / A

They are:	A	assets
	P	profit
	REV	revenues
	CA	current assets
	FC	foreign capital
	CL	current liabilities

Evaluation of the result of CH-index calculation:

2.5 < CH thriving enterprises

-5 < CH < 2.5 grey zone

CH < -5 enterprises going bankrupt

2.4 Řezbová OP model for the Operational Programme Rural Development (hereinafter 'Řezbová OP model')

This model was specifically designed for the Operational Programme Rural Development by Řezbová (Rosochatecká & Řezbová, 2004). It contains 10 indicators of financial analysis. Points are allocated according to the result achieved in the individual indicators. Financial health assessment is carried out for the last three closed accounting periods.

The calculation is made for every year and the final score is the arithmetic average of the results from individual years. Enterprises can achieve a score of 0 to 30 points. If the company obtains a minimum of 9.01 points, it is assessed as financially healthy. In the table below you can see the resulting assessment based using the 'Řezbová OP model'.

Table 1. Resulting assessment for the Řezbová OP model

Category A	**from 22.01 to ∞**
Category B	from 14.01 to 22.00
Category C	from 9.01 to 14.00
Category D	From 6.01 to 9.00
Category E	From 0.00 to 6.00

Source: State Agricultural Intervention Fund, 2016, according to Řezbová OP model

The applicants in categories A – C meet the conditions for subsidy.

This OP model includes the indicators of return on assets and long-term profitability, return on performance from cash flow, added value / inputs, total debt, interest coverage, coverage of stocks by net working capital, maturity of debt from cash flow, overall liquidity and investment activity.

3 Results and discussion

The analysis of indicators included in the financial health assessment shows that the items of the financial statements that are the most easily influenced are the value of fixed and current assets (inventories) and the value of profit of the enterprise. Looking at other indicators most often included in financial health assessment, the indicators of cash flow, interest payable, amount of total capital and immediate liquidity appear to be stable.

The first analysis of the bankruptcy and credibility models focused on evaluating the reliability of the models in predicting the enterprise's financial problems. Table 2 shows the success rate of the models in percentage. The analysis was carried out on data from 200 enterprises with financial problems. All companies were therefore supposed to be assessed as threatened.

Table 2: Reliability (in percentage) of the selected models in predicting the enterprise's financial problems

Classification by models	Correctly classified as threatened	Grey zone	Incorrectly classified as successful
IN05	62.33	18.93	18.74
Gurčík index	50.8	44.4	4.7
CH – Index	4.12	92.78	3.1
Řezbová OP model	13.93	-	86.07

Source: own analysis

The analysis shows that IN05 is the best of the given models for predicting financial problems of enterprises, with a reliability 62.33%. The Gurčík index was second, with a success rate of over 50% in predicting financial problems. Furthermore, only 4.7% of the enterprises were classified incorrectly as successful businesses. Conversely, 'Řezbová OP model' shows the highest error rate. It evaluated 86.07% of businesses in liquidation or bankruptcy as successful companies appropriate for support. The CH-index model showed the smallest error in the classification of these businesses as successful, but again classified more than 90% of the businesses in the grey zone, which does not in any way help the assessment of the financial health of enterprises.

IN05 came out as a suitable model for recognizing enterprises in difficulties also in the analysis of Sušický (2011). According to the analysis of Kopta (2009), the Gurčík index was evaluated as the best at recognizing problems due to profitability and the Řezbová OP model for cash flow. When evaluating the models without distinction between sectors, the IN05 model was the best according to Maňasová (2008), and the ZETA and Z-Score models with a focus on agriculture. The IN models also achieved very good results.

The second, regression analysis tested the effect of individual indicators and ratio indicators on the value of the result of the financial health assessment using the selected models. For this analysis, approximately 10,000 data entries from the Albertina Gold database were used. The results of the analyses are as follows:

IN 05 model

The regression analysis of this model resulted in the statistically significant values of assets, current assets, inventories, EBIT, cash flow, profit, current liabilities, interest payable and total revenues. The value of external resources was the only insignificant indicator. But this indicator reached a p-value of 0.051, which is just above the limit of statistical significance. EBIT, profit for the accounting period and interest payable have the biggest impact on the result of financial health assessment.

Gurčík index

For Gurčík index, the individual indicators were not statistically significant. As for the ratio indicators included in the model, only retained profit/assets, profit/revenues, cash flow/assets and inventories/revenues were significant, with a p-value equal to 0. The indicator of profit/assets was insignificant in the analysis, with a p-value of 0.25. The ratio of retained earnings/assets is a significant indicator that influences the result of financial health assessment most of all.

CH-index

In this model the individual indicators were statistically insignificant. Current liabilities appear to be the most important, with a p-value of 0.15. Ratio indicators were all significant. The ratios of profit and revenues and of current assets and current liabilities influence financial health assessment most of all.

Řezbová OP model

In this model, there were no statistically significant individual indicators for determining the financial health of the enterprise. The lowest p-value was observed for the indicator of external capital (0.11). As for the ratios, there were the statistically significant indicators of return on assets, long-term profitability, the ratio of added value/inputs, total debt, maturity of debt from cash flow and quick liquidity. The indicator of total debt has the biggest effect on financial health assessment. There is a negative correlation between that indicator and the result of financial health assessment.

The most important indicators, with the biggest impact on the value of the index in assessing the financial health of the enterprise, were rated by the selected models. Table 3 summarizes the most significant indicators of the individual indexes.

Table 3. Statistically significant indicators of individual models

Model	Statistically significant indicators	Indicators that influence the value of the index most
IN05	All individual indicators except for external resources, all ratio indicators	EBIT, profit, interest payable
Gurčík index	All ratio indicators except for the ratio of profit/assets	The ratio of retained profit/assets
CH – Index	All ratio indicators	The ratio of profit/revenues and of current assets/current liabilities
Řezbová OP model	All ratio indicators except for return on performance from cash flow, interest coverage and coverage of inventories by net working capital	Total debt

Source: own analysis

From the models above, Kopta (2009) only analysed the Gurčík index. The indicators of profit/liabilities, profit/revenue, cash flow/current liabilities and inventories/returns are shown to be statistically significant according to his analysis. Only the indicator of retained earnings/assets was insignificant.

4 Conclusion

This article focused on evaluating the reliability of selected models for financial health assessment used in the agricultural sector in the Czech Republic. The IN05 model turned out to be the most reliable model to determine financial problems of an enterprise, with a success rate of 62.33%. It is followed by the Gurčík index, with a success rate of 50.8%. The success rate of the two other models was far below 50%.

Earnings, income, current assets and total assets, current liabilities and total debt are among the most important indicators. Among those mentioned, the indicators of profit and amount of current assets offer a larger space for intentional influence by the enterprise with the aim to falsify the results of the financial analysis and financial health assessment. Although, according to many authors, it should be more appropriate to use the indicator of cash flow instead of profit, which is easier to influence, the analysis showed no significant effect of cash flow on the value of financial health assessment. This may be also due to the fact that the success rate of the models was not too high.

The analyses carried out in this research did not bring positive results for potential investors or owners of enterprises with different management from the owners. The results of financial health assessment using the selected models did not show high reliability.

The results of financial health assessment should not therefore be used without further investigation for decisions on the future activities of these individuals.

Further work will perform an analysis using the Generalized Linears model, which will examine the relationship between the values of individual as well as ratio indicators of the financial analysis and the actual standing of the enterprise. Whether or not there is an indicator that could refine the results of financial health assessment to provide a better picture of the real situation.

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Tariff barriers to the EU and the US agri-food trade in the view of the TTIP negotiation

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Abstract: The Transatlantic Trade and Investment Partnership (TTIP) is expected to be the world's largest free trade area. Agricultural issues are one of the most difficult areas of the TTIP negotiation. It is due to the asymmetric level of protection of the agricultural markets of the EU and the US, associated with significant differences in the production potential of agriculture and food industry in these countries. The main aim of the paper is to present the current scale of tariff protection of agricultural markets in the EU and the US and to assess how the possible reduction of duties under the TTIP would influence the bilateral trade turnover between the parties of the Agreement. The results show that the average level of *ad valorem* duties imposed by the US was more than 2 times lower than in the EU. The rates of the MFN customs tariff varies depending on the group of products to be exchanged. Most agri-food sectors in the US were protected by relatively low duties, which usually did not exceed 6%. In the EU, the lowest tariff rates were found in import of products coming from other climate zones or products which were not in sufficient amounts in the EU (oilseeds; cereals; coffee and tea; live animals etc.). The highest tariffs were maintained by the EU in import of tobacco products; preparations of meat or of fish, as well as preparations of fruit and vegetables. The reduction of tariff protection of the US agricultural market should not lead to the strong creation effect in agri-food export from the EU to the US but it may result in a significant improvement in access to the EU market for products from the US. In fact, when reduction of tariffs is observed, greater benefits from liberalisation refer usually to the country that applied a lower level of protection before the establishment of free trade area.

Key words: tariff barriers to trade, applied MFN tariffs, bound duties, agri-food trade, the Transatlantic Trade and Investment Partnership, the EU, the US.

JEL classification: F13, F15, Q17

1 Introduction

The EU is the world's greatest exporter of agri-food products. In 2014 the export worth 576.7 billion dollars resulted in a nearly 38.5% share in the world export of this group of products. The second place and about a 10% share in global exports belonged to the US. However, in view of the fact that about 75% of the value of agri-food export in the EU is done within the Single European Market (424.1 billion dollars in 2014) and considering only the value of export to third countries, the shares of the countries under analysis in the world food export become equal (EU – 10.2%, US – 9.9% in 2014) (UNCTAD, 2016). Apart from that, in spite of the fact that the EU and US are important agri-trade partners for each other, the value of bilateral turnover is relatively low. Between 2000 and 2014 the EU placed agri-food products worth 9.1-20.8 billion dollars on the US market, whereas the US exported agri-food products worth 6.9-13.4 billion dollars to the EU market (UNCTAD, 2016). The abolishment of barriers in mutual trade under the Transatlantic Trade and Investment Partnership (TTIP) would give both parties of the Agreement a chance to increase their market shares and strengthen their international competitive position. The EU and US could remain in the dominant position in the world economy if they deepened their mutual economic relations by signing the TTIP. It is an important issue for both partners, especially due to the increasing importance of countries from Asia and the Pacific region, including China. These problems are the subject of numerous analyses (Wang, 2003; Cheptea, 2012; Fontagné, Gourdon and Jean, 2013; Francois et al, 2013; Bureau et al, 2014; Beckman et al,

2015; Paul, 2016). The US is more liberal in this respect, because it also demands reduced protection of the EU agricultural market, less restrictive sanitary and phytosanitary regulations and reduced internal support of the EU agricultural sector in the forum of the World Trade Organization (WTO). The EU has more conservative position than the US in the TTIP negotiations due to their doubts if the EU producers will cope with the competitive pressure of the US agriculture in the free trade zone because of the structural differences between the agricultural sectors in the EU and in the US. In view of this fact the situation of the agri-food sectors in the new EU member-states, including Poland, is a matter of special concern. In comparison with the EU-15 the new EU member-states are characterised by lower competitive potential of the agricultural sector, which is measured with the volume and efficiency of use of the resources of factors of production and relations between factors of production (Poczta and Pawlak 2011).

The scale of protection of agri-food markets in the EU member states and in the US should be rated both in terms of customs tariffs and non-tariff barriers to trade in these countries. The main aim of this paper is to present the current scale of tariff protection of agricultural markets in the EU and the US and to assess how the possible reduction of duties under the TTIP would influence the bilateral trade turnover between the parties of the Agreement.

2 Materials and Methods

Data from the WTO tariff data base were used to reach the aim. The method of analogies and comparisons, and the deductive approach were used in the research.

The article analyses bound tariffs and Most Favoured Nation (MFN) tariffs applied by the EU and the US in agri-food trade in 2015. Bound tariffs are specific commitments made by individual WTO member governments and they refer to the maximum tariff rate resulting from the MFN clause, which a particular country can impose on a given commodity line (Sapa, 2014). MFN tariffs are these ones that countries promise to impose on imports from other members of the WTO, unless the country is part of a preferential trade agreement. This means that MFN rates are the highest (most restrictive) that WTO members charge one another. In practice, applied customs tariffs are equal to or lower than bound tariffs. The gap between bound and MFN applied duties is termed by Francois and Martin (2003) the ‘binding overhang’. Latest available data were used to present the structure of tariff lines and the value of imports of agri-food products to the EU and the US according to the MFN tariff rates. Then the bound and applied customs tariffs in the imports of agri-food products classified with a two-digit code according to the nomenclature of the Harmonised Commodity Description and Coding System (HS) were considered. Presented effects of the possible liberalisation of trade between the EU and the US resulted from the simulation made by Bureau et al (2014), as well as Fontagné, Gourdon and Jean (2013), with the use of the Global Trade Analysis Project (GTAP) general equilibrium model. Quantitative general equilibrium models are the most complex tools for forecasting the consequences of changes in the trade policy in the agri-food sector (van Tongeren, van Meijl and Surry, 2001). The models of general equilibrium are based 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; Pereira and Shoven, 1988; Robinson and Roland-Holst, 1988).

3 Results and Discussion

Due to the weakness of the Agreement on Agriculture of the Uruguay Round of the GATT/WTO negotiations on improving access to agricultural markets, customs barriers in agri-food trade are higher than in exchange of industrial goods (Ingco, 1996; Tangermann, 2001; Bureau, Jean and Matthews, 2006). This situation can also be observed in foreign trade

of the EU and the US. In 2014 the simple average MFN customs tariff imposed by the EU countries on total imports was 5.3%, but the duty rate on agricultural products was nearly three times as high as the one on non-agricultural products (12.2% vs 4.2%). The tariff protection in the US was relatively lower than in the EU. In total trade the average MFN applied customs tariff was 3.5%. The rate on imports of agricultural products was 5.1%, whereas the rate on non-agricultural products was 3.2%. Thus, the tariff protection of the American market – measured with *ad valorem* duties (AV) – was almost 2.5 times lower than in the EU (WTO, ITC, UNCTAD, 2015).

The analysis of the structure of tariff lines and the value of agri-food imports shows that there was no duty imposed on about 30% of all tariff lines in the EU and the US. Slightly more than 46% of the EU imports and nearly 40% of the US imports were duty-free (Table 1). There are significant differences in other tariff lines. In the EU the tariff lines with duty rates under 10% amounted to nearly 28% of all rates and comprised 25% of the import value. In the US the same tariff line comprised almost 60% of all tariff lines and 50% of the import value. In the EU customs tariff there were more tariff lines with duty rates of at least 50%. They comprised slightly more than 4% of all tariff lines and about 11% of the import value. On the other hand, in the US the highest duty rates were imposed only in 1% of all tariff lines and they comprised 0.6% of the total value of agri-food products imported.

Table 1. Structure of tariff lines (2014) and the value of agri-food imports to the EU and the US (2013) according to the MFN tariff rates (%)

Specification	Duty-free	(0;5>	(5;10>	(10; 15>	(15;25>	(25;50>	(50;100>	>100
				EU				
Structure of tariff lines	31.7	10.1	17.5	13.5	11.4	8.7	3.4	0.8
Structure of import values	46.1	11.9	13.3	7.3	7.3	3.1	4.9	6.0
				USA				
Structure of tariff lines	30.8	46.4	12.2	5.0	3.1	1.5	0.3	0.8
Structure of import values	39.6	35.1	14.9	2.9	1.9	4.8	0.0	0.6

Source: WTO, ITC, UNCTAD, 2015

The rates of the MFN customs tariff are diversified and depend on the category of products traded. As far as tariffs in the EU are concerned, in 2015 the lowest duties were imposed on the import of products from other climate zones or the products which were not in sufficient amounts in the EU, such as oil seeds and oleaginous fruits (HS 12), residues and waste from the food industries and prepared animal fodder (HS 23), chiefly oilcakes and other solid residues resulting from the oil extraction, cereals (HS10), coffee, tea, maté and spices (HS 09) and live animals (HS 01). There was also a relatively high percentage of duty-free tariff lines within these HS codes (Table 2). The highest duty rates and a marginal share of duty-free tariff lines were related with tobacco and manufactured tobacco substitutes imported by the EU (HS 24), edible preparations of meat, of fish or of crustaceans, molluscs or other aquatic invertebrates (HS 16) and preparations of vegetables, fruit, nuts or other parts of plants (HS 20). It is noteworthy that in 2015 the applied tariffs imposed by the EU on the first two groups of products listed above, meat and edible meat offal (HS 02), live trees and other plants (HS 06) and, to a lesser extent, on fish, crustaceans, molluscs and other aquatic invertebrates, fats and oils (HS 03 and HS 15) were higher than bound tariffs on these products. In consequence, the 'afflicted' countries might start compensation proceedings at the WTO forum. The MFN applied customs tariffs imposed by the EU on other groups of products were equal or lower than bound tariffs. The binding overhang ranged from 0.1 (HS 05, HS 07, HS 09, HS 12, HS 20) to 4.6 percentage points (HS 17).

In the US most branches of agriculture and the food industry were protected by relatively low duty rates, which usually did not exceed 6% (Table 2). In many HS codes the percentage of duty-free tariff lines was also higher than in the EU. Only in four groups of products imported to the US the average *ad valorem* duty rates exceeded 10%. These were tobacco

and manufactured tobacco substitutes (HS 24), oil seeds and oleaginous fruits (HS 12), dairy produce, eggs and honey (HS 04) and preparations of vegetables, fruit, nuts or other parts of plants (HS 20). Apart from dairy produce, there were extremely high rates of duties (even exceeding 100%) imposed by the American customs tariff on some products classified in the aforementioned codes. The following products received a very high level of customs protection: tobacco (350% duty rate), groundnuts in shell (163.8% duty rate), shelled groundnuts and groundnut seed for sowing (131.8% duty rate), prepared or preserved groundnuts excluding preserved with sugar (131.8% duty rate; WTO, 2016). Although in 2015 the MFN applied duty rate imposed by the US on tobacco and manufactured tobacco substitutes (HS 24) was lower than the bound tariff (binding overhang reached 8 percentage points), the applied tariff on oil seeds and oleaginous fruits (HS 12) was higher by 3.7 percentage points than the bound tariff. To a lesser extent the bound tariff was exceeded by the applied duty rate in American imports of live trees and other plants (HS 06), vegetable plaiting materials (HS 14), lac, gums, resins and other vegetable saps and extracts (HS 13), fats and oils (HS 15), edible vegetables and certain roots and tubers (HS 07), meat and meat offal (HS 02) and live animals (HS 01).

In view of the fact that the EU and the US differ in the degree of customs protection of their agricultural markets, we can expect the Americans to insist on far-reaching liberalisation of agricultural trade in negotiations on the creation of the transatlantic free trade zone. Due to the asymmetry of protection, if customs tariffs are abolished or at least reduced, the party which applied a lower degree of protection before the establishment of a preferential trade zone will probably benefit more from liberalisation. The likelihood of stronger creation of export of agri-food products from the US to the EU markets rather than in the opposite direction is confirmed by the results of a simulation made by Bureau et al (2014), who analysed the potential effects of signing the TTIP agreement. As results from this analysis, total abolishment of customs tariffs (including an extended three- or five-year period of implementation of the liberalisation provisions for sensitive products) and 25% reduction of non-tariff barriers to bilateral trade in products and services between the EU and the US might increase the EU exports of agri-food products to the US by 56.4%, whereas the growth of value of exports from the US to the EU might amount to 116.3%. Fontagné, Gourdon and Jean (2013) forecast even more dynamic changes in bilateral trade turnover. They prove that the transatlantic trade liberalisation agreement would increase the exports of agri-food products from the EU to the US by 149.5%, whereas the exports from the US to the EU would increase by 168.5%.

Table 2. Bound tariffs and the MFN applied tariffs in agri-food trade of the EU and the US in 2015

HS code	EU				USA			
	Average of all AV bound duties (%)	MFN applied tariffs			Average of all AV bound duties (%)	MFN applied tariffs		
		Average of all AV duties (%)	Maximum AV duty (%)	Percentage of duty-free lines		Average of all AV duties (%)	Maximum AV duty (%)	Percentage of duty-free lines
01	2.0	1.2	11.5	55.6	0.7	0.8	6.8	51.5
02	3.9	5.1	15.4	19.1	4.1	4.2	26.4	25.0
03	10.7	11.1	26.0	25.0	0.6	0.5	15.0	87.8
04	5.3	5.3	17.3	5.7	12.7	12.7	25.0	0.1
05	0.2	0.1	5.1	98.3	0.5	0.4	5.1	77.3
06	5.9	6.7	10.9	13.3	2.3	3.6	7.0	24.0
07	8.6	8.5	15.2	14.4	8.6	8.7	29.8	7.9
08	6.8	5.9	20.8	20.4	4.0	3.4	29.8	31.0
09	2.3	2.3	12.5	68.2	0.4	0.3	6.4	85.0
10	5.4	2.2	12.8	32.7	2.2	1.5	11.2	23.1
11	12.2	12.2	19.2	0.0	3.8	3.8	12.8	13.7
12	1.2	1.2	8.3	73.1	9.4	13.1	163.8	51.4
13	1.9	2.3	19.2	66.7	0.7	0.9	3.8	61.7
14	0.0	0.0	0.0	100.0	0.7	1.1	4.4	58.0
15	5.2	5.4	16.0	21.5	3.4	3.5	19.1	25.7
16	14.9	17.9	26.0	2.4	4.2	3.1	35.0	48.5
17	11.4	6.8	13.4	11.8	6.2	6.2	12.2	2.0
18	6.1	6.1	9.6	18.2	3.3	3.3	10.0	38.1
19	10.7	10.7	12.8	0.0	5.5	5.5	17.5	37.1
20	17.6	17.5	33.6	0.7	10.5	10.2	131.8	9.4
21	9.3	9.2	14.7	9.4	5.6	5.6	20.0	19.4
22	3.9	3.9	32.0	41.9	1.8	1.8	17.5	38.4
23	0.8	0.8	12.0	68.8	0.6	0.6	7.5	40.7
24	39.7	44.7	74.9	0.0	212.2	204.2	350.0	16.4

HS codes: 01 – live animals; 02 – meat and edible meat offal; 03 – fish and crustaceans, molluscs and other aquatic invertebrates; 04 – dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included; 05 – products of animal origin, not elsewhere specified or included; 06 – live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage; 07 – edible vegetables and certain roots and tubers; 08 – edible fruit and nuts; peel of citrus fruit or melons; 09 – coffee, tea, maté and spices; 10 – cereals; 11 – products of the milling industry; malt; starches; inulin; wheat gluten; 12 – oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; industrial or medicinal plants; straw and fodder; 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 and their cleavage products; prepared edible fats; animal or vegetable waxes; 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, flour, starch or milk; pastrycooks' products; 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

Source: authors´ own elaboration based on WTO, 2016

4 Conclusion

The research results show that the rates of tariff barriers limiting access to the American agricultural market are on average 2.5 times lower than in the EU. Additionally, the US provides less support to domestic agricultural production (Tokarick, 2008). Between 1986 and 2014 the support provided to American agricultural producers, which is measured with the Producer Support Estimate (PSE), fell from 23.5% to 9.8% of gross farm receipts. This fall was chiefly determined by decreasing Market Price Support (MPS). Simultaneously, the domestic support of the EU agricultural sector measured with the percentage PSE indicator also decreased from 38.6% to 18.4% (OECD, 2016), but it still remained almost twice as high as in the US.

Due to the current high level of protection of agricultural markets, producers in the EU have not experienced significant direct competitive pressure of the American agricultural sector. It is doubtful that tariff barriers in agri-food trade between the EU and the US will be completely reduced under the TTIP agreement. It is more likely that there will be limited

liberalisation of exchange of sensitive products and a wide range of duty-free and tariff quotas will be set. Nevertheless, the abolishment or reduction of tariff protection of the EU agricultural market may considerably improve the access of American products to the EU market.

American agriculture is characterised by stronger competitive position, which is determined by more favourable relations between factors of production, higher efficiency of production and more advanced farmland concentration. In consequence, there are lower costs of production than in the EU agriculture (Pawlak, 2015). Relatively low productivity of factors of production and fragmentation of the agrarian structure is particularly noticeable in the agricultural sector of Eastern and Central European member states of the EU. The agricultural sector of these countries has created considerable production potential in the Single European Market. If the potential is appropriately allocated and supported with price advantages, it can be effectively used to strengthen competitive advantages on the regional and global markets. However, as the structure of the production potential is not very favourable, it is a weak point which negatively affects the competitive potential of the agricultural sector of Eastern and Central European member states of the EU both on a regional and international scale. A possible increase in exports caused by the abolishment of barriers in bilateral trade with the US will require producers and exporters from new EU member states to face the challenge of strong competition of specialised American farms. Their scale of production is much larger. They raise livestock under less strict standards of environmental protection and animal welfare and thus, they gain competitive advantage over the EU producers due to lower costs of production.

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Measuring the scope of agri-food sector based on Input/Output tables of national economy

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Abstract: Assessing the importance of the agri-food sector based on its share on GDP and employment could be misleading as in the developed countries those shares are low and are continually declining. Besides, GDP and jobs are created also in related sectors. Therefore, the aim of the paper is to assess the real scope of agri-food sector in the Czech Republic (CR) with regard to employment and simulate the impacts of possible decrease of agricultural production. The article is based on Input / Output table of inter-sectoral relations in national economy. It is assumed that agriculture generates the employment in customer's sectors in the same relations as it generates the GDP there; similarly a part of employment in supply sectors exists thanks to agriculture sector. In 2013 the share of agriculture on GDP of the CR was only 2.49%, although after including upstream and downstream sectors it increased to 5.49%. Share of agri-food sector reached 12.61%. Despite that agriculture contributed to total employment by 2.62% in 2013, after including estimated employment in upstream and downstream sectors the share was 6.29%. Share of agri-food sector is much higher (13.83%). Decrease of the scope of agriculture by 5%, would reduce the jobs in agri-food sector by 2 894, decrease of 10% by 5 788 and decrease of 30% even by 17 358. The importance of agriculture is obvious, which should not be neglected during formulation of agrarian policy measures.

Key words: I/O table, employment, agri-food sector

JEL classification: D57, J43

1 Introduction

The agricultural sector is a key contributor to the growth of developing countries. However, its shares on GDP and employment decrease as the state become more developed. Czech agricultural sector experienced significant decline of production and employment and deepening deficit of the agrarian foreign trade during the nineties of the last century. However, it does not mean that the importance of agriculture is decreasing. "All world inhabitants are totally and irreplaceably dependent on agriculture as food consumers and livelihood of approx. 42-45% of current world population dependents on agriculture, although the share of agriculture on GDP worldwide is on average only 4%" (Svatoš, 2004). In addition, agriculture fulfil also non-production functions, therefore, the emphasis is on its multifunctionality. "The concept of multifunctional agriculture emerged in the last decade of the twentieth century in developed countries where the economic importance of agriculture was negligible, and the community was increasingly concerned with the quality of consumed food and the surrounding environment" (Todorova and Ikova, 2014). Importance of agriculture and agricultural-food sector in developed countries underlines also the scope and costs of agrarian policy measures. Besides, the agriculture and related sectors are one of the major employers in the rural areas. Therefore, the aim is to determine the extent of the agri-food sector in relation to employment, not only in the agriculture and food sectors, but also in its downstream upstream and downstream sectors. The employment in agriculture is a long discussed problem from the point of view of ageing of farmers (see e.g. Šimpach and Pechrová, 2015) or their age-and-sex structure. Higher number of older workers in agriculture, forestry and fishery may have implications for the competitiveness of the Czech agriculture. As confirmed by analysis of Giannakis and Bruggeman (2015)

on the agricultural sectors of the EU – those that "are characterized by a young and better trained farm population are more likely to attain high economic performance". Higher unemployment in agriculture can have social and other consequences; especially in rural areas (see Spěšná et al., 2009). The structure of the article is as follows. Firstly, the extended model HDP-1 and data are introduced. Then the results of the analysis are presented. Next section discusses the impacts of the decline of the scope of agriculture. Last section concludes.

2 Materials and Methods

In the EU, there are commonly used models for evaluating the impact of agricultural policies. The European Commission utilizes model CAPRI (the Common Agricultural Policy Regional Impact), which is an agricultural sector model with a focus on Europe (280 NUTS2 regions, detailed activity data, coverage of Common Agricultural Policy). Leclère, Jayet and Noblet-Ducoudré (2013) are using micro-economic model AROPAj for modelling of supplier sectors of agriculture. GLOBIOM is a global recursive dynamic partial equilibrium bottom-up model integrating the agricultural, bioenergy and forestry sectors. Demand and international trade are represented at the level of thirty aggregated world regions. In GLOBIOM-EU, 5 EU regions are disaggregated to countries and the total number of regions is 52. (Aghajanzadeh-Darzi, 2013) For simulating management strategies it is possible to use model EPIC (Environmental Policy Integrated Climate) proposed by Williams et al. (1994). Institute of Agricultural Economics and Information (IAEA) has been continually developing mathematical models analysing and assessing the economic efficiency and competitiveness of Czech producers in agriculture and food industry (see Foltýn et al., 2014). Analysis done in this article is based on the model HDP-1 by IAEA (Chaloupka and Foltýn, 2015). Model is built on Input / Output table of inter-sectoral relations in national economy (NE) (Leontieff, 1941). It is matrix model for n $(i = 1,\dots n)$ sectors of national economy, where it is possible to formulate for each sector the equation of supply and use (1):

$$\begin{aligned} D_1 + X_1 &= Z_{1,1} + Z_{1,2} + \dots + Z_{1,n} + Y_1 \\ D_n + X_n &= Z_{n,1} + Z_{n,2} + \dots + Z_{n,n} + Y_n \end{aligned} \qquad (1)$$

where X_i represents total production of sector *i* in value expression, D_i is value of import of production of the sector *i*, $Z_{i,j}$ is production consumption, i.e. that part of production of the sector *i* (incl. import), that sector *i* supplies to sector j $(j = 1,\dots n)$ and Y_i is final production, i.e. total volume of production of the sector *i*, which leaves the manufacturing sector (incl. exports). As the I/O is squared (*n* x *n*), it contains also intra-sectoral supplies ($Z_{i,i}$), when production of given sector is partially consumed in the same sector. Matrix's rows represent supplies of production of one sector (row) to other sectors (columns). Matrix's columns are supplies of all sectors (rows) to one sector (column). It is possible to calculate, how much agricultural production flows not only to agriculture or food sector, but after the summarization also to the whole NE. Consequently, in the opposite direction it is possible to found out, how much of the production of NE goes into agriculture and food sectors, and hence it is "triggered" by it. It is assumed that in the same relations agriculture and food sectors induce the employment in the downstream sector, and vice versa, that part of employment in the supplier industry exists thanks to agriculture or food sectors.

Data for analyses for year 2013 (updated on 30. 9. 2014) were obtained from Czech Statistical Office (CZSO, 2014). For calculations was used a matrix of supply and use describing the whole economy according to ESA2010 for 99 sectors. For complete expression of relations of agriculture and food production two branches were included to agri-food

sector: agricultural sector (01 – agriculture, 02 – forestry and timber production, 03 – fishing and aquaculture) and food sector (10 – food products manufacturing, 11 – drinks production).

3 Results and Discussion

Model HDP-1 was described in detail by Chaloupka and Foltýn (2015); therefore we present only the results of calculations of share of agriculture on GDP. In year 2013, agriculture in narrower sense (sector 01) contributed to the CR's GDP by value of 2.49% (in 2012 it was 2.26% - see Chaloupka and Foltýn (2015), so its share slightly rose). The share of GDP from domestic suppliers of agricultural inputs was 0.92%, the share of GDP generated by other sectors thanks to the supplies from agriculture amounted to 1.68%, and the share of exports of the agriculture on production in the NE to 0.39%. In total, agriculture including upstream and downstream sectors had 5.49% share on GDP. The share of the agricultural sector (sectors 01, 02 and 03) was 7.00% in 2013 (3.09% a year earlier). In the broader sense including sectors 01, 02, 03, 10, 11 this share reached 12.61% (12.19% in 2012). Share of agri-food sector on the GDP does not equal to the sum of shares of individual sectors on the GDP, since there are strong links between different branches which were considered in calculations and eliminated.

Agriculture contributed to total employment in 2013 by 2.62% (CZSO, 2014) and food sector by 2.75% (IAEI, 2014). For many sectors, agriculture is an important customer and we can assume that some of the jobs in these sectors exist because of it. Conversely, because agriculture supplies its products to other sectors, there is an employment generated. From I/O table (short version is displayed in Table 1.) can be seen, that intermediate consumption in agricultural sector reached 20 477 mil. CZK. Major supplier for agriculture is food industry, where food products have entered as an intermediate in the amount of 41 039 mil. CZK. Chemical substances and preparations entered in the amount of 15 914 mil. CZK. On the other hand, forest products and timber production entered to 01 only in height 27 mil. CZK. Products of agriculture and hunting were used the most in food products manufacturing (10) and drinks production (11). In forestry the value was only 1 044 mil. CZK.

CZSO reports the employment according to the economic activity of CZ-NACE classification, where the sectors are aggregated. For example category A includes sectors agriculture, forestry and fishery (01, 02 and 03 according to I/O table). There were 97 700 of persons employed in 2013, part of them in agriculture, part in forestry and the rest in fishery. Category C contains processing industry, where food sector (10) represents only negligible part. It is necessary to recalculate the employment to match the division in I/O table.

Table 1. Matrix of supply and use (specimen)

Commodity production (in basic prices)	Import	sector CZ-NACE	Commodity name	Agriculture	Forestry and timber production	Fishing and aquaculture	Food products manufacturing	Drinks production
P.1	**P.7**			**01**	**02**	**03**	**10**	**11**
0	0	**01**	Agricultural and hunting products	20 477	1 044	0	87 208	12 932
0	0	**02**	Forest products, timber production	27	8 987	0	6	69
0	0	**03**	Fish, aquaculture	0	3	16	479	0
3 703	212	**10**	Food products	41 039	21	2	62 278	6 713
245 498	128 219	**11**	Drinks	1 314	0	0	199	5 468
0	0		Agricultural sector (01,02,03)	20 504	10 034	16	87 693	13 001
249 201	128 431		Agri-food sector (01,02,03,10,11)	62 857	10 055	18	150 170	25 182

Source: Czech Statistical Office, own calculations, 2016

First, they are considered input sectors for each sector 01, 02, 03, 10 and 11. We will illustrate the method of calculation on sector 01 (calculations for other sectors are analogous). Results are presented in Table 2. It is assumed that part of jobs in supplier industry is created thanks to agriculture. We start therefore from how much supplies to agriculture enter from the other sectors. For the production of agriculture it is needed to supply products from other sectors (including agriculture) in the amount of 160 019 mil. CZK. Agriculture itself represents 20 477 mil. CZK (i.e. 12.80%). For production of forest products and timber production there is supplied 32 185 mil. CZK from other sectors, where the share of agriculture is 0.08%. Supplies of fishery and aquaculture are negligible. On average, the agriculture share on employment in category A is 4.29%, which means that 4 195 workers have job thanks to agriculture. We are interested in detail, therefore it is re-calculated that 4 167 of them work in sectors producing agricultural products and 27 forestry or timber products.

It is assumed that the observed sectors 01, 02, 03, 10 and 11 cause subsequent employment in output sectors. Let's focus again on sector 01. Due to the fact that agriculture delivers its outputs further, the jobs in customer sector are created. The base of calculation is the share of agricultural and hunting products (01) on intermediate consumption of other sectors. The agriculture contributes to the production of agriculture (196 031 mil. CZK) by 20 477 mil. CZK (i.e. 11.01%) and forestry and timber production by 1 044 mil. CZK (1.80%) (fishery is 0.00). Average share of agriculture on employment in sectors 01, 02 and 03 is 4.27% and number of workers in them thanks to agriculture amounts to 4 172. In detail, this means that due to the agriculture 3 585 people work in sector 01 and 588 in sector 02. Calculations enable to summarize number of employed in input sectors – 75 206 (2.02% of total employment) and in output sectors – 61 749 (1.66%). Total number of employed in agriculture including upstream and downstream sector amounts to 234 654 that is 6.29%. Regarding the agri-food sector as a whole, its share on employment is 13.83%.

Table 2. Static model of share of upstream and downstream sectors on GDP and employment (%)

	Agriculture (01)	Agricultural sector (01,02,03)	Agri-food sector (01,02,03,10,11)
Share of sector on GDP in NE (+ operating subsidies – taxes)	2.49%	3.30%	5.44%
Share of GDP from domestic inputs suppliers to sector	0.92%	1.16%	3.07%
Share of GDP of upstream sectors thanks to supplies from sector	1.68%	2.02%	2.36%
Share of export on production in NE	0.39%	0.52%	1.74%
Total share of sector on GDP incl. upstream and downstream sectors	**5.49%**	**7.00%**	**12.61%**
Share of employed in downstream sector thanks to supplies to sector	2.02%	2.50%	5.25%
Share of employed in upstream sector thanks to supplies from sector	1.66%	2.00%	3.21%
Total share of employed in sector incl. upstream and downstream sectors	**6.29%**	**7.12%**	**13.83%**

Source: own calculations, 2016

3.1 Impacts of decrease of agricultural production

If the scope of agriculture decreased, it would mean that the employment in its supplier sector would decrease too. Three cases are simulated: (1) mild decrease of agriculture by 5%, (2) higher decrease of production by 10% and (3) crisis situation when the production of agricultural sector decreases by 30%. Results are displayed in Table 3. If the agriculture decreases mildly, the employment in this sector (01) will decrease by 1 451 on 233 thous. workers. Share on total workforce will decrease by 3 percentage points (p. p.). However, if all agricultural sector is considered (01, 02, 03), the decrease will be 5 p. p. and 2 012 people will lose job. If whole agri-food sector is considered, the decrease will be more pronounced, by 6 p. p., which represents difference of 2 894 employees.

The biggest changes may occur in crisis situations - for example if there were strong long-term droughts, or in connection with climate change as modelled by Chateau and Saint-Martin (2013). They consider that greenhouse gas emissions reduction policy implemented in EU can impact gross domestic product and labour. They illustrated using model OECD ENV-Linkage to which extent certain policy mixes can improve both environmental and labour market performance in different scenarios. In our case 30% decrease of agriculture will bring decrease of the share of it and its upstream and downstream sectors on employment by 0.18 p. p. Hence, crisis would directly impact 8 699 employed in this sector. Considering broader understanding of agriculture including forestry and fishery and their input and output sectors, the impact of possible decrease would be much higher – 12 070 employed (0.27 p. p.). While the share of agricultural sector on employment is currently 7.12%, it would be 6.85% after the decrease.

While mild decrease of scope of agricultural production causes decrease of employment in agriculture up to 1.5 thous., crisis situation would decrease employment by more than 8.5 thous. workers. In relation to the total employment it is not a dramatic decrease, but if we take into account whole agri-food sector including food industry, the consequences

are more significant. Decrease of production in agriculture would cause the decrease of share agri-food sector on employment by 0.36 p. p. and would affect 17 358 employees in Czech Republic.

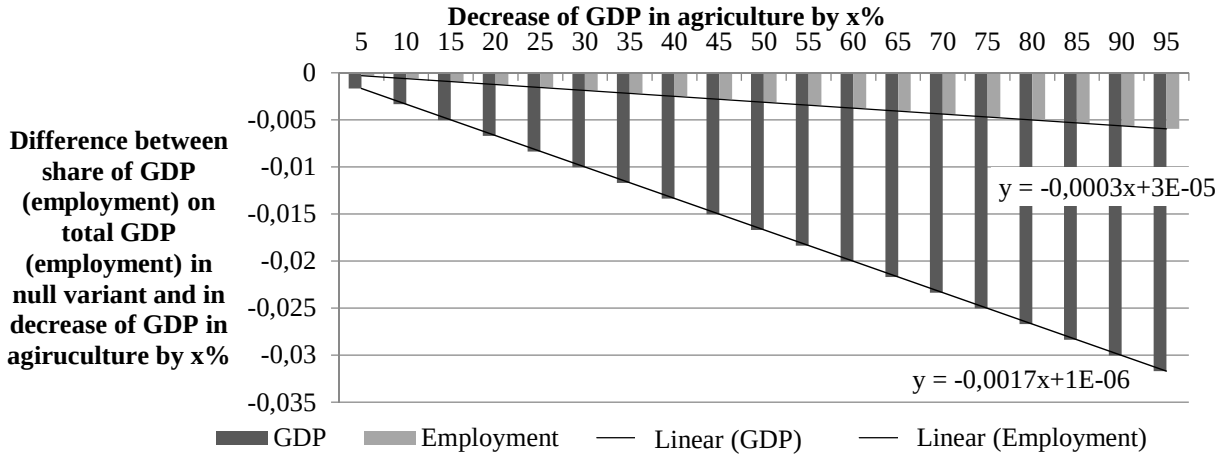
Table 3. Employed including upstream and downstream sectors in various scenarios (in thous. CZK)

Decrease of agricultural production	0%	5%	10%	30%
Agriculture (01)	234 654 6.29%	233 203 6.26%	231 753 6.23%	225 955 6.11%
Agricultural sector (01, 02, 03)	265 534 7.12%	263 522 7.07%	261 509 7.03%	253 464 6.85%
Agri-food sector (01, 02, 03, 10, 11)	515 838 13.83%	512 944 13.77%	510 050 13.71%	498 480 13.47%

Source: own calculations, 2016

The model considered that there were a particular numbers of employees in agriculture regardless the production scope, i.e. fixed number. There were about 70 thous. permanent workers, e. g. management, administrative etc. The number of employed in agriculture cannot decrease under this threshold. It implies that also 100% decrease of agriculture cannot be theoretically modelled. Fig. 1. shows the difference between the share of GDP on total GDP in the null variant (i.e. in the original scope of agricultural production) and in the case of decrease of GDP in agriculture by 5%, 10%, etc. - see dark grey columns. Similarly, it is modelled the difference between the share of employment on total employment in the original scope of agricultural production compared with the decrease gradually by 5%, 10%, etc. - see light grey bars.

Fig. 1. Difference between the share of GDP (employment) on total GDP (employment) in null variant and in decrease of agricultural GDP by x%



Source: own calculations and elaboration, 2016

Neuwahl et al. (2008) are also using simulations in an I/O framework to assess the changes in employment when the biofuels policy targets of the EU for year 2020 are met. They accounted for direct and indirect employment effects associated with the targets specified in defined scenarios. "The results indicate that policies that effectively promote the use of biofuels in the EU-25 up to a substitution share of some 15% would not cause adverse employment effects, assuming that sufficiently mature biofuel production technology is at our disposal." (Neuwahl et al., 2008) The influence of CAP on employment in agriculture was modelled by Petrick and Zier (2012) using labour demand equation augmented by the full set of policy instruments of the CAP on a dataset of 69 East German regions. They came to the conclusion that "direct payments, measures for the development

of rural areas, transfers to LFA and agri-environmental measures had no employment effect in any of the models". However, investment subsidies contributed to the creation of jobs. "Such subsidies were mostly used to finance buildings or machinery. Apparently, increases in capital use were sufficiently complementary to labour that they slowed down labour cuts."

4 Conclusion

The aim of the paper was to assess real scope of agri-food sector in the Czech Republic in relation to employment and to simulate the impacts of decrease of agricultural production based on Input/Output tables for year 2013. Results shows that the importance of agri-food sector in CR is broader than its mere share on GDP and employment. In 2013 in narrower sense the share of agriculture (01) on GDP was only 2.49%, but after including upstream and downstream sectors the share was 5.49%. In broader sense whole agri-food sector (agriculture and hunting, forestry and timber production, fishery and aquaculture, food and drink manufacturing) had share on GDP even 12.61%. Similarly even if the share of agriculture on employment is 2.02%, after inclusion of estimation of employment in upstream and downstream sectors this share is 6.29%. The share of the whole agri-food sector is higher, 13.83%. It is obvious that agri-food sector in CR is important. Policy-makers should take this into account when formulating measures and support for the sector. In future research the model should be broadened and linked to the firm level, in order to enable simulations of impacts of agrarian measures on agricultural holdings and consequently on the whole sector.

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Determinants of Specialty Rice Adoption by Smallholder Farmers in the Red River Delta of Vietnam

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Abstract: Vietnam is one of the major rice exporters experiencing growing increase in domestic and international demands for specialty rice (SR). Still, SR production can be difficult with lack of a trademark, asset investment, and collective action. Empirical enquiry into this situation remains limited. We address this gap by analyzing determinants and intensity of SR adoption in Vietnam by using a sample of 336 farmers from Red River Delta (RRD) who were interviewed between October and December 2014. We follow the adoption behavior model based on the utility maximization criterion and adopt a two-step approach, starting with a Probit model for determinants of SR adoption before analyzing the intensity of adoption using a Tobit model. The selected independent variables included: households' sociodemographic and economic characteristics. Probit model estimates indicate that for every additional sao (equals to 360 m2) and network size the probability of SR adoption increases by 5% (p-value<0.01). Distance to the nearest market and number of laborers are however significant and negatively effecting the probability of SR adoption. Overall, 50% of the probability of SR adoption is explained by the selected independent variables. Tobit model estimates show that group membership (such as in agricultural cooperatives, farmer's union, women's union, etc.) and possession of a two-wheel-tractor increase the share of land allocation to SR production by 3.4% and 7.8% respectively. The model explains 14.8% of the variation of the share of SR planted area and the LR test equals to 44.4 (p-value<0.01) rejecting the null-hypothesis at least one of the predictors' regression coefficients is not equal to zero. Policy adjustments towards improving infrastructure, building social networks, promoting farmer groups, and land reforms would accelerate SR adoption and, thus, the rural economy in Vietnam.

Key words: Specialty rice, adoption, smallholder farmers, network size, Red River Delta

JEL classification: O30, Q16, R20

1 Introduction

Rice production plays a key role in the agricultural development of many developing countries, especially in the rice economies of the Association of Southeast Asian Nations (ASEAN) (ADB, 2012; IRRI, 2003). Billions of people around the world rely on rice as a staple food (Coxhead et al., 2012; Giraud, 2013; Muthayya et al., 2014); as a result, focusing on rice production helps to improve food security issues and stabilize economies (Minot and Goletti, 2000). Furthermore, rice production is a crucial source of export earnings for rice economies like Thailand and Vietnam. Due to increasing consumer wealth coupled with economic growth, demands for rice in terms of food quality and safety is now a global issue (Chaudhary, 2003; Giraud, 2013). Smallholder farmers could raise their incomes by producing specialty rice varieties that are unique in terms of quality and increase their potential for selling to high-value markets. Globally, aromatic rice- one of the most important SR varieties which accounts for 10-15% of world trade, sells at 50% higher price than common rice (Chaudhary, 2003). Producing SR varieties, thus, might be a good tool

for reducing poverty and improving livelihoods, and has indeed made great contributions to these ends in many developing countries, such as India, Pakistan, Thailand, the Philippines, and Vietnam (Chaudhary, 2003; Giraud, 2013; Moustier et al., 2010). In addition, there are increasing opportunities for local varieties to reach specialized and high-value markets. As a result, more attention should be paid to the adoption of SR varieties.

The growth of high-value agricultural and specialty markets presents both opportunities and challenges for smallholder farmers in many developing countries (Gulati et al., 2005). On one hand, this trend creates opportunities for small farmers to raise their income. Wollni and Zeller (2007), for example, find that farmers who participate in specialty coffee markets achieve higher prices than farmers delivering to traditional markets. On the other hand, such markets are often associated with higher costs of participation and stricter requirements concerning food safety and quality control than are traditional ones. In many cases, high-value markets do not necessarily refer to international or export markets, as domestic or regional markets still offer potential for specialty agricultural products.

With a significant increase in GDP per capita by an annual 12.73%[13] from 2010-2013, the demand for SR varieties in Vietnam has risen over time. In accordance, the government has implemented ambitious programs to protect and develop the many kinds of specialty agricultural products with intellectual property rights such as geographical indication (GI) label and collective trademarks. SR is, thus, a relevant case study for adoption of high-quality agricultural products in developing countries. Moustier et al. (2010) find that there is a raising demand for SR within specialized marketing channels in Vietnam. This is a positive development, as a good way to stabilize the country's SR market.

We fill this gap by introducing a conceptual framework and an ongoing empirical research on the adoption of innovation in agricultural production related to social networks (Bandiera and Rasul, 2006, Hoang et al., 2006, 2006; Matuschke and Qaim, 2009; Moser and Barrett, 2006). We hypothesize that farmers are more likely to adopt SR when other farmers in their network have adopted SR through sharing experiences and knowledge. To estimate the effect of social networks on individual adoption decision of SR production we use the network size as the main measurement at the village level (Wellman, 1979). Network size is measured by: how many close farmers a household can rely upon should it face financial problems or other hardship. The aim of this paper is to analyze determinants and intensity of SR adoption in Vietnam. For this study, any farmer that does not cultivate SR seed variety was not considered as an adopter of SR production.

2 Material and Methods

Random sampling procedure was used to sample 336 farmers from the RRD region who were interviewed using a structured questionnaire. We follow the adoption behavior model put forth by Rahm and Huffman (1984) that based on the utility maximization criterion and adopt a two-step approach, starting with a Probit model for determinants of SR adoption before analyzing the intensity of adoption using a Tobit model.

Rice farmer's utility function (U):

$$U_{ji} = \alpha_j F_i(R_i, A_i) + \varepsilon_{ji} \quad (1), \text{ where } j = 0, 1 \text{ and } 1;\ i = 1, 2,..., n \qquad \textbf{(1)}$$

[13] Calculation from the World Bank data (http://data.worldbank.org/indicator/NY.GDP.PCAP.CD).

Rice farmers are assumed to choose rice variety that gives them the largest utility; in other words, U_{1i} must be greater than U_{oi} when the i^{th} farmer chooses to adopt an SR variety over ordinary one.

$$D_i = \begin{cases} 1 \; if \; U_{1i} > \; U_{0i} \; SR \; variety \; is \; adopted \\ 0 \; if \; U_{1i} < \; U_{0i} \; normal \; rice \; is \; adopted \; and \; replaces \; SR \; variety \end{cases} \quad \textbf{(2)}$$

Modelling SR adoption

Firstly, rice farmers decided whether or not to produce SR. Using a simple Probit model (equation 3), we divided the sample into two groups (those that do produce SR and do not), based on the assumption that other conditions remain the same. Secondly, we examined the intensity of use (i.e., how much cultivated land is planted for SR) based on a Tobit model (equation 4 and 5).

Probit model: decision to produce specialty rice (adoption decision)

$$y_{1i}^{*} = X_{1i}'\beta_1 + \beta_2 * \; network \; size + \; v_i \quad \textbf{(3)}$$

Tobit model: how much land is planted for SR (intensity of use)

$$y_{2i}^{*} = X_{2i}'\beta_2 + \; \mu_i \quad \textbf{(4)}$$

$$y_{2i} = \begin{cases} y_{2i}^{*}, if \; X_{2i}'\beta_2 + \; \mu_i > 0 \\ 0, other \; wise \end{cases} \quad \textbf{(5)}$$

Where the SR adopter is a dummy variable indicating whether the farmer adopted SR, and X_i is a vector of explanatory variables expected to affect the adoption decision. In the Tobit model, we used both outcome variables (y_{2i}^{*}), that is, the share of the SR area adopted in the total cultivated rice area (%) and the total planted SR area (m^2) during the winter season of 2013. X_{1i} is the vector of explanatory variables for the adoption of specialty rice; while $X_{2i}$is the vector of illustrative variables for the level of SR adoption in the RRD region. The two error terms v_i and μ_i are expected independent and normally distributed with $v_i \approx N(0,1)$; $\mu_i \approx N(0,\sigma^2)$.

Measuring network size

There are many aspects which measure social networks, including network size, network density, centrality and centralization, tie strength, and network range (Marsden, 1990). In this paper, we use "network size" as the primary measurement of a social network and as such assume that farmers rely on their network to exchange social and economic information. Social interaction may influence rice farmers' decision to produce SR, as Moser and Barrett (2006) found that learning in social networks significantly influences the system of rice intensification (SRI) adoption in Madagascar. In the same vein, Hoang et al. (2006) found that neighborhood networks significantly influenced the adoption of innovation in Northern Vietnam.

We applied the following method created by Wellman (1979) in order to analyze network size: first, respondents were asked about the number of farmers they regularly talk to and share information with in the village about SR production. Second, we asked two hypothetical questions regarding financial and social support in the case of a lack of money or a suddenly occurring hardship in order to clarify how many people in their network. For each question, we asked respondents how many farmers in the village are willing to support them or offer immediate help. Those questions helped to determine the network size of the small rice farmers' interviewed. We assume that the larger network size a rice farmer has, the higher the probability of SR adoption.

3 Results and Discussion

We divided the sample into two groups, 276 adopters who had at least one plot growing SR and 60 non-adopters of SR production. In terms of gender of the household head, 70% were male and 30% were female. The main characteristics of rice households are given in table 1. Overall, SR adopters had higher gross income and per capita incomes than non-adopters.

SR adopters tended to have older household heads; in our study, the SR farmers were on average 53 years old and had extensive experience in growing rice. On average, their mean years of growing rice amount to 29.5 as compared to 8.4 years in the non-adopter group. However, SR farmers are significantly less educated as their counterparts. For instance, about 30% of household heads of adopter group had a high school degree as opposed to 43.3% of non-adopter farmers. Farmers who adopted SR had better access to extension (73.2%) in comparison with farmers producing ordinary rice varieties (56.7%). Another significant difference relates to the access to credit. Among adopter group, about 44% of households obtained financial services as compared to roughly 62% in the non-adopter group.

Table 1. Descriptive statistics by specialty rice adoption (N =336)

Variable description	Adopters ($N_1 = 276$)	non-Adopters ($N_2 = 60$)	Differences
Household characteristics			
Age of household head (in years)	53.192	47.083	6.109***
Age of household head squared	2921.141	2294.983	626.158***
Household head had a high school degree (dummy)	0.304	0.433	-0.129*
Social capital & network size			
Access to extension (dummy)	0.732	0.567	0.165**
Access to credit (dummy)	0.438	0.617	-0.178**
Years growing rice (in years)	29.507	8.367	21.141***
Network size (number)	7.391	3.067	4.325***
Number of local organizations involved	3.014	2.583	0.431**
Farm characteristics			
Number of plots	5.580	4.050	1.530***
Owned land (m^2)	2255.830	1626.060	629.770***
Owned land 5 years ago (m^2)	2411.452	1831.740	579.712***
Cultivated land 2013-2014 (m^2)	2952.404	1730.460	1221.944***
Total planted SR (m^2)	1202.622	0.000	1202.622***
Farm wealth			
Two wheel-tractor owned (dummy)	0.572	0.400	0.172**
Farm performance			
Total of paddy produced 2013-2014 (kg)	2617.496	1595.550	1021.946***
Gross household income (‘000VND)	119655.850	88059.916	31595.935***
Gross household income per capita (‘000VND)	31752.864	22686.987	9065.877***
Food expenditure per month (‘000VND)	2897.053	2582.557	314.496**

Significant at * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Productive labors were calculated as household members who are over 16 and less than 60 years old.

Source: Own calculations

Regarding the agricultural area, the first important finding is that the farm size of farm-household in our sample is dominated by small farms. More than 90% of the respondents cultivate rice on 0.5 hectare or less. There is a difference in average owned land and cultivated land between the two groups. SR adopters also had more land area and a higher

number of plots than did non-adopters. As we observed, rice farmers preferred to diversify of varieties in order to produce for many purposes (e.g. own consumption, providing for their relatives in urban areas, or earning cash). The descriptive results from Table 1 show that SR farmers have a larger network size (about 7.4) than do other rice farmers (3.0). The number of farmers who are able to provide financial and social support is significantly different.

The empirical results of SR adoption are presented in table 2. Model 1 gives the outcomes of a probit model that we estimated without including network size- which is the main variable of interest in our study. There are several explanatory variables that are expected to have an effect on rice farmers' decisions for or against to SR adoption. We also calculated the average marginal effects (AME) of each model that may help to understand the magnitude of the effects of each explanatory variable on the probability of SR adoption.

Some of the explanatory variables are statistically significant. The regression results show that cultivated land, experience of growing rice, and possession of a two-wheel tractor have a significant positive influence on SR adoption. However, the number of productive laborers and the distance to the nearest local market has significant negative effects on SR adoption. Other factors such as age and gender of household head, access to credit are insignificant, and groups' participation is contrary to our expectations.

Table 2. Determinants of SR adoption in the RRD region (probit model)

	Model 1		Model 2	
Variable description	Coefficients	AME	Coefficients	AME
Productive laborers (number)	-0.20249**	-.0388212**	-0.23646*	-.0323541*
	(0.09357)	(.0174539)	(0.13438)	(.0165626)
Experience growing rice (years)	0.02808*	.0053836*	0.03652*	.0049974*
	(0.01677)	(.0031386)	(0.02202)	(.0027884)
Cultivated land (m^2)	0.00072***	.0001377***	0.00066***	.0000901***
	(0.00015)	(.0000261)	(0.00023)	(.0000255)
Network size	-	-	0.38516***	.0526995***
	-	-	(0.07204)	(.0054914)
Distance to the nearest market (km)	-0.28306***	-.0542681***	-0.24043*	-.0328968*
	(0.10471)	(.0192525)	(0.13916)	(.0177005)
Two-wheel-tractor owned (dummy)	0.40289**	.0772418**	0.24571	.0328968
	(0.19035)	(.0347947)	(0.22449)	(.0290792)
Constant	-1.16474*		-2.58229***	
	(0.70618)		(0.82337)	
Observations	336		336	
Wald statistic	51.87		67.40	
Prob > chi2	0.0000		0.0000	
Pseudo R-squared	0.2659		0.4909	

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

Source: Own calculations

Cultivated land has a significant and positive influence on the likelihood of producing SR at a 1% significance level. Due to urbanization trend in the two provinces, more young farmers get out of agriculture to create their own businesses or work in the industry sector, leaving their land to relatives or neighbors for cultivation. On average, if the cultivated land increases by one square meter, the probability of the household's adoption of SR increases by 0.014% equivalent to a 5% rise in probability per additional local unit of land in the RRD region. (*1sao =360 square meters*). If farmer households possess a two-wheel tractor, their probability to adopt SR increases by 7.7%.

In model 2, we added the network size in the adoption model. All other factors held constant, our main variable of interest- network size increases the probability of SR adoption by 5.3% if rice farmers have one more person in their network. The more close neighbors who produce SR a rice farmer has, the more likely it is that a farmer adopts SR. Based on social network relations farmers can learn from others and influence each other by collective decision. Similarly, if rice farmers gained experience one year in growing rice, their probability of adoption SR increases by 0.5%.

The number of productive laborers in the family has a negative and significant effect on SR adoption, a result which supports the trend of increasing opportunities for finding off-farm income in the region. Households with more laborers are more likely to leave agriculture to find a job in the industry sector in order to diversify and raise their income. As expected, distance to the nearest market as a proxy for the transaction cost variable has a negative and significant effect on the probability of SR adoption at 10%. With an unit increase (one kilometer) in distance, the probability of SR adoption decrease by 3.3%. It means that households closer to the nearest market are more likely to adopt SR than ones living farther away. This could be explained by the chance to get more information, training activities, and the higher probability to get access to market.

After analyzing the factors that influence the decision to adopt, we explore the factors that affect the intensity of use (table 3). To do so, we use two dependent variables: the share of SR area adopted in the total cultivated rice area (%) and the planted SR area (m^2). These variables were captured in the winter paddy season in 2014.

Table 3. Intensity of SR production in the RRD region (tobit model)

Variable	Share of SR planted area (%)	Area planted to SR (m^2)
Number of productive labors in household	-0.03675**	-92.35597*
	(0.01558)	(48.17506)
Total cultivated area (m^2)	0.00003**	0.40791***
	(0.00001)	(0.03100)
Number of groups the household is involved in (number)	0.03418**	139.56671***
	(0.01497)	(46.20060)
Two-wheel-tractor owned (dummy)	0.07811**	232.32657**
	(0.03513)	(108.76310)
Constant	0.03001	-875.79790*
	(0.14617)	(452.66687)
Observations	336	336
LR chi2 (10)	44.39***	162.20***
Pseudo R-squared (%)	14.77	3.39

Standard errors in parentheses;
*** p<0.01, ** p<0.05, * p<0.1

Source: Own calculations

The number of groups that rice farmers are involved in and whether they have a two-wheel tractor have a significant influence on the area allocated to SR. The number of groups a household is involved in has a positive effect on the intensity of SR adoption. For additional group a rice farmer is involved in, such increases the planted SR area by $139m^2$. The coefficient of the total cultivated area also shows a significantly positive influence on the intensity of SR, indicating that if rice farmers expand their agricultural land use, they are more likely to increase the SR planted area.

The Likelihood Ratio (LR) Chi-Square tests demonstrate that the Tobit model is appropriate (Wooldridge, 2010). In comparison with the results from the Probit regression, experience

in growing rice and the distance to the nearest local market are not statistically different from zero, indicating they do not appear to influence the intensity of SR. Our main finding is various factors have an influence on farmers' decision to adopt SR production and the intensity of adoption. It was also found that social networks have a close relationship with SR production that is, a farmer's individual decision to produce SR is also influenced by his/her neighbors in the village. This is in line with findings from previous studies showing that social networks has been played a significant role in technology adoption (Bandiera and Rasul, 2006; Maertens and Barrett, 2013; Matuschke and Qaim, 2009).

The number of farmer groups the household is involved in has a positive influence on the SR area adopted. Group participation helps to expand farmers' SR area through common effort and peer learning. This is relevant in the case of Vietnam where most of households participated in at least one farmer group. Being member in farmer groups, household is provided with agricultural training, extension services, market information, and other subsidies (Kijima and Sserunkuuma, 2013; Moustier et al., 2010). In addition to the regression results, the descriptive statistics show that wealthier rice farmers with more land and possession of a two-wheel tractor tend to be more likely to adopt SR. These findings resonate with past studies that found significant difference between cultivated land in the adoption of improved technology (Adedeji et al., 2013). It means that farmers that operate on relatively lager scale level are discovered to have higher adoption level. It should be kept in mind that almost all farmers in our sample are small-scale. Limited availability of suitable cultivated land may be a potential constraint to SR adoption.

4 Conclusion

All in all, the case of SR adoption in the RRD region contributed new insights into our understanding of adoption decisions, especially the role of social network and group membership in rural areas. We find that cultivated area and network size have a positive and significant influence on households' likelihood to produce SR. Additional experience tends to increase adoption SR varieties, and long distance to the nearest local market tends to reduce it. However, some basic farmers' characteristics did not have a significant effect on the probability and intensity of adoption SR. The findings of this study have several important implications for policy making. As expected, in order to expand the area of SR, authorities need to invest more in helping small farmers to build their networks through training activities. Promoting SR production must address the specialized markets where the product is given particular consideration in terms of quality, origin, and quality control. Thus, policy-makers should focus more on addressing and strengthening new marketing channels for specialty products by providing credit or loan to SR farmer associations and supporting market information.

Social network has a positive influence on SR adoption because of it makes knowledge exchange and collective decision-making possible. Based on the findings, this study will help foster the production of SR among smallholder farmers by building up individuals' network size. More importantly, SR farmers should be involved in activities such as: interactions, meetings, events, and other common projects. In addition, a land reform policy will help to increase SR production in the RRD region, for instance implementing of land consolidation program and creating land market. Therefore, it contributes to the overall policy regarding the development of specialty agricultural products in Vietnam's rural areas.

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Economic effects of biogas technology on rural women in Vietnam

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Abstract: The paper explores impacts of biogas technology which was chosen as a national solution for manure management and protection against environmental contamination related to livestock husbandry sector in Vietnam. The objective is to identify the factors that have positive effects on women's life in rural areas by biogas technology. This research also deeply assessed how economic situation of rural households particularly women improved after biogas technology adoption. A sample of totally 254 respondents included 186 biogas users and 68 non-biogas users were randomly chosen from rural areas in Northern and Central Vietnam in summer 2013 by a semi-structured interview method. Quantitative and qualitative analysis was performed. Binary logistic regression was used to identify the determinant variables affecting women life after biogas adoption. Descriptive statistic and correlation test were used to explore economic effectiveness of biogas technology. The findings show that biogas technology improved life of targeted women by two variables *save time* and *economic increasing*. With more free time which saved from energy sources collection, livestock management, and energy expenses respondents had more time to contribute other economic activities. Moreover they can benefit from sub-products of the technology such as fertilizer. Their income also improved thank to enlarging number of livestock. Income level of respondents was increased from 25 % to 50 % after biogas technology adoption. The research show that beside the solution for environmental protection, providing of clean alternative energy sources, biogas technology was admitted with more benefits on socio-economic aspect.

Key words: biogas technology, rural women, Vietnam, economic effect

JEL classification:

1 Introduction

Sustainable energy consumption is a key factor in development of rural areas in Vietnam. However achieving this goal demands huge changes in economic and social aspects. Large proportion of country population is still living in rural areas where agricultural sector is dominating in employment and household income (Zabel and Phung, 2012). Due to insufficient energy supply, Vietnam's agriculture is still based on human force, animal traction and primitive equipment in production process hence 1% of energy consumption countrywide (IEA, 2010).

Biomass is an essential energy source especially in rural regions of Vietnam. It occupied 90 % of total amount energy consumed by rural households (NL agency, 2012). The main solid biomass in Vietnam is originated from three main sources such as wood energy, wood waste and agricultural residues. Here the agricultural residues which were collected from post-harvest of crop productions (rice, coffee, coconut, cassava,..) accounted for roughly 70% of total biomass source (equivalent to 73 million tons of solid biomass fuel). Energy from wood related sources contributed 30% of total solid biomass fuel (Arvo and Nguyen, 2013).

Consuming of raw materials in various forms from domestic collection to large-scale of cultivating and harvesting for household and industrial sectors can have negative effects on nature. Vietnam entered into the Earth's atmosphere 130.5 million tons of CO2 emission from fuel combustion in 2010. Electricity – heat production and industry are two main sources of CO2 emission with nearly 2/3 amount of total gas. Despite the share of agricultural

sector is only 5.3% in CO2 emission, the rural household is facing the dangerous threats of direct exposing to indoor pollution (UNDP and GGCA, 2013). Especially women and children in developing countries are strongly affected by it. Indoor pollution from burning fuels for cooking leads to 1.9 million deaths per year that more than number of deaths every year by malaria (WHO, 2006).

Utilizing of energy usability is considered as the most essential task in poverty alleviation and women rights protection in Vietnam. Sustainable energy consumption brings women more benefit in time arrangement and health safety. Improvement of energy usability not only lessens housework duties but also repositions social order for women by giving them more opportunities to engage into social activities, which support them into understanding and recognition of their role in family as well as in society (Katrine, 2012).

Beside the threat from indoor pollution of CO2 emission practices in household, livestock pollution treatment in Vietnam also provide huge challenges in the local environment management. In order to minimize heavy pollution from livestock, the biogas technology was chosen as major method for manure management of pig production in Vietnam (Cu et al., 2012). Further research also conducted that Biogas technology is not just a solution for waste treatment. Moreover it offers clean biogas energy for many purposes such as cooking, lighting, heating, drying, incubation and electric generation. Its by-products after digesting process – bio-slurry with rich nutrients is suitable for improvement of soil quality as fertilizer and also usable as fish feed. Replacement of chemical fertilizer by bio-slurry reduced amount of emitted CO2 to the atmosphere as well as reduction of discharged manure (Li, 2012).

Recently there were two projects conducting research and development of biogas application in Vietnam:

Project *Biogas program for animal husbandry sector of Vietnam* is a cooperation between Vietnamese livestock production department and Netherlands Development Organization (SNV). The project is operated from 2003 and lasts to 2014 with aims to exploit biogas technology's effects and develop commercial biogas sector in Vietnam, encourage rural development and environmental protection by clean energy, improvement of rural community's sanitation and health and job offers for local people. (Biogas program for animal husbandry sector of Vietnam, 2014).

The two years project *Renewable energy resources for rural areas in Thua Thien Hue province 2011 – 2013* was donated by Czech university of Life Sciences Prague (CULS) and Czech development agency. Project was implemented in the central of Vietnam (Phong Dien and Huong Tra district, Thua Thien Hue province). Project focused on biogas technology to produce energy for household needs and solar energy to monitor electricity production with purposes to improve the access of sustainable energy sources to rural households and support thermal and electric energy production by using renewable sources. (CULS, 2014).

This paper aims to analyze how the biogas technology impacts on daily life of Vietnamese women who live in rural area of central of Vietnam. Research was especially detect socio-economic effects after biogas technology's adoption; discover women time budget and using of extra time after utilizing biogas; compare biogas technology's benefits between different regions in Vietnam.

2 Materials and Methods

The survey was conducted in three districts: Que Vo, Huong Tra and Phong Dien. Que Vo district is located in province Bac Ninh in Northern Vietnam where SNV project is available. GDP per capita of Bac Ninh is US$ 1800 in 2010. There were 2679 farm households in Bac Ninh of which 1339 livestock farms (General statistic office Vietnam). Districts Phong Dien

and Huong Tra belong to province Thua Thien Hue in central Vietnam where both SNV project and CULS project implemented. GDP per capita of Thua Thien Hue in 2010 was over US$ 1000. There were 83 livestock farms of 591 farms available in Thua Thien Hue area. (Thua Thien Hue government portal).

2.1 Data collection

Survey field was verified by random sampling methods. Regarding population size and number of biogas users, author calculated size of respondents. 90% of confidence level can be tolerated and error margin is accepted to 10%.

Total of interviewees is n = 254 divided into 2 groups: biogas user and non-biogas user. 50 biogas users under SNV project were interviewed in Que Vo district. In Huong Tra and Phong Dien districts, 136 biogas users (68 respondents under SNV project and 68 respondent under CULS project) were surveyed. For non-biogas group, there were 68 respondents in Huong Tra and Phong Dien districts.

The interview was done at respondents' house during August and September 2013. Research were carried out by author and a trained volunteer under guiding of responsible people who involves in biogas program (in Bac Ninh) or people from local government (in Thua Thien Hue).

2.2 Data analysis

All qualitative and quantitative collected data was edited, coded and analyzed by statistical program SPSS 20.

Descriptive statistic and correlation test were used to explore economic effectiveness of biogas technology. Different impacts of biogas technology on women in each region was tested by independent t-test (p-value < 0.05 significant different) (Waterlander et al., 2014). Factors influencing family income level were analyzed by bivariate correlation. If p-value < 0.05, there is significant correlation (Peter et al., 2012). Binary logistic regression was performed to identify the most determinant variables affecting improvement of women life after biogas adoption. Chi-square was applied in order to assess the fit of model and for goodness-of-fit, Hosmer and Lemeshow was used. If p-value of Chi-Square is less than 0.05 and p-value of Good-of-fit is larger than 0.05, so model is well-fitting (Zampaligre N. et al, 2014). Binary logistic regression was used with both biogas user groups - Bac Ninh and Thua Thien Hue.

Formula of binary logistic regression: (Rabe-Hesketh and Everitt, 2004)

$$E(Yi|Xi) = \frac{\exp(\beta' Xi)}{1+\exp(\beta' Xi)} = \frac{1}{1+\exp(-\beta' Xi)}$$

$$E(Yi|Xi) = \beta 0 + \beta 1 X 1i + \beta 2 X 2i + ... + \beta pXpi$$

Where: Yi = dependent variable

Xi = independent variable

Summary of variables in model:

Y: Life improvement of women by biogas technology (dummy variable, 0 = no and 1 = yes)

X1: Health improvement after biogas adoption (dummy variable, 0 = no and 1 = yes)

X2: Workload decrease of women after applying biogas technology (categorical variable, ranging from 0 to 5: 0 = decrease 0% up to 5 = decrease more than 75 %)

X3: Save time after using biogas (categorical variable, ranging from 0 to 5: 0 = decrease 0% up to 5 = decrease more than 75 %)

X4: Increase income after adopting biogas technology (categorical variable, ranging from 0 to 5: 0 = increase 0% up to 5 = increase more than 75 %)

3 Results and Discussion

3.1 Improvement of women life by adoption of biogas technology

The determination of the variables that probably affects the improvement of women life was estimated by using binary logistic regression model. In the model, dependent variable is defined as dummy variable which is 1 if biogas adoption improves women life and 0 otherwise. Logistic model was applied for Bac Ninh (BN) biogas users and Thua Thien Hue (TTH) biogas users.

Results of binary logistic regression are presented in table 1. Both models are well-fitting because chi-square test is significant (p-value < 0.05) and Hosmer and Lemeshow test is not significant (p-value > 0.05). All dependent variables in both models have positive sign of coefficient β meaning the marginal increase in dependent variables increase the probability of improving women life by biogas technology.

The binary logistic regression equation for biogas users of Thua Thien Hue group is:

Log (Y) = 0.000 + 1.093X1 + 1.789X2 + 2.196X3 + 1.036X4

Three significant variables are significant in model of TTH group which are: Workload decrease, save time and income increase. With odd ratio = 8.9, saving time is the most determinant factor for improvement women's life after biogas adoption. Improvement of women's life of biogas users will increase nearly 9 times when variable saving time increases 1 unit.

The binary logistic regression equation for biogas users of Bac Ninh group is:

Log (Y) = -8.278 + 1.163X1 + 0.453X2 + 1.880X3 + 0.712X4

Save time and income increase are two significant variables in model of Bac Ninh group. Similar to Thua Thien Hue group, the most determinant factor is saving time. Improvement of women's life increases 6.5 times with 1 unit increase at variable saving time.

The result of applied binary logistic regression indicated similar to "Biogas user survey 2010 – 2011" of biogas development for livestock sector program in Vietnam. The report pointed out biogas technology has positive effect on users' economy, environment protection, health improvement and social aspect. (Nguyen, 2011)

Table 1. Results of the binary logistic regression analysis on factors affecting improvement of life after biogas adoption

Predictor	β	SE β	Wald's χ2	df	P-value	Odds ratio (exp β)
Thua Thien Hue						
Health improvement	1.093	1.182	0.854	1	0.355	2.982
Workload decrease	1.789	0.685**	6.820	1	0.009	5.985
Save time	2.196	0.718**	9.342	1	0.002	8.989
Income Increase	1.036	0.293**	12.482	1	0.000	2.817
Constant	-12.619	3.254	15.041	1	0.000	0.000
Test						
Overall model evaluation			43.775	4	0.000**	
Goodness-of-fit			23.804	7	0.053	
Bac Ninh						
Health improvement	1.163	0.991	1.376	1	0.241	3.200
Workload decrease	0.453	0.837	0.292	1	0.589	1.573
Save time	1.880	0.738*	6.495	1	0.011	6.556
Income Increase	0.712	0.280*	6.462	1	0.011	2.038
Constant	-8.278	2.915	8.065	1	0.005	0.000
Test						
Overall model evaluation			40.797	4	0.034*	
Goodness-of-fit			10.131	7	0.181	

* Significant at α = 0.05, ** significant at α = 0.01

The differences between impact of biogas technology on women's life in two regions TTH and BN was analyzed by independent t-test. The result of t-test presented in table 2. P-value = 0.009 < α = 0.05 means there is statistically significant difference between the mean number of TTH group and the mean number of BN group for improvement of women's life by using biogas.

Table 2. Result of different biogas impact on women's life between Thua Thien Hue and Bac Ninh region

	Bac Ninh		Thua Thien Hue		p-value
	Mean	SD	Mean	SD	
Improvement women life	0.7	0.463	0.89	0.314	0.009

The differences between impacts of biogas technology on women in each region could be understood by various socio-culture efforts on family and economic situation.

3.2 Women time budget

The survey acquired three main points from biogas users to explain why biogas technology has positive effects on their free time. It is: saving time from collecting energy sources; faster cooking and easily kitchen cleaning; and simpler livestock manure management. A part of 20 % respondents also reported that biogas technology gives them free time from all points above. Saving time from collecting energy was mentioned more at TTH group because. It fits to their energy sources as reported above that they collected 44 % of fire wood from forest.

Although they still use fire wood as additional energy but the amount of fire wood reduced. Hence it is unnecessary to collect as much as before.

Cooking with biogas is faster if they compared to coals and agricultural residues. Plus points based on flexibility and comfort when they cook. When they burn conventional energy source for cooking, they will spend all time in kitchen to look after the fire and meals. In case of biogas, users do not have to continuously control the fire and they can leave the kitchen for a while when they are cooking. Therefore it allows women do other tasks at the same time of cooking. Biogas also used as an additional energy for wine cooking however this product requires fire wood or coals.

While almost TTH women must do all household tasks, BN women's tasks was shared equivalently with BN men especially in farm activities and biogas management. Therefore TTH women got more free time from using biogas than BN women. Biogas technology frequently gave them more 51 -75 % free time than before. Free time of BN women is increased by 26-50 % against period of using conventional energy.

TTH respondents spent their free time mostly on income or household activities however they have more free time. They rather do small business at traditional local market or find short time job to increase family income than spending time for themselves or society. BN respondents differ from TTH group that they use extra time to do their own hobby such as chatting with neighbors, watching television, reading books. They are more active in local social actions for instance: women association, singing club. They do not pay attention on income activity as TTH respondent. On all, their extra time is for taking care of their children. Children are also taken into considering by 22.79 % of TTH women when they have extra time.

Faster cooking, easier cleaning kitchen / utensils, and less time for collecting fire wood are factors gave women in survey 2010 – 2011 in average 2.3 hours per day more. On contrast to women in this study, biogas adoption has let them get approximately 50 % of free time more than before which was around 2.5 – 3 hours per day by effects of quicker cooking, saving time of energy collection and convenient in animal management. Relative result was shown in research of Surenda (2014) that women and children in household biogas plant can save 2 hour per day. Women in Surenda's research used save time mostly for recreational activities, social work, income-generating and education (Surenda et al., 2014). The biogas survey 2010 – 2011 found out that women used their spare time for taking care of the family and only 10.9 % of them involved in income activities with extra time (Nguyen, 2011). These findings are closed to information author got from women group in Bac Ninh province. While Thua Thien Hue women group spent extra time after adopting biogas firstly for income activities. Involvement of women in income activities played an important roles support increasing household income level of biogas users especially in rural area. Indeed, this fact was acknowledged in the report "Vietnam biogas assessment research project" by Dang (2011) which analyzed biogas users in three provinces in Vietnam: Tuyen Quang, Thanh Hoa and Phu Yen (Dang et al. 2011).

3.3 Economic aspect

Biogas technology had increase income level of major parts in both groups in average 26 – 50 %. Nearly all respondents got more money after biogas adoption. There were less than 10 % of them have no reaction with financial status of family when using biogas. These cases appeared among respondents whose biogas amount is insufficient. When biogas digester works ineffectively, biogas users consume relatively the same amount of conventional energy sources like before biogas adoption. They spent less consideration on biogas management due to low fulfilment of needs. Hence ineffective biogas digester became more useless.

Income level between two groups is obvious different. Income level of household in TTH region frequently ranges from US$ 50 to 150 while BN respondents have income level above US$ 150. Independence on farming activities could be one fact to explain higher income of BN group against TTH.

Biogas application encouraged of livestock expanding for one quarter respondents in both group. An ease in manure management helps them to enlarge number of livestock without higher labor demand. Saving money from free fertilizer was mentioned around 10 % as less important factor influenced on income increasing by biogas adoption. Although 25 % of saved money from biogas application come from enlarging livestock activities but respondents indeed invested into their farm as much. For BN group, larger part of money was spent for improving living condition such as television, fridge, computer, motor bike, house reconstruction etc. Rising education level of children was following family needs. After that they will make decision to save money for future or upgrade their farms. Graph 26 indicates reasons why respondents can increase income after using biogas technology. The survey 2010 - 2011 found out that biogas user got better economic situation after biogas adoption via decreasing of energy expenditure; and using bio-slurry as organic fertilizer and animal's feed. In average, household could save almost US$ 170 per year from energy sources and yearly around US$ 25 for fertilizing form bio-slurry, total saving money is US$ 197 per year (Nguyen, 2011). A study about ecological benefit of biogas by-products of Li et al. (2012) had found out comparative advantages of using bio-slurry from biogas plant versus chemical fertilizer. Biogas fertilizer can reduce more carbon dioxide emission than chemical, it improves soil quality, and increases plant quality and yield (Li, 2012). Biogas users in Uganda use bio-slurry for their fields as well as selling biogas slurry to other famers in village to increase their income (Kabarole research and resource center, 2012). Compared with the present paper, most biogas users admitted biogas effects such as reducing energy sources, saving money to chemical fertilizer and livestock enlarging have increased their income level from 25 % to 50 % per year, it means respondents can save about US$ 200 per year with biogas users in Thua Thien Hue and more than US$ 350 per year at group of biogas users in Bac Ninh.

Increasing of income level after using biogas came mainly by saving expenses of consuming energy. BN group saves a little bit higher money from unused conventional energy because they do not have access to collect free fire wood such as TTH group. The difference between saved money from energy of our research and the survey 2010 – 2011 can be explained by income activities of respondents because most of respondents in the study are wine producers. For that reason, consumption of conventional energy sources after biogas adoption was slightly decreased than before. They are living in rice wine craft villages. They need to use fire wood/coals to maintain product's quality and taste. Research "Social aspects and economic benefits of using biogas by rural and peri-urban households in central Vietnam'' by Machackova (2012) declared that biogas application in Thua Thien Hue province reduced amount of fire wood from 55 to 6 bundles per month (Machackova et al. 2012). It means respondents in Machackova's survey decreased approx. 90 % amount of burning fire wood after biogas adoption while respondents in our research can cut down only 20 -30 % of using fire wood. Consumption of coals is relatively unchanged.

Natural conditions played important role in how TTH respondents spend their money. They live in the area where natural disaster as flood appears every year with serious damage to houses, farms, animals and people. Therefore they are used to save money for future proposes. They must spend some money to fix broken things caused of flood after-effects. They also paid for improving education level of children but not much as BN group. Related to natural disasters every year, farm investment is not considered as an important factor

4 Conclusion

Biogas technology helps users save time from many tasks as convenient in cooking, animal management, collecting energy source. Therefore women who are mainly responsible for doing these tasks get more free time after biogas adoption. Thanks to biogas effect, women have time for themselves or take more actions on income activities, take care of family and participate in local society.

Users benefited better economic situation after using biogas by saving money and expanding income activities. Firstly users save money from limited energy expenditure. Then users have opportunity to keep more money when bio-slurry is used instead of chemical fertilizer for crops production. Biogas decreases time of animal management and solve environmental problem from manure pollution thus it contributes in enlarging production.

Biogas technology is applied in Vietnam for first purpose of managing livestock manure to protect environment. More effects than expected, it has come with other benefits which have positive impacts on health, workload and economy of users. Women life relates directly with these aspects, women life increase together with family conditions. Hence in general the author can conclude that biogas technology improves women's life in the survey. How biogas technology influences on women also depends on feature culture and economic situation of various regions.

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Farmers Market – Facebook text analysis

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Abstract: This study is focused on the evaluation of activities (like, post, comment, share) at the largest Facebook Page aimed at farmers' markets in the Czech Republic with a fan base of 10,730 people. The research is aimed at the determination of the Degree Distribution in terms of user´s interaction and the number of users who have attended farmers' markets site only with one interaction and identify contributions. The partial aim is to identify contributions (photos, videos, posts, links), that have the most one-off interactions. The results of the study show that the posts with a high number of interactions (like, share, comments) do not contribute to broaden the number of active users (those who will create further interactions). The results show that nearly half of internet users create only one-off interaction and his or her activity ends. It is possible to monitor the long tail effect in terms of the degree distribution with very short beginning. The research also identifies results that can be used to manage marketing communications by identifying initial interest in the topic or issue, however it is necessary to support other user´s activity.

Key words: Social media, Facebook, Farmers' market, User's Engagement

JEL classification: L14, M 31, Q 13

1 Introduction

Food market in the Czech Republic went through significant changes in the last two decades (Turčínková and Stávková, 2009). Lately, customers are more sensitive in terms of perceived quality, longer durability and special product characteristics, which was defined under value proposition of the farmer´s market (Pokorná, Pilař and Balcarová, 2015). Farmers´ markets are meant to be one of the transparent short(er) food supply chain channels which can obviously bring the quality and provenance that points towards more sustainable ways of production (Ilbery and Maye, 2005; Morris and Kirwan, 2010). Key fresh products that are sold at the farmers market are fruit, vegetables, flowers, bakery products, eggs or dairy products. By purchasing at the farmer´s market, customers satisfy not just the nutrition, health or wellbeing needs, but they also concern such issues as a support of local farmers or sustainable development (Pokorná, Pilař and Balcarová, 2015). Because of the consumers' requirements that can be described as ethical, responsible or green values, the number of farmers' markets is rising, as it is the place, where can consumers satisfy such needs (Onianwa, Wheelock and Mojica, 2005). As the customer's purchase behavior and decision-making is specific in the terms of visiting the farmer's market, it is highly important to uncover and understand customers perceptions´of the farmer's market to help farmers distributing through this channel (Pokorná, Pilař and Balcarová, 2015; Šrédl and Soukup, 2011).

The social network research shows that its users are connected and create relationships online, but it does not mean they have a face-to-face relationship with such connections outside the Internet (offline) (Rau, Gao, & Ding, 2008). Social networking is currently considered as a part of many daily routines (Utz & Beukeboom, 2011). Facebook is a worldwide popular social network with more than 1.09 billion daily active users (Facebook, 2016). It is though obvious, that social media started to be one of the basic marketing channels in promotional practice (Hofmann et al, 2013).

One of the reasons why people go to farmer's market is to be modern or trendy (Pokorná, Pilař and Balcarová, 2015). It can be seen as a form of narcissism, where the social network such as Facebook can be considered as a highly controlled environment with superficial relationships, for the extensive management of the self-presentation style (Buffardi and Campbell, 2008). The social media users strategically manipulate their profiles to follow the societal ideals of attractiveness which was identified in the studies of self-presentation within SNSs (Rodgers et al, 2013). Social media have not only been influencing the users and their behavior, but they have been transforming the communication between companies and their audiences and have been even changing the organizations themselves (Cui, 2014). If we for example look at the area of organic products, we can consider the Facebook as an important tool within the promotion (Pechrova, Lohr and Havlíček, 2015). More often the social networks and their analysis has become appealing field of the research due to the quantity of available data (Staab et al, 2005).

Social network can be describe as a system of individuals as vertices and edges as relationships between vertices (Wasserman and Faust, 1994). The roles of subjects within marketing communication process have changed. Consumers are not just passive messages receivers but as well active creators of the communication content (Malthouse et al, 2013). Though the content needs to be as valuable as possible to attract customers into two-way communications. The value is seen through the ability of the content to encourage engagement, discussion, and conversation (Walsh et al, 2013).

The research is aimed at the determination of the Degree Distribution in terms of user´s interaction and the number of users who have attended farmers' markets site only with one interaction and identify contributions.

2 Materials and Methods

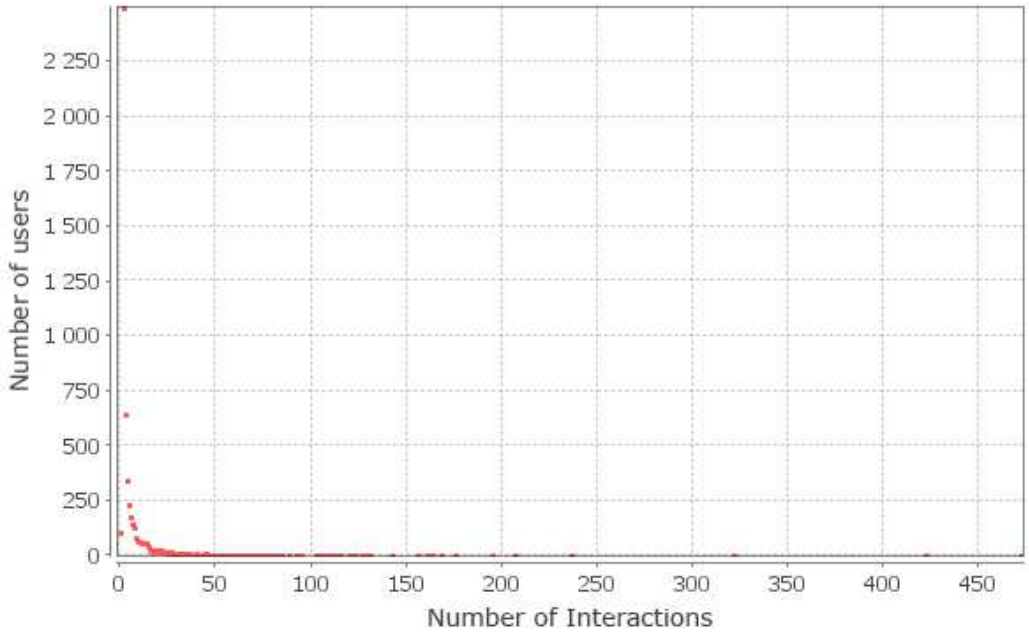
Data were obtained using Netvizz 1.25. Program and collected during March 11, 2013 - November 6, 2015 from Facebook. This study is focused on the largest Facebook Page aimed at farmers' markets in the Czech Republic with a fan base of 10,730 people. Extracted data from 999 posts (limitation of API), with 4249 active users (one or more interactions), giving likes or commenting 17363 times. Subsequently, the data were evaluated in the program Gephi 0.9.1. For a network analysis the Average Degree - the Average Degree of a graph is another measure of how many edges are in set compared to number of vertices in set (Carrington, Scott and Wasserman, 2005), the Graph Density – the Graph Density was defined as the number of edges divided by the number of possible edges (Scott, 2000), the Modularity - it was designed to measure the strength of division of a network within modules (also called groups, clusters or communities). Networks with high modularity have dense connections between the nodes within modules but sparse connections between nodes in different modules (Knoke and Yang, 2008) and the Component Analysis - number of components that are created on the basis of selected modularity detection algorithm (Blondel et al, 2008) method was used. As a graphical representation method Yifan Hu - Algorithm for Visualizing Large Networks (Hu, 2005) was used.

For the purpose of the research as an interaction are considered further actions: adding a comment, adding a like, posting a contribution on the wall, sharing posts. To become a fan of the Facebook page is not considered as an action, and these users are in the range of 0 Degree = 10,730 users. For primary analysis the degree distribution metric was used. Degree Distribution is in the form of a long tail, which is generally the characteristic of social networks (Sigurbjörnsson and Zwol, 2008). However, it is important to measure other features of the Facebook social network in the area of farmers' markets, such as Average Degree, Graph Density, Modularity and Component Analysis.

3 Results and Discussion

One of the primary results in this research was the identification of the degree distribution. Based on an analysis of communities, one can observe an extreme decline in communities from 132 to 10 communities during a change of the analysed group, leaving of nodes with an edge value of 1. In other words: nodes that have only one activity create 122 independent communities, which indicates belonging to only one action in the contribution or photograph. The degree distribution of the users and their interactions can be seen in the figure 1 below.

Fig. 1. Degree Distribution



Source: Farmářské trhy Facebook Fan Page, 2015

A very interesting finding is that upon a change in the scope of interaction (adding a comment, like, posting a contribution on the wall, sharing posts) of individual nodes (photo, post, user) from a minimum value of 2 to values of 3-10 is created by 10 stable communities (with the exception of 12 communities for the scope of 3).

When increasing the minimum value of interaction from 1 to 2, there was not only a major decline by 122 communities, but also a significant reduction in the number of active users (users who have 2 or more interactions) from 4249 users (1 interaction to reviewed period of 10,730 fans on the page) to a mere 1802 users. If we increase the minimum value of interactions to 5, we get only 706 users (6.58% page fan bases). These results can be seen in the table 1 below.

Table 1. Social Network Characteristics

Degree Range	Nodes	Users	Edges	Average Degree	Graph Density	Modularity/ Number of Communities
1-473	5248	4249	16902	6,441	0,001	0,399/132
2-473	2644	1802	14409	10,899	0,002	0,342/10
3-473	1996	1206	13133	13,159	0,003	0,348/12
4-473	1653	907	12128	14,674	0,004	0,330/10
5-473	1420	706	11223	15,807	0,006	0,314/10
10-473	820	333	7754	18,912	0,012	0,284/10

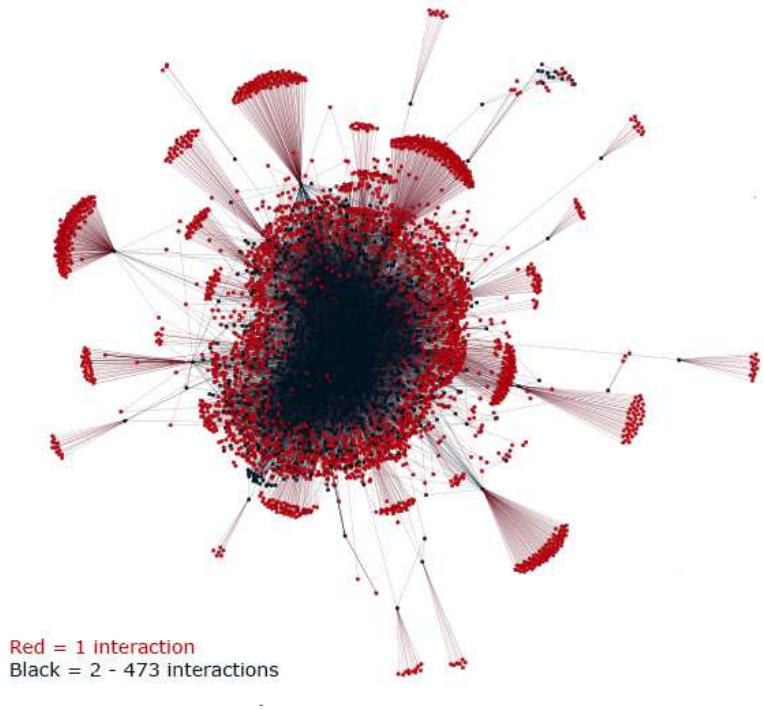
Source: own survey

The results of the study show that the posts with a high number of interactions (like, share, comments) do not contribute to broadening the number of active users (those who will create further interactions). Results determine 6481 – 60.4% users who have no interaction on the Facebook page (except for liking the page) and another 2447 – 22.74% users who have only the one-off interaction. Interactions were identified especially by following topics: Invitation to the opening of the new season, farmers' markets and by various competitions. Although competitions bring new users, in 36% they are without further interaction. Research has identified a lack of call to action activities that would re-engage the user of Facebook pages.

A basic analysis of the communities showed a modularity value ranging from 0.399 to 0.284, which indicates that the communities are well interconnected. The Yifan Hu method - Algorithm for Visualizing Large Networks (Hu, 2005) (see Figure 2) was chosen for the basic analysis of individual community polarisation.

Based on these communities, one can see a large number of separate communities that are far from the centre, and a stable core that is not polarised (there are no longer connecting edges between the individual nodes). The following figures shows nodes in red that have only one interaction, and nodes in black that have more than one interaction.

Fig. 2. Communities distribution - Yifan Hu Algorithm



Source: own survey

In table 2 below, we provide the results of identifying 5 contributions with the highest number of users, who had only one interaction on the given Facebook page.

Table 2. Top 5 contributions with the highest number of users with only 1 interaction

Type of contribution	Number of interactions to the contributions	Number of users with only one interaction	Number of users with more than one interaction	The percentage of users with more than one interaction	Content of the contribution
Post	420	272	148	54.41%	Beginning of the season 2016
Photo	314	262	52	19.85%	Beginning of the season 2015
Photo	194	145	49	33.79%	Competition
Photo	170	122	48	39.34%	Beginning of the season 2014
Photo	164	152	10	6.58%	The picture of the first farmer's market in 2016

Source: own survey

Based on these results, it is not possible to determine what type of contribution brings users with only 1 interaction to the page, despite the fact that a post is in first place and there are 4 photographs in the subsequent ones. This implies the possibility of further research in the form of a detailed evaluation of the average loss of active users, i. e. share of users who terminate activity on the given page after one interaction, depending on the type of interaction (photo, link, post, comment and like).

Research also indicates that the activities of fans is long tail in distribution, which is a sign of the sharp decline in the number of communities and active users depending on their rising activity. Hence, it is not possible to consider a 10,000 base to be 100% active. The research showed that only the stable core of ten communities with high interconnection, composed of only 16.79% of the total number of fans, is capable of performing more than 1 interaction. Therefore, a reference for future research is created, specifically the verification of whether this phenomenon also appears among other farmers' communities, topics, countries, regions, etc.

Based on an analysis of communities, it may be said that the area of farmers' market is not a polarised society. Hence, future research could be focused on identifying and characterising 10 stable communities.

As the Facebook is considered to be a powerful tool for communication between farmers, farmer's market organizers and customers (Cui, 2014), it is crucial to evaluate the value of the interactions and feedback coming from the analysis. As it is stated by Staab et al (2005) the available data is massive and easy to obtain, but we have to resolve value of such data. Users are active and a certain percentage are active more than once.

4 Conclusion

Social networks are a simple tool for monitoring feedback and evaluating marketing communication. Data come in large quantities and are readily available. Their relevance must be verified and based on the results of this research, the references can be used for further studies of relevance of the acquired data. This study can be a reference material for verifying the real number of active fans.

The results show that nearly 40% of fans create only one-off interaction and his or her activity ends. It is possible to monitor the long tail effect in terms of the degree distribution with very short beginning. Based on an analysis of the components, 10 stable groups were identified that actively present on the farmers market Facebook page. The research also identifies results that can be used to manage marketing communication by identifying initial interest in the topic or issue, however it is necessary to support other user´s activity.

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Efficiency of agriculture as related to foodstuffs Autarky in the Czech Republic

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Abstract: The paper deals with statistical analysis of Czech agriculture´s efficiency and with assessment of the level of foodstuffs self-sufficiency in Czech Republic (CR). The solution is subdivided into two parts. In the first part, long-term development tendencies are being discovered, described and modelled, of important indicators of the agricultural sector efficiency, of labour market and of typical natural measures of primary agricultural production in the CR. Applying advanced statistical methods from time series analysis domain, the long-term tendencies of a broad spectrum of Czech agriculture efficiency aspects are being described as based on the development of selected indicators, and future development forecasts are being constructed. In the second part, the paper analyzes Czech agriculture´s self-sufficiency level. The authors start from accessible data bases of Czech Statistical Office, CR Ministry of Agriculture, Ministry of Environment, Ministry of Local Development. When modelling statistically the balance of agricultural production and food self-sufficiency, data on CR foreign trade and customs statistics are analyzed. Based on the analyses mentioned above, development of food security level and of State food self-sufficiency is being predicted, taking into account potential impacts connected with the new European Union Common Agricultural Policy (EUCAP), with CR Ministry of Agriculture efforts for sustainable rural and agriculture development and with nutrition policy of the CR. In spite of satisfactory nature and climate conditions of Czech countryside, efforts to stop or to moderate at least, the drop of domestic production in economically demanding commodities, have so far failed. CR food self-sufficiency has gradually been reduced from the long-term viewpoint. Reduction has accelerated after the Country´s accession to EU. Opinions concerning importance of food self-sufficiency and its degree differ. The aim of the paper based on specific research has been to find and offer appropriate instruments for the analysis of the Country´s food self-sufficiency level and development and factors affecting it.

Key words: agriculture CR; natural indicators; animal production; plant production; exports; imports; self-sufficiency

JEL classification: C8, C22, Q10

1 Introduction

Agricultural production has its own specific position among other sectors of economics in the Czech Republic. It only accounts for 2.7 % of the total employment (data from 2014), however, farmers cultivate about 60 % of Czech territory (CZSO). Agriculture has therefore a very significant and irreplaceable landscape function. Alvarez-Cuadrado and Poschke (2011) present agriculture as a multi-functional industry having great importance for society as a whole with overlaps into other industries. As given by Bečvářová, Vinohradský and Zdráhal (2010), materialization of the reform of national economy at the beginning of the Nineties brought about significant changes in the conditions of future development of Czech economics and of the agrarian sector within it as well. Changes were connected with the overall State´s approach to State´s economic policy formation and positions delimitation of separate industries within Czech economics on the one side and with defining of forms and effects of State intervention on the other side (Svatoš, 2008).

Macroeconomic approaches to industry structure formation within national economy during the economic reform and the start of liberalization processes during this period brought about

a significant decline of support of agricultural undertaking (Rosochatecká, Tomšík, Žídková, 2008). Removal of foreign trade barriers concerning farm and food commodities, at time of the chances opening for a partial solution of farm commodities overproduction problems in some EU Countries and also some Countries overseas, affected Czech agriculture negatively. Limitations of production volume came up as well as the decline of intensity of natural resources exploitation and changes in farm production structure. During the period of preparations for CR accession to EU an outstanding impulse came up for Czech agriculture. Czech EU membership brought about direct competition between unified market on the one side and subsidies with unequal conditions for the old and new EU Member Countries on the other side (Bašek et al., 2010). Accession of Czech Republic to the EU had quite a fundamental importance. After abolition of customs barriers and creation of common European market an increase of imports and exports of separate farm commodities came up. Foreign trade speed accelerated (Svatoš, 2008). Level of self-sufficiency, especially as it concerns commodities not regulated to a degree by agricultural policy measures, can be largely connected with summary rentability level of these and with competitiveness of the downstream processing industries. As Gebeltová (2012) is giving it, self-sufficiency level belongs among the principal indicators referring to a given country´s competitiveness and it shows at what percentage level the country can cover own population´s consumption from own resources. According to Jeníček (1984), the self-sufficiency level can be defined as balanced payments relationship of a national economy in the outer economic relations, or as the balance between national resources and domestic consumption. Reaching self-sufficiency in basic foodstuffs of a given climatic zone is affected by both internal and external conditions of the country. Stress on own foodstuffs production is modified mostly by strategic intentions and the country´s need for independence (Novotná, Volek, 2015).

As for the objective of the paper based on outcomes of special statistical research, an analysis has been performed of time series data of the basic economic indicators in order to find and offer appropriate instruments for decision making in the area of agricultural efficiency and food self-sufficiency. The MAPE (Mean Absolute Percent Error) criterion is presented as the principal instrument, for distinguishing the most appropriate time series model.

2 Materials and Methods

2.1 Data source

Statistical analysis here is mostly based on the resources of Czech Statistical Office and Ministry of Agriculture of Czech Republic. The data used have been obtained based on the new ESA 2010 method (CZSO). Other data sources for the analysis have been the National Accounts and other official statistics of agriculture (Ministry of Agriculture). The long-term time series are not limited explicitly. Selected methods of time series analysis have been applied in the analysis of development of the Czech agriculture natural indicators.

2.2 Analytical smoothing of time series

Real economic criteria should form the basis for decision making based on the appropriate trend function type. Finding the appropriate trend function type is then mostly dependent on the analysis of empirical data. 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)

$$MAPE = \frac{100}{n} \sum_{t=1}^{n} \frac{|y_t - y'_t|}{y_t} \quad (1)$$

y_t, y'_t . . . empirical and smoothed t. s. values.

The model with the lowest MAPE criterion values is generally preferred. It is important to realize, anyway, that none of such criteria is of a universal nature, rather they offer a partial information on the quality of the model studied (Hindls, Hronová and Novák, 2000).

Besides trend functions, the adaptive models, too, have been applied in the trend description. Models of this type quickly react on the structural changes occuring in time and they are very suit- able for prognosticating future course of the time series loaded by irregularities and breaks in the trend. For significance testing of the models and their parameters, the $\alpha = 0.05$ significance level has been chosen. Statistical computations have been performed in the STATISTICA software, version 12, environment.

2.2 Self-sufficiency balance

Balance self-sufficiency is explained as reaching zero level of the balance of trade payments. It is expressed as value equality in money terms:

$$Q + D = P + V, \quad (2)$$

where Q - value of production output volume; D - value of imports volume; P - value of consumption volume; V - value of exports volume. (Jeníček, 1984)

In order to establish the balance level of the agrifood products foreign exchange it holds that, the degree of balance self-sufficiency is given as the relation of the domestic production volume value to the domestic consumption volume value:

$$S = (Q / P)*100 \quad (3)$$

3 Results and Discussion

The development analysis of selected natural indicators of the domestic primary farming sector has been taken as the presumption of balance self-sufficiency analysis in the selected main agricultural commodities. Partial outcomes only of the analyses performed, have been summarized and presented in the paper.

3.1 Sown areas of selected farm crops

Significant changes have appeared from the long-term viewpoint in the structure of farm crops cultivated. Species diversity has decreased and changed as well as the shares of crops on the areas sown. Cultivation of cereals (mainly rye and barley) has been receding and areas of industrial crops have expanded on the opposite. As Czech Statistical Office data give it, the farm crops areas sown have been diminishing in the long-term look. In 1920, almost 50 % of the current CR territory were sown, in 2016 it is by 20 % less, and the outstanding reduction started by the mid-Seventies. The area exploited diminished almost by a quarter, the decline concerned above all rye (– 87 %), then oats (–78 %) and barley (– 41 %). The adaptive model (MAPE = 2.147 %), applied in order to smooth the time series of cereals areas sown, is predicting a continued drop of areas for the following 10 years. (1,396.18 th. hectares in 2016; 1,334.78 th.hectares in 2025) (CZSO).

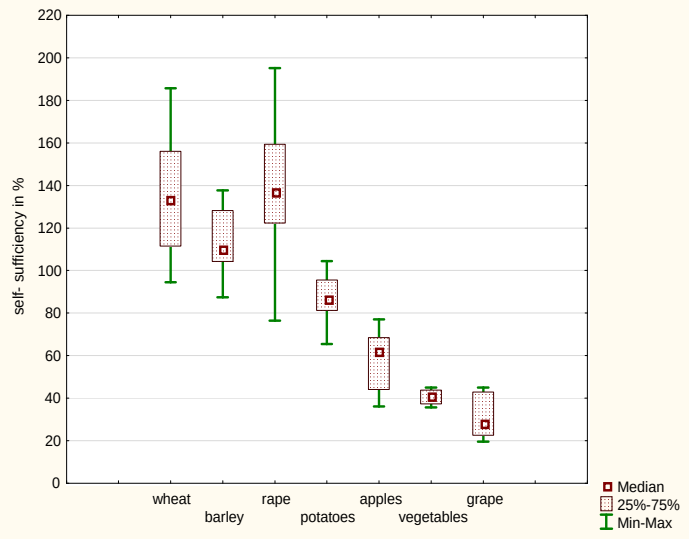
The areas sown by rape-seed, in opposite to the total area exploited for the farm crops cultivation without the permanent crops, have always increased significantly. While during the 1947-1989 years the area of rape rose by 1.6 th. hectares yearly at the average, then after 1989 its areas rose by 11.5 th. hectares yearly at the average. In 2015 every sixth hectare sown belonged to rape.

The area of potatoes has been decreasing over the whole second half of the past century and the trend did not stop with the arrival of the new millenium, either. In the Fifties potato growers grew potatoes on an area larger than 400 th. hectares. In the Sixties the area decreased almost to one half. In 1993 for the last time potatoes were grown on an area exceeding 100 th. hectares. During the years 2012-2015 the area of potatoes stabilized below 25 th. hectares. The adaptive model (MAPE = 7.719 %), applied for smoothing the time series of potato cultivation areas is predicting a continued drop of the areas for the next 10 years.

3.2 Production and consumption balance of selected crop commodities

Czech Republic has an expressly active balance in the cereals. On the other hand, almost 30% of potatoes consumed have been recently coming from imports (Fig. 1). The potato growers have been satisfying the domestic demand to an always lower extent, following the decreasing extent of cultivation areas. If over the 1999-2003 period the average annual deficit of potato foreign trade was 181.0 million CZK, over 2004-2008 317.8 million CZK already, and over 2009-2013 it was 463.7 million CZK.

Fig. 1. Self-sufficiency in the production of selected crop commodities in the CR (1997-2015) in %



Source: Ministry of Agriculture - Situation and outlook reports, own calculations, 2016

Self-sufficiency in fruits including berries decreased almost to 75 %. In fresh vegetables, where Czechs learned to eat these whole the year over, i.e. during the time, too, when they cannot be delivered from domestic sources, the self-sufficiency fell to less than 40 %. 70 to 80 percent of wine come from imports, too. Areas of Czech and Moravian vineyards cannot cover the growing demand of wine.

3.3 Livestock numbers

Livestock breeding in the Czech Republic over the 1991-2015 years recorded a significant drop of the numbers of animals. While in 1990, 3.51 million head of cattle were bred, in 2015 the number was at a level of 40 % only. The last two years brought about some strenghtening of the numbers and the total numbers of cattle rose by 54.3 thousand head during 2014 and 2015 (CZSO). The adaptive model (MAPE = 3.3885 %), applied for smoothing

of the total cattle number time series, has predicted stagnation of the numbers for the ten years following, namely at the level of 1.4 million head.

Reduction of the total numbers of pigs started during the first half of the Eighties already. The drop accelerated after 1990. Pig numbers fell from 4.79 million head in 1990 down to 1.56 million in 2015. The adaptive model (MAPE = 6.9095 %) applied for smoothing of the pig numbers time series has predicted a moderate decrease of pig numbers for the 10 years following, which should in 2025 break through the limit of 1 million head.

The long-term development of poultry numbers does not look optimistic, either. While during the Eighties the numbers exceeded 30 million, over the 2010-2015 period there have less than 25 million been registered annually.

3.4 Production and consumption balance of selected animal production commodities

Following the longdated reduction of cattle and pig numbers the production of these animals fell. While in 1989 525 th. tons of cattle live weight and 763 th. tons of pig live weight were produced in this country, in 2014 the total weight of animals slaughtered reached 170 th. tons only (decline to 32.35 %) in cattle, or 305 th. tons (decline to 39.97 %) in pigs. The total numbers of poultry between the record year 1984 and the 2015 year fell by 34.2 %. The numbers of hens only dropped by more than three fifths during this period. The year 2015 experienced a moderate recovery (CZSO).

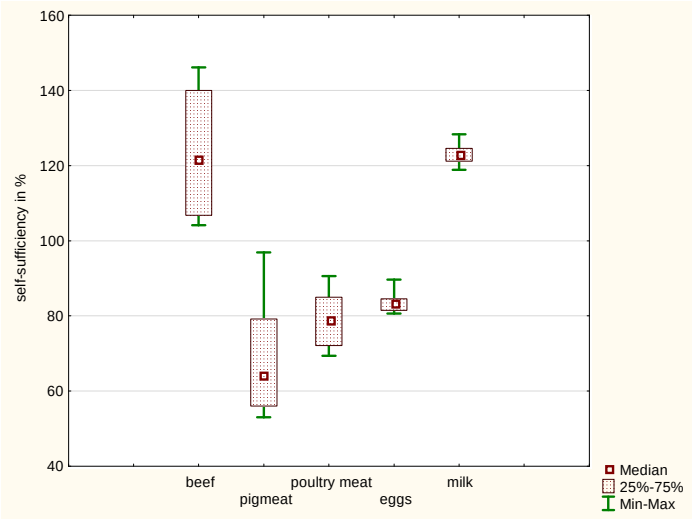
The decline of milk production in the Nineties was closely related to the fast decreasing numbers of cows and the low milk yield. If in 1989 still 4.89 bill. liters of milk were produced in CR, in 1997 the home milk production reached 2.70 bill. liters only. The years following record a stagnating production, but the 2011-2015 period brings a moderate recovery, too, thanks to the higher farmer prices. Most milk has been produced in 2015 in the Czech Republic over the last 19 years (2.95 billion liters).

Poultry production was increasing up to 2008. While in 2008, 329 th. tons of poultry live weight were produced in Czech, in 2014 247 th. tons only were delivered to the downstream processing. During 6 years only, the poultry production fell by one quarter. In 2015 then a moderate increase of production followed (+2.02 %). Production of eggs declined since 1985 following reduction of the hen numbers. In 1984 egg laying reached the historically highest 3.70 bill. eggs, but until 2015 it fell to 2.17 billion (decline by 41.4 %).

Concerning the major animal commodities, CR was self-sufficient during the years 2001-2003 in milk and beef only. At the average of 2004-2009 the level of self-sufficiency in these commodities, as compared with the 2001-2003 pre-accession period, declined by 8.4 p.p. in milk, and a moderate improvement by 0.5 p.p. happened in beef. While the purchase of milk moderately declined at the average of the 2004-2009 years compared with the preaccession period following introduction of the quota system, the domestic consumption rose. The self-sufficiency level always remains at a high level, anyway (almost 130 %). In beef, value of this indicator fluctuates rather high above the 100 % level, and beef is the only case in meat. Most expressive is the decline of the self-sufficiency level in pork, since 2004 till 2015 the annual self-sufficiency decline has been recorded at 5.3 %.

In poultry meat, too, a decline of self-sufficiency level happened, in spite of the growth of production and the parallel growth of consumption. The share of poultry meat imports in the domestic consumption rose from 9.6 % (2001-2003 average) up to 26.8 % (2004-2009 average) and it now stands at about 28 %. The Fig. 2 sums up self-sufficiency in the production of selected animal commodities.

Fig. 2. Self-sufficiency in the production of major animal commodities in the Czech Republic (2005-2015)



Source: Ministry of Agriculture - Situation and outlook reports, own calculations, 2016

4 Conclusion

Czech farmers face tough competition both on the domestic and foreign markets and in order to attain self-sufficiency it is very important to maintain a strong standing and competitiveness. The outcomes of analyses performed fall in with the conclusions of Doucha (2008) and Baška (2010) studies. The level of self-sufficiency, especially in the commodities not regulated by agricultural policy measures, can be connected to a rather high degree with the level reached of their summary profitability and with the competitiveness of downstream processing industries. The level of self-sufficiency in the cereals increased significantly. Concerning livestock products, as seen from long-term viewpoint the level of self-sufficiency has declined, except beef and milk.

Improvement of the domestic foodstuffs consumption balance is being expected due to purchasing patriotism of the Czechs. On the contrary, self-sufficiency in Czech fruits and vegetables is declining expressly. As also Bašek (2010) is giving it, the falling shares of home-processed products on the domestic consumption and exports are signalling losses of competitive positions of some of principal branches of the processing industry.

In comparison with the other EU Member Countries, the position of Czech Republic can be seen within the first half of an imaginary ladder from the self-sufficiency viewpoint in the production of principal farm commodities. The conclusions given above fall in with the conclusions by Svatoš (2008) and Horská (2011). Any further reduction of production capacities is undesirable for Czech farming. Structural disbalance and its negative consequences for the landscape are presenting a threat to the long-term competitiveness of Czech agriculture.

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Trends in Farmers' Share of Consumer Expenditure for Food

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Abstract: The developments of marketing and processing margins continually arouse public interest. The farmers' share as a percentage of the money spent on food, calculated together with other margins, provides a useful starting point in the analysis of the price formation process of food as well as the position of agriculture in the value chain. This contribution aims to examine the development of the farmers' shares in the price of food for human consumption in Austria and Switzerland over the period from 1995 to 2013. Austria uses the Swiss method for calculation. In the long-term, the farmers' share in consumer expenditure for food is declining for example with increases in the division of labour, increased demand for additional goods and services and more specific consumer preferences. Accordingly the development of farmers' shares in Austria and Switzerland for the period of 1995 to 2013 displays a continuous growth in the marketing margins. For the most part, this growth has been progressive. In Austria, the farmers' share declined continuously from 29.5% in the year 1995 to 22.2% in the year 2013 whereas in Switzerland the farmers' share dropped from 36.3% to 32.1%. When interpreting the results, one has to bear in mind that the calculations show developments and not their causes. The results give insight into the formation of marketing margins, the farmers' share and their development over time and thus contribute to more objectivity in discussing the agricultural and food price formation process. However, as calculations are based on estimates, additional information is needed to draw conclusions about the efficiency and performance of markets in the price building process.

Key words: farmers' share, farm-retail price spread, food consumption, marketing margin

JEL classification: D24, D40, D49, E20, Q13

1 Introduction

Farms and their upstream and downstream economies are directly or indirectly aligned with the supply of consumers with products ready for consumption. To a large extent goods are made ready for consumption by the cooperation of numerous actors in the value chain (Deloitte Touche Tohmatsu Limited, 2013). Thus consumer expenditure covers two components: remuneration for (i) agricultural commodities at the farm gate (farmers' share) and (ii) the processing, trading and marketing of products from the farmer to the consumer as well as duties and taxes (marketing margin) (cf. Elitzak, 1997; Sinabell, 2010). The concepts of marketing margin and farmers' share, or farm-to-retail price spread, were developed to measure the difference between consumer expenditure for food and an associated farm value (Orgen, 1956). This sector-based (sometimes referred to as global) approach compares the expenditure for food in total to the value of the agricultural commodities contained within it.

Calculating the farmers' share in consumer expenditure on food – at global or product level – has been examined on many occasions, often in response to concern at times of sharp fluctuations in the farm or retail prices. There is evidence that the gap between the consumer expenditure and an associated farm value has been widening. This has been widely documented in various empirical studies both at the global level (Giuliani, 2015; Sinabell, 2010; USDA, 2015; Wendt and Peter, 2014; Wohlgenant, 2001) as well as at the product level (El Benni and Hediger, 2014; Niemi and Jansik, 2005; Reed et al, 2002).

This contribution aims to show how farmers' share and marketing margin have changed over time. Detailed multilateral comparisons and rigorous econometric or statistical analyses fall

beyond the scope of this contribution. The first part of the contribution concentrates on the development of the farmers' share for selected countries, namely Austria and Switzerland (period 1995 to 2013). This time series for Austria was chosen because the Economic Accounts for Agriculture data is available for this period and conforms to a uniform methodology. Austria uses the Swiss method (Giuliani, 2015) for calculation. The second part compares the Austrian and Swiss results with those of Germany (Wendt and Peter, 2014), the United States (Elitzak, 2016; USDA, 2015) as well as with the calculations published by Austrian Institute of Economic Research (Sinabell, 2016). To illustrate the trend, data series, if available, from 1971 onwards were also considered. The contribution concludes with an interpretation of the results with a view to future work in mapping policy and research directions.

2 Materials and Methods

The calculations of the farmers' share for Austria are based on the Swiss method (Giuliani, 2015). According to Giuliani (2015) the total expenditure for food is compared to the value of the agricultural commodities contained within it. This method only considers food within a narrow definition, i.e. no beverages or commodities for beverages, tobacco and tobacco products, animal feed, inedible commodities and services. The following components are considered: (i) annual domestic expenditure made by end consumers for food (household monetary consumption expenditure, expenditure on eating out) taken from national accounts (Statistics Austria, 2016a and 2016b), (ii) annual production value of domestic agricultural commodities for food production from Economic Accounts for Agriculture (Statistics Austria, 2016c) and (iii) annual imports and exports of food commodities and products from the foreign trade database (Statistics Austria, 2016d). Fig. 1 shows the schematic of the calculation. The difference between the consumers' total expenditure and the total production value of foodstuff (i.e. farmers' share) calculated for the domestic market gives the marketing margin. The difference is the value that is added to the commodities between the farm and the consumer. It is important to mention that agriculture comprises the production of raw materials, whether or not the raw materials are produced inside the country or abroad. Agricultural subsidies as well as the value added tax are not considered in the calculation. The development of the margin and the farmers' share can also be illustrated as an index.

Fig. 1. Schematic illustration of the calculation method

Farm gate		
	Production value of domestic agricultural commodities in mn € (1)	
–	Production value of agricultural goods not relevant for human nutrition in mn € (1a)	
–	Adjusted export value of exported food in mn € (1b)	
=	Domestic production value of foodstuff for domestic market in mn € (2) = (1) – (1a) – (1b)	
+	Adjusted import value of imported food in mn € (2a)	
=	Total production value of foodstuff in mn € (i.e. farmers' share in absolute terms) (3)= (2) + (2a)	100 – (7) = Farmers' share in % (8)
Consumers' side		
	Household monetary consumption expenditure (excluding tax) in mn € (4)	
+	Expenditure for eating out in mn € (4a)	
=	Domestic consumers' total expenditure in mn € (5) = (4) – (4a)	
=	(5) – (3) = Marketing margin in mn € (6)	(6) / (5) * 100 = Marketing margin in % (7)

Source: own elaboration

The statistic 'farmers' share of food expenditure' gives information on the composition of the consumer price and the development of the market structure of food. The statistic does

not evaluate. When interpreting the results, one has to bear in mind that the calculations show developments and not their causes. They illustrate the value added to agricultural commodities on the way from the farm gate to the consumer. Essentially, it is not possible to make meaningful statements as to whether the farmers' share is too big or too small, economically justified or adequate. But it is an interesting instrument to show the changes in the structure of the food market of a country. It tells us something about the impact on the farmers' share of the sharp fluctuations in farm-gate and retail prices and the position of agriculture in the value chain. This calculation gives no details on the individual cost categories or the shares at the different stages in the value chain beyond the farm gate (Giuliani, 2015). It is a global approach focusing on agriculture and where the rest of the money goes. Furthermore, it can be seen as useful and essential information for economic policy and applied economic research.

Principally, the calculations merely highlight developments over time. This notwithstanding, they call for continuous updating and a possible expansion of the time series. For in-depth knowledge further analysis is required. In concrete terms, an analysis of the results must consider the respective frame conditions, i.e. (i) the support from the government, (ii) the (average) degree of processing of the products, (iii) the consumers' habits and needs as well as (iv) the diversification of the range of products and so on.

3 Results and Discussion

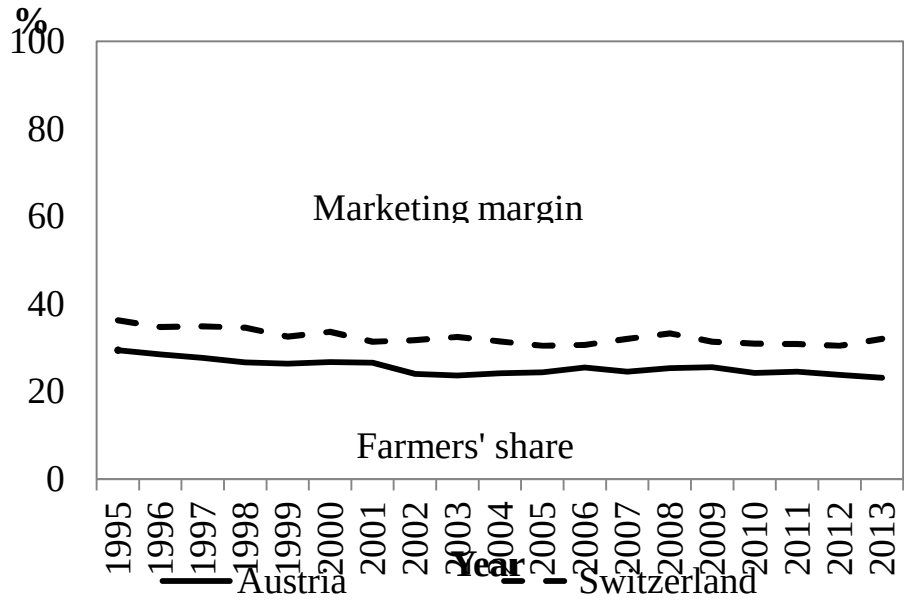
This section illustrates on the one hand the development of the farmers' share and the marketing margin for Austria and Switzerland over the period 1995 to 2013. On the other hand the developments are compared with further data in Austria, Germany and the United States.

3.1 Development in Austria and Switzerland

The development of the marketing margin and the farmers' share is shown in Fig. 2. The increasing division of labour in food supply becomes visible. The additional goods and services provided in terms of processing, packaging, distribution, advertising, product innovation etc. have led to a significant expansion of the marketing margin.

The farmers' shares in Austria and Switzerland for the period 1995 to 2013 reveal a continuous growth of the marketing margins. For the most part, this growth was progressive. In Austria the farmers' share declined continuously from 29.5% in the year 1995 to 22.2% in the year 2013 whereas in Switzerland the farmers' share dropped from 36.3% to 32.1%. The different margin levels between Austria and Switzerland can be attributed to the fact that the market and agri-political framework conditions are different (BLW, 2015; BMLFUW, 2015). The current trend shows that with increased prosperity the farmers' share declines and the marketing margin becomes larger. For reference, the results from Austrian Institute of Economic Research show that farmers' shares for Austria exhibited a clear negative trend up to the year 1996 (1971: 41.7% and 1996: 24.8%), recovered thereafter and levelled off. They have been subject to strong annual fluctuations (2001: 27%, 2005: 23.4%; 2013: 27.1%).

Fig. 2. Long-term development of the farmers' share and marketing margin in Austria and Switzerland (in percent from 1995 to 2013)



Source: Austria own calculation, Switzerland (Giuliani, 2015)

This phenomenon is confirmed by international and national evidence (USDA, 2015; Wendt and Peter, 2014) – for details see Fig. 3. The causes are well known (Department for the Environment and Rural Affairs, 2004; McCorriston, 2015). The two main reasons are (i) changes in the requirements of the demand side; in particular the demand for value added is more elastic than the demand for agricultural commodities; and (ii) changes in the price structure; specifically the prices for marketing services have increased more rapidly than agricultural producer prices.

3.2 Comparison with other Calculations

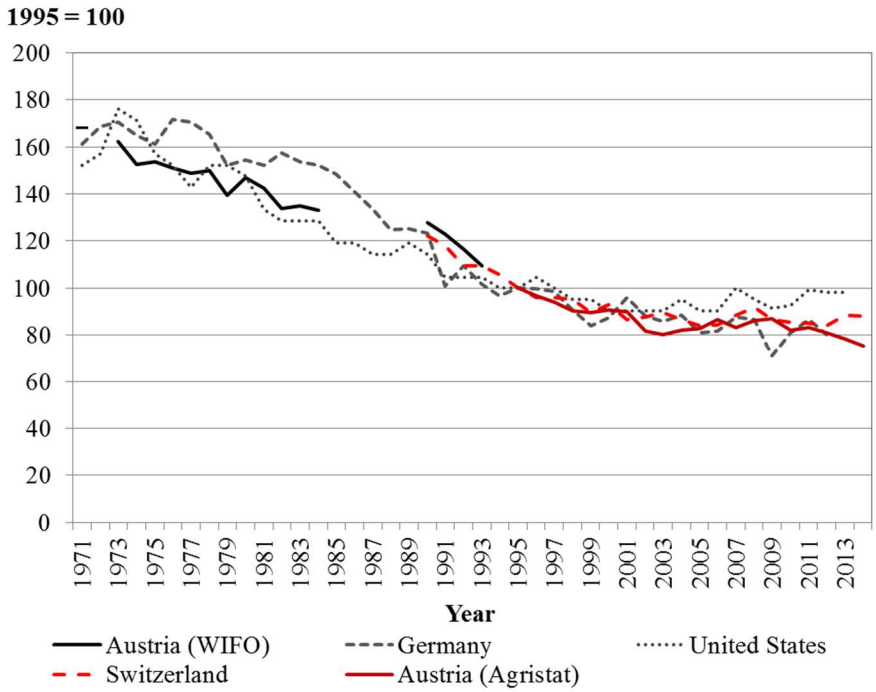
Both in Austria (Sinabell, 2016) and in Germany (Wendt and Peter, 2014) as well as in the United States (Elitzak, 2016; USDA, 2015) the margins in the food sector have been analysed for decades. One can maintain that the countries mentioned have similar levels of prosperity and consumption patterns as well as structure and development of consumer expenditure for food. A comparison of these countries provides a basis for the interpretation of the development of Austrian and Swiss marketing margins. It is quite clear that the trends are quite similar – as shown in Fig. 3. Leaving aside the annual fluctuations, the farmers' shares show a negative trend in the long-term. Nevertheless there seems to be a certain degree of levelling off in this trend.

Each of the measurements applied relates to gross returns, not net returns. Even if the method, the levels of margins and their development are different, the changes in the margin are likely to be comparable. The comparison with the German, the United States and other results with those for Austria and Switzerland is subject to the following considerations:

- The Austrian and Swiss results consider consumer spending for food as including eating out. The German and United States calculations do not consider eating out. Since, in the case of eating out, the marketing margin is particularly high and the farmers' share is correspondingly low, its inclusion would lead to a reduction of the German and United States farmers' shares.
- Germany and the United States have chosen a product-based approach to determine the marketing margin. The marketing margin is calculated for important agrarian products such as cereals, meat and meat products, milk and milk products, eggs, etc. The global margin

is the weighted sum of the product margins. In this respect the calculation can only take into account the main use of each product. For example, due to missing data, the German method assumes that all eggs end up with the consumer in their basic state. Thus the use of eggs in the production of pasta products or mayonnaise is not taken into account. Since they record consumer expenditure for food at the customer level, the methods applied in Austria and Switzerland include all uses of agricultural commodities.

Fig.3. Development of the farmers' share in Austria, Switzerland, Germany and United States (Index basis 1995 = 100 from 1971 to 2013)



Source: Elitzak, 2016; Giuliani, 2015; Sinabell, 2016; USDA, 2015; Wendt and Peter, 2014

There is no common standardised procedure for the calculation of the farmers' share. In-depth comparisons between these countries are hardly possible due mainly to the differences in the statistical data and the methods applied to obtain the results.

Practically speaking, however, we have a measuring instrument that shows us the trend in farmers' share compared to the marketing margin for agricultural commodities for nutrition. Given this calculation instrument and methodology it would seem logical that further work be done to harmonise and expand these approaches on a global scale. This would potentially enable the provision of precise information on the relationships between food production per se (farmers' share) and value of the additional services included in the marketing margin. This is one calculation – a base calculation – which requires further research to make it a holistic monitoring tool. Combining it with other instruments will potentially provide a viable tool for political decision making when considering a fair distribution of global resources and wealth. Furthermore, it would enable policy makers and people to gain a fresh perspective on the importance of agriculture in the food chain.

4 Conclusion

This contribution is about the global margin calculation. The concepts of farmers' share and marketing margin show the difference between consumer expenditure for food and an associated farm value. The advantage of this calculation is that all relevant uses of agricultural commodities for human nutrition are considered and detailed data is available.

In any case no insight is gained into the margin circumstances of single products and product groups or in the cost structure at each stage of the value chain.

According to the results represented, the farmers' share of monetary unit spent in Austria on food has dropped in the period from 1995 to 2013 from 29.5% to 22.2%. This development is similar in Switzerland, namely from 36.3% to 32.1%. The same phenomena have been confirmed internationally, e.g. Germany, United States. The calculations are about developments and currently do not shed light on causes.

The results show interesting findings. Since the nature and cause of these changes are not easy to identify, there is clearly room for additional empirical analysis. Further important fields of research include: (i) relevant information for the political discussion – such as the development of various cost elements or the profits of the different actors – is not available in the necessary break-down, (ii) the market drivers, and hence the economic well-being of producers operating in today's marketplace, need thorough investigation, (iii) understanding the price formation mechanisms requires a careful analysis of the available empirical evidence, (iv) information is required on the factors influencing the development of marketing margins in the food sector by comparing data – especially at the product level – from Austria with other countries (e.g. Germany and the United States), (v) there is a need to analyse the vertical price alterations from farm to retail level to test whether there is empirical evidence of the use of market power in the food chain. These steps together, when properly coordinated could contribute to a holistic monitoring tool on trends, customs and drivers within the value chain based on agricultural produce.

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Preference and recognition of the regional food brand "Genuss Region" in Lower Austria

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Abstract: This paper presents an overview of partial results of the research from Lower Austria region that was conducted in the period of 2014 and 2015 in Lower Austria region, Austria. This paper presents partial results of the research on the recognition and preference of the regional food product´s brand Genuss Region in this region. The brand Genuss Region is the main regional agricultural and food product brand in Austria. The questionnaire survey was conducted at the end of the year 2014 and beginning of the year 2015 on the sample of 450 respondents from this region. Pearson's chi-squared test is used to test independence between the recognition of the regional brand Genuss Region and demographic factors, such as age of the respondents, gender of the respondents, level of education of the respondents and monthly income of families of the respondents. The results show, that respondents in Lower Austria region mostly prefer Austrian food products, more than half of them recognize the brand Genuss Region and buy products labeled by this brand (64, 9%). The most important target group for coordinator of the brand are woman, middle aged and older consumers and consumers with the lowest and middle net family income. Lower Austria is an example of working regional labeling systems; the importance is particularly for geographically isolates areas, which are based on agricultural production systems such as the Genuss Region so they can bring improvements for the regions also in the field economy. Regional food brands seem like a good opportunity for small and medium sized local or regional producers who produce high quality food products, but their weaknesses (for example due to a lack of knowledge and high costs) is the communication of such information to the potential group of customers.

Key words: marketing, consumer behaviour, food labeling, brand, region, Lower Austria

JEL classification: Q13, M31

1 Introduction

The formation of the first food labeling systems, focused on regional food labeling only, is in Austria dates back to 1998, when it was in Lower Austria introduced a brand of regional food producers - Gutes vom Bauernhof. Its aim was and still is to make small and middle-sized food producers more visible and more easily identifiable by consumers. Kögl and Tietze (2010), among others, state that, market saturation from 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 and Mettepenningen (2011) say, that the goal of the regional branding is creating typical image for the region and to improve the competitive ability. McEntee (2003) states that, the regional branding of food is the result of consumer pressure with regards to food quality and the need to create an alternative for those who prefer to purchase local products to global ones.

The regional branding of food is mainly focused on the development of rural areas with natural and cultural diversity (Tregear et al., 2007). Through regional branding regions want stand out from the crowd (Van Ham, 2008). As Hollis (2008) points out, the regional branding of food can be based on several pillars e.g. local culture, traditions and habits, nostalgia, but on the basis

of logistical advantages, etc., too. La Trobe (2001) sees advantages for consumers in terms of freshness by sidelining intermediaries in the supply chain, as well as in the quality of food production for reasonable prices. He also suggests that regional food branding can be particularly significant for distant regions which depend on agricultural production; these systems bring economic benefits to them. Regional food brands therefore provide suitable opportunities for small and medium-sized local or regional producers; they produce high quality food products but lack the appropriate communication instruments (e.g. because of lack of knowledge or high costs) with which to inform customers accordingly. Research by Kalábová and Turčínková (2012), and Horská, Ürgeiová and Prokeinová (2011), proves the significance of branding for consumers.

The development of regional brands is also closely connected to the development of a local identity (GoDu, 2015). Messely et al. (2015), state that the implementation of regional branding increases a region's attractiveness for local inhabitants in all areas of their active lives – work and family life, as well as leisure time. An important factor that also influences the success of regional brand systems is local knowledge of the local brands.

This paper presents partial results of the research from Lower Austria region. This article is focused on the recognition of the regional food product´s brand Genuss Region (the main regional agricultural and food product brand in Austria) in this region (Lower Austria).

Genuss Region Österreich

The brand Genuss Region is a registered trademark of Agrarmarkt Austria Marketing GmbH and Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft. In the analyzed Region of Lower Austria is the regional modification - Genuss Region Niederösterreich (logotype see Fig. 1).

Fig. 1: Genuss Region Niederösterreich

Source: Energie und Umweltagentur Niederösterreich, 2016

The task of brand Genuss Region is to highlight regional agricultural and food products. The emphasis is on providing information to tourists and consumers about specific culinary offerings in each region. Genuss Region is the main pillar for roofing typical regional food products throughout Lower Austria. The purpose is to strengthen the functioning of the brand coherence between the various regions and the merging of individual products into a single brand with an emphasis on the quality of these products.

2 Materials and Methods

This paper presents the partial results of research into the impact of socio-demographic factors on the brand recognition of brand Genuss Region in Lower Austria. At the turn of 2014 and 2015, primary research was undertaken among consumers aged 18-65 years in all the main provincial towns in Lower Austria – Krems an der Donau, Mistelbach an der Zaya, Sankt Pölten, Weidhofen an der Ybbs a Wiener Neustadt. Respondents were selected on the basis of quotas for specific

socio-demographic characteristics (sex, age and net monthly family income). The responses of 450 participants who took part in the survey were selected for further analysis.

The data were analyzed using the Pearson's Chi-square test of independence to test the null hypothesis. The null hypothesis was determined as follows: "Recognition of the regional brand Genuss Region does not depend on the chosen socio-demographic factor". The authors work in research with recognition of the brand, because regional brands aren´t specific product brand. This approach is also applied by other brand researchers - e.g. Kögl and Tietze (2010) or Skořepa and Dušek (2010). This paper presents the results of the Pearson's Chi-square test of independence on the following hypotheses:

H1: Recognition of the regional brand Genuss Region does not depend on the respondent´s gender.
H2: Recognition of the regional brand Genuss Region does not depend on the respondent´s age.
H3: Recognition of the regional brand Genuss Region does not depend on the respondent´s net family monthly income.

3 Results and Discussion

The results of the research show that consumers in the Lower Austria region do recognize the brand Genuss Region. Of the 450 respondents, 292 (64,9 % of the investigated sample) answered positively to the question whether they were familiar with the brand.

Table 1. Recognition of the brand Genuss Region according to respondent´s gender

Recognition of brand Genuss Region	Answer "Yes" (%)	Answer "No" (%)	Total (%)
Man	130 (61,9)	80 (38,1)	210 (46,67)
Woman	162 (67,5)	78 (32,5)	240 (53,33)
Total	292 (64,9)	158 (35,1)	450
	Chi-square	df	P-value
Pearson Chi-square	1,54	df=1	p=0,21

Source: authors

Table 1 shows that Recognition of the regional brand Genuss Region statistically does not depend on the respondent´s gender (the H1 hypothesis of independence was not rejected at a level of independence of 5%), but as the results published in Table 1 show that women (67,50%) in the region know the brand Genuss Region better than men (61,90%).

Table 2. Recognition of the brand Genuss Region depends on the respondent´s age

Recognition of brand Genuss Region	Answer "Yes" (%)	Answer "No" (%)	Total (%)
Respondents in age 18 - 35 years	92 (61,33)	58 (38,67)	150 (33,33)
Respondents in age 36 – 50 years	99 (66,00)	51 (34,00)	150 (33,33)
Respondents in age 51 - 65 years	101 (67,33)	49 (32,67)	150 (33,33´)
Total	292 (64,9)	158 (35,1)	450
	Chi-square	df	P-value
Pearson Chi-square	1,31	df=2	p=0,52

Source: authors

The results of the research presented in Table 2 show that the brand recognition of Genuss Region is the highest (67.33%) among the oldest consumers (age category 51-60 years). The brand is only slightly less well-known by those respondents in the age category 36-50 years (66.00 %).

The respondents with the lowest level of brand recognition (61.33%) were the youngest consumers (age category 18-35 years). The H2 hypothesis was not rejected at a level of significance of 5% - H2 hypothesis "Recognition of the regional brand Genuss Region does not depend on the respondent´s age" was confirmed.

Table 3. Recognition of the brand Genuss Region depends on the respondent´s net family monthly income

Recognition of brand Genuss Region	Answer "Yes" (%)	Answer "No" (%)	Total (%)
Income up to EUR 2.000 incl.	116 (63,39)	67 (36,61)	183 (40,67)
Income EUR 2.001 – 4.000	144 (68,25)	67 (31,75)	211 (46,89)
Income EUR 4.001 and above	32 (57,14)	24 (42,86)	56 (12,44)
Total	292 (64,9)	158 (35,1)	450
	Chi-square	df	P-value
Pearson Chi-square	2,7	df=2	p=0,26

Source: authors

The results presented in Table 3 show that brand recognition is the highest among those respondents with a net monthly income of EUR 2.001 – 4.000 (68.25 %)- that is 49,32 % of all respondents who know this brand. The brand is only slightly less well-known by those respondents with a net monthly income of up to EUR 2.000 (39,73 % of respondents who know this brand). The poorest level of brand recognition was in the group of respondents with a net monthly income of over to EUR 4.001 (57,14 % respondents of this level of net monthly income) - that is 10,96 % of all respondents who know this brand. As the results in Table 3 show - recognition of the regional brand Genuss Region statistically does not depend on the respondent's level of net monthly family income, but from presented results is clear that the brand recognition is the highest among the respondents with middle and lowest net monthly family income.

3.1 Discussion

The results of the research can be matched with the previous research conducted by Rojík, Chalupová and Prokop (2013), who studied the recognition of the brand Genuss Region in the same region (Lower Austria) among students of the local high schools. These results indicate that the young generation aged 18 to 26 years (66,6%) and this respondents aged 18-65 years (64,9%) reported the very similar knowledge. An interesting result was identified within the comparison of the Genuss Region brand awareness, with the closest Czech equivalent brand "Regionální potravina". This research was conducted simultaneously in the South Moravia Region and the Vysočina Region. The results show that Austrian respondents know their brand significantly more than the Czech ones. While the brand Genuss Region is known by the 64,9% of respondents, the "Regionální potravina" brand in the South Moravia Region is known only by 46,9% and in the Vysočina Region this brand is known by 53,8% of respondents. Next results are shown within the evaluated preference of products labeled with regional brands, when such products are purchased by more than half of the respondents from Lower Austria (63,3%), compared to less than a quarter of consumers in South Moravia (22,9%), thus these results confirm the conclusions of Živělová and Janský (2007), that south-moravian consumers show a little interest in buying such labeled food products. The research also complies with the conclusions of the research by Zámková and Prokop (2015), who reported that a growing monthly income of respondents means the declining knowledge of such food brands. Research shows that in terms of income for the coordinators of the brand the most interesting group is a middle-income group of consumers (2001-4000 euro). Research findings also show that these brands are more familiar to the women than men, which confirms the research Chalupová and Prokop (2016) or Factum Invenio (2008). The interesting fact is that very similar knowledge and preferences of the brand

were identified in all age categories of respondents, which is contrary to similar researches implemented in the Czech Republic, for example Zámková and Prokop (2015), Chalupová and Prokop (2016).

4 Conclusion

Lower Austria is an example of working regional branding systems; the importance is particularly for geographically isolates areas, which are based on agricultural production systems such as the Genuss Region. Regional food brands seem like a good opportunity for small and medium sized local or regional producers who produce high quality food products, but their weaknesses (for example due to a lack of knowledge and high costs) is the communication of such information to the potential group of customers. The results presented in the article show that respondents in Lower Austria know the main regional food brand - Genuss Region. This fact was mentioned by more than 60% of respondents. They also actually buy such labeled products. The brand Genuss Region is also in the minds of consumers across customer segments. Even though the most significant group of consumers of this brand is defined as mostly women and consumers with the middle-income (2.001 – 4.000 EUR) and middle and older group of age. Research in Lower Austria was aimed at identification of the differences in consumer behaviour in Lower Austria and in neighbouring South Moravia Region where such branded products are not preferred much by the consumers. The aim is also to identify new opportunities for coordinators of regional brands in the Czech Republic, which can lead to an increased effectiveness of the regional brands in the Czech Republic. The authors believe that an important role in the preference of these foods in Austria has a ground in the high degree of patriotism towards domestic food, which is already evident within youngest age group of respondents. These results in Lower Austria are influenced also by a strong support by the Lower Austria Provincial Government, through overarching regional initiative (brand) So schmeckt Niedeösterreich, which means the marketing support for products branded by regional brands and quality labels. So schmeckt Niederösterreich closely cooperates with certain educational institutions in the region and supports local restaurants and agricultural and food products. That lack of support, from the region initiatives in the Czech Republic, is according to authors, one of the possible reasons for the low popularity of such branded foods in the country. In further research, therefore, the authors wanted to focus primarily on the research of regional labelling of agricultural and food manufacturers and research between coordinators of regional brands and regional municipalities, the importance is particularly for geographically isolates areas in the Czech Republic and Austria, considering the possibility of introducing an overarching regional brand that would be promoting products labelled as regional brands and/or quality labels. This topic is according to authors currently very prospective, particularly with regards to growing consumer preferences and demand for alternative food products.

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The Mainspring of World Food production

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Abstract: This article draws on world agriculture and rural development for the last 54 years (1960-2014) to assess their influence on the featured indicators. The research methods will be applied with (1) estimation of 22 countries output indicators for agriculture and rural development using the World Bank Open Data for 248 countries (2) based on the featured indicators, the efficiency of path analyses output model will be calculated. The indicators will be used in a Structural Equation Modeling (SEM) approach to determine the adjustment on model of world food production and rural development. In order to produce coherent results, all indicators (the country specific cases by factor analyses and principal component in (1) as well as the SEM in (2). The methodology showed a fit model that changes in demand conditions and factor conditions, which both of them can explain a better positive contribution to the production possibilities in almost all countries and biased change were estimated. This paper concludes there are seven important featured indicators into a fit model on world food production by SEM which are more highlighted they may planning for a competitiveness strategic management as key factor of model development throughout by governments and sectors, but they also show there are not demand condition into this model to predict featured permanent cropland (% of land area) as well from features value added (% of GDP) in agriculture as key factor to competitiveness management for the world food production.

Key words: Commodity agreements, Food security, Agricultural policy, Policy making, Resource allocation.

JEL classification: C38, P25, Q10, R11

1 Introduction

Nations throughout the world are under lack of featured indicators estimations which may reduced resources due to inefficient input use in the world food production pressure to do more with less (Charvat, Gnip and Mayer, 2009) Although not all states have the same level of liability for providing services, most of them face a rapidly growing demand for agriculture support as a result of the continuing fast expansion of population (Smutka, Steininger and Miffek, 2009).

Notwithstanding strong evidence of considerable agriculture and rural development benefits from investment in competitiveness at farm level (Román *et al.*, 2006), uptake and implementation around the world livestock and agriculture production remains underprivileged (Pica-Ciamarra *et al.*, 2015). Governments still poor understanding aspects of food production's value, indicators and their influences to competitiveness (Charvat, Gnip and Mayer, 2009). Previous work has shown such rural development to be generally dismissive of agricultural actions and focused more on attribution for the development of demand conditions themselves (Porter, 1985, 2000). This has serious implications for food policy. Understanding which determinants influence countries behavior would assist policy makers to achieve behavioral change.

Although the scarcity decisions relate to development of agricultural competitiveness around the globe for more co-operation at a lower total cost will continue (Nallari *et al.*, 2011) this study aims to present ideas and develop tools which may help to identify the influence on global agriculture and rural development, which according to Lin; Nallari *et al.* (2011) they shall provide government and the instruments to increase the efficiency and cost-effectiveness of states aid and functions, as well as apply the innovation and competitiveness strategy approach to assess the impact on the world food production of some of these main behavioral determinants to the Commission on Growth and Development (2008), towards to the mainspring of world food production.

2 Materials and Methods

2.1 Data

The selection of the indicators has been derived from the whole 22 featured indicators used in Agriculture and Rural Development which are shown by the World Bank Open Data set (Table 1) (2016). At the same time, the selection was influenced by the availability of the selected data, which are especially on the 248 countries often incomplete from 1960 to 2014. Moreover, the sample selection of separated data was examined only if they were more continuously in the displayed indicator series (Hill and Lewicki, 2005) at least out of twenty two hundred forty eight nations (or a year, because a lot missing data) in just two hundred thirteen data. The situation of each indicator is described by the following set of nation. With the help of selected indicators, the displayed data years were discriminated and it was selected the year 2006 as the time for calculation on the agriculture and rural development study in this case.

2.2 Methods

The SEM was used to test the featured indicators analyses using IBM SPSS AMOS 23.0 (Arbuckle, 2015) software was used for data treatment. Analyses were conducted using the full information maximum likelihood estimation method, which estimates means and intercepts to handle missing data (Chernoff and Divinsky, 1953; Jöreskog and Lawley, 1968).

First a descriptive statistical analysis was made of the sample. Then SEM was applied (Ezekiel, 1938, 1942; Klein, 1943), which was world food production models where relationships between variables are causal. Such models allow latent variables to be incorporated or variables which were not observed in the analysis (Achrol and Kotler, 2012; Bagozzi, 1981), to the Confirmatory Factor Analysis and by plug-in whose is developed Lowry and Gaskin (2014) to the AMOS software. To verify whether the proposed model was adequate, various goodness of fit indicators were utilized (NFI), (RFI), (CFI) and (RMSEA), recommended by the authors consulted and used before in other studies of agro-food production (Storer *et al.*, 2014). To validate whether a variable is statistically significant, the goodness of individual fit for the utilized parameters must be known, so intercepts, covariance and variance based model were used. If one of the variables used does not turn out significant, this means that it exercises no effect at all on the model and therefore is eliminated from the model (Tan, 2001). Posing a structural equation model requires significant theoretical support to justify establishing relationships among variables, as well as the formation of theoretical and statistical constructs to the mainspring of world food production and rural development.

3 Results and Discussion

3.1 Measurement model

The measurement model of demand and factor conditions was constructed using seven indicators (WBG, 2016) reflecting two of demand and factor conditions: AG.PRD.FOOD.XD, AG.PRD.CROP.XD, AG.PRD.LVSK.XD, NV.AGR.TOTL.ZS, SL.AGR.EMPL.ZS, SP.RUR.TOTL.ZS and AG.LND.CROP.ZS (Table 1). Thus values of the normed fit index (NFI) and comparative fit index (CFI) >0.95 indicate adequate fit, and the root-mean-square error of approximation (RMSEA) should be <0.06 (Mulaik *et al.*, 1989).

Table 1. Consolidate data from featured indicator of agriculture and rural development at 2006

No.	Variable acronyms	Valid N (countries)	Mean	Variable names
1	AG.LND.IRIG.AG.ZS	62	10.55	Agricultural irrigated land (% of total agricultural land)
2	AG.LND.AGRI.ZS	240	38.14	Agricultural land (% of land area)
3	AG.LND.TRAC.ZS	50	405.87	Agricultural machinery, tractors per 100 sq. km of arable land
4	NV.AGR.TOTL.ZS	214	12.65	Agriculture, value added (% of GDP) *
5	EA.PRD.AGRI.KD	200	9,153.06	Agriculture value added per worker (constant 2005 US$)
6	AG.LND.ARBL.HA.PC	239	0.22	Arable land (hectares per person)
7	AG.LND.ARBL.ZS	239	13.67	Arable land (% of land area)
8	AG.YLD.CREL.KG	211	2,850.09	Cereal yield (kg per hectare)
9	AG.PRD.CROP.XD	231	100.89	Crop production index (2004-2006 = 100) *
10	SL.AGR.EMPL.ZS	134	16.97	Employment in agriculture (% of total employment) *
11	AG.CON.FERT.ZS	185	298.40	Fertilizer consumption (kilograms per hectare of arable land)
12	AG.PRD.FOOD.XD	233	101.93	Food production index (2004-2006 = 100) *
13	AG.LND.FRST.ZS	239	32.16	Forest area (% of land area)
14	SH.H2O.SAFE.RU.ZS	228	79.22	Improved water source, rural (% of rural population with access)
15	AG.LND.TOTL.K2	246	3,637,717.21	Land area (sq. km)
16	AG.LND.CREL.HA	213	21,994,579.11	Land under cereal production (hectares)
17	AG.PRD.LVSK.XD	232	102.25	Livestock production index (2004-2006 = 100) *
18	AG.LND.CROP.ZS	228	4.06	Permanent cropland (% of land area) *
19	SP.RUR.TOTL	245	94,396,840.11	Rural population
20	SP.RUR.TOTL.ZS	245	43.94	Rural population (% of total population) *
21	SI.POV.RUGP	15	22.17	Rural poverty gap at national poverty lines (%)
22	SI.POV.RUHC	30	46.41	Rural poverty headcount ratio at national poverty lines (% of rural population)

* Statistically significant

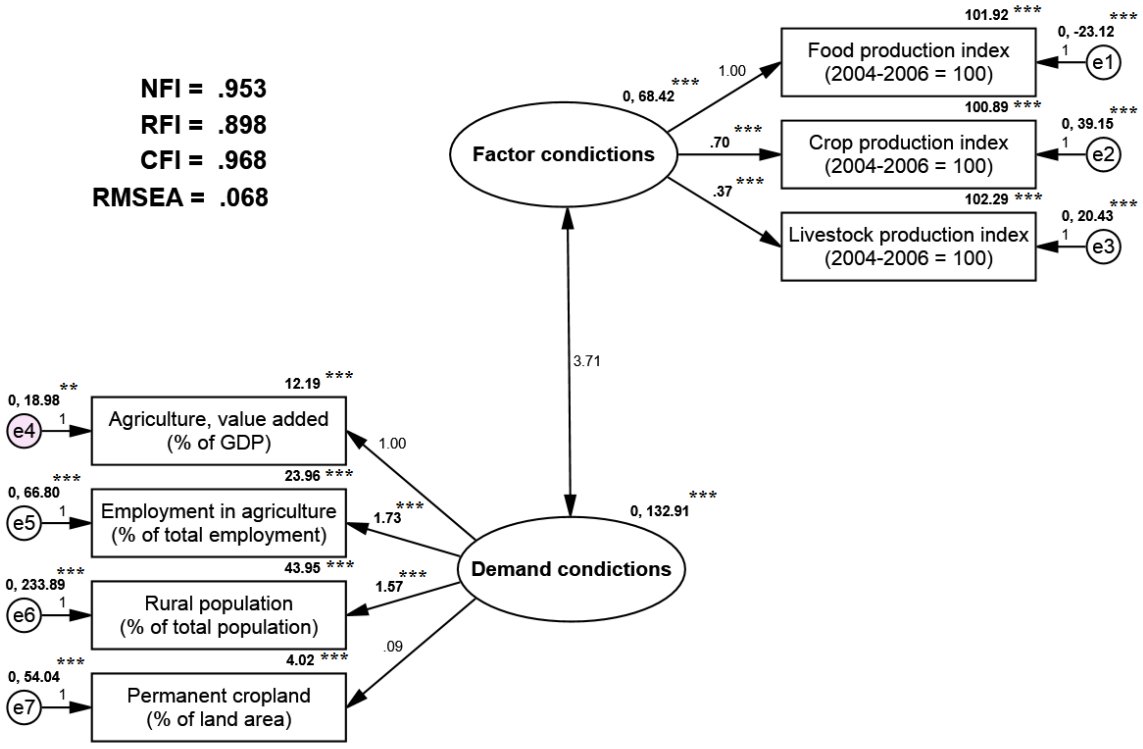
Resource: World Bank Group (2016)

In this case, the values index for the model, (NFI) 0.95, (CFI) 0.97, (RMSEA) 0.07 and (RFI) 0.90, there are fit indices indicated the measurement model as the results as study fit the data very well; Hu and Bentler; Storer *et al.* (1999; 2014) showed this cohesion model for strategic supply chain management indicators explain the power of this kind of models influencing business research (McQuitty, 2004) in the world food production between factor conditions and demand conditions is these type of studies Fig. 2.

Analyses were first conducted the regression weight in the equation for Factor Conditions in prediction of Crop production index (2004-2006 = 100) and Livestock production index (2004-2006 = 100) significantly (H = 0.705 and H = 0.369 P-Value = ***) different from zero at the 0.001 level (two tailed). The regression weight in the equation for Demand Conditions in prediction of Employment in agriculture (% of total employment) and Rural population (% of total population) is significantly (H = 1.568, H = 1.729 P-Value = ***) different from zero at the .001 level (two tailed). Nonetheless the regression weight in the equation for Demand conditions in prediction Permanent cropland (% of land area) is not significantly (H = .860 P-Value = .60) different from zero at the .05 level (two tailed) (Fig. 2). The intercept in the equation for predicting Food production index (2004-2006 = 100), Crop production index (2004-2006 = 100), Livestock production index (2004-2006 = 100), Agriculture, value added (% of GDP), Employment in agriculture (% of total employment), Rural population (% of total population) and Permanent cropland (% of land area) are significantly (H = 100.889, H = 102.288, H = 12.192, H = 23.962, H = 43.947, H = 4.019 P-Value = ***) different from zero at the .001 level (two

tailed) (Fig. 2). The covariance between factor conditions and demand conditions (H = 3.705 P-Value = .446) is not significantly different from zero at the .05 level (two tailed) follow-up assessments. The variance estimate for error four (e4) is significantly (H = 18.976 P-Value = **.003**) different from zero at the .01 level (two tailed). In other words, variance estimates for factor conditions, demand conditions, errors e1, e2, e3 and e5, e6, e7 are significantly (H = 132.909, H = -23.119, H = 39.154 and H = 66.797, H = 233.888, H = 54.043 P-Value = *******) different from zero at the .001 level (two tailed) (Fig. 2).

Fig. 2. Structural Model of World Food Production and Rural Development
-Featured indicator towards competitiveness structural equation modeling-



Source: World Bank Group (2016)

*** It is significantly different from zero at the 0.001 level (two-tailed).
** It is significantly different from zero at the 0.01 level (two-tailed).

3.2 Analysis of Results

The direction biased demand conditions were found to be important reason for variation in the rural populations and employment in agriculture. The results make clear that changes in external factors may explain a better significant positive contribution to the production possibilities around the world apart from agriculture, value added (% of GDP) which truly contributes to extend current re-thinking in the competitiveness strategic management, it is the key factor of model development as well to improve agriculture production from this variable. Thus agriculture have farm animals and harvest indicators to explain production which influences to competitiveness, Charvat, Gnip and Mayer (2009) found that is the level of agricultural knowledge management system in each country, even though Punjabi (2009) remark there are key factor like government, NGO's, development agencies and national development boards which can help these sectors. That is found remarkable to get effort from policy maker and government to make progress in these whole factors what are not evaluate and affect to the sectors according The World Bank Group (2016) of forestry,

hunting, and fishing, as well as cultivation of crops and livestock production to raise the net output of a sector after adding up all outputs and subtracting intermediate inputs.

In this study during the year 2006, permanent cropland (% of land area), which it is defined like land was cultivated with crops that occupy the land for long periods and need not be replanted after each harvest, such as cocoa, coffee, and rubber (this category includes land under flowering shrubs, fruit trees, nut trees, and vines, but excludes land under trees grown for wood or timber (WBG, 2016), it was not a good quality featured indicator for demand conditions in this model. Since Smutka, Steininger and Miffek (2009) determined that permanent growth consumption stimulated growth production, as well as we see trajectory of permanent cropland development is directed to achievement of the technology improvement and technology transfer frontier (Tilman *et al.*, 2011), but at the same time we found the regressions from Demand Conditions determine there are different effects which are the key in the development of human society specially to predict Employment and Rural Population in world agriculture, more of them to make under conditions of perfect competitions as showed Schumpeter; Tan *et al.* (1934;2001).

The external disturbance in Agriculture, value added (% of GDP) showed that random disturbances had no effect during 2006 in this featured indicator, (Toma *et al.*, 2012) remark highlights to acceptance of biotechnology innovations, which should be a main point on policy-makers agenda of developing the economic efficiency in the agricultural sector and rural sustainability (Ouwersloot, Lemmink and Ruyter, 2004).

These results conclude that tangibility as construct is very well predicted by and combines the effect of exogenous variables mentioned (Lin, 2011; Toma *et al.*, 2012) forming the part of afinity construct (Ouwersloot, Lemmink and Ruyter, 2004). In this study, we found Factor Conditions and Demand Conditions are indicators of the quality of the global agriculture and rural development they accuracy were significant factor in decision criteria provided for any country even sector.

4 Conclusion

There are seven featured indicators recognized, which fit in the model were: Agriculture, value added (% of GDP); Crop production index (2004-2006 = 100); Employment in agriculture (% of total employment); Food production index (2004-2006 = 100); Livestock production index (2004-2006 = 100); Permanent cropland (% of land area) and Rural population (% of total population) These indicators show that direction of biased demand conditions, as well as the efficiency differences were found to be important reason for variation in the rural populations and employment in agriculture have a power of this model influencing in business research.

The results also show that changes in external factors can explain a better significant positive contribution to the production possibilities around the world and contribute to broaden planning in the strategic agribusiness management, in agriculture for instance, value added (% of GDP) actually contributes to get the competitiveness strategic management winder hence it is the key factor of model development as well as each country and even sectors around the world may adopted it.

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Small-scale biogas sector in central Vietnam: ways of financing of the technology

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Abstract: Biogas technology is considered as one of the important drivers to struggle challenges as access to energy resources, economic development and environmental pollution. As it solves waste management problems and simultaneously produces biogas and digestate as a by-product. Although household biogas programs have experienced rapid development and achieved remarkable benefits, the current widespread reduction in the use of digesters may hinder further progress. Hence, it is important to comprehend the economic aspect of the technology from the view of its financing as the main beneficiaries are rather poor farmers. The survey was conducted in the province of Thua Thien Hue in central Vietnam from July to September 2012, furthermore followed by field visits in June and July 2016. The target group covered randomly selected owners of small-scale biogas plants (n=141). The collected data were categorized, coded and analyzed using MS Excel. The results revealed that only 6 % of households fully financed the construction of biogas technology with their own savings. This emphasizes the need of various methods of co-financing (mainly subsidies or loans). The subsidy from the National Biogas Program was used by 88 % of the households. Only one third of farmers would consider building biogas plant without subsidy which shows high importance of involvement of other actors. Our findings divulged a high degree of participation of family members in decision on investment in a biogas technology; however, the role of a male household head was dominant in the final decision. Vietnamese domestic biogas sector plays a vital role in farming systems and adds value to agricultural waste. It offers advantages in regard to energy, environmental and economic development. However, in terms of financing of this technology our study reveals that it is not adequately available to the poorer and poorest farmers. Further policy implications should be executed.

Key words: Biogas, Biogas sector, Technology financing, anaerobic digestion, socio-economic aspects

JEL classification: Q01, Q16

1 Introduction

If struggling how to tackle environmental problems such as climate change, natural resources depletion, and biodiversity loss – there is rising an opportunity for systematic changes towards sustainable way (Kanda et al., 2016). Access to the energy resources, economic development and environmental pollution (increasingly threatening the human health) are the major challenges that are currently facing developing countries. One of such technologies to tackle these challenges is biogas technology (Roubík et al., 2016). As it solves waste management problems and simultaneously produces biogas (as a main product) and digestate (as a by-product, which can be used as fertilizer) (Gautam and Herat, 2000). Small-scale biogas plants have been promoted across Asia as a sustainable way of handling manure and as with livestock production has increased dramatically in Southeast Asia their significance is sustaining (Vu et al., 2015). If appropriate management and follow up is practiced, biogas technology is proved to be a clean source of energy (Zhang et al., 2013) which concomitantly improves agricultural productivity and environmental well-being (Thien Thu et al., 2012; Pehme and Veroman, 2015; Mengistu et al., 2016). However, if technology is inappropriately managed, its benefits may be compromised (Bruun et al., 2014; Roubík et al., 2016). As calculated by Bruun et al. (2014) break-even point at which the released biogas to atmosphere (methane) has great impact on global warming as the fuel that has been replaced occurs between 3 % to 51 % depending on the type of replaced fuel. Also as it was

calculated in study from rural China, small-scale biogas plant should be maintained at least 1.78 years to achieve a net carbon emission benefit (Zhang et al., 2013). Therefore proper management and maintenance of biogas technology is essential (Roubík et al., 2016).

Although household biogas programs experiences rapid development and achieved remarkable benefits, the current widespread reduction in the use of digesters may hinder further progress. Promotional measures, interest subsidies and cost buy-downs encourage construction of small-scale biogas plant but do not necessarily ensure continued cooperation (Srinivasan, 2008). However, such a continual operation is essential for sustaining/achieving the environmental benefits and consequent cash-flows.

The main objective of this paper is to describe financing aspects of the small-scale biogas technology in the rural areas of central Vietnam, specifically in Thua Thien Hue province. And through the financing aspects reveal and identify barriers and drivers that influence technology development and further growth.

2 Materials and Methods

2.1 Target area, data collection and data analysis

The survey was conducted in the province of Thua Thien Hue in central Vietnam from July to September 2012. Followed by field visits from June to July 2016 in favor to confirm the obtained information and especially the recommendations for practice, as well as to compare results with the current practice. The target group covered randomly selected owners of small-scale biogas plants (n=141). Methods of data collection included focus group discussions, semi-structured personal interviews, questionnaire survey and observation. The questionnaire survey was conducted to collect information with particular attention to the ways of financing of the biogas technology. The collected data were categorized, coded and analyzed using MS Excel. Especially Spearmen correlation were used to rank values of chosen two variables.

3 Results and Discussion

The biogas plant owners from our study in the target area of Thua Thien Hue province in central Vietnam are characterized with the socioeconomic features as follows: average size of a rural family 4-5 people, with 2.2 people on average actively working; education of the respondents (highest educational attainment in a household) was without education (1%), primary (10%), secondary (55%) and tertiary (34%).

An average farm size with BGP in our study involves 2,821 m^2 with almost 2,000 m^2 attributed for rice production. In addition, this data shows larger size of farms against the state average. This can be caused by lower population density in area. Regarding the number of larger farms in Thua Thien Hue province (defined by sales volume of their products in the range of 40-50 million VND per year), their number has been increasing annually; in 2001 there were 149 larger than small-scale farms, in 2005 already 489 and in 2010 the number reached 591 and has been constantly increasing (General Statistics of Vietnam, 2010). This growth scenario is expected to continue within the next decade (Thornton, 2010).

Respondents reported their occupation as farmers in 90% of cases. Farmers produce rice as a main crop. For 72 % of these respondents (households) farming is the main source of income. 28% make their living also from off-farm activities, such as trade (7 %), rice noodle production (5 %) and rice wine production (4%). Respondents reported total income less than 2 million VND per household and month in 49 % of cases, less than 1 million VND per household and month in 24% of cases, and less than 4 million VND per household and month in 16% of cases.

Also from socio-economic perspective, when increasing influence of off-farm activities at the household level affects growth of the family income, timing of application of manure management activities has to fit around the times when farmers have returned to the farms and are not employed by other activities. This is also a difficult socio-economic challenge to address (Mwirigi et al., 2014; Chadwick et al., 2015); however, incentives to retain a capable and well informed farmers has to be a key objective for setting up a follow ups for farmers to optimize their activities (Roubík et al., 2016). As from the socio-economic perspective, the relationship between income and presence off-farm activities was examined. This relationship was confirmed ($r_s = 0.49$; $N = 100$; $\alpha = 0.05$).

The results revealed that only 6 % of households surveyed fully financed the construction of biogas technology with their own savings. This emphasizes the need of various methods of co-financing (mainly subsidies or loans). The subsidy from the National Biogas Program was used by 88 % of the households. Only one third of the farmers (32 %) would consider building biogas plant without the subsidy which shows high importance of involvement of other actors. Our findings divulged a high degree of participation of family members in decision on investment in a biogas technology; however, the role of a male household head was dominant in the final decision. Vietnamese domestic biogas sector plays a vital role in farming systems and adds value to agricultural waste (Roubík et al., 2016). It offers advantages in regard to energy, and environmental and economic development. However, in terms of financing of this technology our study reveals that it is not adequately available to the poorer and the poorest farmers. Households also commonly take loans for construction as well; it was used in 44.0 % of cases with average amount of 3.35 million VND (± 1.99). These loans were coming from different sources such as from banks (38.6 %), relatives (54.6 %) or other sources (6.8 %). In Vietnam are informal and commercial credits supplying more proficiently than preferential credit (Luan et al., 2016).

Based on information from respondents, the average installation cost of a BGP was set up for 7.47 million (±2.09) VND with the average subsidy from the BPAHS program 3.64 million (±2.11) VND. Average payment by farmers was 3.89 million (±2.20) VND. However, it has been observed that many farmers who purchased biogas plant also took opportunity to upgrade their latrine or pigpens, therefore the investment was higher. The average installation itself was around 3.5 million VND. In the other study from Vietnam, the average installation itself was determined to approximately 4.4 million VND with annual energy reduction costs from 5.8 to 8.9 million VND for size 6-10 m3 (Thien Thu et al., 2012).

The costs and benefits at the household and societal level are summarized in table 1. The cost benefit analysis suggests that small-scale biogas plants are a worthwhile investment from both private and societal perspective. However, there are many barriers for investing into relatively uncertain future benefits, which may be hampering the progress of biogas technology from the private perspective. When considering socio-economic status, it is based on family income, parental education level, parental occupation and societal status (i.e. contact within the community, group associations and community perception of the family). As mentioned in Wang et al. (2016) commonly cost-benefit analysis of BGPs shows to be profitable, however even in the case they would show unprofitable, some researchers suggest that the positive externalities of indirect benefits can be one of the rationales for providing a government subsidy as biogas technology has lots of social and environmental benefits if handled properly (Roubík et al., 2016). If considering the development tendencies, the cost-benefit analysis should not be only limited to the initial period of operation of a biogas plant, however it should also calculate with the structure of the costs and benefits set against the economic lifespan of the biogas plant.

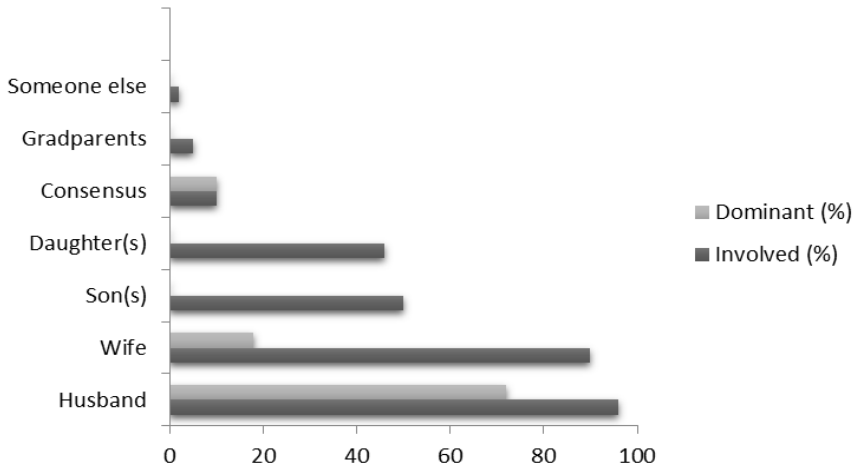
Table 1. Financial and economic costs-benefits associated with BGP and latrine

Level of analysis	Costs	Benefits
Household	Cost of a BGP at the subsidized rate	Cooking, lightning fuel savings
(*financial*)	Cost of a latrine	Saving in households health related expenditures
	Cost of extra time consumed due to biogas plant and latrine installation and operation	Time saving from fuelwood collection
	Cost of hygiene materials purchased by the household	Income effects of improved health and environment
	Financing costs, if applicable	
Societal (*economic*)	Full cost of a BGP	Chemical fertilizer savings
	Repair and maintenance costs for BGP	GHG reduction
	Technical assistance	
	Biogas program costs	Local environment benefits

Source: own

There was a high degree of participation of family members in the process of deciding on building a BGP; however, the male role, as a head of household, in the final decision was dominant (72% of cases); followed by the role of wife in 18% of cases and by family consensus in 10% of cases (figure 1). This can be compared with involvement in DMP, where the husband was involved in 96% of cases, wife in 90% of cases, followed by son(s) in 50% and daughter(s) in 46% of cases. Then there was family consensus in 10% of cases (in families with family consensus about DMP was also consensus in the dominant final DMP) and in 2% there was involvement of someone else, mainly local facilitators and promoters as advisers. Nonetheless, local facilitators and their importance were proven in the study by Roubík et al. (2016), where their influence on further biogas technology maintenance was shown as essential. Similar conclusions about DMP were done in Cambodia by Schmidt and Jordan (2008), only with slightly higher involvement and dominance of male in the final DMP. Furthermore, the relationship between DMP and time spent on maintenance was examined and proved, that with higher DMP there was more time spend at the household on maintenance of biogas plant ($r_s = 0.34$; $N = 100$; $\alpha = 0.05$).

Figure 1: Decision making process of deciding on building a BGP



Source: own calculation

3.1 Access, poverty and equity issues

Conventional approaches define poverty as "low income or low consumption", however, over the recent decades poverty concepts has changed. Currently they include multiple dimensions of deprivation and wellbeing. Therefore, four main dimensions of poverty for small-scale farmers (potential biogas owners) can be settled as: i) lack of opportunity (material deprivation); ii) lack of capability (low achievement in education and health or malnutrition); iii) vulnerability (low level of security or inappropriate background) and iv) being voiceless and powerless. And while i) and ii) are well measured, for iii) and iv) measurements are not adequately possible, especially in the case of biogas technology.

For example in China, the criteria and requirements for successful adoption of and operation of small-scale biogas plant include a sufficient number of penned animals, appropriate temperatures and preferably mild winters and adequate financial resources to overcome liquidity constraints and afford the initial investment (Li et al., 2016).

The benefits of biogas digesters can be expressed in terms of poverty indicators. If household spends less time in collecting fuelwood and more time generating valuable income – this increase the poverty indicator *income*. Also spending less time for collecting fuelwood allows spending more time on children´s education, therefore increasing indicator *knowledge/education*. Switching to cleaner fuels also reduces health risks, therefore increasing the indicator *health*.

Funding of biogas technology is essential to the rapid development of the technology. The main increase in take-up always results from the introduction of financial compensation (Mwirigi et al., 2014; Roubík et al., 2016). However, from the beginning of the National Biogas Program in Vietnam, the subsidy has gradually decreased from 25% of the investment cost to 13% in 2009 and 10% in 2011 and 2012. This is seen as a natural exit strategy for subsidies in Vietnam. But due to the exit strategy biogas technology is still not aiming to the "*poorest from the poor*".

Issues, which must be considered to increase accessibility of small-scale BGP for the rural poor:

- Is technology affordable for the poor?
- Do the poor have access to finance/credit?
- Is there adequate commitment from national government and BPAHS
- What is the economic efficiency?
- Are there possibilities for further costs reduction?
- What is the potential for improvement of the cost-effectiveness?

There is need for further research activities, especially in behavioral studies (considering choices and preferences) including experimental economics, quantification issues (capturing costs and benefits components), socio-economic hurdles and design mechanisms, barriers and bottlenecks, and knowledge transfer issues (awareness, training, and participation).

4 Conclusion

Biogas technology has various advantages and can be used in households for various purposes (cooking, lightning, heating, use of digestate for fertilizing) and can contribute towards improving farmers´ livelihoods. For these reasons is biogas technology widely advocated and subsidies for biogas plants are offered throughout Vietnam. This increased the number of small-scale biogas plants in Vietnam significantly in past decades. However, currently only one third of the farmers would consider building biogas plant without the subsidy which shows high importance of involvement of other actors. Our findings also divulged a high degree of participation of family

members in decision on investment in a biogas technology; however, the role of a male household head was still dominant in the final decision. Vietnamese domestic biogas sector plays a vital role in farming systems and adds value to agricultural waste. It offers advantages in regard to energy, and environmental and economic development. However, in terms of financing of this technology our study reveals that it is not adequately available to the poorer and the poorest farmers. A key policy priority should be to plan for the long-term care of the "*poorest of the poor"* farmers. Therefore further policy implications should be executed.

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Possibilities of Utilization of Univariate Time Series Analysis in Prices Modelling

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Abstract: The paper deals with an examination of possibilities of utilization of univariate time series analysis for description and forecasting of agri-food prices. The analysis is based on monthly time series of farm-gate price, wholesale price and consumer price in 9 agri-food chains in the Czech Republic; 22 time series were examined in period January 2000 – June 2015. Based on Box-Jenkins methodology an appropriate ARIMA models were estimated. Then, the future development of individual time series was forecasted for prognostic horizon of 6 periods and evaluated based on MAPE values. The analysis proved non-stationarity of almost all time series and suitability of ARIMA model utilization in agri-food prices modelling. The suitability of ARIMA models for prognostic purposes was proven in almost all analyzed time series; however, some time series should be forecasted rather using other time series model. Generally, ARIMA model might be considered as an appropriate tool for agri-food prices modelling and forecasting, even the verification and evaluation of forecast quality should not be missed out.

Key words: price, agri-food chain, time series, ARIMA, prognosis

JEL classification: C22, C5, E37, Q02

1 Introduction

Farmers, processing market, trade and consumers are closely related and belong among the crucial components of the agri-food system. The relations among the partial markets as well as their strength might be simply described using the prices. Farm-gate price, wholesale price and consumer price are closely related and the changes at one level are usually postponed into others. Then, the market structure is determined by these relations and differs among individual agri-food chains.

The prices development has been examined on different levels, using different tools and from different viewpoints. The reason is quite simple – it is an actual topic that should not be omitted. Different approaches to the time series analysis of prices in different agri-food chains can be found for instance in the following publications.

Examination of prices using unit root tests and Granger causality is provided in the following researches. Cooke, Robles (2009) examined prices of agri-food commodities using time series analysis. The analysis is focused among others on corn, wheat, soybean and rice. Based on the time series analysis of models in the first differences and Granger causality tests an increasing tendency of examined prices has been detected and proven. Ayinde et al (2015) examined the time series of prices of several agri-food commodities in Nigeria, e.g. maize and rice. The examination based on unit root tests and Granger test show stationary nature of most of examined time series as well as their interdependency.

Examination of agri-food markets with the emphasis on the prices based on univariate time series analysis is in the scope of interest of researchers all around the world. Some illustrations can be found e.g. in the following publications. Ivanišević et al (2015) employed suitable ARIMA model and its prognosis for examination of tomato price in Serbia. The analysis has proven considerable influence over the formation of tomato prices. Honrao (2014) analyzed potato

and onion price and production in India. Based on GARCH models price volatility has been describe and suggestions for potato and onion markets provided. Onour, Sergi (2011) based on GARCH examined volatility of global prices of wheat, rice, sugar, beef, coffee and groundnut. The research shows that the volatility of the future prices exhibits the short memory behavior for almost all analyzed commodities. Nochai, Nochai (2006) used ARIMA model for examination of oil price development in Malaysia. The time series of farm-gate price, wholesale price and pure oil price were described using appropriate models and future values were calculated. Dieng (2008) employed parametric and non-parametric models to examine tomato, potato and onion prices in Senegal. The research has shown commodity specifics, however, ARIMA model has been considered as a generally suitable model for prognostic purposes in all cases. Adanacioglu, Yercan (2012) examined tomato wholesale price development in Turkey. An appropriate SARIMA model has detected seasonality and stationary nature of examined time series. Based on estimated model the future development of tomato price has been also estimated and discussed. Khan et al (2010) analyzed the prices of Boro-hybrid, Aman-hybrid and flour in Bangladesh. The research has shown that appropriate ARIMA model can be employed to describe the development of all analyzed time series as well as their future development. Yang, Hu (2013) employed an appropriate ARIMA model to examine cabbage market in China. The research has shown suitability of ARIMA model for the description as well as for prognostic purposes in the short-run.

Examination of price transmission can be found in the following works. Vavra, Goodwin (2005) analyzed US farm-gate prices wholesale prices and retail prices of the beef, chicken and eggs. The research is focused especially on the price transmission and its asymmetry. Bakucs, Fertö (2015) examined Hungarian milk prices. The analysis was connected with the sales of milk at retail level. Time series analysis has proven non-stationarity of individual prices and their long-run relationship. Lajdová, Bielik (2015) examined Slovak dairy sector. Based on time series analysis they have discovered imperfect competition at milk market. Similarly, Dudová, Bečvářová (2015) examined price transmission in milk agri-food chain in the Czech Republic. Based on multivariate time series analysis and price transmission elasticity the milk chain has been considered as symmetric. Bonnet et al (2015) examined price transmission in French dairy sector. Based on the demand and supply models heterogeneity of both, producers and retailers, was proven. Moreover, different behavior in partial dairy chains has been detected. Han, Ahn (2015) analyzed price transmission and its asymmetry in wheat agri-food chain in Korea. Using multiple time series model relation between examined prices has been proven as well as its asymmetry. Ma et al (2015) examined an impact of oil prices and exchange rate on agricultural prices in China. Based on multivariate time series analysis the authors show that agricultural prices are not affected by the changes in either oil prices or the exchange rate.

The aim of this paper is *to examine the possibilities of utilization of univariate time series analysis to model and forecast prices of the selected agri-food products*. The paper is based on the working hypothesis that *univariate time series analysis is generally suitable tool to describe development of agri-food price and its prognosis*. It means that long-term memory of the time series is crucial in the examination and forecasting of the agri-food prices. The importance of the long-term memory is assumed to be more important than the influence of other external factors.

2 Materials and Methods

The examination of the selected time series is processed based on univariate time series analysis. Concretely, Autoregressive Moving Average model (ARMA) and Autoregressive Integrated Moving Average model (ARIMA) are employed.

To determine appropriate form of ARMA or more generally ARIMA model, *Box-Jenkins algorithm* is employed. The main procedure consists of the following steps (see e.g. Chatfield (2004) or Kočenda, Černý (2007)):

- model specification (identification);
- model fitting (estimation);
- model verification (diagnostic checking).[14]

Model specification is based on the time series stationarity/non-stationarity detection as well as determination of the „*p*" and "*q*" order of the ARMA model or ARIMA model, respectively.[15]

As first, unit root tests are processed to detect the nature of the time series, i.e. whether the time series is stationary or non-stationary. In the paper ADF and KPSS tests are employed to detect the nature of the time series the most precisely (explanation is provided e.g. by Cipra (2008)) because an appropriate detection of the nature of the time series is crucial for the following analysis. If the nature of the time series is detected Autocorrelation function (ACF) and Partial Autocorrelation function (PACF) might be plotted to determine the order of Autoregressive (AR) and Moving Average (MA) process.

Autocorrelation function (ACF) is calculated for observed time series y_t for $t - 1,2,\dots,n$ as sample autocorrelations of order *k* as following:

$$\rho(k) = \frac{\sum_{t=k+1}^{n}(y_t-\bar{y})(y_{t\ \ k}-\bar{y})}{\sum_{t=1}^{n}(y_t-\bar{y})^2}.$$

Then, Partial autocorrelation function (PACF) for $s \geq 2$ can be defined in its sample form as following:

$$\emptyset_{ss} = \frac{\rho_s-\sum_{j=1}^{s-1}\emptyset_{s-1,j}-\rho_{s-j}}{1-\sum_{j=1}^{s-1}\emptyset_{s-1,j}\rho_j}.$$

Model fitting follows the previous step of model specification and is the base for model verification. Since the order of AR and MA processes is determined an appropriate form of ARIMA model can be fitted. Specific models are estimated according to the general ARIMA model. General ARIMA(p,d,q) model is defined in the following form:

$$\Delta y_t = \mu + \sum_{i=1}^{p}\alpha_i \Delta y_{t-i} + \sum_{j=1}^{q}\delta_j \varepsilon_{t-j}.$$

[14] Some authors define also another step of Box-Jenkins methodology, forecasting (e.g. Bleikh, Young (2016)), while other authors consider forecasting as a subsequent step of the whole univariate time series analysis (an application of estimated model).

[15] Since ARMA model is suitable for stationary time series while ARIMA model for non-stationary time series, ARIMA model can be considered as a general model within the univariate time series analysis. For purposes of the paper term ARIMA model covers both, ARMA and ARIMA models as a whole.

Thus, an appropriate model might be estimated in form of AR, MA, ARMA or ARIMA respectively. The general forms of these processes might be written as follows (for more details see e.g. Lütkepohl, et al (2004), Kočenda, Černý (2007), Chatfield (2004)):

General AR(p) process is defined as:

$$y_t = \mu + \sum_{i=1}^{p} \alpha_i y_{t-i} + \varepsilon_t.$$

MA(q) process is defined in its general form as:

$$y_t = \sum_{j=1}^{q} \delta_j \varepsilon_{t-j}.$$

Then, mixed ARMA(p,q) process might be defined in general form as following:

$$y_t = \mu + \sum_{i=1}^{p} \alpha_i y_{t-i} + \sum_{j=1}^{q} \delta_j \varepsilon_{t-j}.$$

An error term ε_t represents zero mean white noise process with time invariant variance.[16]

Model verification is connected with the model significance and residual analysis. The verification is processed based on the ACF and PACF for the series of residuals. Subsequently, Q-tests are employed. If all values of ACF and PACF functions are close to zero and if all the Q-tests do not reject the null hypothesis of no autocorrelation, then the estimated model might be the correct one.

As Chatfield (2004) says it is relatively easy to fit an ARIMA model, however, it is difficult to know when ARIMA model is appropriate and which type of ARIMA model to fit.

Future development of examined time series is forecasted based on estimated ARIMA models. The quality of prognosis is evaluated using Mean Absolute Percentage Error (MAPE). MAPE is calculated according to the following formula:

$$MAPE = \frac{1}{n} \sum_{t=1}^{n} \left| \frac{y - \hat{y}}{y} \right| \cdot 100.$$

The analysis is based on the time series of farm-gate price (FP), wholesale price (WP) and consumer price (CP) of selected agri-food commodities in the Czech Republic, concretely agri-food chains of flour, bread, roll, beef meat, pork meat, chicken meat, milk, butter and egg are examined. The time series contain monthly data in the period January 2000 – June 2015[17]; thus, the time series contain 186 observations. Data set was provided by Ministry of Agriculture, Czech. All calculations are done using econometric software Gretl.

3 Results and Discussion

Table 1 contains the results of empirical analysis for 22 examined time series, concretely farm-gate price of wheat, pork meat (PM), beef meat (BM), chicken meat (ChM), milk and eggs; wholesale price of flour 00, bread, roll, pork meat, beef meat and chicken meat; consumer price of smooth flour (flourS), rough flour (flourR), bread, roll, pork meat, beef met, chicken meat, milk, butter and eggs. As first, ARIMA models were estimated and then, ex-ante prognosis formulated. All presented models were selected and estimated according to the Box-Jenkins methodology;

[16] White noise process is defined as a random process of uncorrelated random variables with zero mean and a finite variance. Formally, *X(t)* is a white noise process if $E(X(t)) = 0$, $E(X(t^2) = S^2$ and $E(X(t)X(h)) = 0$ for $t \neq h$.

[17] Due to the limited database of several agri-food chains some individual models have to be estimated based on shorter time series. The period of final observation in analyzed time series differs from XII/2013 to XII/2015 for individual agri-food commodities.

all models are statistically significant according to the t-test, F-test and Q-test. Ex-ante prognosis was formulated for 6 periods. Forecasted values were compared with the real values and MAPE calculated to evaluate the quality of the models for prognostic purposes.

Table 1. ARIMA models

	FP_wheat	WP_flour00	WP_bread	WP_roll	
Stationarity	I(1)	I(1)	I(1)	I(1)	
ARIMA	1,0,0	1,1,1	1,1,0	0,0,1	
MAPE (%)	3.72	0.19	0.53	3.53	
	CP_flourS	CP_flourR	CP_bread	CP_roll	
Stationarity	I(1)	I(1)	I(1)	I(2)	
ARIMA	3,1,3	1,1,1	1,1,1	1,2,1	
MAPE (%)	12.49	12.21	2.11	1.97	
	FP_PM	FP_BM	FP_ChM	WP_PM	
Stationarity	I(1)	I(1)	I(1)	I(1)	
ARIMA	1,1,1	1,1,0	1,1,1	1,1,0	
MAPE (%)	11.96	1.02	5.72	6.03	
	WP_BM	WP_ChM	CP_PM	CP_BM	CP_ChM
Stationarity	I(1)	I(1)	I(2)	I(1)	I(1)
ARIMA	4,1,1	1,1,1	0,2,1	1,1,2	1,1,2
MAPE (%)	2.45	0.57	1.52	2.38	2.53
	FP_milk	FP_egg	CP_milk	CP_butter	CP_egg
Stationarity	I(1)	I(0)	I(1)	I(1)	I(0)
ARIMA	2,1,2	1,1,1	3,1,3	2,1,1	1,0,0
MAPE (%)	5.67	3.1	4.54	4.32	3.57

Source: own calculation

3.1 ARIMA model

Unit root test based on ADF and KPSS tests proved common assumption about an economic time series. The test has shown that almost all analyzed time series are non-stationary and integrated of order 1, i.e. I(1). Just the time series of egg prices might be considered as stationary while the time series of consumer price of roll and pork meat are non-stationary and integrated of order 2, i.e. I(2) (see Table 1).

ACF and PACF functions recommended as the most common form of ARIMA model suitable for examined time series ARIMA (1,1,1), it is the case of 7 analyzed time series. Then, 5 examined time series are characteristic just by autoregressive process. There is no evidence of the importance of a disturbance term and its lagged values.

Wholesale price of roll and consumer price of pork meat should be described and forecasted just based on moving average process. The order of autoregressive process is zero. Thus, an impact of lagged values on present value was not proven in these cases. The time series might be considered as a stochastic processes.

By contrast, the longest memory was detected in case of the time series of consumer price of smooth flour, consumer price of milk (ARIMA (3,1,3)) and consumer price of beef meat (ARIMA (4,1,1)).

3.2 Prognosis

When appropriate ARIMA models were identified, estimated and verified prognoses for prognostic horizon of 6 periods were calculated. Subsequently, the quality of forecasts was evaluated based on MAPE values.

Most of MAPE values are smaller than 5 % (see Table 1), thus, these estimated ARIMA models might be considered as suitable for prognostic purposes. In case of farm-gate price of chicken meat, farm-gate price of milk and wholesale price of pork meat MAPE reached value of approximately 6 %. However, this result can be still considered as acceptable to use models for prognostic purposes.

Contrary, there are another 3 forecasts based on ARIMA model with MAPE above 10 %. It is the case of farm-gate price of pork meat, consumer price of smooth flour and consumer price of rough flour. MAPE values of these prognoses reached value of approximately 12 %. It may be concluded that ARIMA model is not suitable for prognostic purposes in case of these time series. Probably other type of time series model is more suitable to forecast the time series future development even estimated ARIMA models have a good features and describe the time series in a good way (as the verification has shown).

4 Conclusion

The aim of the paper – an examination of possibilities of utilization of univariate time series analysis to model and forecast prices of the selected agri-food products – was fulfilled based on appropriate forms of ARIMA model for individual agri-food prices. Concretely, the analysis was processed based on farm-gate price, wholesale price and consumer price in 9 individual agri-food chains of the Czech Republic. Appropriate ARIMA models were estimated according to Box-Jenkins methodology based on the time series of monthly data in the period January 2000 – June 2015 and the future development forecasted for the following 6 periods. The quality of the prognosis was evaluated based on MAPE value.

An empirical analysis shows that almost all time series of farm-gate, wholesale and consumer prices are non-stationary and integrated of order 1, i.e. I(1). Then, ARIMA models have been proven as a suitable tool to examine the prices development. Different forms of ARIMA models were estimated for individual agri-food prices. The most common form of ARIMA model recommended based on ACF and PACF functions is ARIMA (1,1,1). Based on estimated ARIMA models the future development of individual time series was forecasted based on ex-ante prognosis and quality of the models for prognostic purposes evaluated. According to MAPE just 19 of 22 analyzed time series can be forecasted based on estimated ARIMA model, i.e. 13.5 % should not, even the models have a good features and describe the time series development well.

Thus, one may conclude that ARIMA model may be used as a suitable tool for description of agri-food prices and their forecasting. Nevertheless, in some cases ADL, VAR/VECM or other models, i.e. models including more factors influencing an examined time series, could be more appropriate. Generally, prices development might be considered as driven mainly by their long-run development rather than the influence of other factors.

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The Economic Aspects of Sugar Beet Production

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Abstract: The EU sugar policy reform threatens the European beet industry. But still there will be a scope to profit from this crop. The basic research question is whether the producers of sugar beet in the Czech Republic and Slovakia can achieve the goal of sugar yield 13 t/ha while maintaining their total costs at €25 per ton of sugar beet for the 2017 and 2018 campaigns. The main aim of this paper is to analyze the yield and the production costs of white sugar and sugar beet in the Czech Republic and Slovakia in order to identify the main development trends. The partial aim of this paper is to determine whether foreign-owned sugar company in the Czech Republic Tereos TTD, a.s. contributes to increase sugar yield from 1 hectare of sugar beet through the delivery of seeds and new technologies of cultivation. The used methods are chain and basic indexes and regression analysis of time series/ trend data - for predicting the development of the next two marketing years. According to our research results the producers of sugar beet in the Czech Republic and Slovakia will be unable to achieve the goal of sugar yield 13t/ha while maintaining the total costs at €25 per ton of sugar beet in the next two campaigns.

Key words: sugar beet, sugar processor, sugar yield, variable costs, sugar price

JEL classification: Q10, Q12, Q13

1 Introduction

The EU Sugar Industry CSR Report 2015 pointed out that over the last 25 years the average EU cost of production for sugar has increased by only +0.4%/year, compared to inflation at +2.3%/year. According to the independent experts such as LMC International, many of the EU beet industries are now ranked in the top quartile of world industries for cost competitiveness (Maitah, Řezbová, Smutka, et al., 2016, Severová, Kopecká, Svoboda, et al., 2011). The sector continues to make improvements in technical efficiencies such as energy reduction and input costs.

At the same time, sugar beet yields have increased consistently over past years thanks to a combination of technical and seed variety improvements driven by cooperation between the industry, growers, research and development and seed trade. The average beet sugar yields (tonnes sugar/ha) have increased by 2% per year for the last 25 years. In recent years yields have strongly increased even more– by 2.5 % per year between 2003/4 and 2013/14 – and this trend is assumed to continue into the post-2017 period. In fact, EU beet sugar yields in sugar/hectare are now higher than those in Australia or Brazil's Centre-South region which are considered to be amongst the top competitive regions in the World (CSR Report, CEFS/EFFAT, 2015).

The sugar content in sugar beet can vary from 12% to 20%. It is the sugar that gives value to the sugar beet crop. The by-products of the sugar beet, such as pulp and molasses, give an added value of up to 10% of the value of the sugar. The sugar extraction rate depends on the sugar content of the sugar beet at the moment of its arrival in the processing plant. European norms define the sugar beet as marketable if it contains 14% sugar or more (in Ukraine, for instance, the average sugar content is only 11.2%). The standard sugar beet should have a sugar content of 16%, which would yield 130 kg of sugar per 1 ton of standard sugar beet processed at a sugar plant - ideal efficiency is 82.5%.

In Europe, the total production cost of beet sugar (16% sugar content) is around € 20–30 per ton in competitive countries and € 30–40 per ton in noncompetitive countries (FAO, 2009).

Question number one is the sustainability of sugar beet growing and beet sugar industry. This sustainability has a fundamental economic aspect regarding competitiveness with cane sugar, and an environmental aspect including mainly the current issue of emissions and foreign chemical substances. The principle of sustainability also sets other relevant research directions: yield potential, resistant breeding (with the aim to decrease the consumption of biocides), alternative uses of sugar beet (sugar, ethanol, methane), growing technologies that decrease the input of chemicals, fertilizers, energy, limiting soil erosion and the position of sugar beet within an agricultural enterprise. Nowadays, full extent research is done only in big sugar beet growing countries in Europe (i.e. France and Germany); in the Czech Republic the research concentrates on individual issues such as sustainability and growing technologies and it is financed exclusively by beet growers and sugar producers (Chochola, Pulkrábek, 2012). Čechura and Malý (2015) quantified the technical efficiency of active sugar beet companies in the Czech Republic and made intra- and inter-sectoral comparisons. Their results show that the sugar beet companies have experienced a significant increasing trend in technical efficiency which can be regarded as very important as far as the preparation of companies for market organization changes is concerned.

Špička and Janotová (2015) evaluated the economic efficiency of sugar beet growers in the Czech Republic in 2013 and conducted international comparison of yields and costs of sugar beet. Economic efficiency has been evaluated using Data Envelopment Analysis method (DEA). DEA results show a potential in efficiency improvement of direct material costs, direct wages and quality of sugar beet (and its selling price) in the group of inefficient growers. The import of sugar substitutes and the strategies of multinational alliances, which control the European sugar market, seem to be the main threat for the Czech market. Holúbek et al (2015) evaluated the production and economic potential of sugar beet of the agricultural entity TAPOS in Slovakia and he pointed out that the average harvest for 7 years reached 55.20 t. ha^{-1}.

The sugar beet growing season preceding the 2015/16 campaign in the Czech Republic was imfluenced by severe rainfall shortage and long periods of tropical temperatures. As a result, the root yield 60.97 t. ha^{-1} is significantly lower than last year (78.11 t. ha^{-1}). The polarizing sugar yield thus amounted to 11.1 t. ha^{-1}. Persistent excess of sugar in the world and European markets continued to weigh on sugar and alcohol prices. The entire beet and sugar industry has been preparing for the new environment after the sugar market deregulation scheduled for October 2017. For the post-2017 period, both growers and processors must pursue their efforts to continuously reduce costs and maximize efficiency (Reinbergr, 2016).

The root yield in Slovakia reached 57.24 t. ha^{-1} in the 2015/16 campaign, which shows a decrease of 20 tons per hectare as compared to previous year. The average sugar content reached 16.19% that is approximately the standard level. The polarizing sugar yield amounted to 9.26 t. ha^{-1} and the white sugar yield amounted to 8.07 t. ha^{-1} (Janíček, 2016).

According to Robert Ohlson, a researcher at NBR association – Nordic Beet Research, the main points of sustainable development of sugar beet production in Europe are:

i. Profit, reducing the cost of 1 ton of sugar beet and 1 ton of sugar (low-cost production)

ii. Environment, growing conditions, use of yield potential of sugar beet cultivars

iii. Personnel, the quality of management

iv. Integrity and mutual cooperation between sugar beet industry and sugar beet growers.

According to the scientists above the basic prerequisite for a competitive and sustainable cultivation of sugar beet in Europe are three magical “15’s” as objectives to fulfill – by the year 2015,

the European growers should reach sugar yield of 15 t/ha while maintaining variable (direct) costs at € 15 per ton of sugar beet.

Reinbergr (2016) points out that the minimum yield of sugar beet in the Czech Republic should be 80 t. ha^{-1} and the minimum yield of white sugar should be 13 t. ha^{-1}.

French sugar company Tereos has announced a guaranteed minimum price of €25 per ton of beet for the 2017 and 2018 campaigns (Tereos, 2016).

The main aim of this paper is to analyze the yield and the production costs of white sugar and sugar beet in the Czech Republic and Slovakia in order to identify the main development trends. The partial aim of this paper is to determine whether foreign-owned sugar company in the Czech Republic Tereos TTD, a.s. contributes to increase the yield from the 1 hectare of sugar beet.

2 Materials and Methods

The basic research question is whether the producers of sugar beet in the Czech Republic and Slovakia can achieve the goal of sugar yield 13 t/ha while maintaining the amount of total costs at €25 per ton of sugar beet for the 2016/17 and 2017/18 campaigns.

The partial objectives of this paper are:

i. To analyse the production costs of sugar beet of the growers

ii. To compare sugar beet yield of Tereos France and Tereos TTD a.s.

iii. To analyse white sugar yield and its trends

The data used in this paper come from the following sources: CEFS SUGAR STATISTICS 2015 (Comité Européen des Fabricants de Sucre), Gain Report Number E80045: EU-27 Sugar Semi-annual Report 9/2013, Tereos – Annual Report 2014/15, FAOSTAT database Online, Crops, Institute of Agricultural Economics and Information IAEI, Czech Republic (Costs of Agricultural Products, 2010-2014), Research Institute of Agriculture and Food Economics-Slovakia, RIAFE, (Costs of Agricultural Products, 2010-2014). Cost surveys are carried out in individual enquiry and only for respondents keeping double-entry accounting, yield and own production costs are converted to 16% sugar content.

The first two used statistical methods are Fixed Base Index Numbers and Chain Base Index Numbers. For Fixed Base Index Numbers (usually just called Index Numbers), the base is given the value 100 and everything after that is given relative to the base, going above 100 for higher values or below 100 for values which drop below the original. For Chain Base Index Numbers, each value is given an index based on the previous value being used as the base. The third used statistical method is simple regression analysis of time series/ trend data, for predicting regression analysis of time series/trend data, for predicting white sugar yield in the Czech Republic and Slovakia for the next two marketing years (2016/17 and 2017/18).

Linear regression can be used to fit a predictive model to an observed data set of y and x values. Simple linear regression predicts values of one variable. The data are pairs of independent and dependent variables $\{(xi,yi): i=1,...,n\}$. The fitted equation is written as $y = ax + b$, where y is the predicted value of the response obtained by using the equation. Regression coefficient represents the rate of change of one variable (y = sugar yield) as a function of changes in the other (x = year); it is the slope of the regression line. The simple linear regression is counted by STATISTICA 10 Software.

Production costs (sugar, sugar beet) may be classified by their behavior as fixed, variable or semivariable costs. Fixed costs do not change with the level of production (e.g. rents, insurances, salaries of certain executives); variable costs are in direct proportion to the volume of production

(e.g. materials, wages, packaging); semi-variable costs increase or decrease as volume of production changes but not in direct proportion. In relation to products or services provided by a manufacturing company, costs could be direct or indirect. Direct costs can be identified with and allocated to products/units (e.g. materials, labour charges including related social costs, expenses such as lease of special equipment required for manufacturing certain products); indirect costs – often referred to as overheads or burdens – cover materials, labour and expenses which it is either impossible or inconvenient to charge direct to the product/unit (e.g. supervision, administration, maintenance, utilities).

3 Results and Discussion

3.1 Sugar beet costs

The price of sugar in the EU continued to fall during March 2015 – reaching its lowest point since the EU price reporting tool began in 2006 – before stagnating at this low, unsustainable level during the second half of the year. Such prices do not corespond with the efforts undertaken by the industry in recent years to increase its competitiveness in response to the challenging reforms in 2006 and 2013

The reform of the EU Sugar Protocol began in 2006, with full liberalization of the EU sugar market scheduled till 2015, including abolition of production quotas. Reform was driven by the need to reduce EU budgets and align the sugar market with the EU's overall move towards a market-oriented CAP (Common Agricultural Policy), which would also enhance the competitiveness of EU sugar production by eliminating unprofitable production capacity. Between 2006 and 2010, the EU had to reduce domestic production and also gradually reduce guaranteed beet prices and reference prices for imports of in-quota white and raw sugar by 36 per cent (Commodity Briefing, 2013).

It is, however, in that challenging context that European sugar companies have pursued their efforts to increase their competitiveness. As explained in CSR Report (CEFS/EFFAT) recent data show that the amount of sugar extracted per hectare and the length of the processing campaigns have continued to progress significantly by 22% and 25% respectively since the 2006 reform. Over the last 25 years the average EU costs of production for sugar have increased by only +0.4%/year, beating inflation levels of +2.3%/year and ranking our sector in the top quartile of world sugar industries for cost competitiveness (CEFS/EFFAT, 2015). To compensate the beet price drop by cost savings, costs should decrease much more to keep the same difference between costs and payment. Therefore, cost saving still leaves a need for raising sugar yield. A combination of both raising yield and saving costs would be profitable for the growers too. One way how to measure the effect of reform on current European Union sugar productivity and efficiency is the examining of costs of sugar production before and after the reform. The lowest cost areas are in The Netherlands and the United Kingdom – under $525 per ton of sugar. The three largest producing countries: France, Germany and Poland are in the intermediate cost set with costs between $525 and $625. The high cost areas are in the Czech Republic, Hungary and Slovakia ($625-$850 per metric ton) and very high areas are in Bulgaria, Finland, Greece, Italy, Portugal and Romania (USDA, GAIN Report, 2011). The cost per ton of sugar depends on the sugar beet yield and the sugar content. This reality has been reflected in the rate of sugar beet profitability. Sugar beet is highly nutrients intensive crop; therefore it is possible to grow it only on fertile land with sufficient fertilization (Homolka and Bubeníková, 2013). Table No. 1 presents the trends for beet production from 2010 to 2014 on direct costs, total costs, yield per hectare (ton), number of respondents, in the Czech Republic.

Table 1. The structure of sugar beet production costs in the Czech Republic (EUR.ha^{-1}, EUR. t^{-1})

Costs**		2010	2011	2012	2013	2014	average	st.dev	CV*
Seeds	EUR.ha^{-1}	218.7	215.3	263.9	237.6	243.6	235.8	16.16	6.9%
Fertilizes	EUR.ha^{-1}	167.7	259.8	319.0	275.0	297.2	263.7	47.52	18.0%
Plant protection	EUR.ha^{-1}	292.1	313.4	338.7	335.0	295.9	315.0	17.59	5.6%
Other material	EUR.ha^{-1}	38.0	41.9	60.9	45l.1	42.5	45.7	7.26	15.9%
Direct material costs	**EUR.ha^{-1}**	**716.4**	**830.5**	**982.5**	**892.5**	**879.2**	**860.3**	87.1	9.9%
Other variable costs and services	EUR.ha^{-1}	300.2	320.9	325.9	369.9	358.1	335.0	23.26	6.9%
Labor cost	EUR.ha^{-1}	220.3	270.4	547.9	371.1	390.5	36.0	103.21	28.7%
Depreciation (direct)	EUR.ha^{-1}	5.8	17.9	25.9	13.7	17.2	16.1	5.93	36.9%
Cost of utility operation, machinery	EUR.ha^{-1}	156.5	268.9	337.2	262.2	373.4	279.7	67.92	24.3%
Overhead cost	EUR.ha^{-1}	295.7	346.3	331.7	240.3	266.8	296.2	35.96	12.1%
Total production costs	EUR.ha^{-1}	**1694.9**	**2054.9**	**2551.0**	**2149.9**	**2285.3**	**2147.2**	256.64	12.0%
Direct material costs/Total costs	%	**42.3%**	**40.4%**	**38.5%**	**41.5%**	**38.5%**	**40.1%**	x	x
Yield per hectare	t.ha-1	56.3	66.3	70.4	62.4	76.9	66.5	6.39	9.6%
Costs per tonne	EUR.t^{-1}	30.1	31.0	36.2	34.5	29.7	**32.3**	2.35	7.3%
	CZK/EUR	*25.29*	*24.586*	*25.143*	*25.974*	*27.533*	x	x	x
Number of beet growers/respondents		*32*	*30*	*22*	*29*	*32*	x	x	x

Source: Institute of Agricultural Economics and Information IAEI, Czech Republic (Costs of Agricultural Products, 2010-2014), www.kurzy.cz, own calculation.

Note: *CV= Coefficient of Variation, **cost surveys are carried out in individual enquiry and only for respondents keeping double-entry accounting, yield and own production costs are converted to 16% sugar content.

Five-year average total costs of growing sugar beet in the Czech Republic over the period 2010 to 2014 amounted to **2147.2 €.ha^{-1}**. Plant protection is an essential element and its costs amounted to 315 €.ha^{-1}, 14.7 percent of total costs. Costs of fertilizers per hectare were usually €167.7 to €319 (approximately 263.7 €.ha^{-1}, 12.3 percent of total costs) and costs of seeds amounted to 235.8 €.ha^{-1}.ha^{-1} (10.9 percent of total costs). The share of direct material costs to total costs was 40.1 percent. Five-year average total costs per ton of sugar beet in the Czech Republic reached **€32.3** (per average root yield 66.5 tons, i.e. per **10.64 tons** of sugar). Table No. 2 present the trends for beet production over the period 2010 to 2014 on direct costs, total costs, yield per hectare (ton) and number of respondents in Slovakia.

Table 2. The structure of sugar beet production costs in Slovakia (EUR.ha^{-1}, EUR. t^{-1})

Costs		2010	2011	2012	2013	2014	average	st.dev	CV*
Seeds	EUR.ha^{-1}	179.83	178.14	198.31	197.3	193.5	189.4	8.7	4.6%
Fertilizes	EUR.ha^{-1}	157.22	189.25	192.4	233.13	267.27	207.9	38.3	18.4%
Plant protection	EUR.ha^{-1}	353.18	364.81	378.81	394.61	370.26	372.3	13.9	3.7%
Other material	EUR.ha^{-1}	14.14	49.18	25.96	24.63	44.68	31.7	13.2	41.5%
Direct material costs	**EUR.ha^{-1}**	**704.4**	**781.4**	**795.5**	**849.7**	**875.7**	**801.3**	59.5	7.4%
Other variable costs and services	EUR.ha^{-1}	210.52	168.39	117.67	153.78	131.77	156.4	32.2	20.6%
Labor cost	EUR.ha^{-1}	76.97	77.19	26.02	30.68	41.29	50.4	22.3	44.3%
Depreciation (direct)	EUR.ha^{-1}	37.22	30.23	9.94	9.87	4.94	18.4	12.8	69.4%
Agrochemical services	EUR.ha-1	54.7	73.57	90.59	68.32	93.06	76.0	14.3	18.8%
Cost of utility operation, machinery	EUR.ha^{-1}	411.76	506.02	577.37	444.8	447.59	477.5	58.4	12.2%
Overhead cost	EUR.ha^{-1}	414.76	388	427.68	391.55	348.01	394.0	27.3	6.9%
Total production costs	EUR.ha^{-1}	**1908.9**	**2024.78**	**2044.75**	**1948.67**	**1942.37**	**1973.9**	51.9	2.6%
Direct material costs /Total costs	**%**	**36.9%**	**38.6%**	**38.9%**	**43.6%**	**45.1%**	**40.6%**	x	x
Yield per hectare	t.ha-1	63.95	68.03	46.25	57.5	76.71	62.5	10.2	16.4%
Costs per tonne	EUR.t^{-1}	29.84	29.76	44.21	33.89	25.32	**32.6**	6.4	19.6%
Number of beet growers/respondents		*14*	*17*	*15*	*15*	*13*	x	x	x

Source: RIAFE, Research Institute of Agriculture and Food Economics Slovakia (Costs of Agricultural Products, 2010-2014), own calculation.

Note: *CV= Coefficient of Variation, **cost surveys are carried out in individual enquiry and only for respondents keeping double-entry accounting, yield and own production costs are converted to 16% sugar content.

Five-year average total costs of growing sugar beet in Slovakia over the period 2010 to 2014 amounted to **1973.9 €.ha^{-1}**. Plant protection is an essential element and its costs amounted to 372.3 €.ha^{-1}, 18.9 percent of total costs. Costs of fertilizers per hectare were usually €157.22 to €267.27 (approximately 207.9 €.ha^{-1}, 10.5 percent of total costs) and costs of seeds amounted to 189.4 €.ha^{-1}.ha^{-1} (9.9 percent of total costs). The share of direct material costs to total costs was 40.6 percent. Five-year average total costs per tonne of sugar beet in Slovakia reached **€32.6** (per average root yield 62.5 tonnes, i.e. per **10.01 tons** of sugar).

3.2 The sugar beet yield of Tereos France and Tereos TTD, a.s.

The Czech company Tereos TTD, a.s. (owned jointly by French Tereos/62 percent and German sugar group Nordzucker/38 percent), which was bought over in the early 1990s, controls a significant part of the Czech sugar market, and its management has also been raving enthusiastically about expansions and acquisitions and producing lots of ethanol from sugar beet and selling some of it to Germany. In France and the Czech Republic Tereos is the leading sugar producer. Table No. 3 shows the sugar beet yield per hectare of Tereos France and Tereos TTD a.s. (Czech Republic). Important is the dynamic in the analyzed years (2009/10 – 2015/16), because it shows the trend for next years. The Fixed Base Index Numbers is higher for Tereos TTD a.s. (1.232 in the marketing year 2015/2016) than for Tereos France (nearly 1.122 in the same period). Table No. 3 shows the % difference between sugar beet yield of Tereos France (Base, 100 %) and Tereos TTD a.s. (Czech Republic). In the marketing year 2006/07, the difference of yields (per hectare) was 26.86 percent, in 2012/13 the difference has dropped to 5.69 percent.

Table 3. The sugar beet yield in the marketing year 2009/10 - 2015/16, tons per hectare, 16% sugar content

	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16*
Tereos France	94	84.2	95.5	84.3	85	91	89
Tereos TTD a.s. (Czech.R.)	66.7	61.4	81	79.5	68.1	82	71.5
Difference (%)	29.04%	27.07%	15.18%	5.69%	19.88%	9.89%	19.66%
Base index Tereos France	1.185	1.061	1.204	1.063	1.071	1.147	**1.122**
Base index Tereos TTD a.s. (Czech R.)	1.150	1.058	1.397	1.371	1.174	1.413	**1.232**
Chain index Tereos France	9.94%	-10.43%	13.42%	-11.73%	0.83%	7.06%	-2.20%
Chain index Tereos TTD (Czech R.)	5.54%	-7.95%	31.92%	-1.85%	-14.34%	20.41%	-12.80%

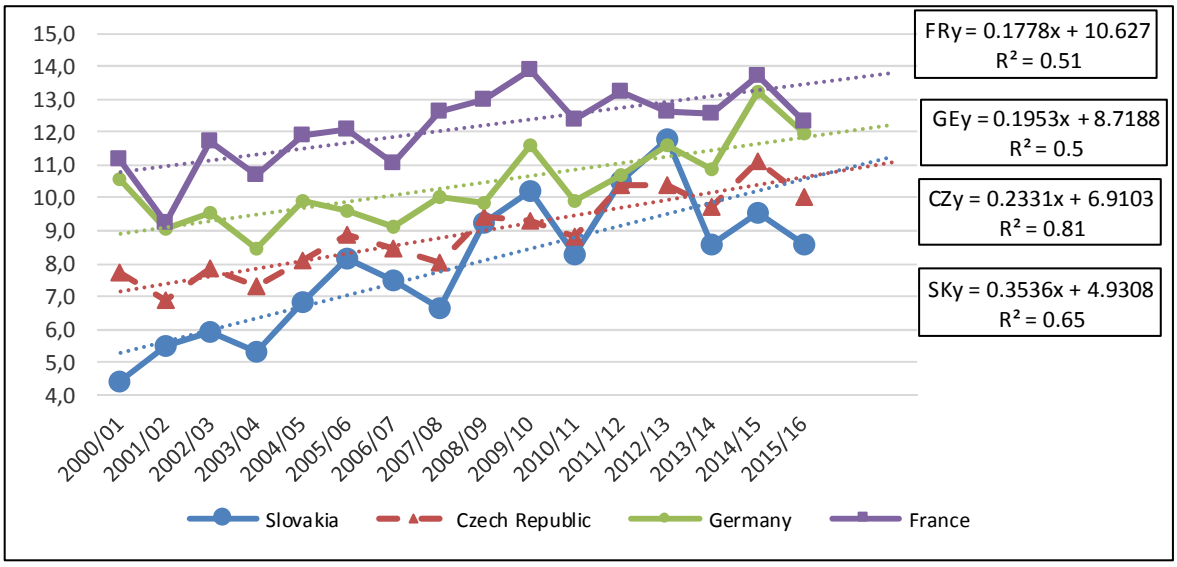
Source: TEREOS Annual Report 2012/13 and 2014/15, Tereos' Communications Department, 2013, 2015, own calculation. Note: *2015/16 – estimation.

The 2012/13 Tereos TTD, a.s. campaign made it possible to achieve abundant production again, with a sugar beet yield of 79.5 tons per hectare at 16%. These results have been achieved due to favourable weather conditions the increase in growing areas and efficient facilities. In the Czech Republic, the sugar beet growing season proceeding in the 2015/2016 campaign was impacted by severe rainfall shortage and long periods of tropical temperatures. As a result, the root yield (71.5 tons per hectare) is significantly lower than the year before (82 tons per hectare). The polarizing sugar yield thus amounted to 11.1 t ha^{-1}.

3.3 The white sugar yield and its trends

Regression line, calculated in the Graph No. 1 is linear (y = ax + b) and the regression coefficient is constant. Regression coefficient represents the rate of change of one variable (y = white sugar yield $t.ha^{-1}$) as a function of changes in the other (x = year); it is the slope of the regression line.

Graph 1. The average sugar yield, t.ha-1, regression analysis of time series



Source: CEFS SUGAR STATISTICS 2012 and 2015, Comité Européen des Fabricants de Sucre, STATISTICA 10 Software, own calculations.

Note: In statistical significance testing, the p-value is under 0.015 by all countries. The results are statistical significant. The authors are aware that M.A.P.E. statistics is not used.

The highest value of regression coefficient includes **Slovakia** sugar yield line, Beta = 0.3536, i.e. year-to-year prediction growth is 0.3536 tons of sugar per hectare. According to our research results, in the marketing year 2017/18 the producers of sugar beet in Slovakia will be able to achieve **11.29** tons of sugar per hectare.

The second highest value of regression coefficient includes **Czech Republic** sugar yield line, Beta = 0.2331, i.e. year-to-year prediction growth is 0.2331 tons of sugar per hectare. According to our research results, in the marketing year 2017/18 the producers of sugar beet in the Czech Republic will be able to achieve 11.11 tons of sugar per hectare.

The third highest value of regression coefficient includes Germany sugar yield line, Beta = 0.1953 i.e. year-to-year prediction growth is 0.1953 tons of sugar per hectare. In marketing year 2017/18 can be achieved 12.234 tons of sugar per hectare.

The lowest value of regression coefficient includes **France** sugar yield line, Beta = 0.1778, i.e. year-to-year prediction growth is 0.1778 tons of sugar per hectare. According to our research results, in the marketing year 2017/18 the producers of sugar beet in France will be able to achieve 13.827 tons of sugar per hectare.

According to the conducted simple linear regression the conclusions are statistically significant and correct, but there is a necessity to compare the linear trends to the real European situation.

4 Conclusion

The Marketing year 2013/14 was crucial for the future of beet sugar production in the European Union. Regardless of its minor share, sugar beet as a raw material – compared to sugar cane – has a potential of further qualitative production growth. In the European Union, sugar beet yields reach 80-110 t/ha and white sugar yields reach 10-11 t/ha. This growth potential is also one of the main arguments for prolonging the current form of sugar regime in the European Union until 2020. During the time period 2002 to 2012 the average volume of Czech sugar beet yields per hectare recorded about 61 t/ha. In the same period the average yields of sugar beet per hectare increased by 57% in the Czech Republic (for example in France it was only by 39.7%). During the analyzed time period, the average growth of Czech yields per hectare (in the case of 16% sugar content) reached 2.85 t/ha the Czech Republic (for example in France it was around 2.45 t/ha).

In the Czech Republic foreign-owned sugar company Tereos TTD, a.s. contributes to increase the yield from 1 hectare of sugar beet through the delivery of seeds and new technologies of cultivation. The accession of the Czech Republic into the European Union affected the Czech sugar production. The sugar reform made by the European Union in 2006 significantly influenced the Czech sugar and sugar beet production capacities. This reform did not influenced only Czech sugar industry but it has a direct impact on the whole EU sugar production capacities.

Five-year average total costs of growing sugar beet in the Czech Republic in the time period 2010 to 2014 amounted to **2147.2 €.ha^{-1}**. Five-year average total costs per ton of sugar beet in reached **€32.3** (per average root yield 66.5 tons, i.e. per **10.64 tons** of sugar). Five-year average total costs of growing sugar beet in Slovakia in the time period 2010 to 2014 amounted to **1973.9 €.ha^{-1}**. Five-year average total costs per ton of sugar beet reached **€32.6** (per average root yield 62.5 tons, i.e. per **10.01 tons** of sugar). The producers of sugar beet in the Czech Republic and Slovakia will be unable to achieve the goal of sugar yield 13 tons per hectare while maintaining the amount of total costs at €25 per ton of sugar beet in the next two campaigns.

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The Czech agrarian foreign trade development in 21st century

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Abstract: The Czech agrarian foreign trade recorded significant changes during the last years. Its value, volume and territorial and commodity structure and performance are changing fast. This paper aims to identify changes which have occurred during the analysed time period. Except for individual changes also individual factors responsible for them are specified. The paper provides the following findings related to Czech agrarian trade performance. While the territorial structure became even more concentrated, the commodity structure became more diversified. The Czech trade is quite competitive especially in relation to the European countries, while the competitiveness in relation to other territories is limited. The significant weakness of the Czech agrarian trade is its inability to generate added value. The Czech agrarian trade comparative advantages are existing especially in relation to the following set of aggregations: Cereals, Live animals, Oil seeds, Tobacco products, Dairy products, Sugar, Vegetable oils, saps and plaiting materials, Milling products, Beverages and alcohol. In relation to the rest of the World (without EU28 internal trade) Czech agrarian trade is competitive especially in relation to the following commodity groups Live animals, Dairy products, Sugar, Beverages and alcohol, Oil seeds, Preparation of cereals, Milling products, Cocoa preparations, Vegetable saps and Tobacco products.

Key words: Agrarian trade, Czech Republic, Commodity and Territorial structure, performance, value, volume, development, competitiveness, comparative ad

JEL classification: Q13, Q17

1 Introduction

The article analyses the basic transformation trends related to Czech agrarian foreign trade territorial and commodity structure in period 2001 – 2015. In relation to specific Czech agrarian foreign trade formation, it is necessary to emphasize several factors significantly influencing its development and the current performance. The Czech agrarian trade represents only a minor part of total Czech merchandise trade performance. However its value is constantly increasing, its share in total trade is less than ten percent. The Czech agrarian trade is representing extremely specific part of Czech economy performance (Burianova, Belova, 2012). Its character, structure and value were in the past affected by the significant changes related to Czech agrarian policy in the Czech economy transformation period – especially in nineties. Czech agrarian trade was in that time affected by applied protectionist policy. On the other hand it was also affected by reduction of agricultural production performance and the government effort to encourage cooperation especially in relation to other European countries (Smutka, Steininger, Maitah, 2015). The results of government effort was continuous liberalization process especially in relation to the European Union countries and CEFTA members. That liberalization process especially in relation to the EU was not symmetric one. Czech agrarian market was reducing its applied protection measures in relation to the EU faster than it was done by EU countries in relation to the Czech Republic (Svatos, Maitah, Belova, 2013). One of the important events for the Czech agrarian market was the EU accession. Already before that event the Czech Republic was preparing its membership and the necessity to eliminate almost all of barriers protecting Czech agrarian market both in relation to “old” EU and “new” EU members (Clark, J. Stephen; Smutka, Lubos; Cechura, Lukas; et al., 2015). The transformation process especially in the period before Czech accession was not really positive one. The period after the EU accession significantly encouraged not only the export, but also the import performance (Svatos, 2008). During the first years of Czech EU

membership the import value was growing even faster in comparison to export value development. The result was constantly growing negative trade balance performance until 2011 (the record of negative trade balance reached at about 36 billion CZK). But since that the situation significantly improved and inter annual growth rate of Czech agrarian export even exceeded the inter-annual growth rate of imports. The current negative trade balance reached only 20 billion CZK. While in 2001 the share of negative trade balance in relation to total agrarian trade performance was 17% and in relation to agrarian export performance even more than 40%, in 2015 it was only 4.7% and 9.9% respectively. But not just the value of performance recorded significant changes. During the last 15 years also the commodity and territorial structure have been changed significantly. The commodity structure became more diversified, especially because of production profile re-structuralization, better access to EU market and also because of higher level of investments coming into agriculture both from domestic and also foreign sources. The Czech foreign trade became also more focused on cooperation to other European and especially EU countries. While in 2001 the share of those two groups of countries in Czech exports was about 83% respectively 88%, in 2015 it was more than 91% respectively 95%. In the case of imports the trends was very similar (2001 – cc 74% respectively 77% and 2015 – cc 85% respectively 85%). The importance of so called non-European and especially the "third" countries is disappearing.

2 Materials and Methods

The paper aims to identify changes which have occurred during the analysed time period. Except for individual changes also individual factors responsible for them are specified. The paper is focused especially on the period of Czech EU accession (the monitored time period includes a few years before accession and also the post accession development). Territorial structure is analysed both in relation to the EU countries and also in relation to the "third countries" (e.g. CIS, OECD, European countries without the EU28, World and World without the EU). Commodity structure (we applied HS system dividing agrarian trade into 24 commodity groups) is analysed especially in relation to added value development and distribution. The paper also specifies the distribution of comparative advantages both in relation to EU single market and also in relation to the rest of the World. To reach the above mentioned objectives the paper applies the basic and competitiveness analyses (Lafay index and trade balance index). The results coming from individual analyses are highlighted through the modified "Product mapping method" identifying the process of Czech agrarian foreign trade commodity structure profiling. Data sources for individual analyses are following: UN COMTRADE, Czech statistical office.

As it was mentioned before we applied several different types of indices to measure the level of Czech agrarian trade competitiveness. Comparative advantage from observed data is named "revealed" comparative advantage (RCA). In practice, this is a commonly accepted method for analyzing trade data. The Balassa index tries to identify whether a country has a "revealed" comparative advantage rather than to determine the underlying sources of comparative advantage. RCA is based on export performance and observed trade patterns. It measures a country's exports of a commodity relative to its total exports. The index is calculated as follows:

$$RCA = (X_{ij} / X_{it}) / (X_{nj} / X_{nt}) = (X_{ij} / X_{nj}) / (X_{it} / X_{nt}) \quad \textbf{(1)}$$

where x represents exports, i is a country, j is a commodity and n is a set of countries, t is a set of commodities. Balasses index (1977, 1991) varies between 0 and infinity, with values between 0 and 1 indicating that the country does not have a comparative advantage and values between 1 and +infinity signaling that the country has a comparative advantage in that sector.

RCA has been under critique for its alleged incomparability and inconsistency. Shortcomings of the Balassa's index are described by many economists. Here we will not dwell on this account.

We will try to circumvent the shortcomings of the index still using two indices, each of which covers the weaknesses of RCA and allows us to conduct a comprehensive study of the above-mentioned issues.

One of these indices is Vollrath index. Evaluating the shortcomings of Balassa's index, Vollrath index (1991) allows us to assess trade flows not only in term of export values, but also taking into account values of import. Furthermore, in contrast to Balassa's index, Vollrath index is symmetric, with positive values indicating a revealed comparative advantage and negative values a revealed comparative disadvantage. (Vollrath, 1991) The revealed competitiveness is calculated as the difference between relative export advantage (RXA), which is the equivalent to the original Balassa index (RCA), and its counterpart, relative import advantage (RMA).

$$RMA = (M_{ij} / M_{it}) / (M_{nj} / M_{nt}) \quad \textbf{(2)}$$

Where M accounts for imports.

$$RXA = RCA = (X_{ij} / X_{it}) / (X_{nj} / X_{nt}) \quad \textbf{(3)}$$

The measure of Vollrath is the revealed competitiveness (RC), expressed as:

$$RC = \ln RXA - \ln RMA \quad \textbf{(4)}$$

The advantage of expressing these latter two indices in logarithmic form is that they become symmetric through the origin. Positive values of Vollrath's three measures, RTA, ln RXA and RC, reveal a comparative/competitive advantage (Ferto, Hubbard, 2003).

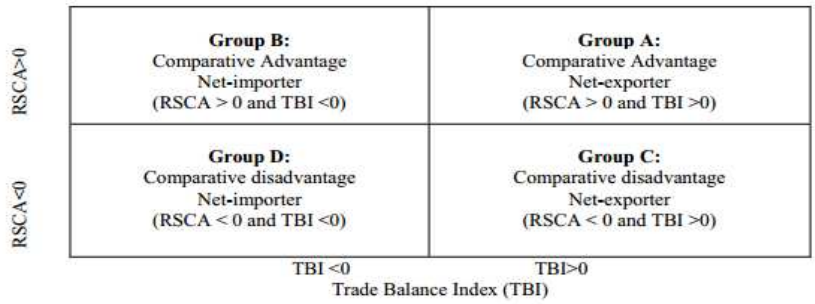
The next index used in the paper is Lafay index (Lafay, 1992). Using this index we consider the difference between each item's normalized trade balance and the overall normalized trade balance. Unlike the above indexes, Lafay index does not take into account world variables. Using LFI index we can focus on the bilateral trade relations between the countries and the regions. Moreover, this index is more reliable on the over-time comparison of sectors within a country. The Lafay index helps us to understand how the comparative advantages over time and to compare strength of comparative advantage of individual products and product groups, for individual regions and countries. For a given country, i, and for any given product j, the Lafay index is defined as:

$$LFI_j^i = 100\left(\frac{x_j^i - m_j^i}{x_j^i + m_j^i} - \frac{\sum_{j=1}^{N}(x_j^i - m_j^i)}{\sum_{j=1}^{N} x_j^i + m_j^i}\right)\frac{x_j^i + m_j^i}{\sum_{l=1}^{N} x_j^i + m_j^i} \quad \textbf{(5)}$$

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 the value the higher the degree of specialization. (Zaghini, 2003)

The next part of the analysis presented in this paper was conducted using the analytical tool, named "products mapping". This tool enables to assess leading exported products from two different points of view, i.e. domestic trade-balance and international competitiveness. (Widodo, 2009)

Figure 1. Product mapping scheme



Source: Widodo, 2009

The figure 1 represents a matrix for the distribution of the entire set of exported products into 4 groups according to the two selected indicators. The Revealed Symmetric Comparative Advantage (RSCA) by Dalum et al.(1998) and Laursen (1998) is the indicator of comparative advantage and Trade Balance Index (TBI) by Lafay (1992) is the indicator of export-import activities. The RSCA index is a simple decreasing monotonic transformation of Revealed Comparative Advantage (RCA) or Balassa index. RSCA index is formulated as follows:

$$RSCA = (RCA_{it} - 1)/(RCA_{ij} + 1) \quad \textbf{(6)}$$

The values of $RSCA_{ij}$ index can vary from minus one to one. $RSCA_{ij}$ greater than zero implies that country *i* has comparative advantage in group of products *j*. In contrast, RSCAij less than zero implies that country *i* has comparative disadvantage in group of products *j*. (Dalum et al.,1998) 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:

$$TBI_{ij} = (x_{ij} - m_{ij})/(x_{ij} + m_{ij}) \quad \textbf{(7)}$$

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 "net-importer" in a specific group of product if the value of TBI is negative, and as "net-exporter" if the value of TBI is positive. (Widodo, 2009)

Figure 2. Modified product mapping scheme

Lafay index	LFI>0	Group B: Comparative Advantage Net-importer (SLFI>0 and TBI<0)	Group A: Comparative Advantage Net-exporter (SLFI>0 and TBI>0)
	LFI<0	Group D: Comparative disadvantage Net-importer (SLFI<0 and TBI<0)	Group C: Comparative disadvantage Net-exporter (SLFI<0 and TBI>0)
Czech Agrarian Foreign Trade Commodity Structure		TBI<0	TBI>0
		Trade Balance Index	

Source: own modification and processing, 2016

Because the original approach does not take in consideration the real intensity/influence of imports (see the RCA structure), we decided to slightly modified the original "product mapping approach" and we replaced the RSCA index by LFI index to get more precise data about the real competitiveness of Czech agrarian trade commodity structure. The figure 2 represents the modified matrix for the distribution of the entire set of exported products into 4 groups according to the two selected indicators. The original RSCA index is replaced by Lafay index (LFI). The advantage

of that index is its ability to take in consideration only those transactions which are really related to individual countries' trade performance (in this case the Czech Republic's trade performance). The Trade Balance Index is applied in non-changed form. The advantage of above applied modification is its better ability to divide the products according to their real trade performance into above specified four quadrants. While the first approach provides a possibility to identify the comparative advantage at general level, the second approach provides a possibility to specify the comparative advantages on the base of real bilateral trade performance (in relation to selected group of partners).

3 Results and Discussion

When we look at the territorial structure of the Czech agricultural trade, it is apparent that it is more and more focused especially on EU-countries. The EU share in the Czech agricultural trade reaches about 90% in the long-term. The commodity structure is profiling significantly in recent years. The Czech agricultural exports and imports are based on a relatively small number of commodity aggregations, which represent a substantial part of the realized trade performance. However, the value of import is constantly increasing but the level of self-sufficiency is not decreasing. Czech exports are able to compensate even the growth of imports – especially through its increasing added value. The key aspect of the Czech agrarian trade is its competitiveness. The Czech agrarian sector still does not finish the process of its restructuring and its commodity structure profile is constantly changing.

The value of Czech agrarian trade is typical especially because of its specific character in relation to individual partner territories. As it was mentioned already above, Czech agrarian trade is heavily focused especially on European territory.

If we compare the period between 2001 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 Czech agrarian trade partners.

Czech agrarian export growth rate even exceeded the import growth rate especially in relation to the EU28, OECD members and also in relation to non-European countries. The only regions that increasing their imports to the Czech Republic faster than the Czech Republic exporting to them are European countries without the EU and CIS members.

The Czech Republic also significantly reduced its negative trade balance share both in relation to total agrarian trade turnover and export value. In this case the situation improved especially in relation to the EU28, other European countries and OECD members.

During the last 15 years Czech agrarian trade became extremely concentrated. The concentration is not related only to territorial structure (focused especially on European region), but it is also related to its commodity structure

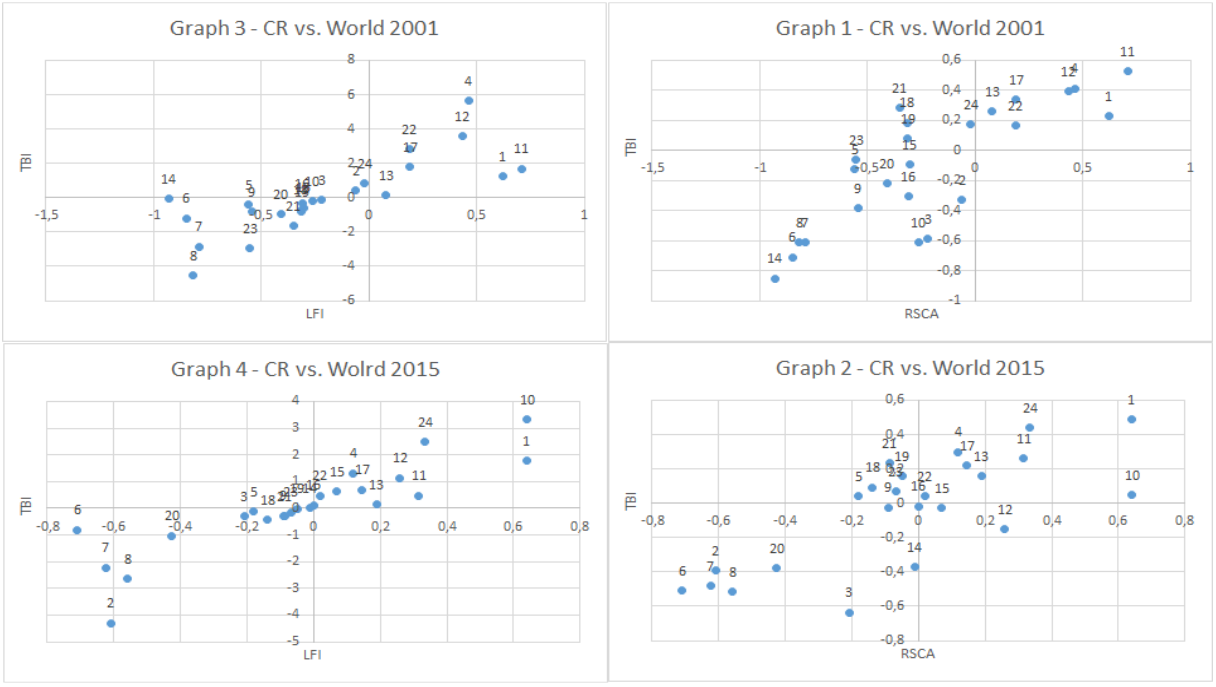
The specific feature of Czech agrarian foreign trade performance is its competitiveness. However the value of Czech exports is constantly increasing the Czech agrarian trade does not keep comparative advantages in relation to the total Czech merchandise foreign trade performance. The Czech Republic is an industrial country and its comparative advantages exist outside the agricultural sector.

All indices proved the existence of Czech agrarian trade comparative disadvantages both in relation to the EU28 and also in relation to the third countries. As total Czech agrarian trade does not keep the significant comparative advantages in relation to almost any territory. But on the other hand Czech agrarian trade probably is able to be competitive especially because of its constantly increasing trade performance.

The existence of comparative advantages is proved through the application of LFI and RSCA indices taking in consideration only agricultural trade performance (Other sectors are not included into comparative advantages calculation). Comparative advantages are analysed only at the level of individual trade items only in relation to total agricultural trade performance. The below mentioned 4 graphs provide an overview related to individual Czech agrarian trade items competitiveness. The first two graphs (1 and 2) provide an overview by classical product mapping approach while graphs 3 and 4 provide a different overview through the modified product mapping approach (for details see the methodology).

On the base of both applied approaches it is evident that the Czech agrarian trade commodity structure has been significantly changing its character. The commodity structure is still looking for its optimal state. It is also possible to see that comparative advantages are especially influenced by bilateral relations. The Czech Republic is not competitive at general level, but it is able to get comparative advantages at least at the bilateral level especially because of our EU membership and also because of existence of special agreements between the EU and selected partners. On the other hand there is also a negative feature related to that development. Czech territorial structure is becoming more and more concentrated – even the share of developing countries in the Czech trade performance is constantly decreasing because of re-exports from other European countries and our export profile is becoming more and more concentrated only into a few items. That specialization could be considered as advantage but on the other hand the specialization process is negatively affecting some traditional production sectors (e.g. pork meat, fruit, etc.) and it is also reducing Czech food self-sufficiency.

Graphs 1 – 4. The Czech agrarian exports' comparative advantages distribution – traditional and modified "Product mapping approach"



Source: own processing, 2016

Note: 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 specified or included, HS-05 Products of animal origin, not elsewhere specified 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, maté and spices, HS-10 Cereals, HS-11 Products of the milling industry malt starches inulin wheat gluten, HS-12 Oil seeds and oleaginous fruits miscellaneous grains, seeds and fruit industrial or medicinal plants and fodder, HS-13 Lac gums, resins and other vegetable saps and extracts, HS-14 Vegetable plaiting materials vegetable products not elsewhere specified or included, HS-15 Animal or vegetable fats and oils and their cleavage products prepared edible fats animal or vegetable waxes, HS-16 Preparations of meat, of fish 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

4 Conclusion

On the base of the results coming from the applied approaches it is possible to see that the last fifteen years of development have affected the level of Czech agrarian trade concentration. While the territorial structure become even more concentrated, the commodity structure became more diversified. The export commodity structure is based especially on the set of commodities having a comparative advantages – especially at the bilateral level. While the Czech trade is quite competitive especially in relation to the European countries, the competitiveness in relation to other territories is limited. The modified product mapping approach proved that the process of Czech agrarian trade re-structuralization in relation to traditional partners (especially the Europeans) is almost finished. In relation to other partners this process is still not finished and we are still looking for the final commodity structure. The significant weakness of the Czech agrarian trade is its inability to generate the added value. The Czech agrarian trade is still growing especially through the constant volume growth. The export volume is growing much faster in comparison to import volume. The result is the significant disproportion between the Czech agrarian trade export and import unit price. The low value of export unit price is especially influenced by the high portion of unprocessed water and wheat in Czech agrarian export. If we exclude those two groups of items from our trade performance the difference between Czech export and import prices is marginal.

The important question related to the current and especially future Czech agrarian trade profile is its competitiveness. The combination of especially RCA, 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. In relation to the rest of the World (without EU28 internal trade) Czech agrarian trade is competitive especially in relation to the following commodity groups Live animals, Dairy products, Sugar, Beverages and alcohol, Oil seeds, Preparation of cereals, Milling products, Cocoa preparations, Vegetable saps and Tobacco products.

The Czech agrarian trade profile is still not fixed. It is possible to expect even significant changes in its commodity structure profile and also in its volume and value performance. The EU market is changing fast not only because of internal factors, but also because of changes in external environment. Those changes represent not only threats, but also opportunity for Czech farmers and food producers to realize their production especially in relation to fast growing developing regions.

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Assessment of the competitiveness of the Polish food industry against the background of EU Member States

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Abstract: The aim of the study was to assess the competitive position of the food industry in Poland against the background of other EU Member States. The food industry in Poland is growing faster than in the EU-15 and is a leader among the EU-13. Integration with the European Union (EU) had a positive impact on boosting growth in the value of production of the Polish food industry and several years of adaptation to EU requirements significantly changed the image of Polish food producers in the Single European Market (SEM). The Polish food industry became a major food producer in the market and Polish food processing enterprises are considered among the most advanced in the EU. Rapidly growing export of food products was the main driver of the development of the food industry in Poland after its accession to the EU. Currently, the Polish food industry enjoys a stronger position than before the accession and Poland is one of the leading food producers among EU Member States.

Key words: food industry, production, competitiveness index, export, import

JEL classification: F14, F15

1 Introduction

Poland is one of the most important food producers in the European Union and one of the major exporters of agri-food products. It is ranked sixth in terms of the value of marketed production of the food industry (at comparable prices – at purchasing power parity) in the EU with a share of nearly 9% and eighth as regards export of food products with a share of over 5%. In 2003-2014, the value of marketed production of the food industry in Poland (at comparable prices) increased by 64% to EUR 91 billion, while in the EU-15 – it increased by only 26%, and in the EU-12/13 – by 45%. The pace of development of the Polish food industry is one of the fastest in the EU, thus strengthening its position in the Single European Market (Tereszczuk and Mroczek, 2015; Mickiewicz and Mickiewicz, 2010).

The period of Poland's membership in the European Union was marked by a systematic increase and improvement in results of foreign trade in food industry products. Positive changes were evident already in 2003 when Poland became a net exporter of food products for the first time, achieving a positive trade balance of USD 1.0 billion and recording a double-digit export and import growth rate. In 2003-2014, export of Polish food products increased more than six-fold (from USD 4.4 billion to USD 28.0 billion), while import – nearly five-fold (from USD 3.9 billion to USD 19.2 billion) (Ambroziak and Szczepaniak, 2015; Szczepaniak, 2010). Modernised production assets which surpass highly developed EU Member States in terms of modernity and development dynamics are behind the export success of the Polish food industry. Structural changes ongoing in the Polish economy, including those resulting from processes of adaptation to operation within the EU, left no choice but to modernise the productive capacity of the food industry, while high investments with a large share of foreign capital contributed to the thorough modernisation of food composition and packaging processes (Mroczek, 2013).

The main objective of the presented paper is to evaluate the international competitiveness of the Polish food industry and to verify the thesis that the competitiveness of this sector during Poland's membership in the EU has increased. Presenting in this study an assessment

of the competitiveness of Polish food industry shows several issues. First, based on the Eurostat data, assess the food production in Poland against the background of EU member states. Then assess the competitive position used two selected indicators (trade coverage index – TC and the Balassa revealed comparative advantage index – RCA) rated the competitive position of Polish food producers in the world market (Misala, 2011; Bojnec and Ferto, 2015).

2 Materials and Methods

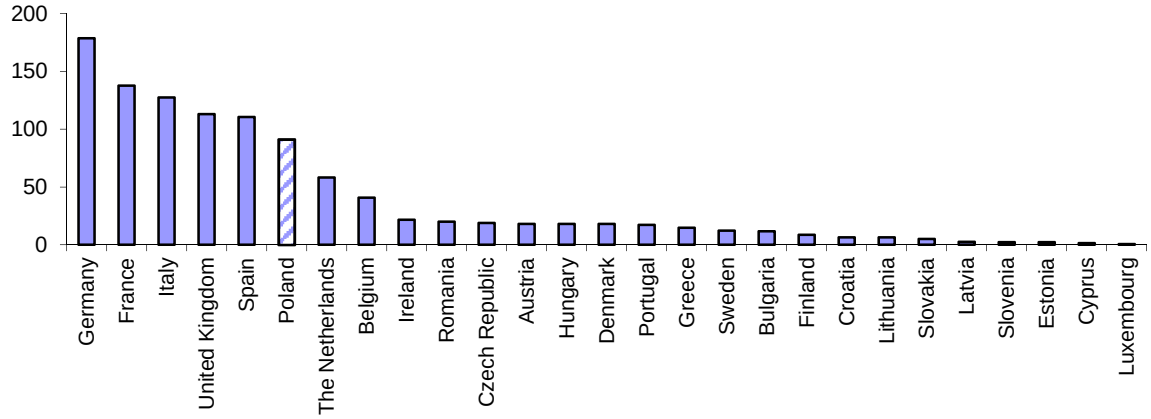
The competitive position of the Polish food industry against the background of the EU was assessed based on statistical data from WITS-Comtrade (foreign trade data, expressed in USD) and Eurostat (data on the value of marketed production of the food industry, expressed in EUR) and 2003-2014 were taken as a comparative period. Comparability of important data on the value of marketed production of the food industry in individual EU Member States was achieved by adjusting the value of production at current prices by the EUR purchasing power index (parity) in individual EU Member States. The competitiveness of Polish foreign trade in food industry products was analysed based on selected competitiveness indices, i.e. the trade coverage index (TC) (Olczyk, 2008) and the Balassa revealed comparative advantage index (RCA) (Balassa, 1965; Balassa, 1989).

3 Results and Discussion

3.1 Comparative assessment of food industry development in the European Union

The European Union has been a major world food producer for many years. In 2003-2014, the value of marketed production of the food industry (at current prices) in the EU-27/28 increased by nearly 30% to EUR 1 036 billion and at comparable prices – to EUR 1 064 billion. Over 80% of this production is manufactured in the EU-15 and its main producers are: Germany with a share of 17% in the value of marketed production of the EU food industry, France (13%), Italy (12%), the United Kingdom (11%) and Spain (10%). Poland is the sixth food producer in the EU with a share of nearly 9% in the EU production of the food industry (Fig. 1). The production of the Polish food industry, including tobacco products and alcohol (at comparable prices) in 2014 amounted to EUR 91.2 billion – the highest in the EU-13. At the same time, it is more than two times less than in Germany (EUR 178.8 billion) and more than in the Netherlands (EUR 58.3 billion) – by 56% or Belgium (EUR 40.7 billion) – more than two times (Tereszczuk and Mroczek, 2015).

Fig. 1. Value of food production in EU countries in 2014, in EUR billion (at purchasing power parity)



Source: (Tereszczuk, 2015) based on Eurostat data, http://ec.europa.eu/eurostat/data/database

The importance of the food industry for the Polish economy is much greater than in EU Member States, as evidenced by the ratio of the value of marketed production of the food industry to GDP. In 2014, the production value of the food industry in Poland accounted for approx. 13% of GDP generated, while the average in the EU-15 was 7%, in the EU-13 – 10%, and in the entire EU-28 – 7%. In Ireland (15%), the ratio was higher than in Poland, while in Germany, the United Kingdom and France (5-7%) – it was approx. half that in Poland.

The level of food industry development measured by turnover per capita in 2014 amounted in Poland to EUR 2.4 thousand and was similar to that of the largest food producers in the EU, i.e. Germany (2.2), France (2.1) and the United Kingdom (1.7), and close to the EU-15 average (2.2). In 2003-2014, the value of marketed production of the food industry per capita in Poland increased by an average of 5% per year, in Germany – by 3%, while in the EU-15 – this turnover increased by 1% per year, and in the EU-12/13 – by 4%. In this period, the average annual increase in production per capita was the highest in Lithuania (6%) and Bulgaria (5%), and high in Romania (4%).

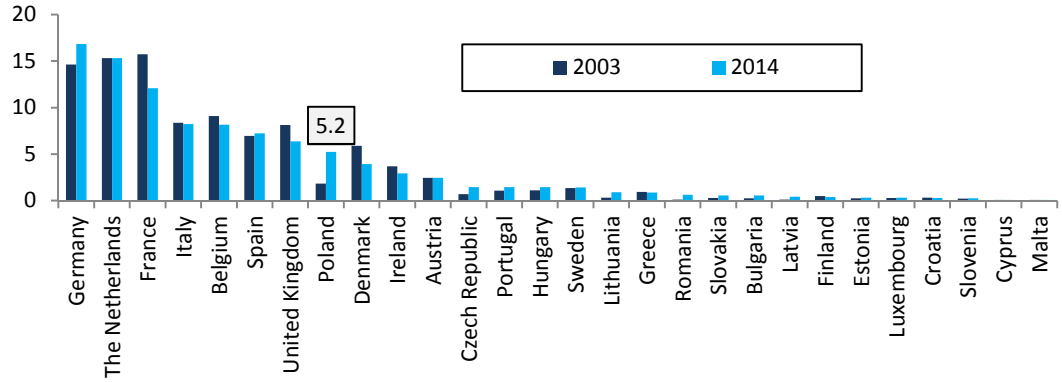
In 2003-2014, the value of marketed production of the food industry in the EU-27/28 increased by an average of 2.2% per year, while in Poland – by 4.6%, compared to 2.5% in Germany, 1.6% in the United Kingdom and 0.9% per year in France. This means that the largest increase in the value of marketed production of the food industry in the analysed period was recorded nowhere else but in Poland – from EUR 55.5 billion to EUR 91.2 billion, and its dynamics was twice that in Germany, Spain or Italy (Mroczek, 2015).

This diversity in the development of the food industry in EU Member States means that the gap between the EU-15 and the EU-13 is narrowing. The food industry in the EU-15 is gradually losing its position in favour of EU-13 producers, including the Polish food industry which is becoming stronger each year.

3.2 Competitive position of Poland in trade in EU food industry products

Polish foreign trade in agri-food products covers primarily food industry products. In 2014, the share of these products in Polish food export was as high as 84.7% (while in the EU – 76.8%) and was one of the highest among EU Member States. Only Ireland, Luxembourg, Malta, Austria, the United Kingdom, Germany and Finland had a higher share than Poland.

Fig. 2. Share of individual countries in export of EU food industry products (intra-EU and extra-EU, in %)



Source: (Bulkowska, 2015) based on WITS-Comtrade data, http://wits.worldbank.org

The dynamic development of Polish export of food industry products in the period of EU membership has contributed to a significant increase in the importance of Poland in total export of EU food industry products. In 2003-2014, the share of Poland in export of EU food industry products increased nearly three-fold, i.e. from 1.8% in 2003 to 5.2% in 2014 (Fig. 2). Thus, Poland

was ranked eighth in terms of the value of food export in the EU. Nevertheless, it is still lagging behind the largest EU exporters of food industry products, such as: Germany, the Netherlands, France, and subsequently also: Italy, Belgium, Spain and the United Kingdom (Bulkowska, 2015). Although the position of Poland in EU export of food industry products has clearly improved in the period of EU membership, it still does not fully correspond to either economic potential or ambitions and expectations of Polish food producers. In 2014, Poland was ranked third among EU Member States in terms of a surplus in trade in food industry products (USD 10.6 billion), giving way only to the Netherlands and Germany. Undoubtedly, it was a great success of Polish exporters of food products, as in the last year before EU accession, Poland's surplus was only USD 1.0 billion which ranked our country only on sixth place among EU countries. In the period of EU membership, Poland has become an undisputed leader among the new Member States in terms of food export.

The analysis performed revealed that Poland enjoys a strong position in trade in food products among EU Member States. A high share of food industry products in agri-food export is favourable for the Polish economy, as export of processed products brings greater benefits than export of raw materials necessary to manufacture them. Processing of food intended for export makes it also possible to better use resources and thus derive greater benefits from the scale of production (Ambroziak and Szczepaniak, 2015).

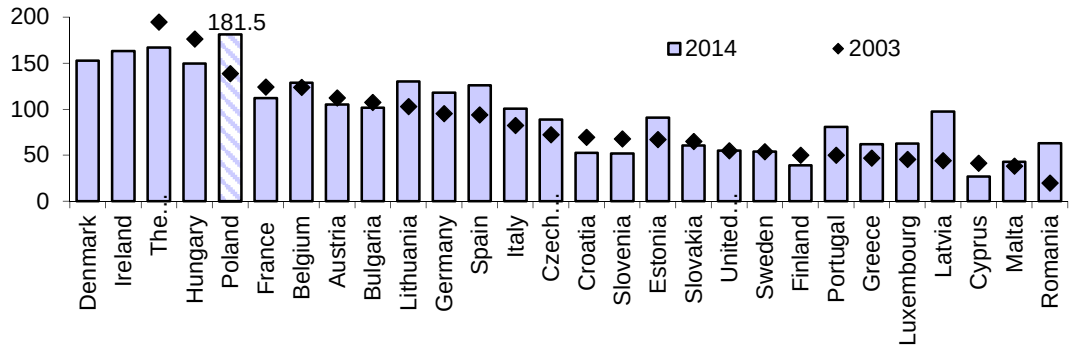
3.3 Significance of Poland in foreign trade in EU food industry products – index analysis

3.3.1. Trade coverage index for food industry products

One of the basic competitiveness indices for a given country's export in foreign markets is the trade coverage index (TC). It determines the extent to which spending on imported goods is covered by export earnings. The TC index is applied to examine export-import relationships at the level of trade as a whole, a sector or a product. If the trade coverage index is over one, a country generates a surplus in trade in products of a given group and, consequently, enjoys a competitive advantage in trade in products of this group. If the TC index is below one, the country has a trade deficit, a weak competitive position in foreign markets and no ability to compete (Olczyk, 2008, Ambroziak, 2015)).

Despite multidirectional fluctuations, the trade coverage index for food industry products in the period of Poland's membership in the EU has been higher than one. This means that Poland has generated a surplus in trade in food industry products throughout this period. In 2014, the index in Poland amounted to 181.5% and was the highest among all the EU Member States, outstripping the Netherlands by 14.6 percentage points, Ireland – by 18.4 percentage points, and Denmark – by 28.9 percentage points (Fig. 3).

Fig. 3. Trade coverage index for food industry products (TC) by individual EU countries, in %



Source: (Ambroziak, 2015) based on WITS-Comtrade data, http://wits.worldbank.org

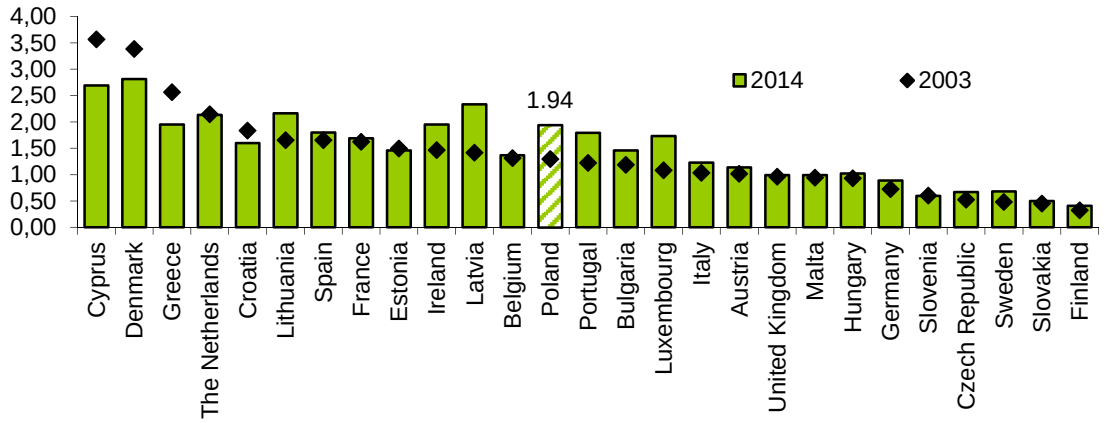
In the period of Poland's membership in the EU, the trade coverage index for food industry products has increased by nearly 1/3 (from 138.8 to 181.5%), reflecting the fact that the competitive position of Polish food producers in foreign markets has been strengthening.

3.3.2. Balassa revealed comparative advantage index

The essence of the Balassa revealed comparative advantage index in export (RCA) consists in determining whether the share of a given product group in export of the country in question is higher/lower than the share of this product group in world export to a specific market. When the index takes values greater than one (the share of the given product group in export of the country in question is higher than the corresponding share in world export), the country in question enjoys revealed comparative advantages in export to the specific market. Otherwise, when the index takes values lower than one (the share of the given product group in export of the country in question is lower than the share of this product group in world export), the country in question does not have revealed comparative advantages in export to the specific market (Szczepaniak (ed.), 2014; Ambroziak, 2015)).

In 2014, Poland belonged to EU Member States with one of higher RCA indices in export of food products to the world market (Fig. 4). The share of these products in total Polish export was nearly two-fold higher than their share in world export (RCA = 1.94). Among the new EU Member States, only Cyprus, Latvia and Lithuania enjoyed stronger revealed comparative advantages in food export than Poland. Thus, these were relatively small countries where food processing still plays an important role. In terms of competitiveness, Poland was also inferior to three EU-15 Member States, namely Denmark, the Netherlands and Greece. In the period of EU membership, revealed comparative advantages have become clearly stronger in export of Poland's and also most new EU Member States' food industry products (except for Cyprus, Croatia and Estonia), while the greatest improvement in the value of the index was recorded by: Latvia, Romania, Lithuania and Bulgaria (Szczepaniak (ed.), 2014).

Fig. 4. RCA indices in export of food industry products by individual EU countries



Source: (Ambroziak, 2015) based on WITS-Comtrade data, http://wits.worldbank.org

In 2003-2014, the competitive position of Poland in export of food industry products strengthened, as measured by the revealed comparative advantage index (RCA), from 1.30 in 2003 to 1.94 in 2014. The largest increase in this index was recorded by Latvia, i.e. from 1.42 to 2.33, while the largest drop – by Cyprus, i.e. from 3.57 to 2.69.

4 Conclusion

Poland's accession to the European Union provided food producers with conditions for revealing previously achieved competitive advantages. Their appropriate use had an impact on boosting the development of marketed production of the Polish food industry and several years of adaptation to EU requirements significantly changed the image of Polish food producers in the Single European Market (Figiel and Kufel, 2013). The Polish food industry became a major food producer in the European market and Polish food enterprises are considered among the most advanced in the European Union. The process of reducing disparities in the level of development of the food industry in Poland and the EU-15 as well as a significant alignment of national sectoral and business breakdown structures with the largest EU food producers are progressing. The pace of development of the Polish food industry is one of the fastest in the EU, thus strengthening our position in the Single European Market each year. Very rapidly growing export of food products after EU accession was one of the main drivers of the development of the food industry in Poland.

In the period of EU membership, the importance of Poland in trade in EU food industry products has significantly increased. In 2014, Poland was ranked eighth in terms of the value of their export. The share of Poland in EU food export amounted to 5.2%, against 1.8% in 2003. Furthermore, Poland managed to achieve the third largest surplus in trade in these products in the EU (USD 10.6 billion in 2014). Food industry products clearly dominated Polish agri-food export (accounted for over 80% of its value) and their share was the highest among EU Member States.

Very good results of foreign trade and an improvement in competitiveness indices prove that the international competitiveness of the Polish food industry is growing. The progress that has been made in this area in the period of membership, i.e. strengthening of the position of Polish food industry enterprises in the EU market, was primarily due to economic conditions, such as free trade of Poland with other EU Member States and the development of the global market. Certainly, it would not be that significant, however, without competitive advantages of Polish food producers and the impact of the Common Agricultural Policy and the Common Commercial Policy of the EU.

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Food Wastage in the Czech Republic and Sustainable Development

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Abstract: The article explores responsible approaches to food buying within the context of the basic principles of sustainable development. Food wastage stands for a topical problem for each individual when satisfying his/her basic life requirements. The aim of this paper is to examine the approach of Czech households to food wastage in general and to suggest options which would prevent food wastage generated by households in particular. Comprehensive comparative research combined with quantitative and qualitative analysis was applied as the primary method to obtain input data. The first investigation was held in November 2014 in 121 households. It focused on the relevance of food wastage from the households' point of view. Within the second follow-up investigation, 64 households were approached in March 2015. They were asked to record their actual daily food wastage in a logbook for a period of one month and comment on their general attitudes towards food handling.

The results indicate that the level of the Czech domestic food wastage is high. On one hand, there are households which do not waste any food at all (with unused food utilised as compost or livestock feed). On the other hand, there are households which dispose food products almost on a daily basis. Expired date of consumption and not consumed stored meals are the most frequent reasons of food wastage. People largely do not even realise the high volumes of food wasted by themselves albeit they consider food wastage a significant social problem in general. However, more efficient food handling can positively contribute to households' economies.

A change at the level of consumer buying habits is a key factor in the extensive application of more responsible choices made by end users. Furthermore, monitoring the date of food expiry and date of consumption stand for the most crucial factors.

Key words: Food, household, responsible approach, risk, sustainable development, wastage.

JEL classification: D12, M14, Q01

1 Introduction

Food wastage has recently become a topical and increasingly debated issue associated with non-waste and sustainable development phenomena. Problems related to food wastage have to be considered a global problem - encompassing food wastage on one hand and lack or inaccessibility of food on the other hand (Butler, 2012, Evans, 2011, Farr-Wharton et. al. 2014, Frewer and Gremmen, 2007).

Food wastage stands for an urgent issue which closely corresponds with economic, social - ethical and ecological aspects of life of society and, simultaneously, it is related to sustainable development (Grote, 2014, Kouwenhoven et. al., 2012, Lin, 2014). The risk related to excessive, impulsive, and irresponsible food purchasing resulting in food wastage represents a set of factors which negatively affect sustainability schemes. They modify and/or limit the balance of principal features of sustainable development. As stated by Smejkal and Rais (2013) understanding to risk analysis relations (assets, threats, vulnerability, counter-measures) provides for prevention and/or a reduction of risk impacts.

Impulse and creativity represent topical phenomena of in-store decisions. Thereby, current food purchasing trends are affected significantly. Impulse purchasing fueled by numerous in-store

marketing and promotional tools accounts for a high proportion of the entire volume of purchase. It is obvious that a final household consumer does not merely purchase groceries which are needed or planned to buy. In-store decisions are frequently made under the influence of current marketing campaigns of various forms (Regnerová and Šálková, 2016). In 2009, an in-store decision rate was at the level of 72%. However, in 2015 the in-store decision rate climbed up to 87% as indicated by the Shopper Engagement Study Czech Republic by Ipsos and POPAI CE[18], the research agency, in December 2015. Therefore, the significance of sustainability in consumers' behaviour should be emphasised to a greater degree (Prokeinová and Paluchová, 2014).

The following section reviews relations and connections between sustainable development, responsible approach to food buying, and food wastage.

Food Wastage

Food wastage as a general category refers to any food lost. However, the concept of food wastage has not been defined unambiguously in research literature, and it is frequently replaced by the concepts of food waste and food loss.

- Food loss has been defined by the FAO (Food and Agriculture Organisation of the United Nations) as a decrease in edible food mass excluding inedible parts and seeds throughout the entire supply chain. This specification of loss includes parts which were originally meant to human consumption; however, they were directed to a non-food use as fuel or animal feed, for example.
- Food waste has been measured only for products that are directed to human consumption but which get lost from the human food chain, particularly in retail or in restaurant services (Rohn et al., 2014) or at the point of final consumption. The food is discarded (Gustavsson et al., 2011) even though the waste is utilised for non-food purposes subsequently as bioenergy, for example.

According to the above definitions, the food wastage concept refers to any food substance, raw or cooked or frozen, which was originally meant for human consumption and which is discarded, or intended or required to be discarded.

Pursuant to the European Commission, households account for 42%, manufacturers for 39%, vendors for 50%, and restaurant services for 14% of food wastage in Europe. The European Commission estimates that around 90 million tons of food is wasted in the EU annually. A great proportion of this volume is still suitable for human consumption (Stenmarck et al., 2016).

Czech Republic 'produces' 729 thousand tons of food wastage annually. Thereby, each citizen of the Czech Republic produces 69kg of food wastage annually (one European accounts for 95 – 115kg of discarded food annually) which equals to an average of 189g of daily food wastage per each Czech Republic citizen; in other words, 189g of food wastage is produced by each Czech Republic citizen-consumer every day. Considering an average of 77 year life expectancy, it represents 5,313kg (around 5.3t) of food throughout an individual's entire life. Indicated numbers are alarming given the fact that almost every seventh human being on earth has suffered from famine, and almost one third of food is wasted (Kuznická, A., 2014). The European Commission indicates that a growing number of analyses tend to dispute the long-term sustainability of current food production and consumption trends. Within Europe the field of food market and problems of food consumption are very important and are broadly discussed (Šrédl

[18] POPAI Central Europe is the Central European branch of POPAI, worldwide non-profit association. Its mission is to provide in-site marketing support.

and Soukup, 2011). The European Commission intends to reduce food wastage by 50% by 2020 (Stenmarck et al., 2016).

The aim of the article is to demonstrate an approach of Czech households to food wastage in a broader scope on the basis of investigation data gathering. It is explored whether and to what extent the food is wasted, whether food wastage affects households' economies and whether the volume of purchased food is related to food wastage, food disposal and average income of a household's member. Subsequently, the paper aims to provide basic suggestions to prevent households from food wastage.

2 Materials and Methods

Given the subject of the paper, an investigation was carried out through field research using individual interviews as well as a questionnaire survey. The first investigation was held in November 2014 in 121 households. It focused on the relevance of food wastage from the households' point of view. Within the second follow-up investigation (the results of which are demonstrated within this article) 64 households were approached in March 2015 (Table 1 and 2). Both investigations covered households from municipalities and rural areas. Households were with or without children, contained from one to six members of different age categories, and differed by monthly income per a household member. Households were asked to record their actual daily food wastage in a logbook for a period of one month.

Investigation of food wastage in Czech households was implemented at several different levels. The district of household location, overall net income, number of members, and data on each household member were reviewed at the first demographic level. A regular food store, frequency of shopping, and of a warm dinner cooking which is directly linked to food wastage were examined at the second level. The second part was followed-up by a stage which examined opinions on food wastage including suggestions on food wastage reduction in the households. The households were asked to record their actual food purchase data (price and structure of the purchase) and food disposal data (reason, storage period, method of disposal) in a logbook for a period of one month. The research was complemented by ascertaining general attitudes of households towards food handling. This investigation served as pilot research which will be extended by more detailed research on food wastage in the future.

Table 1. Demographic structure of participants in the second investigation held in March 2015 – I.

Size of the site (number of inhabitants)	**Age**				
	18–29	**30–39**	**40–49**	**50–59**	**60 yrs +**
Up to 500	2	1	4	0	1
Up to 3,000	1	2	5	1	1
Up to 5,0000	2	0	1	2	1
Up to 250,000	3	1	6	1	6
1,000,000 +	7	4	10	3	3

Source: Own calculations based on questionnaire survey, 2015

Table 2. Demographic structure of participants in the second investigation held in March 2015 – II.

Number of household members	Monthly income per a household member			
	0 – 10,000	**11 – 15,000**	**16 – 20,000**	**21 – 30,000**
1	2	5	2	6
2 – 3	11	13	1	3
4 – 5	7	9	2	2
6 – 7	1	0	0	0

Source: Own calculations based on questionnaire survey, 2015

The result of the investigation carried out is categorical data (qualitative characteristics) that is not directly measurable and is therefore expressed in verbal form. Regarding a pilot stage of the research second investigation in which just 64 households were asked to cooperate, it was not feasible to ascertain correlation of selected characteristics. χ^2 – test for *r x s* contingency table is not possible to be used if more than 20% of theoretical frequencies are lower than 5 and/or an expected frequency in at least one contingency table field is less than 1. Ascertaining of these correlations would be feasible in an expected follow-up detailed research.

Methods of secondary research were based on structured data analysis, descriptive analysis, and a comparative method within publication sources. Induction and deduction methods were implemented to discover whether a general principal applicable to the phenomena in another time and another place - food wastage in the Czech Republic households in general can be derived from the regularity of specific researched phenomena (food wastage in randomly selected Czech households).

The following initial prerequisites were stipulated: 1) more food is wasted in larger sites; 2) food wastage significantly affects households' economies; 3) expired food is consumed rarely; 4) bulk purchases which are not entirely consumed stand for a frequent food wastage.

3 Results and Discussion

Food wastage and households' behaviour

It is claimed by two thirds of monitored households that they attempt not to waste food. Nevertheless, food is wasted; in particular, in municipalities with higher numbers of citizens. Simultaneously, this is confirmed by Secondi et al. (2015). Generally, people living in municipalities tend to produce more waste. A prevailing number of households would appreciate access to statistical data on discarded food volumes at each level of the food chain - manufacturers, distributors, vendors. **Only almost 50% of households consider** food wastage a reason of significant financial loss (Table 3). It is claimed by households that they waste food minimally (10% of monitored households only). Therefore, they do not believe that food wastage accounts for any significant financial loss.

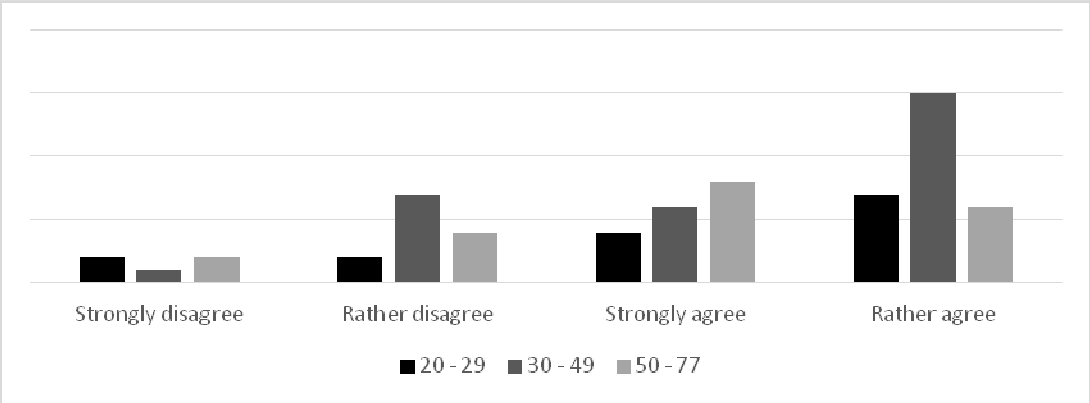
Table 3. Food wastage accounts for household's significant financial loss

Household's response	Number
Strongly disagree	31.3 %
Rather disagree	26.6 %
Strongly agree	21.9 %
Rather agree	20.3 %

Source: Own calculations based on questionnaire survey, 2015

Consumption of expired food was monitored at the same time. The households were questioned whether they consume 'after expiration date' food in case they do not consider this food perished. Observed values classified by age categories (households were grouped into three categories by age) are presented in Figure 1.

Figure 1. Consumption of expired food and age categories

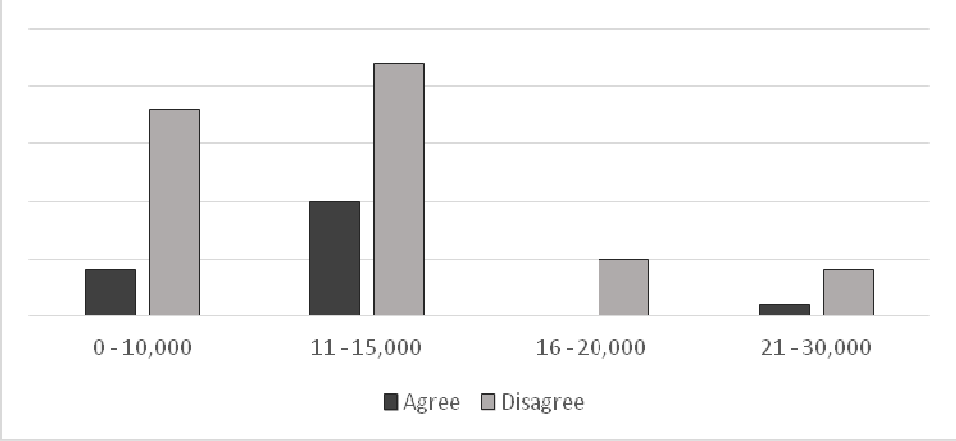


Source: Own calculations based on questionnaire survey, 2015

The results suggest that a great majority of households consume expired food regularly if it is visually obvious that the content has not perished. The above stated results demonstrate that the risk of any health impacts caused by perished food consumption has still been underestimated. No significant difference among age categories has been found. Therefore, it cannot be claimed that young people would perceive these potential risks more. Simultaneously, an assumption that senior citizens would consume expired food much more due to their financial limits has not been corroborated either.

Most households do not acknowledge that purchases of large volumes of food - bulk discounted packaging would be directly linked to a larger volume of wasted food. Figure 2 demonstrates a relation of average income per a household member, purchase volume, and food wastage.

Figure 2. Purchase volume, food wastage, and average income (in CZK per month) per a household member relation



Source: Own calculations based on questionnaire survey, 2015

Porpino et al. (2015) points out several major antecedents of food wastage origin in households: excessive purchasing, over-preparation, avoidance of leftovers, and inappropriate food conservation. Therefore, this research concurrently focused on households' opinions and potential suggestions on food wastage reduction. The majority of households tend to favour more regular control of purchased food expiry date (82% of households), planned shopping and less impulse

buying (58% of households), composting or other utilisation of unused food, and better information on expiration (bigger and more visible information on packaging - 84% of households). 59% of households agree with better planned cooking of smaller portions and 56% of households would prefer smaller packaging containing less items.

Suggestions on food wastage reduction

The most frequent food products which are wasted in Czech households are bakery products, fruit, vegetables, and dairy products as yogurts, milk, cheese, etc. These products are followed by smoked meats and cooked meals or served food. Excessive buying - bulk purchasing of food which cannot be consumed by household members accounts for food wastage significantly.

The following are principal suggestions on food wastage reduction:

- rational planned buying
- reduction of excessive buying of food with short expiration
- reduction of bulk purchasing (‘actions’ offers)
- education on appropriate storage
- less advertisement driven buying

The current supply in the Czech Republic food market highly excesses the demand. Thereby, the behaviour of consumers is strongly affected when shopping for food or at restaurants. Such changes have strongly altered current shopping and eating habits of consumers (Regnerová and Koubová, 2013) and contributed to an increase in food wastage.

4 Conclusion

Provided that sustainable development represents a balance of economic, social, and ecological (environmental) aspects of life of a prosperous society which can utilise its sources economically, then food wastage reduction stands for an important phenomenon of such sustainability. It is the phenomenon which concurs with sustainable development significantly as food wastage is inhered in both economic, social-ethical, and ecological layers of society.

The research which was held in the autumn of 2014 and spring of 2015 demonstrates current food wastage trends in households and, simultaneously, the relation of food wastage, impulse food purchasing, and consequent sustainable development risks. Out of the initial prerequisites it was confirmed that food wastage is more frequent in more populated municipalities. Likewise, a significant part of households regularly consume after expiry food if they consider the food not perished based on a thorough visual check. Contrarily, it was not confirmed that food wastage affects households’ economies. Simultaneously, the households do not admit any direct relation between bulk purchases (large economical packaging of a product) and volume of food wastage. This pilot research should be followed by a more detailed investigation. It would be highly beneficial to concentrate on discrepancies between declared and actual behaviour of consumers during their food purchasing and food consumption in relation to food wastage.

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Utilization of cloud computing in Agricultural Holdings

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Abstract: The contribution is concerned with the usage of cloud computing in agricultural holdings for storage of firm data and for usage of program equipment for processing of entrepreneurship's data. Based on the questionnaire survey, was found out the percentage of usage of cloud computing at farms for both, storing data and for usage of software. The results of the research were analytically assessed and compared with the results of survey in non-agricultural enterprises. Part of the questionnaire also determines the amount of spending on information systems and information and communication technologies. The survey results are compared with the observed price proposals for usage of cloud computing services.

Key words: data, information, knowledge, Cloud computing

JEL classification: Q13

1 Introduction

The way in which the most of firms currently works with information was a few years ago fully sufficient and corresponding to the possibilities of that times. Past means to get the quality information flow were unbearably expensive; high-quality tools for the dissemination and analysis of information were not readily available. Nowadays we have the instruments to acquire, share and use information in completely new ways.

Understanding the work with information and their use as an activity represents an intellectual shift of fundamental importance. In today's computer networks it is possible to easily and quickly retrieve and view almost any data. They can be analysed at different levels and from different points or viewed from different angles. It is possible to exchange information with other firms, people and systems. The ideas and work of many people or teams, often geographically separated, are integrated, into a single, highly coordinated complex.

The quality of a company is determined to what extent is its information infrastructure able to connect, share and structure information. Isolated applications and data do not make possible to creation of a highly functional behaviour of the company. Managers at all levels must have easy access to all available data and information, wherever they are.

Information and communication technologies currently are no longer critical. In the recent past, when the price of technology was very high, the amount of stored data was influenced just by information and communication technologies in the company. Investment in information and communication technologies is nowadays no longer a factor that would influence the amount of processed data. In recent years, security of data and information in corporate systems has become a critical factor. Environment, in which the company secures its software and especially all stored data and information, is becoming increasingly demanding and often dangerous. One possibility

a solution of described situation is usage of cloud computing. Also Chen et al. (2012) are concerned with the research about usage of Cloud computing in agricultural companies. They state that "applied examples show that usage of cloud can provide heterogeneous services of sharing resources for whole agricultural holding" (Chen et al., 2012). Observed issues are also elaborated by Jarolímek et al. (2014) and Al Zamil (2015).

Currently, also at farms volume of stored data and information is vastly increasing. There is therefore a question, how to store data, and how to deal with the software that the company will use. There is a possibility to invest in new information and communication technologies, or to use of cloud computing services. The article deals with the possibility of utilization cloud computing in Czech agriculture. Hurafuji (2014) stated that "cloud services for data collection and storage are also very suitable service for agriculture. This service provides access to large groups of users." The possibility how the organic farmers can use social media (particularly Facebook) for their marketing purposes are examined for example by Pechrová, Lohr and Havlíček (2015).

The aim of the paper is to retain or reject stated hypothesis:

H1 – There is an increase of the usage of cloud computing for data storage and use of software for data processing in the non-agricultural sector. The first hypothesis assumes also an increase in the usage of cloud computing also at farms.

H2 – It is expected more than 40% reduction in spending on data storage and utilization of software via cloud computing in comparison with use of own resources for data storage and the purchase of software and its maintenance.

On the basis of the stated hypotheses a primary survey was carried out by the authors in 2015 in the agricultural holdings with primary production. Stating of the hypotheses is based on the knowledge and experience of the authors with the situation in the agricultural sector.

The farms are currently experiencing huge growth in data and they are unable, considering the rapid development of information and communication technologies and security of data and information, to process such large volumes of data and especially secure them and use them effectively for their decisions making.

"With emerging industry of cloud computing, the computing resources are easily and flexibly available to customers" (Zhang et al. 2016). Currently, in every company there is an incredible increases of internal data and information. However, it is also necessary to increasingly use external data and information that affect more successful increase of firm's competitiveness. Storing all those data in the internal data storages requires constant increase of financial resources to increase memory resources, to ensure the security of stored data, and on software updates. Fast software innovations are driven mainly by the changing legislation, but also by the requests on computing systems. Many users utilize the present computer systems, functionality created by supplier especially in management systems. The requirement for frequent changes is expensive. It demands regular software upgrades and the associated integration requirements of the individual modules of the entire information system. All these changes are difficult for IT personnel department, and in particular for their knowledge. Especially on farms there are problems of personal character with the ensuring of regular operation and innovation across the monitored issues. "Most of the information systems that are currently used by Japanese farmers are used for duties such as filing tax records and evidence of traceability to meet the demands of farmers in e-government and distribution industries" (Hori et al., 2010). Situation in Czech agriculture is very similar. It implies from the preformed surveys that many farms use the stored data and information only for the elaboration of mandatory reporting and for collaboration with suppliers and customers. They do not work extensively with the data. Data and information are currently stored on farms in systems whose modules are not integrated and hence it is not possible to uniformly work

with and use data and information in a company for further decisions-making. To obtain the data in different time series is very hard. Of course it is not possible to carry out economic modelling and other analysis required. The possibilities of cloud computing use can contribute to a better use of data and information, especially by the use of computer systems that will be part of the software in the cloud. Ludena et al. (2013) states that "processing of the large volumes of data changes some of the current knowledge of the paradigms in the science and industry. Processing of large volumes of the data will be extensively used also in the agriculture, with the aim to improve the efficiency and accuracy of the proposed system, and to improve all decision-making process".

Secure storage of large volumes of data, use of computer systems supporting data analysis, making economic predictions, smooth access to the data from any location, those are positive assumptions which may affect the use of cloud computing. Need of processing and further use of data cannot be influenced by the price of information and communication technologies and by the price of the software. Also large and small entrepreneurships need to process and use the data for their further decisions. Relationship data processing methods in agriculture also addresses Jarolímek et al. (2014). Exactly the possibility of using of cloud computing creates them the preconditions for this processing.

2 Materials and Methods

Despite declaration of the necessity of using internal and external data for improving the competitiveness of companies they are still not widely used. There is still no integrated information system with specialization on agricultural production concerning the crop and livestock with technical services, economics and management, which would support the decision-making processes of the farmers. Data and information are often stored locally - almost 65% of observed firms.

The article was prepared on the basis of scientific methods - analysis, synthesis, induction and deduction. The theoretical part was created using secondary sources, studying the scientific and scholarly articles. On the basis of the set hypotheses a questionnaire was elaborated. It consisted of 15 questions – 12 questions were closed and 3 questions were open. There were interviewed 97 farms – response rate was 67.1% (65 companies reacted to the questionnaire). It was chosen the structure of farms that corresponds to the representation of the companies in the national structure. From all 97 surveyed companies there were 38 companies with an acreage over 2 000 ha, 24 holdings with an area of 1 000–2 000 ha, 26 companies with an area 400–1 000 hectares, and 9 enterprises with an area of 100– 400 hectares. All respondents had the crop and livestock production, 15 respondents had also other activities – agro-tourism, hydraulics manufacturing, processing of milk, meat, feed production, etc.

Based on the survey results there was also done a direct questioning for 56 enterprises. The questions for the respondents during direct interview were formulated based on years of experience of the authors of the article (cooperation with practice) with the issue of agriculture, with the use of data, information and knowledge management issues throughout the primary production in agricultural sector. The outputs from a questionnaire survey were used to conclude about stated hypotheses.

3 Results and Discussion

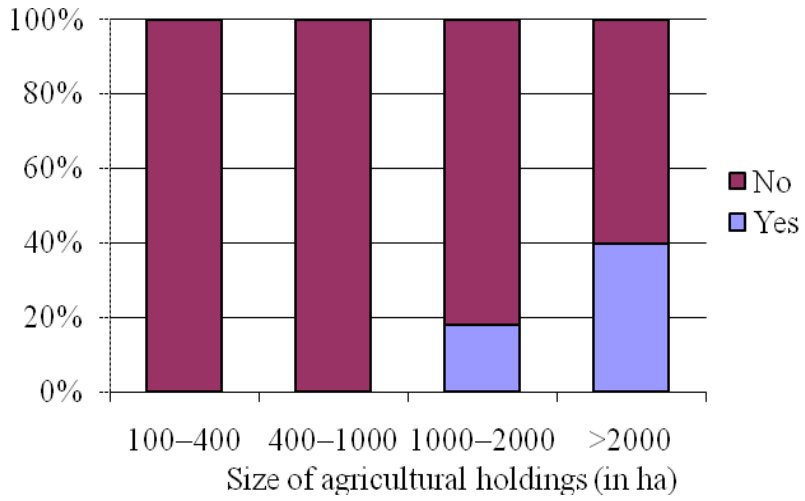
Currently, the importance of using the data and information stored in information systems is increasing; especially for management are required processed data and information almost daily. In each company must be ensured the access to all data and information at any time, ideally from anywhere. Executive workers often need to make qualified decisions, when they are outside

the company at that moment. The current situation in storage and processing of the data does not normally allow them to access data and information.

In the observed sample of companies, only 15 companies have integrated information system. If the data and information at the moment are not available, it becomes a huge problem to make a competent decision. Currently, at farms (at nearly 80% of them) the executives solve the problem of accessing the data at the desired moment. If a worker is present in a company, generally it is not an issue to obtain necessary data and information. In the sample of companies 15% of them have access to integrated data, i.e. to data from all company activities, through the appropriate software. These companies have individual modules of information system integrated and it is possible to work with corporate data uniformly and use them for other activities. In 28% of the companies the data are available, but there is no data integration. If it is necessary to make the decisions that require data from multiple modules, it is necessary to somehow save the data and further work with them. Method of storing and further processing is dependent on the capabilities of the company and the abilities of individual workers. In 57% of companies it is not possible to work further with stored data - mostly the data are stored locally (in the computer company's employee who is storing them and rarely using them). Data integration is performed only with the accounting module and in this case it is done either by re-acquisition of data into the accounting module, or either by the transfer to external memory. Data at these companies are often used only for elaborating different reports for e-government. They are not widely used for creating simulations and predictions.

The results of survey and the questions related to H1 show the situation of usage of cloud computing at farms. The situation at farms is currently the same (regardless of the size of the company) – farms are not currently use the cloud computing offers. In direct interview when they were added questions about "Use of cloud computing in the company" the respondents answered the question whether they assume the use of cloud computing, and if so, whether in order to store data or to utilize the software. The Fig. 1.shows that the possibility of using cloud computing is considered only by companies with an area of over 1 000 hectares. From farms with size over 2 000 ha assumes the implementation 40%, and of companies whose size is 1 000-2 000 hectares envisages the use of cloud computing only 18%. The reason for the answer was the concern about data security and the possible unavailability of data.

Fig. 1. Assumption of cloud computing use



Source: own elaboration, 2016

If agricultural holdings are considering the use of cloud computing, in 100% of responses the usage of software only is foreseen. They do not currently consider the utilization of the possibility of data

storage outside the company. In the non-agricultural firms, 48% of companies use cloud computing services. The difference between the agricultural and non-agricultural businesses is very noticeable. It can be assumed that it is significantly affected by the availability of software offered in the clouds. Dave et al. (20xx) stated that "Cloud computing enables innovations in holdings, development of the business models and efficient usage of information technologies in general. Similarly as in any economic activity there are certain costs and benefits related with the Cloud computing. The bases of the solution is economics, which will help during structuring of the future of the computer technologies based on cloud. Moreover, if the economic perspective of the cloud is created correctly, it will also serve to effective fight against the economic decline".

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Also other factors must be taken into account considering the reasons why the companies do not want to store the data externally. For example the management style of the managers, which can for example differ by the gender (see study of Pechrová and Šimpach, 2015).

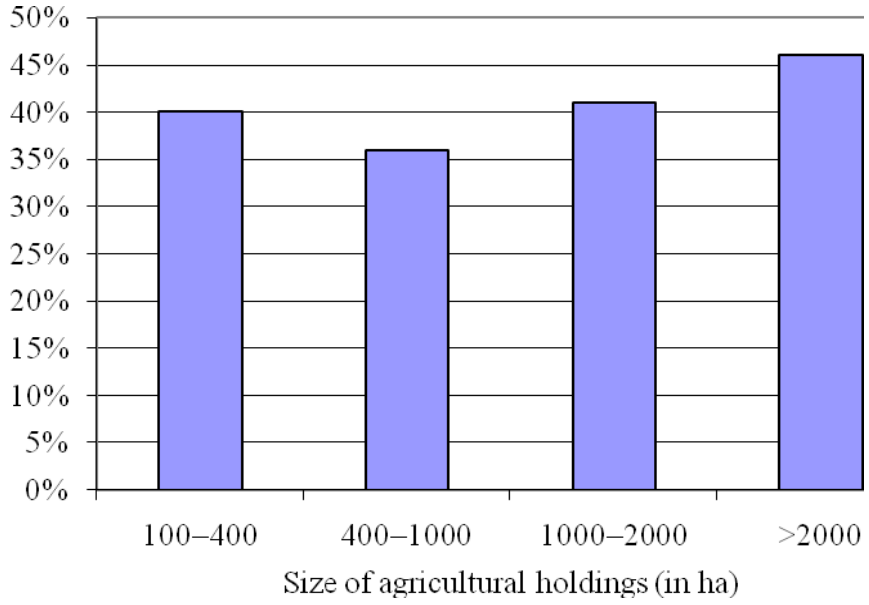
For testing the second hypothesis H2, the prediction was used as it was not possible to compare real decrease of costs related to the solution in the company and the solution when the transition to cloud computing takes place. From the observed firms none of them is using the Cloud computing services. The current solution, where all observed companies use the information system implemented in the company and at the same time the data are stored in the firm is compared with possible hypothetical use of cloud computing.

For comparison we used firms who underwent direct questioning. The spending on informatics differs greatly among the farms. In companies whose size is larger than 2 000 hectares the spending are regularly annually around 6% of total annual expenditure. Based on the elaborated survey it is possible to state that the smaller is the size of the company, the spending is lower.

For the farms whose size ranges from 100 to 400 hectares, the spending on informatics are around 1%. In all studied the companies the increase of spending on information technology happens only during the implementation of a new information system. Large companies are buying information systems mostly from general contractor and small are buying packaged software. Kuada et al. (2013) after the comparison of Cloud computing with the solution in the company came to the following conclusion: "For correct decision it is necessary to compare all expenditures related with in-house computing and cloud computing. It is necessary to take into account many other factors depending on the company. The price and hence the share of the total expenditure are also fully dependent on the method of acquisition. In the case of cloud computing the company pays only for the use of software, utilization of data storage and access time. From the surveyed data (the volume of data processed, the use of modules, the number of users, access time) was predicted the price for usage.

Based on the stated predictions it is possible to retain the hypothesis H2, that the spending on the area of informatics will be reduced. Expenses incurred in various types of companies (according to the acreage in ha) were compared with the budgeted spending laid down by firm size, processing data, used the software. The greatest decline can be expected in companies whose size ranges from 400 to 1 000 hectares. At the majority of monitored companies, it can be assumed the decline in spending by more than 50%.

Fig. 2. Decrease of spending while using the cloud computing (as percentage of original spending on ICT)



Source: own elaboration, 2016

4 Conclusion

Agriculture is becoming knowledge-intensive sectors, where the key factor of profitability will be what employees know (what data and information source). Especially executive managers require for their decision-making current data. They often need the access to current data from outside their company. Those accesses are facilitated by storing data in the cloud and using the software from the cloud. The results of survey shows that currently none of the studied companies use cloud computing. The prediction of the difference in spending between own processing and use of cloud computing services is enormous, an average annual decrease of spending would be about 52%. During the transition to cloud services an important role would be played by removing the fear from these services – the fear from the loss of the data, internet dependence, and customization. It is possible to proclaim that the usage of the Cloud computing will improve and speed up all decision-making process and will positively influence the competitiveness of the agricultural holdings.

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Analysis of software licensing options in agricultural companies

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Abstract: The paper deals with the issues of determining details of SW license in an agricultural company environment. Licensing options and SW distributions based on EULA, GNU-GPL or specialized tailored licenses are more represented in the research analysis. Open Source SW can pose a threat as well, since many users automatically assume that such SW is free. Very common issue is a third party usage clause. Users in agricultural companies often do not know the details of their licensing contracts which can lead to misuse of SW and breaches in terms and conditions. Even after the development in globalized networks and shift towards SaaS, the issues of licensing are still very relevant. Therefore, an approach on determining the SW license was proposed based on experimental evaluation in real agricultural companies. The process handles both conventional SW and cloud SaaS solutions. The goal is to help the user determine what are the licensing details of any given SW, whether or not is the SW being used legally, and provide guidance to the user on how to ensure proper legal SW usage.

Key words: SW, license, usage, process, agricultural company

JEL classification: L86, M15, K22

1 Introduction

The issues of licensing and software (SW) distributions are concern of every company and almost every end user. Software license within the information technology environment is a legal tool, that allows to use or redistribute SW protected by law. SW licenses are generally highly complex and terms such as Shareware, Freeware, Open Source etc. actually do not represent a concrete license. Many companies create their own tailored licenses, which are in most cases based on more universal licenses and tools, for instance End User License Agreement (EULA) or General Public License (GNU-GPL). Most companies use EULA to protect their intellectual property (IL-Hwan, 2014). This license is very commonly re-tailored to fit concrete companies, regions or countries (Orozco-Jurotan, 2016). Companies and end user often do not know how the software they have installed is licensed, and how it can be used within the terms of that license. Great danger lies in the fact that many users install SW on company hardware (HW) without the knowledge of company leadership or respective information technology department. This introduces the danger of massive economic repercussions to the company (illegal usage penalty fees). The issues of classifying EULA is being tackled for instance by Borg (2011) or Lavesson (2011). They however focus on very narrow part of the issue.

Open Source SW can sometimes be mistakenly considered as free software by many users. Such SW is often under the GNU-GPL license, but that is always the case. Many business models are built upon open source SW (Perr, 2010), but due to bad interpretation of the license by the users there is a danger of economic sanctions for the company as well. Sometimes users even breach the licensing contracts knowingly (Toko, 2014). Based on long term research conducted by the Department of Information Technologies at CULS Prague, it is clear that most agricultural

companies who do not employ someone from the field of ICT have little to no knowledge of their SW licensing details (Vanek et al., 2010) [19].

Even after the shift towards globalized networks and SaaS systems (Software as a Service), which is considered a very advanced business model with increasing market penetration and usage (Wu, 2014), the issues of licensing are still main stage. The situation is similar with cloud services in general (Petric, 2013). Companies or users pay for using the SW, but are unaware for what purposes exactly can they use the software. These issues are partly solved in concrete licensing management tools that companies can use (Alawneh, 2008) or within the licensed services frameworks (Gangadharan, 2011). However, this approach is only utilized in certain bigger companies where the economic repercussions are more severe threat. Smaller companies are often lacking general concept on how to handle licensing issues.

2 Materials and Methods

Basic scientific method of analysis and synthesis was utilized in this research, along with experimental evaluation of model situations. First step was thorough analysis of licensing options and methods of SW distribution. The most commonly used licenses are:

- free SW, open source SW
  - licenses based on GNU-GPL (GNU, 2007) or GNU-GPL compatible
  - licenses incompatible with GNU-GPL, for instance BSD
- proprietary SW
  - based on EULA
  - special license defined by the developer

Selected SW distributions for further analysis (not necessarily license):

- Open Source
- Demo
- Trial
- Freeware
- Bundleware
- Shareware
- SaaS
- Proprietary SW

Next step was experimental evaluation of licensing options and SW distributions for the purposes of actual agricultural company. Last phase of the research consisted of defining a methodological process of determining SW license in agricultural company environment. During research of these issues the fact that the SW needs to be used commercially played a crucial role.

3 Results and Discussion

Licensing options and SW distributions based on EULA, GNU-GPL and special licenses made by the distributor themselves had a higher representation during the detailed analysis. Common issue was a third party clause part of the license which tends to be the most often breached part of the licensing contract. For instance, this is the case with SW drivers for printers, where the printed therefore cannot be used to print anything for a third party. As part of proposing the methodological approach of determining SW licenses, several key questions were defined,

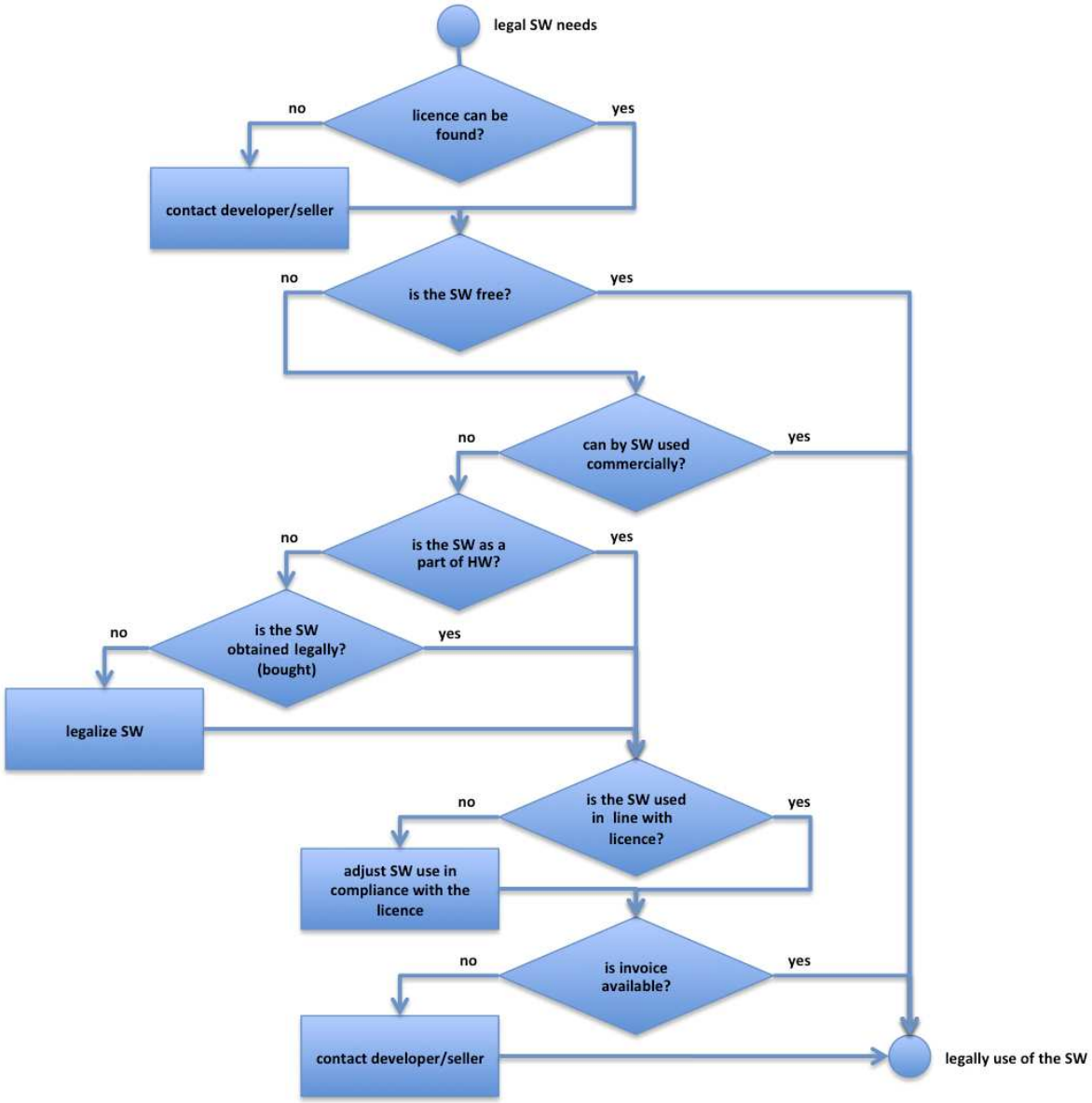
[19] Data from the ongoing research was not published yet

to which the company should know the answers:

- Is it possible to locate the SW license?
- Is the SW free?
- Is it possible to use the SW commercially for free?
- Is the SW part of purchased HW?
- Was the SW paid for (purchased legally)?
- Is the SW being used within the terms of its license?
- Does the company possess the necessary paperwork to prove the ownership of SW or SW license?

The entire process consisting of questions, answers and appropriate actions is graphically represented by the following schema:

Fig. 1. Process of determining SW license



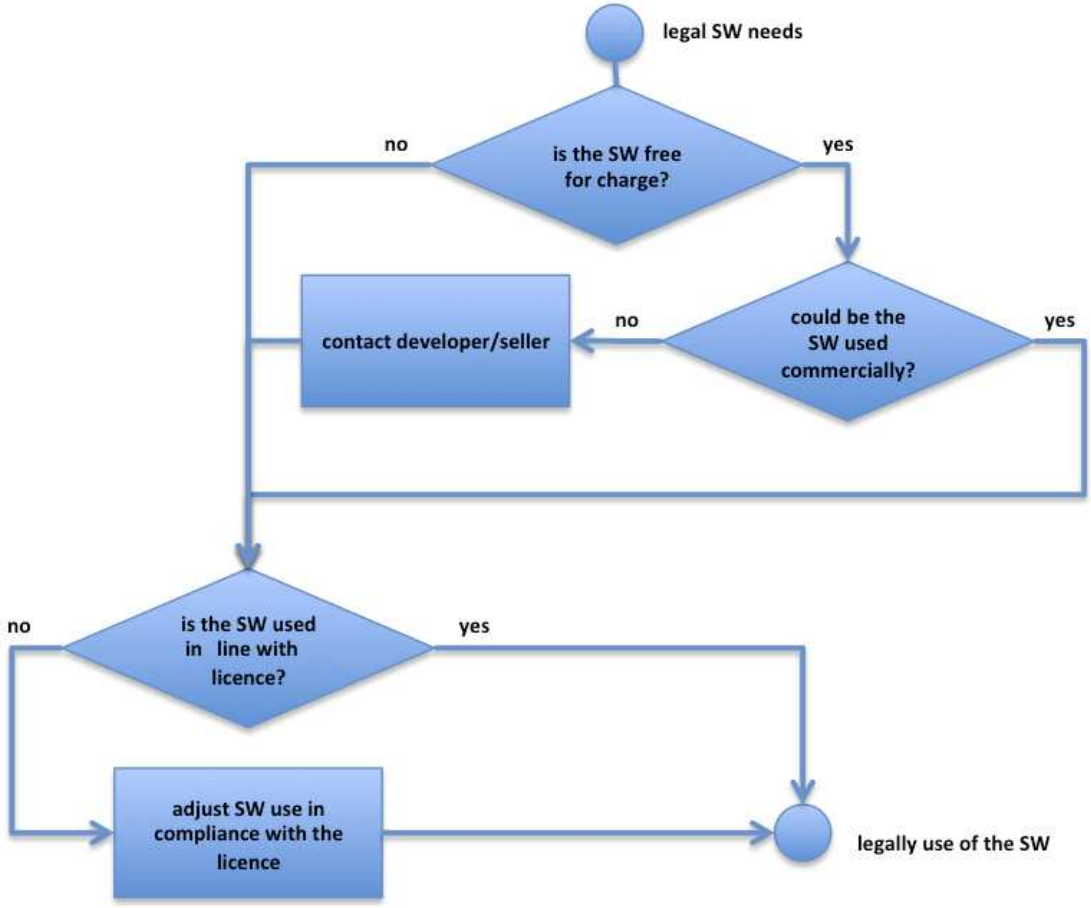
Source: Own research, 2016

The goal of the process of determining SW license is to ensure that the SW is being used legally by the agricultural company. The process was devised in such a way, that even users with only basic computer skills who work in agricultural companies can by themselves determine the type

of license and reach the conclusion whether or not the SW is being used legally. During experimental evaluation of this process, several issues arose. In several cases, the problem was with the first step of locating the actual license print. Another main issue was the part of determining whether the SW is being used within the license terms. The experimental evaluation showed, that if the SW is obtained legally, it is highly likely it is being used legally as well. The only breaches in that case are instances of third party usage, or using the SW commercially towards third parties. (This was the most common issue with printers)

The situation is much simpler when it comes to SW that is being distributed as a service for rent, as it is with most cloud solutions. Here, the user only needs to determine whether the service is free, free to use commercially, or if the software is being used in terms of licensing contract. The most common issue in this case is similar to regular SW and has to do with third party usage / third party commercial usage.

Fig. 2. Process of determining SaaS license



Source: Own research, 2016

Determining the ownership of copyright is particularly important when the ownership of property changes. Ownership of copyright or intellectual property is very different than ownership of regular properties (Bola, 2013). Users from agricultural companies do not need to specifically determine the actual copyright owner at any given time, they only need to accurately determine if they are using the SW legally. Similarly, this is the case of SaaS solutions (Wu, 2014) or cloud services (Petric, 2013). When it comes to using open source software or solutions (Mildorf et al., 2014), there is a great inherent chance that the product is being used legally.

4 Conclusion

The issues of SW licencing are a concern for every agricultural company today. Based on analysis performed by Department of Information Technologies we can deduce that many users do not know the licensing details of SW they use and therefore are unaware of possible licensing contract breaches they might be making. In order to mitigate these problems a simple process of licence identification was proposed. It is comprehensible for users with at least average computer literacy within the field of agriculture or related to agriculture.

During experimental evaluation of the proposed process, many users in actual agricultural companies exhibited inability to determine the SW license and whether or not the SW is being used in accordance with its license. In most cases it was due to the fact, that licence agreement is only available and visible during the first SW installation and has to be searched for (within the folder structure in a computer or on the developer's web pages) which can be quite complicated task for inexperienced users. Users who have more computer skills tend to overcome this issue more easily but still struggle to determine whether or not the actual licensing contract is being breached. Licensing agreements are generally lengthy records which require lot of effort and patience to read carefully. Another issue is the language barrier, since many licenses are only available in English.

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Development of Population in Predominantly Rural Regions of the Czech Republic and Slovakia

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Abstract: The aim of the paper is to assess the population development in predominantly rural regions of the Czech Republic and Slovakia and to project further trends. Rural areas in both countries underwent relatively similar development and currently suffer by the changes in agriculture. The demographic data and statistics about NUTS 3 regions for period 2002–2014 were obtained from Eurostat database. We consider the predominantly rural regions as defined by the Eurostat. There are 6 those regions in the CR and 4 in SR.

Firstly, a hierarchical cluster analysis was used to group the regions according to the number of live birth, deaths, net migration and total population change. Three groups emerged where Prešovský (alternated by Plzeňský) outstand in separate group due to its high number of inhabitants and birth rates. First cluster had worse development conditions (number of deaths higher than live births, emigration higher than immigration, and hence negative total population change during the whole observed period) than the second cluster, where the population development was more positive. The affiliation of regions to particular group was changing during the period, but Jihočeský region stayed always in the first cluster.

Secondly, cohort-component method was used to project the population development in five-year intervals from 2014 to 2029. The population projection shows that the population bases are downsizing due to generation ageing and increasing average age of economically productive persons in observed predominantly rural regions.

Key words: cluster analysis, population projections, rural development, Czech Republic, Slovakia

JEL classification: J11, J16, Q01

1 Introduction

Rural areas in both countries underwent relatively similar development and currently suffer by the changes in agriculture. “Over the past decades, major changes have taken place in Europe’s rural areas. These changes include contrasting developments like depopulation and land abandonment in some regions, and urbanisation and agricultural intensification in others.” (Westhoek et al., 2006) In the strategic policy documents of the Czech Republic are highlighted especially population ageing, unfavourable age structure, flee of the young, educated inhabitants and competent entrepreneurs, and low potential of economic diversification as the main threats. According to the Rural Development Programme (RDP, Ministry of Agriculture, 2013), the major problem faced by rural areas is the stabilization of the rural population as it is aging more rapidly than the rest of the country because of the emigration of young people to urban centres to obtain jobs and better social infrastructure. Agriculture – with its relatively low share in the total employment (11 % in rural areas and 3.8 % overall) – has a limited capacity to reverse this trend (Tvrdon, 2011). In many parts of rural Europe the main cause of ageing and depopulation is selective out-migration of young adults from remote and economically weak regions to prosperous urban areas (Leibert and Wiest, 2011). This brain-drain may lead to the situation when the rural regions are lagging behind the developed. Therefore, European Union implemented special policies, programmes and measures to support the growth of the lagging regions. However,

"Understanding the drivers of regional growth in an ex-post integrated economic environment is an important assignment for both theory and policy," (Petrakos et al., 2011).

For example Becker et al. (2010) observed the development of average annual growth of GDP per capita at purchasing power parity and average annual employment growth at NUTS 2 and 3 levels during a programming period and tried to assess the effects of EU's structural policy (particularly of the Objective 1 facilitating convergence and cohesion within the EU regions). They found that "Objective 1 treatment status does not cause immediate effects but takes, in the average programming period and region, at least four years to display growth effects on GDP per capita". (Becker et al., 2010) Pechrová and Šimpach (2013) grouped the regions in the EU according to their development potential which was described by four categories of indicators: economic and social area, equipment and agricultural characteristics.

Agarwal et al. (2009) were searching for key factors which enhance the competitiveness of the rural areas in UK and came to the conclusion that the essential development drivers are economic and human capital. Dufek and Minařík (2010) also utilized the indicator of human resources in the regions of the CR as one of the most important factor for their development potential. They used indicators from: demographic area, economic and employment field, standards of living and social level, and education, health and criminality. The demographic development was assessed by population density, share of rural inhabitants, age structure, age index, life expectancy at birth, live born and death on 1 000 inhabitants, and migration increment on 1 000 inhabitants. Urbancová and Hlavsa (2014) examined the usage of Age Management measures (which may help to improve the situation on the labour market and encourage young people to work in the agriculture) by Czech agrarian businesses and found that the farmers were not quite familiar with those practices.

The aim of the paper is to assess the population development in predominantly rural regions of the CR and Slovakia and to project further trends. Future state of the population is calculated based on knowledge of the previous state of population and prediction of the number of deaths and born, and the number of immigrants and emigrants from particular regions. The paper is structured as follows: First, there are introduced the data from Eurostat, the methods of cluster analysis and demographic projection. Then the next section presents and discusses the results. Last section concludes.

2 Materials and Methods

The data about the fertility, mortality and migration for NUTS 3 regions for period 2002–2014 were obtained from Eurostat database (Eurostat, 2016). We consider the predominantly rural regions as defined by the Eurostat, i.e. the population which is living outside the urban areas is rural. Urban areas are determined as territories where the density of population is above 300 inhabitants/km^2 applied to grid cell and a minimum size threshold (5 000 inhabitants) applied to grouped grid cells above the density threshold. (DG Agri, JRC, Eurostat, 2012) There are 6 those regions in the CR and 4 in SR. We observed age-and-sex specific number of live births, deaths, net migration (statistically adjusted), total population on 1 January, and total population change in each region during the period 2002–2014 and described the development. Based on selected uncorrelated indicators, the regions were clustered into 3 groups according to observe the changes of their character.

The clustering procedure forms hierarchical groups of mutually exclusive subsets, each of which has members (regions) that are maximally similar with respect to demographic indicators. "Given n sets, this procedure permits their reduction to $n - 1$ mutually exclusive sets by considering the union of all possible $n(n - 1)/2$ pairs and selecting a union having a maximal value for the functional relation, or objective function, that reflects the criterion chosen by the investigator" (Ward, 1963). This procedure is repeated until there is only one group. We used Ward's method that merges

the clusters with minimal within-cluster sum of squared deviations from objects to centroids. The distances were measured by Squared Euclidean distance (*d*). The distance between two data points (X_i and Y_i) is calculated as the the sum of the squares of the differences between corresponding values (1).

$$d = \sum_{i=1}^{n} \left(X_i - Y_i\right)^2 \quad (1)$$

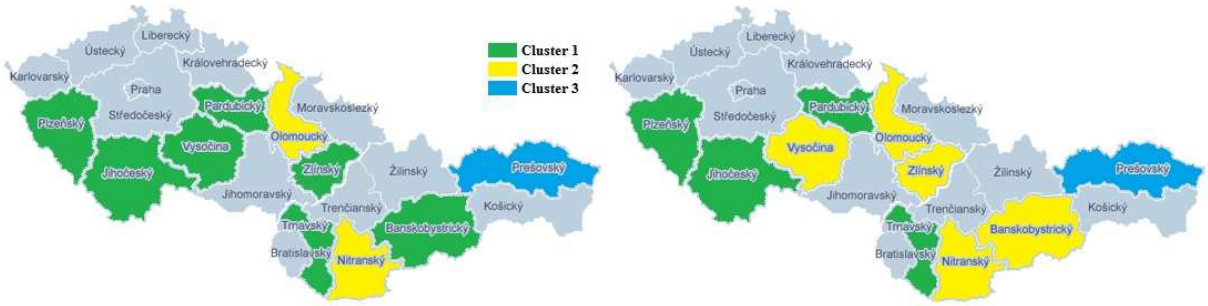
Ward's method tends to create relatively small clusters because of the squared differences, but with similar numbers of observations. Its disadvantage is that the distance between clusters calculated at one step of clustering is dependent on the distance calculated in previous step. It is also sensitive to outliers. The clustering process was stopped when three groups of regions were created. Calculations were done in Stata 11.2.

For the projection of future state of population a component method based on several assumptions is used. Cohort-component method which moves age-and-sex specific numbers of persons of particular sex (components) based on set scenarios (for detailed description of the modelling process see Šimpach (2015)). We set the scenarios of development of fertility rate, decrease of death rate and assume zero net migration balance in the calculations. Consequently were calculated the future age-and-sex specific death rates $m_{x,t}$, (where t denotes time and x age of the person) and number of live born persons N^v_t. Number of immigrants I_t and emigrants E_t might have changed, but the total net migration was supposed to be constant as there is a problem with its prediction. Data were known for time period from 2002 until 2014, and the prediction was done for five year intervals (until 2029). The projection horizon will cover two EU's programme and planning periods (2014–2020, 2021–2026). During calculating the regional population projections is in the case of the mortality scenario considered the coefficient of decline in the probability of death $q_{x,t}$. From the studies of e.g. Šimpach and Dotlačilová (2015) it is possible to overtake the coefficient in the range of 0.96 to 0.98 for every 5 years, differing by gender. Based on this assumption we gain the scenario of the development of age-and-sex-specific table numbers of survivors $l_{x,t}$, which serves not only to calculate other derived statistics of mortality tables ($d_{x,t}$, $L_{x,t}$, $T_{x,t}$ – see Šimpach and Dotlačilová, 2015), but also for prediction of future development of life expectancy at birth $e_{0,t}$, and also for the projection coefficients $P_{x,t}$. The level of total fertility rate (*tfr*) is considered for each analysed region to be the same as at the beginning of the projection, and is divided by the actual age-specific fertility rates of a particular region.

3 Results and Discussion

First, the correlation between chosen demographic indicators was assessed and only those where the paired correlation coefficient was lower than 0.8 were used – particularly: the number of live births, deaths, net migration and total population change. Hierarchical cluster analysis formed three clusters of regions with different characteristics. Almost each year the affiliation of particular region changed (i.e. it belonged to another group). Only exception is Jihočeský region, which stayed in the first cluster during whole period. Fig. 1 presents the map of the first and the last year of the observed period.

Fig 1. Clusters of rural regions in 2002 (left) and 2014 (right)



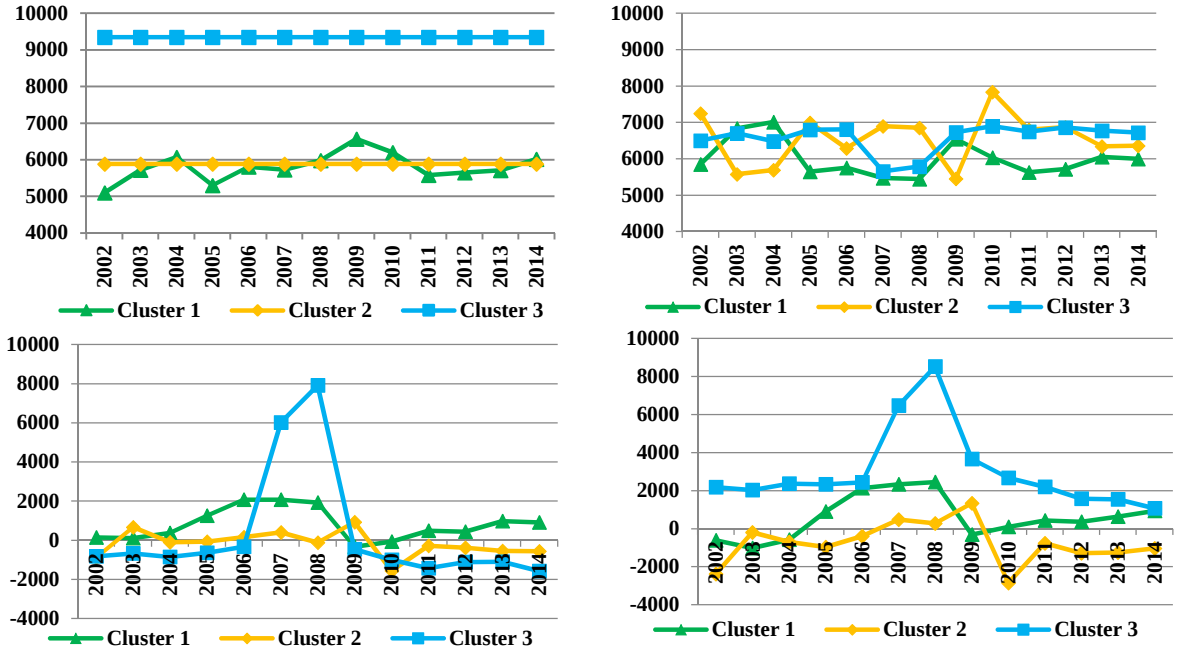
Source: own elaboration, 2016

Between those years Vysočina, Zlínský and Banskobystrický regions moved from first cluster to the second as their development situation slightly worsened. Prešovský region stay in the same group because it is characterized by the highest birth rate and the highest number of inhabitants from all regions. On the other hand, population in Vysočina was the lowest and further decreased which also contribute to the change of other determinants of its affiliation to particular cluster. Net migration and total population change was on average negative in 3 Czech and 2 Slovak regions. The highest positive population change was noted in Prešovský region and then in Jihočeský. On the other hand, total population change showed negative development in Nitranský, Zlínský, Banskobystrický, Olomoucký and Vysočina regions.

Clusters' characteristics are displayed in Fig 2. Cluster 3 is typical with the highest birth rate from all clusters of almost whole observed period. The number of deaths is lower than number of births which imply positive population change. It contains only Prešovský region with exception 2007, 2008 where there is Plzeňský region instead. The development of deaths is more similar to other groups, again with the exception of the years 2007 and 2008. Since 2012, the most people died in this cluster, but on the other hand, the most people were born. Net migration was highly positive in year 2007 and 2008 due to the presence of Plzeňský region instead of Prešovský. Plzeňský region belonged to the one with positive migration balance for almost whole period and hence it was included in the first cluster. Only in 2010 the number of outgoing was higher than incoming. Development in other clusters is various.

Second cluster might be characterized by higher death rate than birth rate (with exception of 2003, 2004 and 2009), by negative migration balance (number of emigrants was on average higher than number of immigrants for the whole period with exception of four years) and by negative total population change. This may negatively influence its development potential. In majority of years to this category belonged Olomoucký, Nitranský, and Zlínský regions. For those regions is typical very negative net population change and negative net migration. First cluster, contrary to the others, has the best potential of positive future development.

Fig. 2. Demographic characteristics of clusters: live births - total (top left), deaths – total (top right), net migration pus statistical adjustment (down left), total population change (down right)



Source: own elaboration, 2016

Number of deaths was lower than number of birth in period 2006 to 2010 and in year 2014. The number of live births was the most volatile from all clusters as same as the number of deaths. Total population change and migration balance were mainly positive or close to zero. It contained Jihočeský region for all periods, than Pardubický and Trnavský for 9 years.

Second, year 2014 was taken as a base for the projection of the state of population in next 15 years. Tabled numbers of surviving $l_{x,t}$ were estimated based on coefficient of decrease of probability of death $q_{x,t}$ (which was chosen to be the same for all ages, but various for gender in the range of 0.97–0.98 in order to ensure that during 20 years the life expectancy at birth would increase by approximately 1 year (it differs among gender and regions)). Life expectancy at birth divided according to the gender in each region is displayed in Table 1. It is higher for females than males. The most positive was for Vysočina region, where the females can live in 2029 up to 83.2 years and males to 77.2. Life expectancy of males was the highest in Plzeňský region in all periods. On the other hand, Nitranský and Banskobystrický regions report the lowest life expectancy in many periods.

Table 1. Projections of life expectancy at birth of males (M) and females (F) in rural regions of CR and SK

Year	2014		2019		2024		2029	
Region	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**
Jihočeský	75.7	81.5	76.0	81.8	76.3	82.0	76.7	82.3
Plzeňský	76.3	81.4	76.6	81.7	76.9	81.9	77.3	82.1
Pardubický	74.0	80.0	74.4	80.3	74.7	80.6	75.1	80.8
Vysočina	76.2	82.5	76.5	82.8	76.9	83.0	77.2	83.2
Olomoucký	75.2	81.9	75.6	82.2	75.9	82.4	76.2	82.7
Zlínský	75.3	81.3	75.7	81.6	76.0	81.9	76.3	82.1
Trnavský	73.2	80.0	73.6	80.2	74.0	80.5	74.3	80.8
Nitranský	72.4	79.3	72.8	79.6	73.1	79.9	73.5	80.2
Banskobystrický	72.7	79.8	73.1	80.1	73.4	80.4	73.8	80.6
Prešovský	73.3	80.2	73.7	80.5	74.1	80.7	74.4	81.0

Source: own calculations, 2016

Total fertility rate is also assumed to stay the same for the whole projected period, but different for various regions. The number of children is decreasing as the fertility is lower than 2.08. Reproduction period of females was considered already from 10–14 years (because in Slovak regions these events occurred even in such a low age groups) to 50–54 years. It was set that there is 51.5% probability that a new born child is a boy and 48.5% that it is a girl. Numbers of live born boys and girls are presented in Table 2.

Table 2. Projections of number of live born boys (B) and girls (G) in rural regions of CR and SK

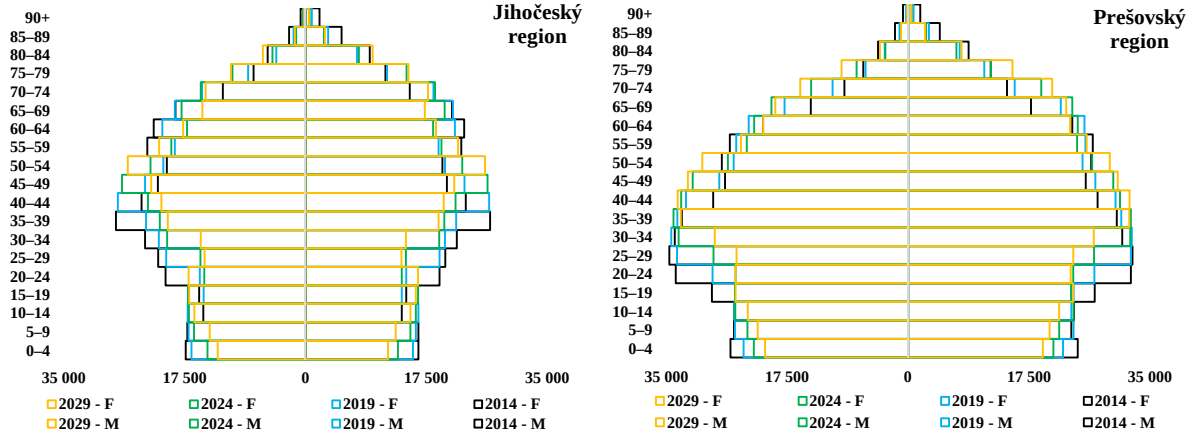
Year	2014–2018		2019–2023		2024–2028		2029–2034	
Region	**B**	**G**	**B**	**G**	**B**	**G**	**B**	**G**
Jihočeský	15 924	14 997	14 227	13 398	12 727	11 986	6 034	5 682
Plzeňský	13 866	13 058	12 079	11 375	10 636	10 016	5 821	5 482
Pardubický	16 354	15 401	14 687	13 832	13 107	12 344	6 198	5 837
Vysočina	13 445	12 662	12 311	11 594	10 997	10 357	5 175	4 874
Olomoucký	15 894	14 968	14 210	13 382	12 580	11 847	5 914	5 570
Zlínský	14 010	13 194	12 621	11 886	11 095	10 448	5 180	4 878
Trnavský	13 193	12 424	11 482	10 813	9 785	9 215	4 509	4 246
Nitranský	14 919	14 050	13 128	12 363	11 308	10 649	5 230	4 925
Banskobystrický	15 056	14 179	13 499	12 712	11 983	11 285	5 647	5 318
Prešovský	23 797	22 411	22 559	21 245	20 903	19 685	10 029	9 445

Source: own calculations, 2016

Finally, the population projections for years 2014, 2019, 2024 and 2029 are elaborated. From population trees at Fig. 3 it is possible to see that the population bases are downsizing due to generation ageing and increasing average age of economically productive persons in observed predominantly rural regions. In Jihočeský region in 2014, the most of males was in age group between 35–39 (27 thous.); in 2019 in category 40–44 (27 thous.); in 2024 in category 49–50 (27 thous.); and finally in 2029, the majority will continuously move to category 50–54 years (25 thous.). The same situation is with females. There are 26 thous. Of them in category 35–39

and almost the same number of them move to the group 50–54 in 2029. Number of young people will continuously decrease and therefore there will be also less people in the highest category of 90+. Similar situation is in Plzeňský region, but the number of males in 2014 starts at 25 thous. and ends at 24 thous. Number of females is also lower (25 thous. at the beginning and 24 thous. At the end). Also Pardubický, Vysočina, Olomoucký, and Zlínský regions follow the same pattern. Surprisingly the development of Slovakian Trnavský region was similar to Czech regions. However, other regions are more diverse. In Nitranský and Banskobystrický regions in 2029, the most males will be in the age from 40–49 as same as in 2024. Prešovský region is special as the population there is the youngest. The most males (35 thous.) in 2014 are in age 25–29. In 2029, the majority (33 thous.) continuously moves to category 40–44. Similar pattern is also for females, but there is less of them (32 thous.).

Fig. 3. Population projections in selected predominantly rural regions 2014, 2019, 2024, 2029



Source: own elaboration, 2016

Our results can be compared with those of other researchers or institutions. For example CZSO does extrapolation of population development and recalculates it every five years according to the current conditions and recent statistics on population development. From other institutions that prepare population projections including those of the Czech and Slovak Republic can be named the Eurostat or OECD. CZSO's and Eurostat's results are relatively similar. OECD studies tend to have divergent results because of different methodology. Our projections consider the population in regions as same as prediction of CZSO which project the population in regions up to 2050 (CZSO, 2014), but it is revised it only every four years.

4 Conclusion

The aim of the paper was to assess the population development in 6 Czech and 4 Slovakian predominantly rural regions and to project further trends based on the data for period 2002–2014 from Eurostat database. First, a hierarchical cluster analysis grouped the regions according to their similarity in each year based on demographic indicators: the number of live birth, deaths, net migration and total population change. Ward's method was used to create three clusters. Second, cohort-component method with zero migration balance assumption was used to forecast the population development in five-year intervals from 2014 to 2029.

Slovakian Prešovský region (alternated by Czech Plzeňský region) outstand in separate cluster number 3 due to its high number of inhabitants and birth rates. However, future development of this region is expected to adjust to the trends in other regions and the population will get older (majority of people will move from age category 25–29 to 35–39, 40–44). Cluster 2 had worse development conditions (number of deaths higher than live births, emigration higher

than emigration, and negative total population change during the whole observed period) than the Cluster 1 whose conditions were the best. The affiliation of regions to groups was changing during the period. The exception is Jihočeský region which stayed in Cluster 1 for all period. Population projection shows that the population bases are downsizing due to generation ageing and increasing average age of economically productive persons in all predominantly rural regions. Almost in all regions, the major share of population will move from age group 35–39 in 2014 to 50–54 in 2029. In future research it is planned to include other EU regions, project their development and cluster them for policy-making purposes.

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Website mobile usability of agrarian subjects

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Abstract: This paper deals with mobile usability of agrarian farms webpages. The pilot study was performed to determine level of optimization for mobile devices. Questionnaires were used to collect data. 86 respondents were included in study. SUS (System Usability Scale) method and open questions were used to get a better view of user opinion on the matter. Users were asked to reveal their opinion on the importance of usability in general and of mobile usability. 4 points scale from important to not important was used. Descriptive statistics of the SUS method results and list of the most frequent responses were included in the paper. The result of this study is that only 5.8 % of subjects included in study are using responsive design. Limitations, such as problems with reading and displaying content of pages, in use of these websites were confirmed.

Key words: mobile usability, responsive design, agrarian objects, websites

JEL classification: D83, L86, Q13

1 Introduction

Since the recent time, importance of mobile usability has been still growing following the use expansion of mobile phones and tablets. People are using these devices to be in contact with friends and family, to entertain themselves, and to gather information.

User behavior changed rapidly during past years (Barnum, 2010). They are online during working days; they have easy access to internet and to information. Users can find and confirm everything by searching on the internet (Šmejkalová, 2015). The decision-making process sped up according to these changes (Korum, 2015). This leads to the higher importance of usability optimization to get and keep the users. Usability testing depends heavily on individual user background, information literacy and previous experience with similar web application (Šimek, 2015).

Responsive design represents ways how to display page content according to device parameters and improve user experience during work with websites. Usability optimization according to increasing number of devices have its limitations. It is not possible to optimize a product for all devices. When a website is optimized for a mobile device with the highest screen resolution, responsive design should take care of the main issues (Lee, 2015).

Optimization for mobile devices can help promote business of farming in the rural sphere and help them to get customers. The main focus was on the private farms websites, because they can have economic impact. These subjects could contribute to rural areas development through tourism, they can attract new business, etc. (Zhang, 2016)

In the stage were applications is distributed between users different methods could be use – Click stream analysis, Moderated Remote Usability Studies or Phone Interviews, System Usability Scale (Šmejkalová, 2015). However, Click stream analysis requires the access to the statistical data, which are not easily accessible. Moderated Remote Usability Studies or Phone Interviews require communication between participants and a person who performs testing. This communication can have impact on the results, wrongly asked questing, misleading questions, etc. (Insfran, 2008)

2 Materials and Methods

The goal of this study was to determine the level of mobile usability optimization of agrarian farms websites.

First part was to define if a subject has a webpage optimized for mobile phone or tablet. SUS (System Usability Scale) method was used in both situations – when a website is optimized for mobile devices and also when it is not. See Table 1.

Table 3. System Usability Scale criterion

No.	Criterion
1	I think that I would like to use this website frequently.
2	I found the website unnecessarily complex.
3	I thought the website was easy to use.
4	I think that I would need the support of a technical person to be able to use this website.
5	I found the various functions in this website were well integrated.
6	I thought there was too much inconsistency in this website.
7	I would imagine that most people would learn to use this website very quickly.
8	I found the website very cumbersome to use.
9	I felt very confident using the website.
10	I needed to learn a lot of things before I could get going with this website.

Source: Brooke, 2016, self-authored

The scale strongly agree – agree – neutral – disagree - strongly disagree was used for the SUS method. This scale was represented by number 0-4, where option “strongly disagree” was represented by number 0 and “sternly agree” with number 4.

The open question on mobile usability followed. The goal of this question was to get better view of user perspective, to give them opportunity to specify some parts that are not included in SUS method.

To determine if the importance of criterion have some influence of results in testing all respondents were asked to give their opinion on the importance of usability and mobile usability. For these questions was used this scale:

- Important
- Significant
- Not significant
- Not important

Pilot study was conducted through a questionnaire. Respondents were asked to find different subjects from the rural area and evaluate their web presentation from the mobile usability point of view. The focus was on websites of farms. 244 questionnaires were uploaded into the system. 23 of them were incomplete, so they were eliminated from study. 70 questionnaires dealt with another subjects from agrarian and different areas. 61 included redundant information, because these respondents chose the same subject. 86 farms websites were included in the study.

3 Results and Discussion

Based on the collected data, only 5.8 % of the selected subjects are using responsive design. The rest of subjects are displaying the original website. This leads to different problems in case of complicated pages and makes browsing unpleasant to users.

Table 4. Average value for SUS criterion

No.	Criterion	Avg. value
1	I think that I would like to use this website frequently.	2.77777778
2	I found the website unnecessarily complex.	0.55555556
3	I thought the website was easy to use.	3.48148148
4	I think that I would need the support of a technical person to be able to use this website.	0.18518519
5	I found the various functions in this website were well integrated.	2.74074074
6	I thought there was too much inconsistency in this website.	0.51851852
7	I would imagine that most people would learn to use this website very quickly.	3.33333333
8	I found the website very cumbersome to use.	0.7037037
9	I felt very confident using the website.	3.55555556
10	I needed to learn a lot of things before I could get going with this website.	0.2962963

Source: self-authored

The original web was displayed for 94.2% of the respondents. Average value for the first criterion was 2.77 out of 5. Almost 45 % of all respondents mentioned that they need to zoom in to be able to reach all information on page. All of them chose value 2 or lower for criterion "I think that I would like to use this system frequently".

This issue had similar impact on the "I thought the system was easy to use" criterion.

"I think that I would need the support of a technical person to be able to use this website" and „I needed to learn a lot of things before I could get going with this website" got the lowest average score. There is a visible connection between these results and the respondents' answers to open questions, where they established that websites are simple and easy to use.

The SUS method was used for both situations when the website is optimized and when it is not. However, the number of websites with responsive design was so low, that comparison of these results was not possible.

26.7 % of respondents think that usability is important criterion. 40 % respondents have the opinion that usability optimization is significant and the rest of users - 30 % - share the view that usability is not significant. Only 0.3 % thinks that usability is not important. In a case of mobile usability, the situation is similar. 3.4 % of users have the opinion that mobile usability is not important for subjects from agrarian area, because they will look for these information via desktop version.

4 Conclusion

The pilot study proves that there is limited use of mobile optimization on agrarian private farms websites. Responsive design is not standard part of these websites. There are problems related to this situation that lead to limited use of websites via mobile devices. This situation can have negative effect on their business and the number of webpage visitors.

23 % of respondents were men and 77 % were women. The relationship between answers and gender was not part of the study. This can represent a part of a following study.

The result of SUS method for each subject can be used to determine which subjects should be included in the following qualitative study. The study focus will be to compare results from qualitative and quantitative approach in the next step of research.

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Distribution of the investment subsidies in the Czech meat processing industry

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Abstract: The meat processing industry has been one of the key producers in the Czech food processing industry for a long time. The aim of the paper is to describe and evaluate the distribution of the investment subsidies for meat processors from the RDP in the Czech Republic in the programming period 2007-2013. The analysis of investment subsidies between the meat processors can reveal typical receivers of investment support from the RDP, investment priorities of the companies, a concentration of the subsidies distribution and the duration of the project completion. The database of 533 investment projects since 2007 in the sub-measures I.1.3.1 and I.1.3.2 was used as the secondary data source. The database was linked with Albertina database of accounting reports. The analysis is based on description of the distribution of investment subsidies. Moreover, statistical hypothesis testing (Kolmogorov-Smirnov test) was applied to reveal differences between participants and nonparticipants. The distribution analysis showed that the Pareto principle of distribution has been fulfilled: 24 % of participants received 80 % of investment subsidies. 36 % of participants successfully applied repeatedly. The success rate was lower in the group of small companies than in the medium and large ones probably because the bigger companies usually use own specialists or professional consulting services. Hypothesis testing indicated that participants were significantly bigger, had better financial situation and were more capital-intensive than nonparticipants. The question is whether the strategic goal of the Ministry of Agriculture is to change the strategy of investment support in the new programming period 2014+ to be distributed more evenly.

Key words: Rural Development Programme, investment support, innovations, Pareto principle, financial analysis

JEL classification: M21, L66

1 Introduction

1.1 Problem definition

The meat processing industry, as defined by CZ-NACE code 10.1, has reported the highest share of sales in the Czech food processing industry for a long time (Mezera, Plášil and Náglová, 2015). Meat processors are the second most important employers after the bakery industry with more than 21 thousands employees. The long-lasting problem in the branch is the low wage level relative to other food processing industries and the low competiveness in relation to neighbor states (Pohlová, Mezera and Špička, 2016).

The competitiveness of the meat processing industry could be enhanced by higher investment activity. Since 2007, the Axis I of the Rural Development Program (RDP) has provided subsidies for extension and upgrade of the technologies in agriculture and the food industry. The evaluation of investment effects requires comprehensive overview of the investment projects, their distribution and target. It is valuable for policy makers and analysts to know it before they make decision or start to assess impacts of investment support. So, the analysis of the distribution of the investment subsidies in the meat processing industry (as one of the most important beneficiaries) is a good introduction for impact assessment of investment subsidies and more in-depth analysis of applications.

The aim of the paper is to describe and evaluate the distribution of the RDP investment subsidies in the meat processing industry in the Czech Republic during the previous programming period 2007-2013. In this paper, the analysis of the investment subsidies in the meat processing industry reveals features of the typical receivers of the investment support from the RDP, investment priorities of the companies, a concentration of the investment subsidies and the duration of the project completion.

1.2 Literature overview

Technological changes in the food industry are less dynamic than in other sectors of the manufacturing industry (Christensen et al, 1996; Martinez and Briz, 2000). In the Czech Republic, there had been published some research studies about impact assessment of the investment subsidies in the agri-food business (Mezera and Špička, 2013; Ratinger, Medonos and Hruška, 2013). However, there is a lack of research articles about the distribution of the investment subsidies in the European food industry. Most studies concern income distributional effects of the first pillar types of agricultural policies (Guyomard, Mouel and Gohin, 2004; Salhofer and Schmid, 2004; Ciaian, Kancs and Swinnen, 2012). Less attention has been paid to income distributional effects of the RDP (Ciaian and Ratinger, 2009). Ciaian and Ratinger (2009) concluded that benefits from investment support are shared with capital suppliers (e. g. machinery suppliers). Moreover, setting minimum and maximum thresholds as eligibility criteria for investment determine the income distribution effects of the investment support.

Besides the distribution of the investment subsidies in the Czech meat processing industry, the paper also examines whether there were significant differences in structural and economic level between supported and not-supported companies at the beginning of the previous programming period. The analysis in the agricultural sector showed that participating farms were not only substantially larger but also much more capital and labor intensive than non-participating farms (Medonos et al, 2012). In the food industry, such comparison has not been carried out so far.

Another research questions in the paper is whether the distribution of subsidies in the group of beneficiaries follows the Pareto principle, i.e. if a relative small number of companies receive major part of the investment subsidies. Recent studies highlighted that the distribution of subsidies interacts with the market structure and the implementation details of the investment subsidy program (McCorriston and Sheldon, 1991; de Gorter, 1992; Munk, 1994; Salhofer and Smid, 2004; Ciaian and Ratinger, 2009).

2 Materials and Methods

Meat processors are defined as companies with prevailing activity CZ-NACE 10.1 Processing and preserving of meat and production of meat products. Authors investigated the investment subsidies of the RDP (measure I.1.3 Adding value to agricultural and food products) from 2007 to the end of the 2014. The database of 533 investment projects in the sub-measures I.1.3.1 (Adding value to agricultural and food products) and I.1.3.2 (Cooperation for development of new products, processes and technologies or innovations in food industry) provided by the Ministry of Agriculture was used as the secondary data source. The database was linked to the database Albertina Gold Edition that contains accounting and selected structural data of individual companies.

The projects were classified by different indicators. The status of the project was the first criterion.

- First group includes “approved and completed projects”, i.e. projects that have been successfully completed and the beneficiary submitted a request for payment by the end of 2014. This group covers 256 completed projects.

- The second group with status "approved and pending projects" includes the pending projects that were approved for funding and supported, but the beneficiary did not submit the request for payment by the end of 2014 because the project was going on. The second group consists of 118 projects.
- The third group of "rejected projects" includes the projects that were officially rejected. It means that the projects were not recommended for funding or the project was closed during the implementation because of the administration issues. There were 159 rejected projects.

The first and the second group are considered as "approved projects" or "participants". The third group is called "nonparticipants". Authors calculated various indicators of the subsidies distribution in the group of participants.

- Total amount of investment subsidies.
- Average subsidy per one project.
- The average required subsidy rate.
- The rate of success, calculated as the number of approved projects (1st and 2nd group) to the total number of submitted projects.
- The average project completion, i.e. the time between the submission of the application and registration of the request for payment.

The indicators were calculated separately for sole-holder enterprises and legal entities that were further divided into small, medium and large[20] companies according to the number of employees[21].

As the last measure, the structure of projects according to their regional affiliation was evaluated. This structure includes approved and completed projects (1st group) and approved pending projects (2nd group).

In the paper, we used the distribution analysis to verify if the Pareto principle of distribution (80/20) had fulfilled. Vilfredo Pareto was a late nineteenth-century economist/sociologist who first noted and reported his observation that about 80 percent of wealth was concentrated in about 20 percent of a population. This is the basis for what we now call the Pareto principle. In the paper, authors calculated how many participants received 80 % of investment subsidies in both sub-measures. This was applied to businesses their projects were completed or approved/pending. Authors also verified if individual beneficiaries successfully asked for the investment support repeatedly.

Based on the combination of the database from the Ministry of Agriculture and the database Albertina, authors verified if the participants were significantly different in financial situation from nonparticipants. Following structural indicator (size of the company) and economic indicators (financial ratios) were used to test the two-side hypothesis about difference.

- Size of the company (total assets, thousands CZK).
- Return on Assets (%) = Earnings Before Interests and Taxes / Total Assets * 100
- Credit Debt Ratio (%) = Bank Loans / Total Assets

[20] The sub-measure I.1.3.2 (Cooperation for development of new products, processes and technologies or innovations in food industry) was also eligible for large companies.

[21] Small companies employ 0-49 workers, medium 50-249 and the large more than 250 employees.

- Depreciation per Total Assets (CZK) = Depreciation of tangible and intangible assets / Total Assets
- Labor costs per Total Assets (CZK) = Labor costs / Total Assets

To test the differences, the Kolmogorov-Smirnov test (Kába and Svatošová, 2012) was applied because the sample followed neither the normal distribution nor the equal variances even though the dataset was removed from outliers.

3 Results and Discussion

Table 1 shows the indicators by the legal form of the meat processors (sole-holder enterprises and legal entities) and by the size of legal entities (small, medium, large).

Table 1. Indicators of investment project in meat industry

	Legal entities					
Indicator	Small	Medium	Large	Legal entities total	Sole-holders	Total
Total number of projects	181	143	42	366	167	533
Approved and completed projects	70	90	30	190	66	256
Approved and pending projects	55	19	3	77	41	118
Rejected projects	56	34	9	99	60	159
Approved beneficiaries with completed projects	51	46	13	110	50	160
Approved beneficiaries with pending projects	55	18	3	76	41	117
Rejected beneficiaries	44	29	6	79	51	130
Project completion (days)	479.09	472.96	539.67	497.24	482.42	484.89
Total amount of subsidies (th. CZK), from completed projects	180 776.66	326 865.12	342 058.23	849 700.01	112 904.64	962 604.65
Average subsidy (th. CZK), from completed projects	2 582.52	3 631.84	11 401.94	4 472.11	1 710.68	3 760.17
Financing rate (%)	41.97	43.84	39.53	42.47	42.67	42.52
Rate of success (%)	69.06	76.22	78.57	72.95	64.07	70.17

Source: own calculation based on the data from the Ministry of Agriculture

Total number of submitted projects was 533 and 68.7 % of them was submitted by legal entities, mostly by small (181 projects) and medium companies (143 projects). Large meat processors applied for financing their cooperation for development of new products, processes and technologies or innovations in food industry (sub-measure I.1.3.2).

Sole-holder enterprises had the lowest rate of success (64.07 %). The bigger is the company, the greater chance has the company to be supported. It is evident from the fact that the highest rate of success had projects of medium and large meat processors (76.22 %, resp. 78.57 %). The rate of success might depend on the quality of consulting services and own specialists that helps applicants to create and submit projects. Alternatively, the small companies usually rely on their own staff.

The average subsidy per one completed project follows the size of the beneficiary. The sole-holders completed projects of having an average subsidy of 1.71 million CZK. On the contrary, the large

companies in the sub-measure I.1.3.2 carried out the projects having an average subsidy of 11.4 million CZK. Such big projects included subsidy for cooperation between the meat processors and research centers that developed an innovative technology or product. The product and process innovation requires expensive technology and complex solutions. Typical supported innovation projects in the meat processing industry targeted at improvement of the quality, nutritional value and safety of meat products, ripening and packaging of fermented meat products, innovation of technology of sausages to extend shelf life without preservatives. The large meat processors usually cooperated with the University of Chemistry and Technology Prague. The complexity of the large projects (539.67 days of competition on average), the quality of projects and cooperation and the capital power of large meat processors were the main reasons why the large companies had the highest rate of success. Moreover, the large meat processors asked for the slightly lower rate of co-financing (39.53 %) compared to the small and medium enterprises (more than 40 %). However, the difference is not significant. In the sub-measure I.1.3.1, most of projects upgraded only the technology (equipment).

The structure of approved applicants was very diverse. Table 2 shows the distribution of project application and investment subsidies between regions in the Czech Republic.

Table 2. Regional distribution of investment subsidies in the meat processing industry

Region	Share of the approved project applications (%)	Share of the amount of subsidies (%)
Praha	2.94	4.78
Jihočeský	6.42	9.85
Jihomoravský	14.71	14.20
Karlovarský	2.67	2.99
Vysočina	9.36	5.89
Královéhradecký	4.81	3.57
Liberecký	4.55	3.88
Moravskoslezský	7.49	10.07
Olomoucký	3.21	1.34
Pardubický	6.15	5.31
Plzeňský	8.29	8.70
Středočeský	14.71	12.21
Ústecký	3.74	3.50
Zlínský	10.96	13.72

Source: own calculation based on the data from the Ministry of Agriculture

The meat processors in the Jihomoravský and Středočeský region together represented nearly 30 % of the number of approved project applications and more than one quarter of the investment subsidies (26.41 %). Zlínský region ranked the third place. When compared the difference between the share of approved application and the share of the subsidies, authors can identify regions with higher and lower capital-demanding projects. The exceptionally large projects were approved in Praha, Jihočeský region, Moravskoslezský region and Zlínský region. Alternatively, the smallest projects were approved in Olomoucký region, region Vysočina, Královéhradecký region and Středočeský region. It corresponds to the structure of the meat processing capacities in the Czech Republic.

One of the aims of the paper was to calculate the concentration of the investment subsidies in the group of approved applicants. Authors separately calculated the distribution of approved projects and the distribution of investment subsidies. Table 3 clearly demonstrates that businesses successfully applied of maximum six times. The most enterprises asked for support once (149 businesses) and twice (52 businesses). 33 enterprises were supported more than three times. In total, 36 % of businesses were supported repeatedly. Moreover, the distribution analysis showed that the Pareto principle of distribution has been fulfilled – 24 % of participants received 80 % of investment subsidies in both sub-measures.

Table 3. Distribution of the number of application

Frequency of application	1x	2x	3x	4x	5x	6x
Number of companies	149	52	19	7	6	1

Source: calculation based on the data from the Ministry of Agriculture

Table 4. Distribution of project applications by the size of the company

Annual turnover (millions of CZK)	Average number of applications per company	Average investment expenditures per company (CZK)
<= 2	1.00	1 367 024
3 – 9	1.22	1 645 379
10 – 29	1.45	3 801 514
30 – 59	1.38	3 032 089
60 – 99	1.50	2 561 505
100 – 199	1.69	3 531 183
200 – 499	2.29	11 467 097
>= 500	2.32	22 799 390

Source: own calculation based on the data from the Ministry of Agriculture

The number of applications increases with the size of the company (table 4). The smallest group of applicants with annual turnover less or equal 2 million CZK applied only once. Alternatively, the biggest applicants with turnover equal or higher 500 million CZK applied 2.32 times on average. It confirms the assumption that the bigger companies have better access to external financing and are able to manage applications and investment projects better than the small companies. The big gap between the average investment expenditures of biggest companies (turnover 200 million CZK and more) compared to the smaller companies reflects the capital-intensive projects on innovation in the sub-measure I.1.3.2.

The final part of the results focuses on the comparison of the meat processors which were supported in the period 2007-2014 (i. e. companies with approved projects = participants) and the meat processors who were always rejected or they did not ask for support at all (the group is called “nonparticipants”). Table 5 presents the results of the Kolmogorov-Smirnov test and basic statistical description of the two groups in 2007 which represents the start of the previous programming period. Because we cleaned data for extreme values, the number of observations differs in each indicator.

Table 5. Differences in size and economic indicators between participants and nonparticipants (2007)

Indicator	Total Assets (thousand CZK)		ROA (%)		Credit Debt Ratio (%)		Depreciation to long-term assets (CZK)		Labor costs to total assets (CZK)	
	Part	Nonpart	Part	Nonpart	Part	Nonpart	Part	Nonpart	Part	Nonpart
N	62	106	62	102	62	105	60	87	62	106
Mean	243 748	73 119	7.37	4.24	13.88	10.80	0.164	0.138	0.305	0.346
Median	62 207	13 726	5.20	2.80	6.12	4.58	0.112	0.084	0.253	0.228
St. Dev.	582 398	300 770	10.65	11.53	15.87	14.73	0.191	0.164	0.253	0.499
P5%	2808	197	-0.07	-9.04	0	0	0.024	0	0	0
P95%	738 573	280 940	26.0	26.35	42.58	34.47	0.548	0.488	0.695	1.227
K-S test	0.4105		0.3248		0.1375		0.2247		0.2118	
p-value	0.000		0.001		0.453		0.055		0.060	

Source: calculation based on the data from the Ministry of Agriculture and Albertina

The results of the comparison show that participants were significantly bigger than nonparticipants. The average value of assets of participating companies was 3.3 times higher than that of nonparticipants. The profitability of participants was also higher (7.37 %) than that of nonparticipants (4.24 %). It could be explained by pre-selection of applicants by their financial results. The results comply with the findings by Medonos et al. (2012) who investigated agricultural companies. The credit debt ratio did not significantly differ; however, the participants used slightly more bank loans than nonparticipants. The capital intensity is significantly higher in the group of participants (at the significance level $\alpha = 0.1$). Alternatively, the labor productivity was slightly higher in the group of nonparticipants, the difference is significant at the significance level $\alpha = 0.1$. Comparison of labor and capital intensity indicates that participants are more capital-intensive but less labor-intensive than nonparticipant. It corresponds to the capital-labor substitution.

4 Conclusion

The aim of the paper was to describe and evaluate the distribution of the investment subsidies for meat processors from the RDP in the Czech Republic in the previous programming period 2007-2013. The analysis revealed some important finding that can be useful for policy makers and agrarian economists as the basis for more detailed analysis. The participants in the RDP were significantly larger, more profitable and more capital-intensive than nonparticipants. If the Ministry of Agriculture will keep the company's financial condition as the requirement for applications, the difference will remain in the current programming period. The success rate of application was lower in small meat processors which often prepared the application without professional consulting services or own specialists. Small companies usually apply only once whereas the bigger companies usually apply repeatedly. Moreover, the small meat processors required higher rate of co-financing than large companies. The results also showed the concentration of investment subsidies towards a group of a few medium and large meat processors according to the Pareto principle. The question is if the strategic goal of the Ministry of Agriculture change to distribute the investment subsidies more evenly in the current programming period 2014+. The relatively low success rate and frequency of applications of small meat processors and concentration of subsidies in medium and large companies raise a question whether the Ministry of Agriculture would rather prefer small meat processors and provide them high-quality advisory service.

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Monitoring the spread of varroa bee through the open data

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Abstract: The issue of open data is now highly discussed matter. Open data has become an important source of information in the public sector and now is discussed their benefit in the commercial sector. The relevant question is the possible merits of open data in the agricultural sector. The paper deals with the potential of the open data in the agricultural resort in connection with monitoring the spread of varroa bee. Data relating to the monitoring of the spread of varroa bee clearly have the character of open data. The authors of this paper define the possible potential of the data relating to the varroa bee and then propose the applicable procedure to use this potential. Subsequent verification shows that these data have some potential, which can initiate a qualitative change in the functioning of beekeeping in CR. The results achieved in exploring issues, i.e. designed procedure using the potential of open data relating to the varroa bee can be generalized for other similar uses in the agricultural sector. These examined issues are the content of the grant project Technology Agency of the CR number TD03000438, whose solvers are authors of this paper.

Key words: Varroasis bees, monitoring varroa bee, beekeeping, open data, information needs, data integrity.

JEL classification: L86, D83, Q19

1 Introduction

Recently, spreading of varroosis of honey bees has negatively influenced the bee-keeping in the Czech Republic. Varroosis is parasitic disease of honey bees caused by Varroa destructor parasitic on bee's body (Webster and Delaplane, 2001). This parasite weakens the bee colony and has negative effect on the honey production (Anderson and Trueman, 2000). Uncontained varroosis infection can even lead to total extinction of the colony.

Varroosis is a problem that should not be ignored for the following reasons:

- it decreases the resistance of the colony against pests and other diseases,
- it decreases the efficiency of infected colony and thus its honey production,
- it destroys bee populations

In the Czech Republic, the varroosis containment is on fairly good level thanks to the State Veterinary Administration. Some of the treatments are nationwide compulsory, other are optional. However, the combination of high density of bee populations in the area of the Czech Republic together with very little chance of restricting bee flight tracks makes is impossible to effectively prevent the spreading of the infestation.

Current state of the honey bee varroosis in the CR can be described with the following attributes:

- the whole area is infested by the parasite,
- organized actions allow to keep the number of actual infections low, which contributes to the fact that there have been no uncontrolled mass extinctions of bee colonies so far,
- the situation is complicated by unrestricted relocations of bee colonies,
- rapid spreading speed of the disease – radius of 5 to 10 km per year (Titěra, 2013).

Every year the varroosis causes substantial losses for bee-keepers and one of the ways of limiting such losses is prevention (Titěra, 2013). Introduction of preventive measures can be fundamental factor leading to decreasing colony losses, sanitation of colonies and not to mention it can

contribute to minimizing the yearly costs of treating the actual infection (Guzman-Novoa and Eccles, 2010). The diagnosis is determined on the basis of laboratory analysis of the hive debris and bees. The foremost recommendation is to avoid concentrating too many colonies at the same site leading to exceeding the feeding capacity of the area and attempt to station the colonies at evenly spaced sites – especially when the nomadic bee-keeping is used and the colonies are being relocated to multiple sites during the season (De Jong, 1997).

The main aim of this paper is to define the possibilities of monitoring the spread of varroa bee through open data. A partial aim will be to propose an acceptable procedure of using of such data as relevant information support in solving of the problems associated with the spread of varroa bee.

2 Materials and Methods

For the design of our innovative solution to monitoring the spread of varroa bee through databases, we use data resulting from a laboratory analysis available at all district representations of the Regional Veterinary Administration and local Czech Beekeepers Association (see Tab. 1).

Table1. Data relating to the laboratory analysis of the samples of bees

Region	District	Village	ID_ beekeeper	Number of sites with varroa	Number of hive with varroa	Number of varroa	Number of varroa/hive	Number of sites with varroa/ colony=0	Number of sites with varroa/ colony<3	Number of sites with varroa/ colony>3
Středočeský	Beroun	Mořinka	11123	1	22	1	0,05	0	1	0
Středočeský	Beroun	Lážovice	11135	0	0	0	0,00	0	0	0
Středočeský	Beroun	Skřipel	11142	2	9	13	1,44	0	2	0
Středočeský	Beroun	Vižina	11155	6	39	159	4,08	1	1	4
Středočeský	Beroun	Kotopeky	11156	7	115	110	0,96	1	4	2
Středočeský	Beroun	Otmíče	11183	0	0	0	0,00	0	0	0
Středočeský	Beroun	Bykoš	11191	1	6	2	0,33	0	1	0
Královéhradecký	Rychnov	Olešnice	11205	9	95	187	1,97	1	6	2
Královéhradecký	Rychnov	Olešnice	11206	10	75	11	0,15	7	3	0
Královéhradecký	Rychnov	Opočno	11207	20	194	121	0,62	4	16	0
Královéhradecký	Rychnov	Orl. Záhoří	11208	1	4	0	0,00	1	0	0
Královéhradecký	Rychnov	Osečnice	11210	8	42	12	0,29	4	4	0
Královéhradecký	Rychnov	Pěčín	11211	17	140	72	0,51	5	10	2
Královéhradecký	Rychnov	Podbřezí	11212	11	154	155	1,01	7	1	3

Source: State Veterinary Administration CR, 2016

Such data have the nature of open data and can represent a relevant source for strategic and tactical decision making support of beekeepers (Vostrovský and Rysová, 2014). The use of the open data should not be limited by any technical or other restrictions and their use must be free. Open Data (OD) can become a relevant source of information readily available on the Internet, not only in the public sector but also the commercial sector (Berg, 2013), (Vostrovský, Tyrychtr and Ulman, 2015).

As the initial costs of starting beekeeping operations are relatively high (see Tab. 2), the data may be crucial especially when it comes to deciding whether to start beekeeping operations at a particular site and with what intensity, what may be the related costs and what profitability can be expected.

Table 2. Acquisition costs for the breeding of the three bee colonies

Beekeeping aids	price in euro
hive	3x80
bee hive	3x120
beekeeping frames	60
bee grid	6
colander	15
honey extraction	300
overalls, gloves	50
sealing transformer	40
feeders	8
glass for honey	20
additional aids	30
Total for the aids:	**1129**

Source: Czech Beekeepers Association, 2015

It can be assumed that these data contain within themselves some potential to improve the operation of apiculture in the Czech Republic (Zviran and Glezer, 2000). However, if the data from this laboratory analyse are to meet such potential they need to be of certain quality. In general, the quality is defined by international standards (SQuaRE) in the established quality model. The existing information need (Říhová, 1996), (Rosický, 2009) related to the varroa bee is caused by:

- the relative shortage of available specialists,
- the existence of a large amount of problems accompanying this disease, which require a rapid and highly skilled solution (Tyrychtr, Ulman and Vostrovský, 2015).

To meet objectives of this paper will be using the techniques and procedures of the relational database technology (Awad and Gotterer,1992). The proposed solution will be demonstrated and subsequently verified on the issue of open data relating to varroa bee. Other used methods will be the methods of the relational database technology, in particular methods of data integrity enforcement (Motro,1989), (Salman, Rehman and Shahid, 2012).

The focal point for such evaluation of the open data related to the varroa bee will the relational database technology and specifically the query language SQL (Motro, 1989). This query language provides a variety of options for these purposes. These are mainly the following SQL commands:

```
CREATE TABLE < table_name> (<column_name>
   < data_type> [NOT NULL][PRIMARY KEY][CHECK]…] >
   [FOREIGN KEY(<jméno-sloupce> REFERENCES <column_name>(<data_type>…]
DELETE  FROM <table_name> [WHERE <selection condition>]
SELECT [DISTINCT]  {*|<seznam-sloupců>
    FROM <table_name> [, <table_name>] ...
      [WHERE  <selection condition>] [GROUP BY <seznam-sloupců>
          [HAVING <selection condition>]][ORDER BY <column_name>
            [ASC|DESC] [,<column_name> [ASC|DESC]]...]
CREATE VIEW <view_name>
  [< list of new column names >] AS < command-SELECT>
```

3 Results and Discussion

The proposed procedure for evaluation of open data in the monitoring of the spread of the varroa bee may take the following form (see Fig. 1).

Pivotal in this proposed procedure will be the following issues: *authentication*, *anonymization*, *integration* and *aggregation* (Wang, Lin and Yao, 2014). The individual steps of the proposed procedure comprise the following activities:

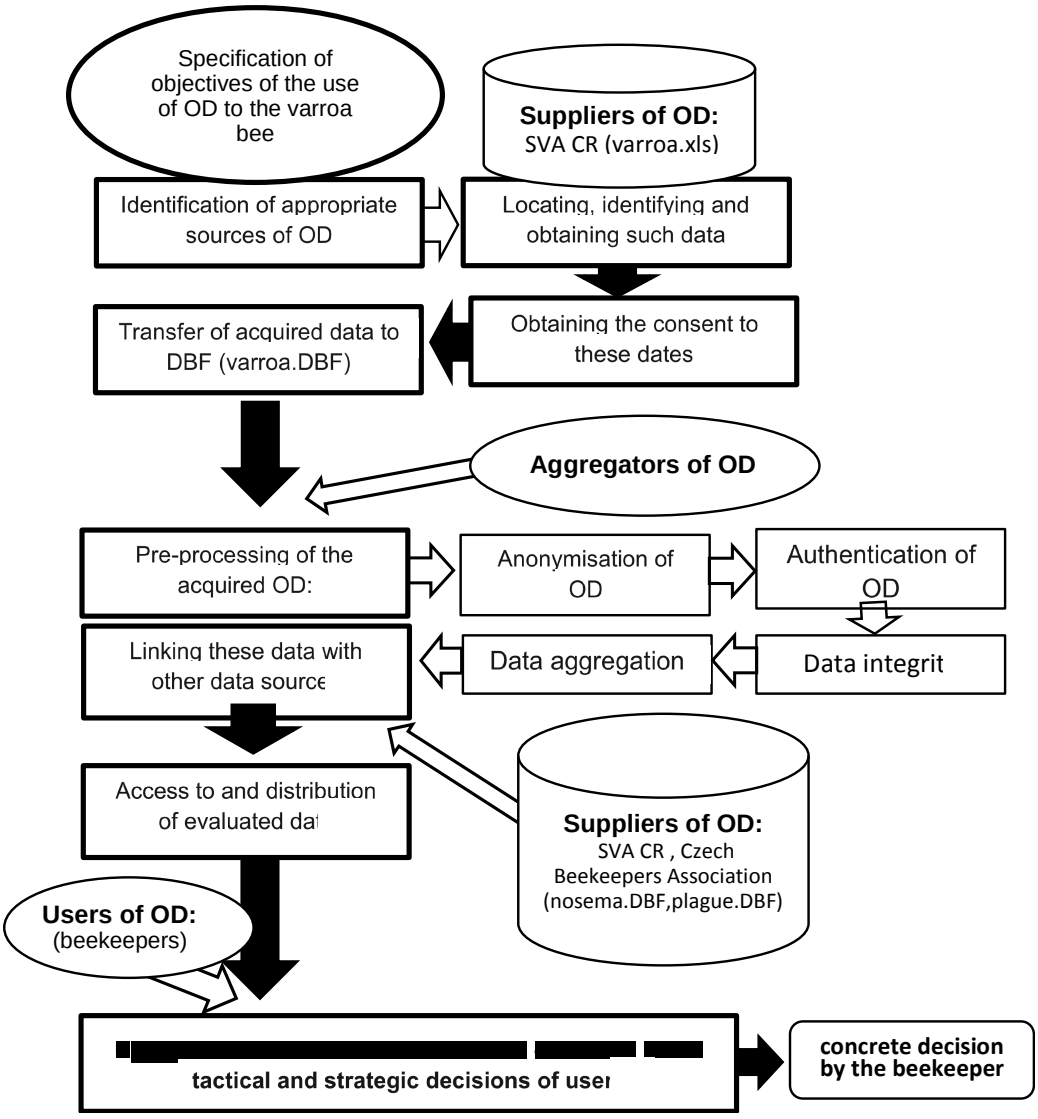
Step of the proposed procedure: Specification of objectives of the use of OD to the varroa bee

The aim of this step will be the realization of information support for strategic and tactical decisions beekeepers in solving problems related to the varroa bee.

Step of the proposed procedure: Identification of appropriate sources of OD

In this stage was identified the source of open data relating to the varroa bee, which is implemented by the State Veterinary Administration CR. This institution thus becomes the category *Supplier of the open data*.

Fig. 1. Proposed procedure for evaluation of open data in the monitoring of the spread of the varroa bee



Source: self-authored

Table 3. Listing of the data source relating to the varroa bee

Region	District	Village	ID_ beekeeper	Number of sites with varroa	Number of hive with varroa	Number of varroa	Number of varroa/hive	Number of sites with varroa/ colony=0	Number of sites with varroa/ colony<3	Number of sites with varroa/ colony>3
Středočeský	Beroun	Mořinka	11123	1	22	1	0,05	0	1	0
Středočeský	Beroun	Lážovice	11135	0	0	0	0,00	0	0	0
Středočeský	Beroun	Skřipel	11142	2	9	13	1,44	0	2	0
Středočeský	Beroun	Vižina	11155	6	39	159	4,08	1	1	4
Středočeský	Beroun	Kotopeky	11156	7	115	110	0,96	1	4	2
Středočeský	Beroun	Otmíče	11183	0	0	0	0,00	0	0	0
Středočeský	Beroun	Bykoš	11191	1	6	2	0,33	0	1	0
Královéhradecký	Rychnov	Olešnice	11205	9	95	187	1,97	1	6	2
Královéhradecký	Rychnov	Olešnice	11206	10	75	11	0,15	7	3	0
Královéhradecký	Rychnov	Opočno	11207	20	194	121	0,62	4	16	0
Královéhradecký	Rychnov	Orl. Záhoří	11208	1	4	0	0,00	1	0	0
Královéhradecký	Rychnov	Osečnice	11210	8	42	12	0,29	4	4	0
Královéhradecký	Rychnov	Pěčín	11211	17	140	72	0,51	5	10	2

Source: State Veterinary Administration CR, 2016

Step of the proposed procedure: Obtaining the consent to these dates

Identified data related to the varroa bee have the character of open data. These data are freely available, it is not necessary the agreement for their use.

Step of the proposed procedure: Transfer of acquired data to DataBase File (DBF)

The file containing the open data relating to the varroa bee has .xls format and contains the following data: region, district, village, ID of beekeepers, number of sites with varroa, number of hive with varroa, varroa/hive, number of sites with varroa/colony=0, number of sites with varroa/colony<3, number of sites with varroa-colony>3. Transfer of data from this format into .DBF can be realized in conventional manner. The resulting database file will be created with the following SQL command:

```
CREATE TABLE varroap (IDvill INTEGER(6) PRIMARY KEY,vill CHAR(20), distr CHAR(20),reg
CHAR(20),IDbeekeeper INTEGER(5), numbsites INTEGER(3),numbhives INTEGER(3), numbvar
INTEGER(3), numbvarhive NUMBER(3,2), numbvarhive NUMBER(3,2), numbvar0 INTEGER(3),
numbvar03 INTEGER(3), numbvar3 INTEGER(3), numbvar33 INTEGER(3));
DESCRIBE varroap;
      Name                Type
      -------------   ------------------
      IDvill          INTEGER(6)PRIMARY KEY
      vill            CHAR(20)
      distr           CHAR(20)
      reg             CHAR(20)
      IDbeekeeper     INTEGER(5)
      numbsites       INTEGER(3)
      numbhives       INTEGER(3)
      numbvar         INTEGER(3)
      numbvarhive     NUMBER(3,2)
      numbvar0        INTEGER(3)
      numbvar03       INTEGER(3)
      numbvar33       INTEGER(3)
```

VARROAP.DBF	
IDvill 🗝	**INTEGER(6)**
vill	CHAR(20)
distr	CHAR(20)
reg	CHAR(20)
IDbeekeeper	INTEGER(5)
numbsites	INTEGER(3)
numbhives	INTEGER(3)
numbvar	INTEGER(3)
numbvarhive	NUMBER(3,2)
numbvar0	INTEGER(3)
numbvar03	INTEGER(3)
numbvar33	INTEGER(3)

Step of the proposed procedure: Anonymisation of OD

Very important step of proposed procedure is the anonymity of these open data. In this step will be deleted the data item IDbeekeeper. This step will be realized through the following SQL commands.

```
CREATE TABLE varroa(IDvill INTEGER(6) PRIMARY KEY,vill CHAR(20),distr CHAR(20),reg
     CHAR(20), numbsites INTEGER(3),numbhives INTEGER(3), numbvar INTEGER(3),
     numbvarhive NUMBER(3,2),numbvar0 INTEGER(3), numbvar03 INTEGER(3), numbvar33
     INTEGER(3));
DESCRIBE varroa;
    Name                 Type
     -------------    ------------------
     IDvill           INTEGER(6)PRIMARY KEY
     vill             CHAR(20)
     distr            CHAR(20)
     reg              CHAR(20)
     numbsites        INTEGER(3)
     numbhives        INTEGER(3)
     numbvar          INTEGER(3)
     numbvarhive      NUMBER(3,2)
     numbvar0         INTEGER(3)
     numbvar03        INTEGER(3)
     numbvar33        INTEGER(3)
```

VARROA.DBF	
IDvill 🗝	**INTEGER(6)**
vill	CHAR(20)
distr	CHAR(20)
reg	CHAR(20)
numbsites	INTEGER(3)
numbhives	INTEGER(3)
numbvar	INTEGER(3)
numbvarhive	NUMBER(3,2)
numbvar0	INTEGER(3)
numbvar03	INTEGER(3)
numbvar33	INTEGER(3)

```
INSERT INTO varroa  SELECT
     IDvill,distr,reg,numbsite,numbhive,numbvar,numbvarhive, numbvar0,numbvar03,
     numbvar3,numbvar33 FROM varroap;
SELECT * from varroa;
```

IDvill	Vill	Distr	Reg	Numbsite	Numbhive	Numbvar	Numbvarhive	Numbvar0	Numbvar03	Numbvar33
533912	Mořinka	Beroun	Středočeský	1	22	1	0,05	0	1	0
533939	Lážovice	Beroun	Středočeský	0	0	0	0,00	0	0	0
533963	Skřipel	Beroun	Středočeský	2	9	13	1,44	0	2	0
534048	Vižina	Beroun	Středočeský	6	39	159	4,08	1	1	4
534072	Kotopeky	Beroun	Středočeský	7	115	110	0,96	1	4	2
534111	Otmíče	Beroun	Středočeský	0	0	0	0,00	0	0	0
534145	Bykoš	Beroun	Středočeský	1	6	2	0,33	0	1	0
576573	Olešnice	Rychnov	Královéhradecký	9	95	187	1,97	1	6	2
576581	Olešnice	Rychnov	Královéhradecký	10	75	11	0,15	7	3	0
576590	Opočno	Rychnov	Královéhradecký	20	194	121	0,62	4	16	0
576603	Orlické Záhoří	Rychnov	Královéhradecký	1	4	0	0,00	1	0	0
576611	Osečnice	Rychnov	Královéhradecký	8	42	12	0,29	4	4	0
576620	Pěčín	Rychnov	Královéhradecký	17	140	72	0,51	5	10	2
576654	Podbřezí	Rychnov	Královéhradecký	11	154	155	1,01	7	1	3
…	……	……	……	..	…	…	….	.	..	.

Step of the proposed procedure: Data aggregation

The information value of some data can be increased by their aggregation ((for example: the numbers or averages for districts, for regions, calendar years etc.).

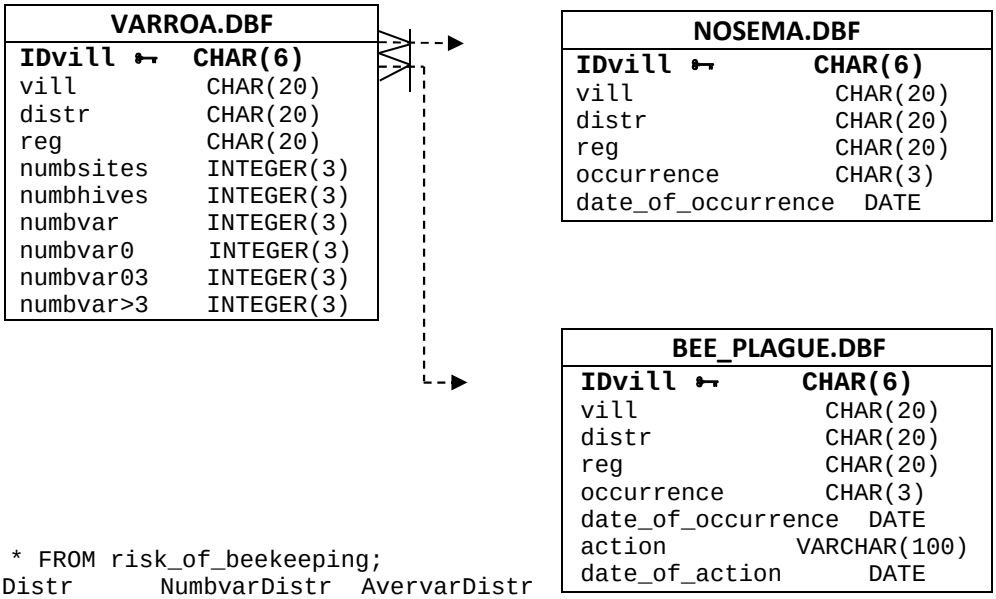
```
CREATE VIEW numbers_for_districts (Distr, NumbvarDistr,AvervarDistr) AS SELECT
    Distr,SUM(Numbvar,AVG(Numbvar)  FROM varroa GROUP BY Distr;

SQL> SELECT * FROM numbers_for_districts;
            Distr          NumbvarDistr          AvervarDistr
             Beroun             387                   15
             Rychnov            733                   23
             …                  …                     …
CREATE VIEW numbers_for_region (Reg, NumbvarReg,AvervarREG) AS SELECT
    Reg,SUM(Numbvar,AVG(Numbvar)  FROM varroa GROUP BY Reg;
```

Step of the proposed procedure: Linking these data with other data sources

This step will involve linking these data with other data sources. These date sources can be records of other diseases of bees (Nosema bees, bee plague). Supplier (owner) of these data will be the State Veterinary Administration CR and the Czech Beekeepers Association. The interconnection of these data sources will be implemented using the following SQL statement:

```
CREATE VIEW risk_of_beekeeping (Vill,Distr,NumbvarDistr,AvervarDistr,NumbPlague,
        NumbNosema) AS SELECT Distr,SUM(Numbvar,AVG(Numbvar),
        AVG(NumbPlague),AVG(NumbNosema
            FROM varroa,nosema,plague WHERE varoa.Distr=nosema.Distr AND
        nosema.Distr=plague.Distr GROUP BY varroa.Distr;
```




```
SELECT * FROM risk_of_beekeeping;
       Distr       NumbvarDistr   AvervarDistr
      Beroun             387          15
      Rychnov            733          23
      …                   …           …
```

Step of the proposed procedure: Access to and distribution of evaluated data

The resulting data will be freely accessible to their users (to beekeepers) on the website of the Czech Beekeepers Association.

Step of the proposed procedure: Utilization of the analysis conclusions of the open data in the tactical and strategic decisions of users

This step proposed procedure involves the practical use of the resultant data in strategic and tactical decisions beekeepers. An example can be the solving the following dilemma: The beekeeper decides whether it would be appropriate to start behaving bees on a larger scale in the village Opočno. Solutions to this problem can be realized by using the following SQL statement.

```
SELECT Vill,NumbvarDistr,AvervarDistr,NumbPlague, NumbNosema FROM
     risk_of_beekeeping WHERE Vill='Opočno';
Vill      NumbvarDistr     AvervarDistr     NumbPlague      NumbNosema
Opočno         24               45              0        strong incidence
```

The obtained data can be interpreted as the following recommendations: *In the concerned area it is not appropriate to operate the beekeeping complying in the greater scale. This area is determined by a higher level of infection of bees, which can be causes of the lower efficiency of this activity.*

4 Conclusion

The above described procedure shows that the data relating to the varroa bee can be an inspiring example for similar use of the open data in the beekeeping. The proposed procedure the use of the available open data may become relevant information support in solving problems with bee varroasis and greatly help to minimize the potential risks novice beekeeper. This proposed procedure can be generalized to other possible application in the agricultural sector. The precondition of such generalization and subsequent implementation will the ensure of the absolute correctness of these data, including the willingness and disposition of users for their meaningful use. Only under this assumption, this data can become a relevant information support in the strategic and tactical decision-making of their users. Only in this way will be face the threat effectively with the spread of varroa bee and the eventual decline of interest in beekeeping.

This innovative approach brings advantages for beekeepers, such as:

- The current open data can be used more effectively during the decision making processes. The key indicators of the spread of the varroa bee can be analysed from different points of view of aggregation (the numbers or averages for districts, for regions, calendar years etc.).
- Internal data of beekeepers can be enriched using information gained from e-government open data.

Presented results are only the first step of a more complex research. Authors of this paper are working to automated transformation of knowledge rules into multidimensional databases and finding suitable means of such transformations for decision making support of beekeepers.

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Ecological Consideration of Ukrainian Agribusiness

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Abstract: Agriculture is one of the priority sectors of the Ukraine economy. However, during long period of time the significant ecological, economic, technological and technical changes have been occurred in the Ukrainian agriculture that had negative affect on the land resources and the environment in general. Changes in technology of agricultural production to intensive level, aimed at obtaining heavy yield and high economic indicators that increase profitability have led to a violation of crop rotation, decreasing of organic fertilizer treatment and focus on chemical fertilizers treatment. As a result, the air and water have been polluted, soil porosity has been broken. Thus, the Ukrainian agribusiness requires changes that will take into account the environmental specifications and will reduce the ecological destruction impact on environment. The experience of developed European countries shows that instead of intensive agricultural production the environmentally friendly technology comes. This paper shows reasons of ecological negative consequences which caused in the process of agriculture production. The aim of the article is to find a way of how Ukrainian agribusiness can be oriented into eco-friendly direction by providing ecological services. As a result, Ukrainian agribusiness will use effective its natural resources, will increase extent of Ukrainian producers and consumers of ecological products and get new opportunities to integrate into the European market for organic products.

Key words: agribusiness, eco-friendly, ecological consulting, ecological services, environmental, land resources, market for organic products.

JEL classification: Q13, Q57

1 Introduction

Agricultural land in the structure of Land Resources of Ukraine occupies an area of 42.4 million hectares that are nearly 70% of the land fund of Ukraine. The black soil that belongs to one of the most fertile ones prevails in its structure. It is characterized by high humus content and favorable conditions for farm crop feeding. However, the intensification of production processes in Ukrainian agriculture has significant negative ecological impact on the Land Resourses, Water Resourses, quality of food and environment in the whole.

In Ukraine mineral fertilizers and pesticides treatment during the 1960-2015 led to a number of interrelated and destructive ecological effects: soil, groundwater and surface water contamination by chemicals; food quality decrease because of contamination through the food chain by residues of fertilizers and pesticides, decline of population health conditions. The use of chemicals in the period of 1960-1990 was indispensable under the totalitarian regime as the decision of the Communist Party. From the beginning of 1990 the chemical fertilizers use was a conscious choice of agriholdings, farms, and private farms as the best way to get a guaranteed yield and corresponding income. The common feature of social and economic processes that took place in that period of time was ignoring by public, damages caused chemicals to ecosystems and human health. The logical consequence of such social behavior is that the state control over the ecological condition of agricultural land, air, water and food safety has been and remains declarative and unefficient. The obvious fact that the future vector of agricultural development will depend on the degree of consumers' and producers of agricultural products ecological awareness and their subsequent choice.

Development of new methodology, which is adapted to agriculture provide more opportunities for farmers not to conflict with the principle of sustainable development. One of these, for example, is to use agro-ecological management technique. According to scientists (Marada, P. et al, 2012) this methodology is a tool for monitoring risks and producing quality products by doing some activities or providing services. Thus, it can introduce all business entities in agriculture what need to define, implement, maintain and improve processes that will minimize the negative effects of their activities on the environment in the framework of agro consulting system and in the process of education (Marada, P. et al, 2012).

Agribusiness development is closely associated with the new technologies used in the production process. Thus, according to Kubankova, M. et al. (2016), the practice of sustainable development in agriculture is based on innovation. These innovations can occur for example by growing intermediary crops, to maintain soil quality and save proper agro technical procedures.

One of the modern methods of natural ecosystems maintenance during the process of agriculture production is organic products production, what eliminates the use of any crop protection chemicals and synthetic growth factors. Thus, according to Zámková, M. et al (2013) organic farming respects the natural cycles and relationships to produce products of high quality and value. The basic priority in organic production is quality, not quantity (Zámková, M., 2013). Organic farming means protection and environment-friendly use of resources which lead to sustainability (Kutnohorská, O et al., 2013).

Nowadays in Ukraine, more and more consumers are aware of the importance to consume eco-friendly (organic) products. Each year, the number and magnitude of organic operators is increasing. However, the Ukrainian organic production and market for its products is influenced by a number of factors that restrain its development. Among these factors the most active are: the lobbying by Ukrainian agriholdings their interests and their control over the export of agricultural products; high price on organic food and their little range in the Ukrainian market; only seller's market development; low purchasing power of most of the population.

Organic farming has been successfully developed more than 30 years in Europe. This direction of agriculture production is relatively new in Ukraine, and its implementation requires considerable efforts, on the first of an informational nature. That’s why the purpose of this paper is to consider organic farming as an ecological direction of Ukrainian agribusiness, find the factors which restrain its intensive expanding and analyze the possibilities to create an integration platform for the common development of organic agriculture in Ukraine and European countries.

Solving the problems associated with the formation of an integration platform, it would begin with an information block, especially with the introduction of ecological services. Ecological services are a special kind of activity in the market that provides organizational measures that explain, prevent and control ecological problems and meet the environmental needs of society. The content, principles and forms of implementation of ecological services studyed Costanza, R. (1997), Mishenin, Y. (2010), Marada, P. (2012), Křikava, L. (2012), Kutlvašr, K. (2012), Sláma, P. (2012), Chloe J. Hardman (2016).

The experience of European countries shows that ecological services development creates new opportunities for agricultural producers, namely, among them: attraction of investments, the diversification of the primary activity, new trends to integrate with the same companies outside the domestic market, expansion of possibilities for domestic products to enter foreign markets. Such services make new working places and ensure its employees in wages. The benefit from such ecological services completely exceed the negative effects come from intensive agriculture production.

2 Materials and Methods

The informational background of research was made by the materials throughout own observations, questionnaire of business entity in agriculture and other periodicals, scientific works of Ukrainian and foreign scientists, Internet sources on the topic of research. To compare the organic farmland area and number of organic operators in EU countries and in Ukraine we have used FiBL and IFOAM research data in 2013. Statutory instruments of Ukraine and EU (in particular Council Regulation on organic production №834 / 2007, 889 / 2008, Law of Ukraine "On production and marketing of organic agricultural products and raw materials") led to compare countries policy in the field of organic production, to analyze the reasons that restrain the Ukrainian market for organic products development and to synthesize directions of possible cooperation between the EU and Ukraine in this sphere. The working group's data, which is disposed on the web-site of Ministry of Agrarian Policy and Food of Ukraine helped to formulate area of Ukrainian legislation improvement under the European standards. Material which is posted on the site of the first Ukrainian certification center of organic production "Organic Standard" have provided with information on existing and ongoing projects on the market of organic products.

We use a marketing research in the form of questionarry to understand if agriculture producers require to receive ecological consulting services concerning the organic production. The sociological method was selected (questioning and interviewing techniques). The farm managers at different organizational and legal forms of business and owners of individual households of one of the Ukraine region were selected as respondents. The criteria for calculating the number of respondents were: confidence coefficient (relevance): 95%; confidential interval (error): +/- 5%; general totality (agricultural enterprises, individual households): 1339; 493500; sample volume: 283 respondents – for the survey of agricultural enterprises and 387 – for the survey of individual households. The questions that are considered it this paper were represented as follows: «Are you interested in such ecological service as consultation of organic products growth? » (the question to the individual household owners) and «Are you interested (required) in ecological service – ecological (agricultural) consulting (in particular: providing recommendations on the use of biologics, eco- and biosafety in the livestock production, informational support in environmental issues solving, training)?» (the question to the farm managers).

The methodological base is conducted by the general scientific and specific methods. By means of comparison method, the essence of the term "organic" in the EU and Ukraine was found. The abstract-logical method allowed to give its own understanding of the concept of "ecological services" and to summarize the essence of ecological consulting. The method of analysis and synthesis has allowed to assess the situation of Ukrainian market for organic products, to compare it with developed European market, to formulate the main factors that restrain its activating and to offer a form of international cooperation with the experts participation. The questionnaires and interviewing techniques of sociological research method helped to understand the attitude of business entities in one of regions of Ukraine to get an ecological consulting about organic production.

3 Results and Discussion

Organic production has developed rapidly in the world and in particular in EU countries. According to FiBL research in 2013, Spain and Italy, as EU countries, are among the ten global organic producer leaders. Ukrainian market for organic products began its development relatively recently (around 1990). It has a number of problems that restrain the active expansion of the organic method of production in Ukraine. In spite of the significant potential of Ukrainian agribusiness over large areas of agricultural land, availability of fertile soils and favorable climate conditions, relatively

cheap labor force, the number of operators (producers, processers, exporters and importers) is significantly small in comparison with the developed and neighboring countries in EU. According to the data of Organic Federation of Ukraine, in 2011 there were: producers – 155; processers – 45; exporters – 32; importers – 28 (Willer, H., 2013).

Ukrainian market for organic agricultural products is presented by: crop production (winter wheat, oats, rye, barley, buckwheat, millet, soybeans, corn, vegetables, fruits, berries); livestock products (beef, veal, turkey, byproduct, etc.); derived products (milk, yogurt, cheese, fermented baked milk, juice, etc.); herbs and honey. The adoption of the Law of Ukraine "On production and marketing of organic agricultural products and raw materials" in 2013, the market for organic products began to activate. According to it the certified organic farmland area and domestic market have been increased, promotion of organic products through the media and distribution of various international and national projects have been started. One of these is the Swiss-Ukrainian project "Organic market development in Ukraine" (2012-2016). Its idea is to increase the competitiveness of Ukrainian organic market by increasing the number of small and medium-sized entities in the organic food sector and building up organic food supply chains (FiBL).

However, the Ukrainian organic market can be considered relatively undeveloped market in comparison with neighboring EU countries. In our opinion, further development of organic agriculture and organic market in Ukraine depends on how it will be integrated into the European economy. So it is very important to analyze the components that form the area of cooperative co-evolution of European and Ukrainian market, namely legislation, certification, financial resources, mentality and information.

- *Legislation.* Nowadays the Ukrainian legislative base of organic agriculture development is the Law of Ukraine "On production and marketing of organic agricultural products and raw materials" and 16 regulations. According to the workgroup that works on the United integrated strategy of agriculture and rural areas development on 2015-2020 years, firstly these documents should be adapted to the EU Regulations, and secondly, it should be reduced the numbers of such documents to eliminate duplication of text (Ministry of Agrarian Policy and Food of Ukraine).
- *Certification*. Ukrainian small and medium-sized farmers think that the certification process is labor-intensive, wasteful and required significant financial investment. Besides it is still not determined which certification institutions have the rights to certified farms that have intension to produce organic products on the domestic market. As of 01.07.2013 in Ukraine certified: "Organic Standard" (the first Ukrainian certification institution), and 14 foreign institutions (in particular: IMO, Switzerland; Ecocert SA, France; Austria Bio Garantie GmbH and SGS Austria Controll-Co. GmbH, Austria; Control Union Certifications, Netherlands; ETKO, Turkey; CERES, Abcert AG, Lacon GmbH, QC & I GmbH and BCS Oko-Garantie GmbH, Germany; Bioagricert S.r.l., ICEA and Suolo e Salute srl, Italy) (Prokopchuk, N. et al., 2014). However, they provide certification of farms that is specialized on the organic products supply in those countries what own the certification institution.
- *Financial resources*. Transition from the traditional way of agricultural production to the organic, required significant financial investment. This process takes for many years (the conversion period may take more than 2 years) and it's difficult for Ukrainian producers to decide how to do that in economic sense without state and investors support. In our opinion, farmers should receive guaranteed financial support from the state. The support should be directed on: reducing loan rates for farmers, providing dotation and benefits to buy equipment, seeds and make a certification process, stimulating organic products export, giving privileged vacation during conversion period.

- *Mentality.* Currently in Ukraine there is a low percentage of consumers who easily find the organic product on the grocery shelves and understand the difference between the products produced by traditional and organic technologies. Ukrainian consumers haven't formed yet the point about necessity to be interested in what they eat, product composition and ecological footprint that production operations leave on the environment. Mostly Ukrainian consumers start thinking about it when they buy food for children. So that's why it's necessary to change the perception.
- *Information.* It is felt in a society among suppliers that the process of organic production "is difficult" (producers' unwillingness to learn more). Among consumers it is felt that the organic products "are too expensive" (consumers' unwillingness to understand organic food advantages). As a result, there is a low demand for organic products and small number of organic operators in Ukraine. In our opinion, the reason of that is lack of relevant information that is easy for understanding.

Analysis and synthesis of factors which are described above direct us to search for effective organizational actions that would encourage Ukrainian market for organic agricultural products. In our opinion, the ecological services implementation is one of the alternative directions of popularizing the ecological production method among all business entities in agriculture. One type of modern ecological services is an ecological consulting - information tool for creating new ecological opportunities and projects. The purpose is to form ecological conscienceness of business entities, to eliminate the lack of knowledge regarding to environmental safety and environmental technology. Nowadays there are some consultation centers in Ukraine, which provide consulting services in the field of organic agriculture. But unfortunately the number of such centers is currently quite small and the cost of their services is high enough.

In the research literature the examples of market research on consumer attitudes to organic products can be found. For example, Koudelka, J. (2013) describes customer segments based on purchase preferences to organic foods, food consumption behaviour, lifestyle statements etc. However, our task was to study the opinion of the potential organic producers. Therefore, to understand if ecological consulting service will be popular among agricultural producers in Ukraine, we conducted a separate market research in one of Ukrainian region. The results show that 19.9% of farm managers are interested in obtaining ecological services (agricultural) consulting and 10.6% of individual household owners are interesting to receive advices about growing organic products.

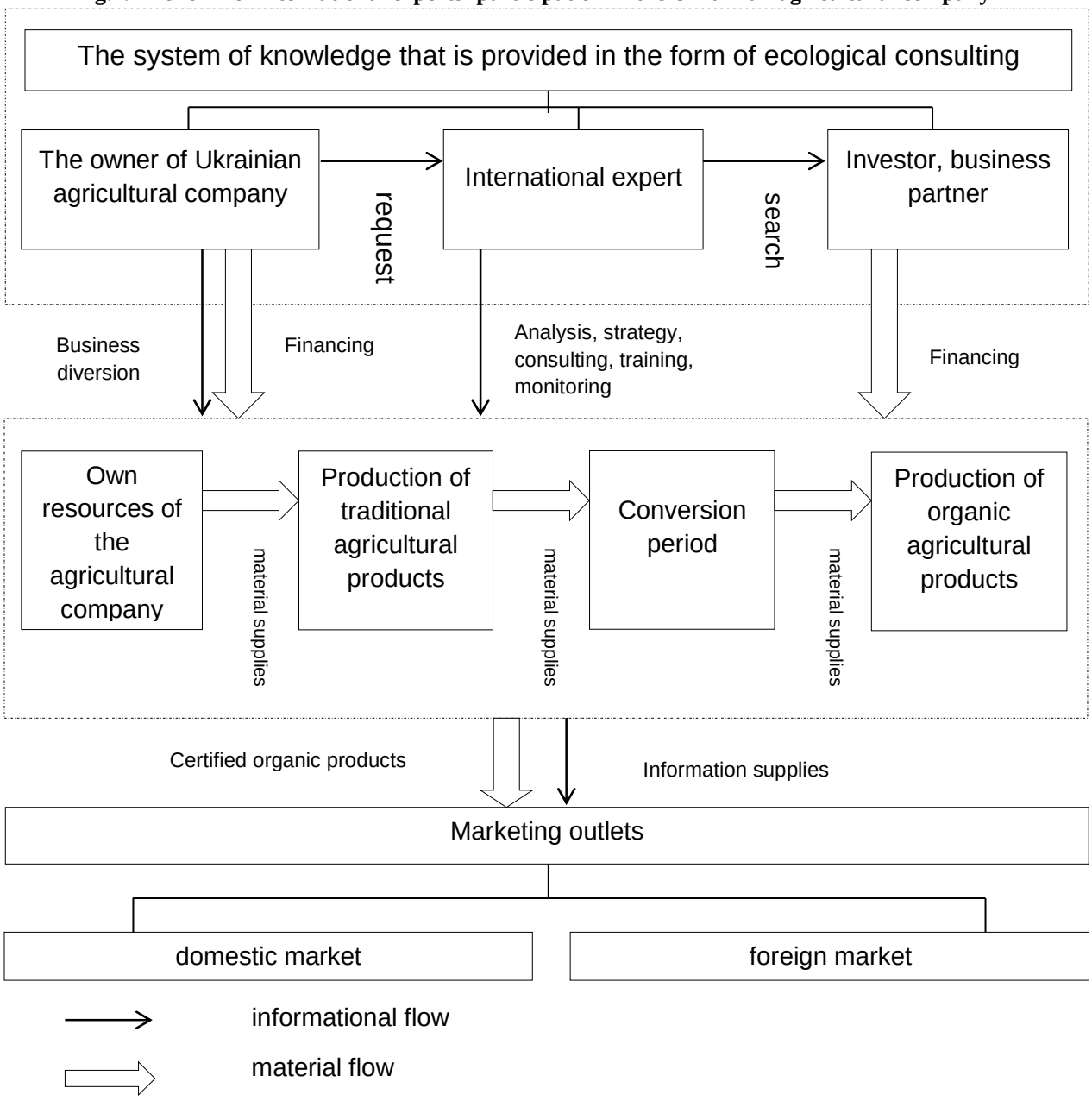
However, the needs implementation in ecological information even these numbers of business entities in agriculture will be the first step to create critical mass of organic producers and internal Ukrainian market for organic products enhance in the direction of international cooperation on the European organic market. Based on the results obtained above, we recommend the algorithm of practical implementation of such cooperation with the assistance of international experts, fig. 1.

The issues facing agricultural producers who intend to produce organic products is associated with changes in production technology. An international expert who works as an ecological consultant should explore the special aspects of the agricultural enterprise that made a request to receive consultations. The assessment should focus on the determination of strengths, weaknesses, opportunities and threats.

In terms of receive data specialist should prepare general company strategy, short-term plans for each time period and make a business plan that will interest foreign investors and business partners. During company conversion period, an international specialist should focus on the following issues: selection and training of staff according to European standards of organic production; clarifying specificity of the technological process; consultations on the selection of technical machinery, animal and plant protection (which is permitted in organic agriculture according to EU Regulation); selection the certification system. The expert must accomplish

periodic controlling and be a part of the team to be sure the new information was understandable by the participants of agricultural enterprise. It is important to focus on the marketing strategy, product placing, searching target and potential partners, points-of-sale, dealers, customers, producers' participation in international exhibitions.

Fig.1. The form of international experts' participation in the Ukrainian agricultural company



Source: own research

Thus, in our view, the ecological consulting implementation with the international experts' support could be one of the effective steps to increase the number of organic operators in Ukraine. Attention should be focused on relevant and understandable information popularization to the agriculture producers about the importance of transition to an ecological method of production. Therefore, future scientific research should be continued in the direct of adaptation and integration of Ukrainian organic business to the EU market.

4 Conclusion

The paper specified, that Ukraine has great potential in agribusiness. It is characterized by 70% agricultural land in the structure of the land fund of Ukraine, fertile soils, favorable climate conditions. However, this sector has a significant negative ecological impact on the environment.

It is defined, that chemicals treatment during 1960-1990 years and the current agriholdings and other entities choices to use fertilizers and pesticides causing natural ecosystems and human health damages. Thus, the vector of development of Ukrainian agriculture has changed in favor of awareness of environmental problems and changing agricultural production technologies. The development of organic agricultural production depends on consumer awareness of the need to use eco-friendly products.

Believe that organic agriculture is a long-range area of ecological Ukrainian Agribusiness and can take a leading position in the domestic and international market for organic products. However, it was analyzed and synthesized that there are a number of factors, which restrict its activation, including: legislation, certification process, the mentality, lack of information and financial resources. It is proposed to build an integration platform of Ukrainian and European market for organic products through the introduction of ecological services, specifically ecological consulting services. According to the analysis of Ukrainian business entities in agriculture opinions, the recommendations that involve an international expert who works in the form of ecological consultations to the enterprise were proposed.

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