

**CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE  
FACULTY OF ECONOMICS AND MANAGEMENT**



# **AGRARIAN PERSPECTIVES**



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# Foreword

Ladies and gentlemen, colleagues and friends,

I am honoured to open the *Agrarian Perspectives 2011* conference on behalf of the Scientific Committee. The conference has been traditionally organized by the *Faculty of Economics and Management* at the *Czech University of Life Sciences* since 1991. This year, the conference has already reached its 20<sup>th</sup> anniversary.

During the past two decades the conference has gradually evolved. What has, however, remained unchanged is the essence of this event driven by the common interest of scholars to better understand the issues related to countryside and rural areas. In comparison with the early years when the focus on the Czech context prevailed, the Conference has gained an international character in respect of both its participants and the topics that are generally presented.

The *Agrarian Perspectives* conference now attracts scientists from a variety of social and economics disciplines. The major ones include economics, management, sociology and informational management. The contents of this year's book of proceedings show the agricultural sector from these perspectives.

The presented collection of papers has resulted from careful evaluation (double-blind peer review) to ensure that they match the scope of the conference and meet the criteria of topicality and adequate academic standards. Papers of 49 participants from 11 different countries have been selected on this basis, and included in the proceedings that have already been published as part of the official conference programme.

The book of proceedings is divided into four thematic parts that correspond with the conference sections – (1) Economics, (2) Management and Entrepreneurship, (3) Rural Development, and (4) Information Management and Quantitative Methods. Each section had a chance to welcome scientists from different parts of the world and thus they facilitated a truly international discussion of the conference topics.

I am taking this opportunity to express my thanks for the work of all the people, who took part in the organization of this event, particularly the members of the Programme Committee, my colleagues and professional partners, and also the academic staff of the Faculty.

Professor Jan Hron  
Head of the Programme Committee



# **Economics**



# Rationale and Historical Support to Agriculture in Canada

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**Annotation:** This study presents a comprehensive analysis of the rationale for intervention into Canadian agriculture and government support to Canadian agriculture. The rationale for intervention is discussed as related to both efficiency and equity considerations. Efficiency considerations include: public goods, externalities, countervail for market power and asymmetric information. Support to Canadian agriculture presents evidence of direct support and support through market development and return to research studies. Several different aspects of support to Canadian agriculture are presented, including producers subsidy equivalents, rates of stabilization, rates of income enhancement, rates of return to investments into agriculture, capitalization of government payments into agricultural land. Much of the discussion is by commodity. The results suggest that direct government intervention into Canadian agriculture has been increasing over time but that there is a wide variation across commodities. Direct intervention is also moving away for commodity specific intervention to a more whole farm approach. This is partly explained by the desire of the Canadian government to move towards more decoupled programs to be compliant with international agricultural trade commitments. Results also suggest that stabilization is reasonably effective by commodity group but there is a wide variation across commodities. The overall rate of return of government support to landlords is lower than rate of return to agriculture due to research investments, indicating that a reallocation of government support from direct payments to research and development activities would increase overall returns to Canadian agriculture.

**Key words:** Government support, efficiency, equity, Canadian agriculture

**JEL classification:** I38, Q16, Q18

## 1 Introduction

This research will combine methods used by Clark and Thompson (2011) and Thompson and Clark (2011) to present a comprehensive analysis of support to Canadian Agriculture.

Direct government support to agriculture has been a cornerstone of Canadian agriculture for the post World War II era. Governments have been actively supporting agriculture as a means of social equity, income stabilization, income support, rural development and food security. This study examines two aspects of Canadian agricultural policy in Canada. The first is the various economic reasons commonly given as a rationale for intervention into Canadian agriculture. The second is an outline of historical support for agriculture by commodity and region in Canada.

## 2 Materials and Methods

Analysis includes several different methods. These includes a trend analysis of support to Canadian Agriculture, which includes a synopsis of historical support to agriculture by commodity. Another approach to government payments to Canadian agriculture includes a “normative” approach using theoretical models such as computable general equilibrium models (e.g.Gohin and Latruffe (2006)) has a long history in the economics literature.

Studies using this approach presented include various studies on Canadian agriculture by the Organization of Economic Co-operation and Economic Development (2002), (2009) and (2010) and studies on the rate of return to research (many of which are summarized in Gray and Malla (2007)). A third approach studies the behaviour of government payments from a more “positive” econometric approach. Examples of econometric approaches to the study of government payments equations for the US include Goodwin and Vado (2007) , who conduct a regional analysis of government payments to US agriculture and Shaik et al. (2005), who study an aggregate US government payments in conjunction with farmland capitalization to determine the impact of government payments on farmland values and income stabilization. Other studies on farmland values include Clark, Fulton and Scott (1993). Canadian studies on the capitalization of government payments into land values include Clark, Klein and Thompson (1993) and Weersink, et al. (1999).

### **3 Results and Discussion**

#### **3.1 Why Intervene?**

The rationale for government intervention is the topic of numerous studies, including Rama and Harvey (2009) and Spriggs and Van Kooten (1988). The two most commonly given economic reasons for government intervention into agriculture are:

Intervention can improve the distribution of income (the “equity” argument); and

Intervention can improve the functioning of the market place by correcting a failure in the market’s operation (the “efficiency” argument).

Under the general heading of efficiency, there are several sub-headings that can justify intervention.

These include a number of conditions under which there is market failure. In technical terms, market failure “occurs when market systematically and substantially fail to allocate resources to their most valuable use (Rama and Harvey (2009)). There are several conditions that can result in market failure and for which government intervention may be appropriate: public goods, externalities, market power, and imperfect information.

Examples of public goods include Statistics Canada’s free information regarding crop conditions and general extension services. The key features of public goods are that it is not possible to exclude people from consuming public goods and use by one person does not affect another’s use. There is also a lack of rivalry for the property right for public goods. Because of these features, the private sector will not provide enough of these goods or services.

When the actions of someone impact others either negatively or positively but the person who impacts others is either unaware or unconcerned, an externality occurs. Higher health care costs resulting from smoking or obesity are examples of a negative externality. The private sector will provide too little or too much of a good or service in the case of an externality.

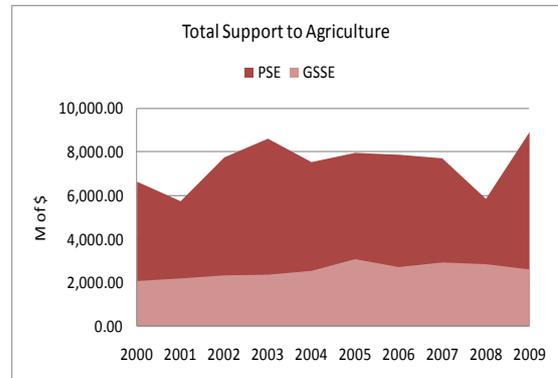
When one component of a supply chain has market power, a market solution can occur that does not yield the competitive solution. Governments put in place regulations to limit the power to increase competition. In agriculture for example, governments may put in place regulations to protect producers from trade practices by input suppliers.

When asymmetric information occurs, one party has more information than another. Producers know the quality of the food they have produced, for example, but consumers may

not know the quality until they consume it or perhaps not at all. In the case of issues such as food borne illness, neither producers nor consumers know if a food is contaminated without testing. This is another type of information problem that may require government intervention.

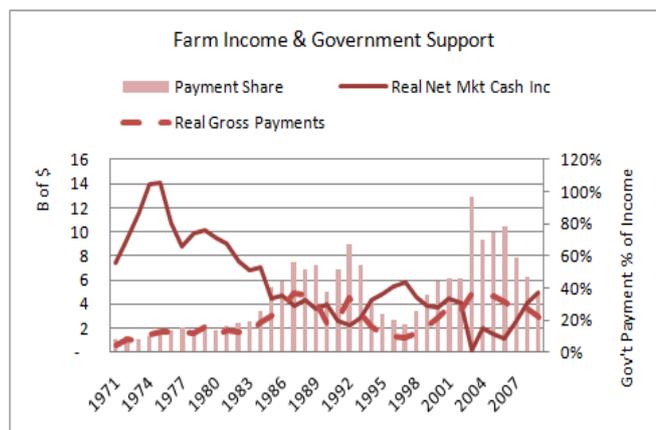
### 3.2 Summary of Support to Agriculture in Canada

Canadian agriculture has received \$100 B in total support (from federal and provincial governments and consumers) over the last decade as measured by the OECD's Total Support Estimate (TSE). This metric captures "the monetary value of transfers arising from all policy measures that support agriculture". Over the 2000 to 2009 period, 41% of total support was transferred from consumers and 63% was transferred from taxpayers. Almost \$75 B has been transferred to producers from consumers and taxpayers because of agricultural policies. This is known as the Producer Subsidy Equivalent (PSE) - the "additional money farmers receive in a particular year because governments intervene in agriculture" (Organization of Economic Co-operation and Development (2002)). The sector also benefits from policies that support producers collectively. The General Services Support Estimate (GSSE) captures the value of these policies (Organization of Economic Co-operation and Development (2009)). Over the 2000 to 2009 period, almost \$26 B was transferred to the sector. The following chart shows the size of these transfers on annual basis. In 2009, the TSE was \$11.5 B. The PSE and GSSE make up almost all of the TSE and were \$8.9 B and \$2.6 B in 2009, respectively (Organization of Economic Co-operation and Development (2010)).



Over the last decade, the largest components of the PSE have been market price support (50%); payments based on current acres/animal numbers/revenue/income that require production (28%); and payments based on non-current acres/animal numbers/revenue/income that do not require production (12%). Milk received just over two-thirds of market price support. The other supply managed commodities, poultry and eggs, received 5% and 2% of market price support. Grains and oilseed crops did not receive any market price support, but did receive support through other program areas. Beef received market price support in 2001 and 2002.

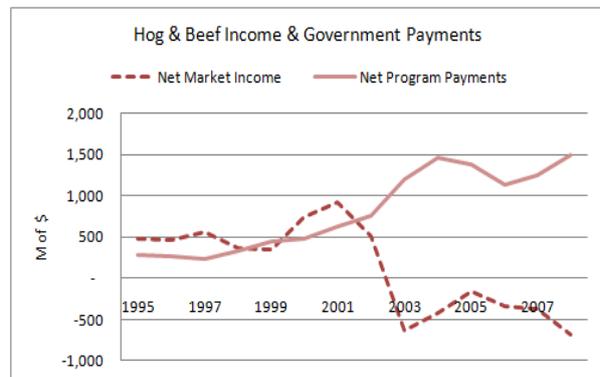
Policies that provide support to producers on a collective basis do so through support to R&D, extension, inspection services, infrastructure, and marketing and promotion. In 2009, Canada spent \$2.6 B on general support. Inspection services accounted for one-third of expenditures. Marketing and promotion programs (including food aid) represented 25% of expenditures while research and development accounted for 18%.



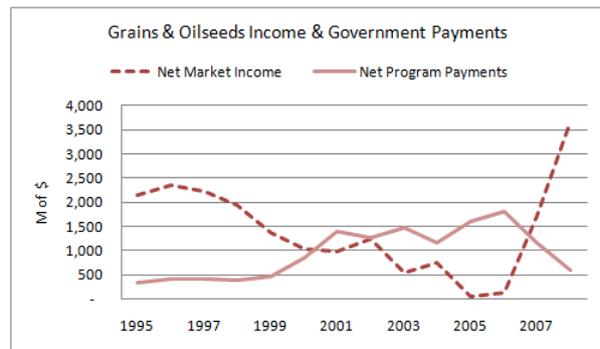
Agricultural income has trended downwards over the last four decades and farm direct payments have trended upwards. The decline in net market farm cash income has been

accompanied by a rise in direct government payments. These payments rose between 1970 and 1989, went sideways between 1990 and 1998, and then began rising after 1998. Therefore, for agriculture in general, direct payments and income are counter-cyclical and help stabilize farm income. At times, government payments have made up a significant proportion of farm income. During the BSE year of 2003, government support reached a peak of a staggering 97% of farm income. In 2009, direct payments accounted for 37% of total net farm cash income.

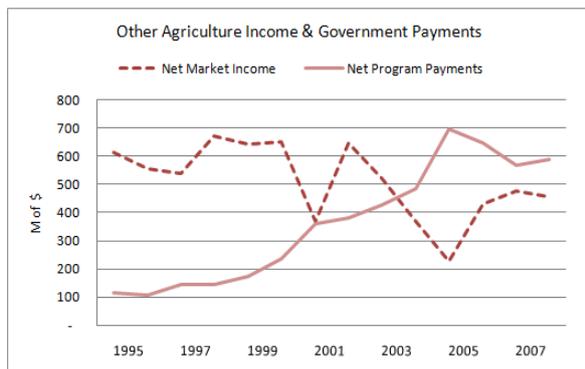
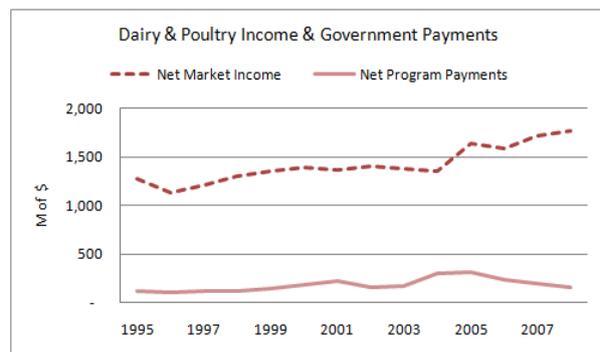
Clark and Thompson (2011) (CT) present historical support for Canadian agriculture by commodity. The following chart shows direct government support and net market farm income for the hog and beef industry. Government support has been increasing while income has been falling. This confirms that both industries have undergone substantial upheavals in the last two decades; hogs due structural change and beef due to the BSE crisis of 2003.



CT also document direct government support for the grains and oilseeds sectors trended upwards during the mid to late 1990's and has since gone sideways (see chart). The commodity boom in the grains and oilseeds sector is evident from the last year. The figure indicates that direct government payments and income tend to be countercyclical, as would be expected from stabilization.



CT also plot income and direct government payments for the supply managed industries (dairy and poultry) produces a chart that is much different than those for grains and oilseeds and beef and pork. Because of the nature of supply management, direct government support is minor source of income support for these producers.



A final chart plotted by CT includes income and direct government payments for other agriculture. Other agriculture includes potatoes, other vegetables, fruit and tree nut, greenhouse nursery and floriculture, other crops, and other animal production. Since 2000 there has been a rise in support to this sector. This reflects a whole farm approach of policy and a movement away from commodity specific programs.

### 3.3 Transfer Efficiency

Some instruments used to support the agri-food sector are more efficient in terms of transfer than others. Consequently, the transfer efficiency of these two types of support is greater than 100%. If program payments are decoupled from production, then 100% of the payment remains with producers. Experts suggest that Canada's farm income stabilization programs are essentially decoupled and thus these programs are 100% transfer efficient. Price stabilization, market price support, and farm input subsidy programs are examples of non-production neutral programs.

### 3.4 Transfer Effectiveness

Analysis by Tibodeau and Clark (TC) examine two measures of transfer effectiveness: rate of income stabilization (how well does the policy stabilize income) and the effect of past government support on the variance of income. The econometric study estimated the following income stabilization coefficients by region. For example in Central Canada, every \$1 decrease in income is offset by \$0.42 in support.

**Table 1.** Income Stabilization Coefficients

Region	Income Stabilization Coefficient
Atlantic	-0.085
Central	-0.424
West	-0.297
BC	-0.233

*Source: Thibodeau and Clark, (2009)*

The effectiveness of income stabilization<sup>1</sup> can also be examined on a commodity basis. The results of the following table clearly indicate that **Canadian agricultural policy within the last 20 years has been an effective tool in income stabilization.** Aside from the supply managed industries, stabilization of income through government payments ranges from approximately 25 to 50%, depending on the commodity. Agricultural support programs maintain an important element of increasing **income support**, with estimates ranging from approximately 5% to 8% per year.

**Table 2.** Stabilization and Income Enhancement Coefficients 1994-2008

Sector	Income Stabilization (payment to reduce income variability)	Income Enhancement Per Year (payment to increase level of income)
Hogs & Beef	27.3%	7.1%
Grains & Oilseeds	35.6%	5.0%
Other Agriculture	49.0%	8.0%

TC also find that government support programs in Canada may encourage riskier behaviour (moral hazard). In Quebec, for example, a 1% increase in government support results in a 1.9% increase in the variance of income. In Saskatchewan, a 1% increase in government support results in a 0.377% increase in the variance of income.

<sup>1</sup>Stabilization payments reduce the variability of income by providing countercyclical payments. Complete stabilization implies an income stabilization coefficient of -1. Income stabilization effectiveness is measured by how close the coefficient of stabilization is to -1.

### 3.5 Capitalization

There is substantial evidence that government support is eventually capitalized into farmland values. TC conclude government payments are capitalized into land values the same across all Provinces in Canada. While the rate of capitalization is the same for all regions of the country, the effect of removing all government payments from producers is not, because the Provincial and Federal level of government payments to producers is different across regions. Government support as a proportion of land value ranges from a low of 6.5% in British Columbia to a high of 63% in Manitoba. Central Canada receives the highest amount of support per acre TC also show that there are differences in Provincial payments per acre, with Quebec topping the list by a substantial margin.

TC estimate the rate of discount used to capitalize government payments into agriculture land values. This is an estimate of the rate of return of government payments into land values across Canada. This rate of return is estimated by TC as 9.29% (based on a capitalization rate of \$11.76 per dollar of government payment). This rate of return is a measure of the rate of return to government payments to Canadian landlords. **Therefore, 9.29% is the return to landlords from government payments.**

### 3.6 Indirect support to Canadian Agriculture

Funding agricultural research and development is one way that governments support agriculture. Producer groups also fund R&D. The private sector can be a very significant investor in some commodities, for example canola. **Agricultural R&D has a high rate of return.** The studies described in the following table are just a few of those finding high rates of return.

While these studies indicated a high rate of return to producers from agricultural research, **consumers and input suppliers can also benefit.** Consumers benefit when price falls. Input suppliers can benefit if output expands and if the innovation does not reduce the need for the input. Benefits also differ because of supply management.

Table 3.

Study	Commodity & Time Frame	Results
Klein, Freeze and Wallburger , (1996)	Return to research to Wheat Research in Canada	IRR to producers= 27-38.9 Benefits/Costs = 6.4-24.6
Scott, Guzel, Furtan and Gray (2003)	Return to West. Canadian wheat and barley research funded through the Western Grains Research Foundation (WGRF) over from 1988 to 2020	IRR to producers on wheat research = 23.8% IRR to producers on barley research = 36%
Scott, Furtan, Guzel, and Gray (2005)	Return to crop research funded by SK Agriculture and Food's Agricultural Dev. Fund 1990 to 2020.	IRR to producers and consumers (society) = 20.6% Producers B/C = 3.43 to 1

Source: Gray and Malla (2007)

**Governments also provide support for market facilitation services such as inspection and market and trade promotion.** In 2009, Canada spent \$848 M on inspection services (federal and provincial) according to OECD data. It is likely that Canadian government expenditures on inspection services have a positive rate of return. The federal and provincial governments expended \$141 M on marketing and trade in 2008-09. Industry organizations also provide funds for these activities. The Canadian Canola Council (CCC) and AAFC have both provided funds to assist in the development of markets for canola oil. "Returns on investment from CCC market development work to date are already evident: Every \$1 invested in U.S. market development has resulted in \$1,000 of additional canola oil sales to the U.S., the largest customer of Canadian canola oil.

## 4 Conclusions

Direct agricultural support in Canada has been rising over time. Therefore direct payments are a more important component of agricultural policy. Income stabilization is a stated goal of agricultural policy, but the amount of stabilization in Canada differs greatly by commodity and region, revealing inequities in agricultural policy in Canada. The Atlantic region of Canada receives the smallest amount of stabilization and the western region the highest. Clark and Thompson find supply managed industries in Canada also receive direct payments, even though these industries are protected. Income enhancement, rather than income stabilization, is found to be an important aspect of Canadian agricultural policy. The returns to landlords resulting from direct payments is approximately 10%, and this compares unfavourably to the rate of return to R&D expenditures of between 20-36%.

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# Technology, Technical Efficiency and Subsidies in Czech Agriculture

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**Annotation:** This paper deals with the analysis of changes in technology and technical efficiency in individual sectors of Czech agriculture after the EU enlargement in 2004. The paper attempts to elaborate on the following questions. The first questions concern technology – are there any inter- and/or intrasectoral differences in Czech agriculture? The second question is connected to technological change among the sectors, while the third question deals with the relationship between technical efficiency, direct payments and localization of the company. We elaborate on these questions by employing the parametric approach – Stochastic Frontier Analysis (SFA). Specifically, we employ the Random Parameter Model specification, in which sector dummies are used to capture the intersectoral differences in technology. The results show there is significant heterogeneity among the studied sectors (i.e., combined, plant, animal and other production). Animal production results differ from other sectors in Labour elasticity, where this value reaches its lowest level (this may be connected to the fact that technology is labour saving). Capital and Material elasticities in animal production may suggest the use of other forms of financing, such as leasing, in this sector. Moreover, the analysis shows that technological change has a negative impact on production, and that it accelerates with time. We found that added value in Czech agriculture is going down, since technological change is Material using and the other production inputs saving. The intrasectoral differences in technological change are not statistically significant, thus we suppose that direct payments may not have such a strong impact on farmers' motivation to invest in new technology. Finally, the analysis did not confirm any statistically significant relationship between SAPS subsidies and technical efficiency. On the other hand, the estimation shows technical efficiency may be increased by TOP UP subsidies. Localization of the company in LFA has a negative impact on technical efficiency. The paper arose within the framework of solution VZ MSM 6046070906.

**Key words:** Stochastic Frontier Analysis (SFA), Technology, Technical Efficiency, Direct Payments, Czech Agriculture.

**JEL classification:** C 33, D 24, Q 12

## 1 Introduction

What can be expected from EU membership? This was a very common question relating to all segments of the Czech economy before the EU enlargement. The accession of the Czech Republic to the EU was a center of special interest with regard to agriculture, in light of the amount of money coming into this sector, as well as the strong competition from the common market. Seven years after the entrance of the Czech Republic into the EU, we can answer several questions relating to EU membership and Czech agriculture. In this paper we will especially focus on the following three questions. The first question concerns technology. We will identify the inter- and intrasectoral differences in Czech agriculture. The second question deals with technological change. We will analyze the Hicksian biased technological change among sectors. The last question concerns technical efficiency. We will investigate the relationship between technical efficiency, subsidies and LFA. Moreover, we will analyze the intersectoral differences in technical efficiency.

The analysis of technical efficiency has been the subject of many research studies throughout Europe. The relationship between technical efficiency and subsidies was studied in Hungary (Bakucs et al., 2006), Spain (Gaspar et al., 2009), Greece (Rezitis et al., 2003),

France (Guyomard, 2006), and Ireland (O'Neill et al., 1999), among other places. The authors mostly found that direct payments negatively impacted the technical efficiency of farms. In addition, Chau and de Gorter (2005) and Väre (2007) point out that direct payments may affect a farmer's decision to remain or leave the sector. Sipiläinen and Kumbhakar (2010) found that technological change in the sector can be slowed down by farmers who remain in farming longer than they would otherwise. Due to the EU subsidies, farmers may not have such a strong willingness to constantly improve the overall performance of their companies (Ferjani, 2008; Bergström, 2000).

Most of the studies dealing with the technical efficiency of farms include localisation (or soil characteristics) (e.g., Liu and Zhuang, 2000; Latruffe et al., 2004) as well as specialisation of the farm (e.g., Latruffe et al., 2005; O'Neill et al., 2002) as explanatory variables entering the model. Concerning the impact of LFA, Lambarraa and Kallas (2009), Zhu et al. (2008) and Madau (2010) found that LFA had a rather negative effect on the level of technical efficiency.

Efficiency in Czech agriculture has been analyzed by several authors, including Mathijs et al. (1999); Curtiss (2002); Davidová and Latruffe (2003); Jelínek (2006); Čechura (2009), (2010); and Kroupová (2010). Most of the studies show that technical efficiency is an important factor in determining the performance of Czech agriculture; however, due to the character of the data chosen and the method and/or specification of the model, the level of technical efficiency differs (Čechura, 2009).

## **2 Materials and Methods**

### **2.1 Data**

The panel data set was drawn from the CreditInfo Company Monitor database, collected by Creditinfo Czech Republic, s.r.o. This database contains all registered companies and organizations in the Czech Republic. Among other things, the database includes information on final accounts and a financial analysis of individual companies. The data have been collected since 1992.

In our analysis, we use the final accounts of those companies whose main activity is agriculture, according to the OKEČ classification (OKEČ 01). Since not all companies in the database have complete information, our database was cleaned as follows: for further analysis we used only those companies having two or more final accounts in the CreditInfo database over the period 2004 – 2008 and positive, non-zero values for our variables of interest. We also removed outliers for all variables.

Thus, we used an unbalanced panel data set containing 1,247 companies with 4,727 observations, representing the period from 2004 to 2008 (i.e., 3.79 observations on average per agricultural enterprise).

Furthermore, according to the State Agricultural Intervention Fund (SZIF) database we identified the individual agricultural enterprises as beneficiaries of specific subsidies – SAPS, TOP UP, and LFA. The database LPIS was used to collect all information about the amount of agricultural land used for production owned by individual agricultural companies in our sample. This database contains data from 2004 onward.

Finally, the price indices and regional wages were taken from the Czech Statistical Office (CZSO) database. The source of official land prices is a study by Němec et al. (2006).

We used the following variables in our model: Output, Labour, Land, Capital, Material, SAPS subsidies, TOP UP subsidies, LFA dummy variable and sector dummy variables:

- Output (y) is represented by total sales of goods, products and services and was deflated by the index of agricultural prices (2005=100).
- Labour (A) input is total personnel costs per company, divided by the average annual regional wage in agriculture (region = NUTS 3).
- The total quantity of land employed in the production process (L) of a particular agricultural company is adjusted (multiplied) by the land quality (land quality index is expressed as the ratio of the official land price of a given region to the maximum official regional price of land).
- Capital (C) is represented by the book value of tangible assets and was deflated by the index of processing prices (2005=100).
- Material (M) is represented by the total costs of material and energy consumption per company and was deflated by the index of processing prices (2005=100).

Direct payments SAPS are represented by the amount of single area payments and TOP UP are represented by national additional payments. The localization of the company in LFA is represented by a dummy variable (D1). The sector dummy variables distinguish between plant production (S1), animal production (S2), and other production (S4).

All companies in the sample were split into four sectors according to the OKEČ classification they belong to (see Table 1).

**Table 1.** Sectors according to OKEČ classification

Sector	OKEČ classification	No. of observations
Sector 1 – Plant production	01.1	398
Sector 2 – Animal production	01.2	148
Sector 3 – Combined production	01.3	4081
Sector 4 – Other production	01.4	91

## 2.2 Estimation strategy

We assume that the production process can be approximated well using the translog frontier production function model. That is, the deterministic part of the model can be written as:

$$\ln f(t, \mathbf{x}_{it}; \boldsymbol{\beta}) = \alpha_0 + \sum_{j=1}^K \beta_j \ln x_{ijt} + \frac{1}{2} \sum_{j=1}^K \sum_{k=1}^K \beta_{jk} \ln x_{ijt} \ln x_{ikt} \quad (1)$$

$$\beta_t t + \frac{1}{2} \beta_{tt} t^2 + \sum_{j=1}^K \beta_{jt} \ln x_{ijt} t$$

where  $\mathbf{x}_{it}$  is a vector of inputs containing the production factors – Labour ( $A_{it}$ ), Land ( $L_{it}$ ), Capital ( $K_{it}$ ) and Material ( $M_{it}$ ). Indices  $i$ , where  $i = 1, 2, \dots, N$ , and  $t$ , where  $t \in \tau(i)$ , refer to a certain agricultural company and time, respectively, and  $\tau(i)$  represents a subset of years  $T_i$  from the whole set of years  $T$  ( $1, 2, \dots, T$ ), for which the observations of the  $i$ -th agricultural company are in the data set (see unbalanced panel).  $\alpha_0$  is an intercept (productivity parameter).

We employ Random Parameter Model (RPM) specification in which sector dummies are used to capture the intersectoral differences in technology and to control for heteroscedasticity in the technical inefficiency term.

RPM was developed by Green (2005) and is characterized as follows:

$$\ln y_{it} = \ln f(t, \mathbf{x}_{it}; \boldsymbol{\beta}) + v_{it} - u_{it} \quad , \quad (2)$$

where  $v_{it}$  stands for the random error (statistical noise) and  $u_{it}$  is the technical inefficiency term. We assume that  $v_{it} \sim N(0, \sigma_v^2)$ ,  $u_{it} \sim N^+(0, \sigma_d^2)$ , and  $u_{it}$  and  $v_{it}$  are distributed independently of each other and of the regressors. The heteroscedasticity is controlled by using sector dummies in the distribution of  $u_{it}$ , in particular:  $\sigma_d^2 = \sigma_u^2 e^{\sum_d s_d \gamma_d}$ , where  $s_d$  refers to the  $d$ -th sector.

Vector  $\beta$  is defined as:

$$\begin{pmatrix} a_0 \\ b_j \end{pmatrix} = \begin{pmatrix} \alpha_0 \\ \beta_j \end{pmatrix} + \begin{pmatrix} \Delta_\alpha \\ \Delta_\beta \end{pmatrix} \mathbf{h}_i + \begin{pmatrix} \omega_{i\alpha} \\ \omega_{i\beta} \end{pmatrix} \quad (3)$$

The first term in relation (3) represents the means of random parameters, the second term captures intersectoral differences in technologies (vector  $\mathbf{h}_i$  contains sector dummy variables), and the last term accounts for intrasectoral differences in technology.

RPM is estimated by maximum simulated likelihood in the econometric software LIMDEP 9.0.

### 3 Results and Discussion

#### 3.1 Heterogeneity in technology and technological change

Table 2 provides parameter estimates of the production function. First, we start with a discussion of the theoretical consistency of the fitted production function model. Since all the variables are divided by its geometric mean, the fitted coefficients represent production elasticities. The results show that the fitted production elasticities are consistent with economic theory on the sample mean. That is, the elasticities satisfy the criterion of monotonicity, i.e., they are all positive, and the criterion of quasi-concavity, i.e., we estimated diminishing marginal productivity for all inputs. Moreover, production elasticities are also consistent with the information we have in the dataset – see the relationship of material and labour costs in production.

We estimated that both intersectoral and intrasectoral heterogeneity in technology are important phenomena characterizing Czech agriculture. As far as intersectoral heterogeneity is concerned, there are significant differences among sectors, especially in productivity parameters. Labour (A) elasticity differs in animal production. Compared to the other sectors, Labour elasticity is significantly lower in animal production. This finding is to be expected, since the technology in animal production is Labour saving. On the other hand, we did not find any significant differences in Capital elasticity (C) between plant, animal and combined production. Only other production has significantly higher production elasticity of Capital. However, this result can be explained by significant intersectoral differences in Material elasticity (M). The estimated Capital elasticity is quite low, 0.059, which suggests that either the farmers are financially constrained or that other forms of financing<sup>1</sup> are preferred (or both possibilities). In light of the expected Capital-using form of production in animal production and the significantly positive Material elasticity for this sector, the second possibility might be relevant. Land elasticity (L) is not significantly different among plant, animal and combined production. The intrasectoral differences are important in all sectors for all inputs.

Technological change has a negative impact on production, and it accelerates with time. The hypothesis about the Hicks neutral technological change was rejected at a 5% level of significance. Technological change was Material using and Labour, Land and Capital saving. This suggests that added value in Czech agriculture is going down. The intersectoral

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<sup>1</sup> The forms entering the accounting as material costs, e.g., leasing.

differences are only pronounced for plant production at a 10% level of significance. This suggests that the technological regress is lower in plant production as compared to animal and combined production. The intrasectoral differences in technological change are not statistically significant. These results suggest that subsidies, which increase the income of agricultural companies, may not motivate companies to invest in new technology.

**Table 2.** Parameters estimate

Variable	Coefficient	P   Z   >z	Variable	Coefficient	P   Z   >z
<b>First-order parameters</b>			<b>Second-order parameters</b>		
Constant	0.15637	0.0000	TT	-0.04020	0.0000
Constant - Plant production	0.10375	0.0000	AT	-0.01296	0.0000
Constant - Animal production	0.02609	0.3620	LT	-0.01634	0.0002
Constant - Other production	0.14561	0.0000	CT	-0.00784	0.0000
Constant - scale	0.07895	0.0000	MT	0.02246	0.0000
A	0.26613	0.0000	AA	0.04052	0.0000
A - Plant production	-0.01569	0.1392	LL	0.09250	0.0001
A - Animal production	-0.07814	0.0021	CC	0.02525	0.0000
A - Other production	-0.02463	0.1714	MM	0.10719	0.0000
A - scale	0.17141	0.0000	AL	-0.18815	0.0000
L	0.09883	0.0000	AC	0.02695	0.0000
L - Plant production	-0.01686	0.4505	AM	-0.07177	0.0000
L - Animal production	-0.01175	0.8520	LC	0.06070	0.0000
L - Other production	-0.26373	0.0000	LM	0.03997	0.0001
L - scale	0.15935	0.0000	CM	-0.02396	0.0000
C	0.05903	0.0000	suONE	1.17007	0.0000
C - Plant production	-0.00177	0.8410	suS1	0.37247	0.0000
C - Animal production	-0.01657	0.4901	suS2	1.13015	0.0000
C - Other production	0.09000	0.0000	suS4	-0.01523	0.8490
C - scale	0.04927	0.0000	Sigma_v	0.06097	0.0000
M	0.68345	0.0000			
M - Plant production	0.03263	0.0045			
M - Animal production	0.08297	0.0001			
M - Other production	-0.02055	0.3323			
M - scale	0.17018	0.0000			
T	-0.01732	0.0000			
T - Plant production	0.01089	0.0766			
T - Animal production	-0.00321	0.8680			
T - Other production	-0.01310	0.1092			
T - scale	0.00045	0.7374			

Source: own calculations

### 3.2 Technical efficiency

Table 3 provides descriptive statistics of technical efficiency for all sectors. The highest average of technical efficiency is reached in other production. However, the variability among firms is also high in this sector. Thus, we may observe that there are large differences between the best and worst companies in this sector. On the other hand, the lowest average of technical efficiency was estimated for animal production, which suggests that high competition in the meat market translates to lower technical efficiency, e.g., as a result of unused capacities (see Čechura, 2009). Average technical efficiency in plant and combined production is at approximately the same level. The high level of average technical efficiency, together with the low variability of technical efficiency in plant and combined production, suggest that technical efficiency is not an important source of the improvement of competitiveness in these sectors.

**Table 3.** Technical efficiency

Sector	Descriptive Statistics of Technical Efficiency				
	Mean	Std. Dev.	Minimum	Maximum	No. Of Observations
Plant Production	0.8941	0.0902	0.2641	0.9934	398
Animal Production	0.8144	0.1561	0.0696	0.9942	148
Combined Production	0.8901	0.0735	0.1429	0.9944	4081
Other Production	0.9117	0.7749	0.3641	0.9942	91

Source: own calculations

In the second step of our analysis, we estimate the relationship between technical efficiency and various factors, namely SAPS, TOP UP and several dummy variables representing LFA (D1) and the analyzed sectors – plant production (S1), animal production (S2) and other production (S4). Since both the Lagrange Multiplier test and Baltagi and Li's modification of the LM statistic for unbalanced panels favor FEM or REM specification over the classical linear regression model, respectively, and the Hausman statistic argues in favor of the fixed effect model, we used the fixed effect model in our analysis.

The parameter estimates are provided in Table 4. The results show there is no statistically significant relationship between technical efficiency and SAPS. However, we estimate that the subsidies - TOP UP - increase the level of technical efficiency. This suggests that there is a qualitative difference between the subsidies SAPS and TOP UP. Moreover, the localization of the company to the LFA has a negative impact on the level of technical efficiency. This observation is consistent with other studies; see Lambarraa and Kallas (2009), Zhu et al. (2008) and Madau (2010). Finally, the coefficients on sector dummies are consistent with the information in Table 3. That is, the level of technical efficiency in plant production is at approximately the same level as in combined production. Compared to combined production, animal production has a lower, and other production has a higher, level of technical efficiency.

**Table 4.** Determinants of technical efficiency

Variable	Coefficient	Standard Error	P     Z   > z
LSAPS	-0.00024	0.00259	0.9256
LTOPUP	0.00901	0.00200	0.0000
D1	-0.04358	0.00629	0.0000
S1	0.01021	0.00561	0.0688
S2	-0.06672	0.01006	0.0000
S4	0.08238	0.00967	0.0000
Sum of Squares	6.5510	Log likelihood	6456.663
R-squared	0.6250	Estd. Autocorrelation. of e(i,t)	0.28834
Model test - F test	5.51 (0,0000)		

Source: own calculations

## 4 Conclusion

The analysis shows that there is significant heterogeneity among the studied sectors – combined production, plant production, animal production and other production. The results obtained for Labour elasticity suggest there is a difference between animal production and the rest of the studied types of agricultural production, which is mainly due to the fact that technology is Labour saving in animal production. Both Capital and Material elasticities for animal production suggest that the companies in this sector prefer those forms of financing, such as leasing, which actually enter their accounting as material costs. With regard to Land elasticity, no significant differences were found among the sectors.

Technological change has a negative impact on production; moreover, it accelerates with time. When technological change is Material using and the other production variables saving Material, we can assume that added value in Czech agriculture is going down. Concerning intersectoral differences, plant production has a lower technological regress compared to the rest of the production types. In addition, since the intrasectoral differences in technological change are not statistically significant, we may suppose that subsidies (as part of farmers' income) do not have such a strong impact on farmers' motivation to invest in new technology. This seems to be one of the problematic issues connected to the original idea of the positive effect of direct payments on the development of farms.

Technical efficiency analysis shows that there are notable differences between the companies in the other production sector. Average technical efficiency in plant and combined production is at approximately the same level, while animal production reached the lowest number and other production had the highest number. This may be connected to unused capacities and high competition in the meat market. We can suppose that companies in both plant and combined production do not take technical efficiency into account as one of the sources of their improvement in competitiveness.

As far as direct payments are concerned, our analysis did not confirm any statistically significant relationship between SAPS subsidies and technical efficiency. On the other hand, the estimation shows that technical efficiency may be increased by TOP UP subsidies. This suggests that there is a qualitative difference between the subsidies SAPS and TOP UP. Localization of the company in LFA has a negative impact on technical efficiency.

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# Determinants of Knowledge Economy in Agricultural Enterprises

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**Annotation:** Agriculture as an important element of rural economy development, faces currently many problems. The unfinished process of economic transformation, division of land use and land ownership, disintegrated social networks, under-developed institutions – these are the problems hindering the knowledge economy enforcement. Among the agricultural enterprises there is a high level of distrust resulting into weak cooperation, reluctance against partnerships and networks which represent the main instrument for knowledge economy enforcement. Moreover, the current EU agricultural policy which is adjusted for agricultural conditions in the old member states, hampers innovation activities of agricultural enterprises and conserves inefficient structures in them.

**Key words:** Agriculture, rural areas, knowledge economy, innovations, social networks

**JEL classification:** O31

## 1 Introduction

A new phase of restructuring and concentration caused by the globalization process occurs in agri-food system. As McMichael (2004) says, “...closed commodity chains are rapidly being replaced by wholesale or immediate markets. They are ruled by non-agricultural sectors which take advantage of global purchasing and use the advantages of processing and transport technologies“. Existing forms of direct control of the agricultural production are being replaced by new forms of „remote control“ through standards determined by the trade (Pimbert et al. 2001). Discussion about the agricultural model suggests that agricultural systems switch from “productivist era” to “post-productivist era” (Wilson and Rigg, 2003). Ploeg et al. (2000) say that a new model of development of agriculture and rural areas starts to appear. Modernization paradigm is being replaced by a new rural development paradigm. In agri-food system, it means turnover on the quality and links to new, alternative agro-food chains (Goodman (2003). After a period of innovations of the first level, the onset of innovations of second level follows – radical innovations (Brunori et al., 2010). Intensity of the changes in agriculture and rural areas and their direction signalizes changes in cognitive frameworks. Therefore, promotion of the principles of knowledge economy and its material outputs – innovations – is of fundamental importance in agriculture. In the existing model of “modern agriculture“ (maintained in majority of Slovak agricultural businesses), the innovations of first level prevail, focusing on changes within the existing system (Godin, 2005). In a new, enforcing model of “multifunctional agriculture“, the innovations of second level appear, based on the “non-linear model“ issuing from social capital. Innovations arise from within the changing production networks in this case (Burt, 2001). The creation of such innovations rises from the changing interactions between the actors, instruments and natural resources. It results in system changes, new development trajectories and predefined cognitive frameworks. The innovations of second level are based on „social learning“ process (Porter, 1998).

## 2 Materials and Methods

The objective of the paper is to explore the dynamics of knowledge-based processes in agricultural enterprises within the Nitra Self-governing Region, which is a rural region. Agriculture in the region is an important part of its economic base and, regarding its high share in agricultural production of Slovakia, it is also a strategic sector. Its competitiveness, based on an ability of flexible reactions towards the changing cognitive frameworks and socio-technical systems, is a key one for the region as well as for Slovak economy.

The methodical approach was based on the **secondary research** aimed at provision of the basic framework for searching on dynamics of knowledge trajectories. Within the research, existing statistical sources (Statistical Office of the Slovak republic, EUROSTAT, FADN), Reports on Agriculture and Food Industry of the Slovak republic (green report), available research papers, conceptual and strategic documents (Prognosis and vision of development of Slovak agriculture, food industry, forestry and rural areas; Rural development programme 2007-2013), EU studies and documents and others were analyzed. Next, the methodical approach is based on the **primary research** whose aim was to analyze the dynamics and knowledge trajectories in creation of innovations in agricultural enterprises within the Nitra region – the representative of rural regions. As a methodical tool for acquirement of primary data we used a **structured interview** (Buček et al. 2010).

The structure of interview questions was based on a hypothesis formulated as follows: “Knowledge creation is seen as a collective process that requires mobilization of more agents. This process is significantly influenced by economic, territorial, social and policy factors.” This hypothesis was tested using basic and additional questions that were sorted according to the factors influencing the process of knowledge creation in the sector.

Basic questions identifying economic factors of knowledge creation:

“Which type of knowledge (internal or external?) is critical? Is the dynamics of knowledge in the sector characterized by cumulative or composite processes? Do the processes of specialization or the processes of diversification prevail in the sector? What is the role of substantial financial sources in the processes of knowledge creation, acquiring and distribution?”

Basic questions identifying social and territorial factors of knowledge creation:

“Which type of impulses (external or internal) is critical in the process of knowledge creation? Are innovations connected by interaction of local agents or by remote interaction? What is the character of institutional context of knowledge creation? What is the role of formal and informal contacts in knowledge acquiring? What are the old and the new generations in the sector and their hierarchical and power structures like? What is the level of inter-company trust and trust in formal institutions in the sector and within the region?”

Basic questions identifying policy factors of knowledge creation:

“What is the role of policy in changes within the sector and the region? What level of the government affected sectors and companies the most? Which policy instruments influence the condition of the sector and the company the most?”

All of the basic questions were supplemented by additional questions which specified individual problem areas in detail.

The choice of the questioned enterprises and managers was performed under the criteria: the managers should have represented socially accepted experts, the enterprises should have represented the most important legal forms of agricultural enterprises (agricultural cooperatives, commercial companies, individual farmers) and the level of their specialization was taken into account, too. As much as 13 managers took part in the structured interview;

seven of them represented traditional agricultural businesses, six of them represented partly specialized and specialized ones.

### 3 Results and Discussion

The period of transformation towards the conditions of functioning market economy affected agriculture more than the other sectors. The transformation process in agriculture is more or less still unfinished and, as the managers said, the chosen transformation model is not a suitable one. *„...the direct responsibility for long-term results of the company is not up on managers' shoulders. The management of the company is divided from ownership of factors of production. The transformation model should have been based on the specialization of smaller farms where there is a direct responsibility of an owner. People (owners, professional employers) did not want to go into the conflict which had been brought about by transformation, a good level of agricultural companies connected with ownership and successful land use and high yield was not created. The previous ownership structure still determines the current one and limits the development of economically effective forms of land use”.*

The change in economic system and access of Slovakia to European Union brought the farmers not only transformation problems in field of ownership relations but also an opportunity for technical and technological innovation and growth in labour productivity. The technological level in agriculture increased substantially due to free access to the newest technologies. All of the respondents recognize that the market opening contributed to technical and technological restructuring of agricultural production base and to a marked increase in a labour productivity. The respondents expressed themselves as follows: *„Technological level has increased and there was also an opportunity to buy new machines, the access to food market has loosened, ICTs speed up information”.* *„Technological level has increased, modern technologies, agrochemicals and quality seed corns were made available“.*

#### 3.1 Human capital in agriculture

According to Ivaničková and Vlčková (2010), human capital is usually defined widely as a complex of inherited talent and abilities of an individual together with his/her skills acquired by upbringing and education (sometimes it includes also health). The knowledge economy anticipates permanent learning society where each individual has to create his/her qualification life-long according to changing needs of societal development. Slovak agriculture has currently serious problems with quantity and quality of human capital. The total employment in the sector has dropped almost by 90 % since 1989. While in 1989 agriculture was an important sector in light of share in employment on national level, nowadays, its share is only 4.2 % whereas in companies with more than 20 employees its share is only 2.7 %. As a result of extensification in agriculture and decrease in labour-intensive branches, the demand on manual workers has declined. The outburst of modern, highly efficient and sophisticated technologies has, on the contrary, increased demand on qualification of labour forces, thus enhancing the qualification and educational structure of agriculture workers. For example, the share of workers with elementary education dropped from 39.7 % in 1989 to 14.8 % in 2009, however, share of workers with university education increased from 3.6 % to 7.5 % respectively (Blaas 1999, Fáziková, Mariš 2010). The demand for drivers – operators, repairmen and technicians grows in particular. All the respondents allege lack of such professions.

The lack of qualified high-school workers is sometimes even a barrier in using of the modern technologies. The lack of human capital is nowadays becoming a barrier in further progress of agriculture. The managers in this connection mention the total quantitative and

qualitative decrease in agricultural vocational and university education. It is documented by conclusions of managers concerned with the quality of graduates. „*The artificial employment is created by accepting more students. Many of them study only for a degree and get a job outside the sector. When agriculture was on its top, there were 3 000 students at the SUA (Slovak University of Agriculture) and now, when it is on a decline, there are 10 000 of them. Only enthusiastic people or those who cannot be used in practice work at the university.*“

### **3.2 Cumulative vs. composite processes**

The rising multifunctional model of agriculture assumes rootedness of an agricultural company in a regional production system and searching for new business opportunities even in new, non-agricultural markets. It anticipates acquirement of new knowledge about new markets, creation of new ties and utilization of factors of production in new combinations. The cognitive frameworks in an agricultural business and also in agriculture itself, are changing.

The multifunctional model of agriculture is connected with a non-linear innovation model presuming diffusion of knowledge from other sectors; composite processes prevail in the learning process.

The composite knowledge processes within agriculture have applied only little so far, yet they are enforced in the top innovative companies. The respondents claim that the introduction of an innovation, new products and services requires specialists in sectors different than agriculture. These are gained mainly by educating of their own employees or accepting new employees with an appropriate qualification. For example, a construction of a biogas plant requires employment of experts from field of building industry; each technical and technological change requires further learning of employees. As one of the respondents said: „*...each new product requires complete self-education, e.g. starting the production of feedstuff required a new agrolaboratory and a professional employer had to be accepted.*“

Regarding the dominance of input innovations into agriculture having their origin abroad, the most common cooperation of agricultural companies in field of education is run with the input suppliers and their business representatives. These companies provide also courses abroad, directly by the producer in Germany, Finland or Canada if necessary.

### **3.3 Social capital in agriculture**

A multifunctional agricultural enterprise is closely interconnected with its partners within a regional production system. There, it comes to a process of social learning – common sharing of regional knowledge. The social learning influences shared cognitive frameworks and it is a base for establishment of social networks (Brunori et al., 2010). The existence of social networks created on base of trust and partnerships is an elementary prerequisite for social capital building (Trigilia 2001). According to Hudec et al. (2009), social capital is formed by special interest groups which share basic norms, values, knowledge and enable a cooperation within a group or between groups. The connection between human capital and a specific environment is a baseline for creativeness and growth in regional, sectoral and company competitiveness. The more developed social capital, the better conditions for birth and diffusion of new knowledge, innovations and growth in regional competitiveness it brings. Social capital is most commonly measured by a level of trust between the regional agents and a level of their participation in various types of networks.

According to the research results, one of the key problems of a weak innovative activity of agricultural enterprises in the Nitra region is a high level of mutual distrust which is a barrier in creation of company networks. Following statement represents an opinion of a majority of respondents: „*...the distrust dates back to the period of privatization in mid-‘90s.*“ Another manager of the company said that „*In regional environment there is no*

*cooperation among enterprises, not even among enterprises from the different sectors. There is a rivalry which is not based on a quality outcomes of companies and, therefore, there is a distrust towards networking.*“ The opinions of agricultural managers could be globally characterized by a statement of the manager: *„The economic relations has changed substantially. The advantages and disadvantages of globalization have come out. The nature of human relations, cooperation and a sound rivalry depend on managers' qualities and level of knowledge. The problems in the sphere of partners' trust express themselves in a slow development of networking – both in horizontal connections between primary producers and in vertical connections between primary producers and processors. The processing companies are mostly owned by foreign owners who use their monopoly position in a subjective enforcement of their interests.*“

According to most of respondents there is an apparent generation problem in agriculture, having an influence on decision-making in enterprises. *„...there are three groups. A new generation of predaceous owners with settled ownership of the companies. The second group represents the generation of progressive lingering manager from the past cooperatives. These two groups are more or less equal. The third group lags behind. They just want to survive.*“ *„The former managers of cooperatives form the old generation; their sons with legal and economic education but without the relationship to land form the new generation.*“ According to most of respondents, there are strong power ties within agriculture. *„...a new agrarian bourgeoisie is being formed.*“ *„...a cooperative mafia exists. The old managers of cooperatives have a powerful position, lobbying rules. Some branches, such as poultry breeding, small animals breeding, growing vegetables were pushed to the periphery of policy interests.*“ *„...injustice rules in the sector.*“

### **3.4 The role of policy in agriculture**

After the accession of the Slovak republic to the EU, Slovak agriculture utilizes the tools of the Common Agricultural Policy, respects its principles and applies its instruments. The subvention support in the EU is very high. The importance of an institutional support for innovations is inevitable for agricultural enterprises. Most of respondents said that without the institutional support there would probably be no innovations.

The selectness of such support because of limited budgetary sources remains an unsolved problem in agriculture. Innovations are therefore supported selectively, their diffusion is not of a continuous character but rather of a random character. This information is fully approved by results achieved from in-depth operated interviews with chosen agricultural managers. According to them, *„...there is no substantial support.*“ *„...active support for new technologies introduction is absent, there is a need for a change in an approach towards agriculture, for a support towards orientation on nutrition and quality of food.*“ *„Focus on investment supports does not force enterprises towards a maximal economic efficiency. State should support compensation of interests within investment loans. There is a tend to corrupt practices in decision-making concerning the subsidies.*“ *„...the support for export and publicity and soft loans are absent.*“

The managers took a particularly critical stand towards an agricultural policy of the Slovak republic. They are not satisfied with a total amount of subsidies as they are disadvantaged compared to the farmers from the old member states. The share of subsidies on a total amount of production of the agricultural enterprises (PSA) is 36 % in the EU whereas in Slovakia it is only 20 % (Fáziková, Mariš 2010). This fact is understood by the farmers as a clear discrimination from the state and the EU, creation of a competitive disadvantage, attenuation of investment development and labour productivity growth. The managers feel also insufficient conceptual, political and financial support for agriculture. *„The state defined a role of agriculture and rural areas. Yet there is no accepted relevant conception. Chaos and disunity persist. Slovakia wastes billions compared to Austria or Germany.*“ The managers

sense an inability of state to identify future developmental trends in agriculture and, based on it, to appoint a conception, supported by relevant economic and managerial instruments. As the manager of E company, who is also an influential home lobbyist said: *„...an unclear conception of agricultural transformation caused destruction of many systems, e.g. destruction of high school and vocational education. Currently, we lack professional handicraftsmen – car mechanics, electricians, plumbers, masons, highly educated employees for a plant and animal production.“*

The managers see the role of policy in transformation of the region and, particularly, of the agricultural sector very differently. Their opinions and attitudes can be divided into two groups: the managers of unspecialized enterprises see the role of policy rather in a negative light, whereas the managers of specialized enterprises see it rather positively. For example, the one of the managers declared that *„...the role of policy is a cardinal one. The right wing governments try to damp agriculture by reduction of subsidies.“* According to the A company manager, it was a crucial political mistake that *„...the primary producers were disabled to privatize the processing industry and it caused a destruction of supplier – purchaser relationships and, thus, destruction of regional food markets.“* According to the I company manager, *„...the instruments of the EU agricultural policy have a low efficiency.“* The positive effect of the Common Agricultural Policy is *„...an opportunity to buy new technologies from the Rural Development Programme.“*

The attitudes of the specialized enterprises managers, not dependent on agricultural subsidies, are totally different. According to them, policy had an important effect on *„...enabling the entrepreneurship, loosening export and import.“* *„Transition from centrally planned production to a free market enabled to establish the success of companies on abilities of managers.“*

## 4 Conclusion

The results of the paper indicate that an important role is played by the managers of the enterprises who have a specific vision of the future position of the enterprises, who are able to identify and take advantage of new opportunities, work on their key competencies and are internally motivated. Nevertheless, such managers are often the only bearers of innovative thoughts due to the immaturity of external and internal environment, low density of institutions, desintegrated social networks, absence of regional innovative systems and underdevelopment of in-plant innovative and incentive systems. The other co-workers are often in position of executors, waiting for direct orders. *„This causes a high fragmentation of economic activities connected with diffusion, absorption and utilization of knowledge which run within the small circle of agents without coordination.“* In agriculture there is currently a generation problem, having important effects on decision-making in the enterprises. *„The key agents of the old social networks are the key agents of the new social networks, too. Next to them, the new agents have implanted themselves. With their force of capital and power ties, they are able to strongly influence the direction of regional and local agricultural system.“* The political dimension of enforcement of knowledge economy and innovations in agriculture is within the framework of the EU Common Agricultural Policy. Regarding the uneven position of the enterprises within the food production vertical, the effects reached by technological innovations express themselves in a labour productivity growth and reduction in costs per unit; however, they do not express adequately in increased profitability and, thus, in competitiveness of agricultural enterprises. Such an agricultural policy is little efficient because its effects overfall into processing sector and into profits of business chains. The support for product innovations realized through measures focused on diversification of agricultural enterprises towards non-agricultural activities seems to be a more efficient, pro-innovative policy. However, only a small part of the total subsidy sources was directed to such kind of policy; that is why the potential of product innovations could not have approved

itself so far. Although there is a great volume of financial support which flows into agricultural enterprises through the CAP, the enterprises feel its insufficient coordination, internal inconsistency and weak efficiency of its tools in field of innovations. „*The sector of agriculture has been still going by economic transformation and its transition towards knowledge economy has been rather spontaneous than systematic.*“

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# Governance in Bulgarian Agriculture

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**Annotation:** This article deals with elements of new institutional economics and transaction costs. It is a current, contemporary institutional exploration beyond the boundaries of individual disciplines - economics, sociology, history, political science and legal science. It is widely recognized that achievement of economic, social, environmental and inter-generational targets of sustainable development requires effective governance and coordinated actions at various levels - individual, regional, national and transnational levels.

It is also known that effective forms of governing sustainable development are universal, and there is a wide variation among different countries, regions, etc. Experience shows that different societies achieve to a different extent the economic, social, environmental and other targets of sustainable development. The aim of the article is to propose a comprehensive framework for analyzing the mechanism of governing sustainable development. The agrarian sector will be used for a practical application of theoretical knowledge.

The first part is focused on sustainable development and its economic aspects. The next section will analyze and propose improvements of the governance of sustainable development. This approach takes into account specific institutional environments and the behavioral characteristics of individual agents, as well as transaction costs that are associated with different forms of governance. Theoretical knowledge will be put into practice using the example of Bulgarian agriculture. Bulgarian agriculture has seen fundamental changes since 1989, with the abandonment of centralized planning of farming and the liberalization of agricultural markets.

Bulgarian agriculture is very specific and differs from other European countries. Agrarian development is linked to specific environmental problems such as contamination of farmland, pollution of groundwater, loss of biodiversity, etc. This is a result of the specific institutional and governing structure that has been evolving in the sector during recent years.

**Key words:** Agriculture, agrarian sector, Bulgaria, governance, mechanism of governance, sustainable development, transaction cost

**JEL classification:** Q01, H11

## 1 Introduction

The meanings of public administration, including governance and sustainable development in a global context, are reviewed in order to explore how public administration can ensure sustainable development, within the context of limited resources and inequality. Responsibility for sustainable development – that is, for the complex mosaic made up of economic, social, political, cultural and ecological components that must be put together under a specific set of conditions – rests at the national level.

Institutional economics seeks to resolve issues that classical and neoclassical economics cannot address. Acceptance of New Institutional Economics (NIE) thought has revised basic economics. Another key concept is transactional costs, as specified by D. Coase. The neoclassical economic view of the comparative market focuses mainly on the price mechanism and assumes the zero transaction. However, in a world with a positive transactional cost, the New Institutional approach becomes useful. In an NIE market, the governance structures of transactions are explored (WILLIAMSON, 1996). The purpose of the market as an organization is to organize exchanges efficiently, or in other words, to

facilitate market transactions (FURUBOTN, RICHTER, 1997). In recent decades, traditional governance mechanisms have started to become destabilized, and new governance arrangements have emerged. Such shifts in governance have occurred in the private, semi-private and public spheres, and at the local, regional, national, and global levels. Changes have taken place in the forms and mechanisms of governance, the location of governance, governing capacities and styles of governance.

NIE provides a new insight into the efficiency of various markets with public, private and mixed modes of governance. This approach requires modes of governance influencing individual behavior which include the institutional environment (the rules of the game), market modes, and public and hybrid modes. The NIE (Transaction Costs) framework can be adapted (FURUBOTH, RICHTER, 1998; NORTH, 1990; WILLIAMSON, 1996) to assess the efficiency and sustainability of governing structures in Bulgarian farming. The aim of the article is to propose a comprehensive framework for analyzing the mechanism of governing sustainable development. The agrarian sector will be used for applying theoretical knowledge to actual practice.

## **1.1 Sustainable development**

The concept of sustainable development has exploded in developed countries, as a response to concerns about the impacts of agriculture on the depletion of non-renewable resources, soil degradation, health and environmental effects of chemicals, loss of traditional values, food quality, worker safety, decline in self-sufficiency, decreasing number of farms, etc. (EDWARDS et al., 1990). Sustainable agriculture is very often used as an umbrella term for approaches to conventional agriculture, and includes organic, biological, alternative, ecological, and low-input agriculture, among others. More recently, social issues such as modes of consumption and quality of life, decentralization, community and rural development, preservation of agrarian culture and heritage, improvement of nature, and ethical issues (like animal welfare, use of genetically modified crops, etc.) have all been incorporated into the sustainability concept (VANLOON et al, 2005.).

An important part of economic theory concerns the problem of sustainability. It has been discussed countless times in relation to the efficiency of using common natural resources (tragedy of commons<sup>1</sup>) (HARDIN, 1968) and negative externalities<sup>2</sup> associated with some activities (PIGOU, 1932).

The governance of agrarian sustainability is among the most topical issues in academic, business, and policy debates in all countries (VANLOON et al., 2005). Experience has shown that countries achieve economic, social, environmental, and other targets of sustainable development to different extents. This is a result of specific governing structures which affect individual behavior in dissimilar ways, and lead to diverse actual performances. Nevertheless, institutional aspects are largely ignored, normative approaches dominate, and informal modes and transactional costs are not included in analyses. Consequently, the potential of market and private governing modes for the specific economic, institutional and natural environment in each country cannot be properly assessed, nor can effective modes for public (government, international assistance, etc.) interventions in the agrarian sphere be designed.

## **1.2 Mechanisms of governance**

In recent decades, traditional governance mechanisms have started to become destabilized, and new governance arrangements have emerged. Institutions have been variously defined.

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<sup>1</sup> Tragedy of commons can be avoided by alternative institutional arrangements

<sup>2</sup> A negative externality is market failure (allocation and sustainable use of natural resources)

According to D. North, institutions are humanly-devised constraints that structure political, economic and social interactions (NORTH, 1990). A. Schmid defines an institution as “*sets of ordered relationships among people which define their rights, exposure to the rights of others, privileges and responsibilities*” (WILLIAMSON, 1996). According to Furubotn and Richter, modern institutional economics focuses on the institution of property and on the system of norms governing acquisition or transfer of property rights (FURUBOTN, RICHTER, 1998). These definitions of an institution operate at the level of the institutional environment called “*rules of the game*”.

Agriculture has changed dramatically since the end of the Second World War; in particular, food and fiber productivity has soared due to new technologies, mechanization, increased chemical use, specialization, and governmental policies that have favored maximizing production. Although these changes have had many positive effects and reduced many risks in farming, there have also been significant costs. The movement for sustainable agriculture is garnering increasing support and acceptance within mainstream agriculture. Sustainable agriculture integrates three main goals--environmental health, economic profitability, and social and economic equality. A variety of philosophies, policies and practices have contributed to these goals.

## **2 Materials and Methods**

This article deals with elements of NIE and transactional costs. It is widely recognized that the achievement of economic, social, environmental and inter-generational targets of sustainable development requires effective governance and coordinated action at various levels - individual, regional, national and transnational. This paper, after a synthetic review of the main literature, defines a theoretical approach that can help explain the governance and sustainable development of the Bulgarian agricultural sector. The data were collected through the Ministry of Agriculture and Food (MAF) and the National Statistical Institute (NSI).

The aim of the article is to propose a comprehensive framework for analyzing the mechanism of governing sustainable development. The agrarian sector will be used for applying theoretical knowledge to actual practice.

## **3 Results**

At the beginning of 1989, Bulgaria passed through a time of political and economic transition which changed a lot of its basic institutions and subjected society to stresses unknown in the forty-five years of totalitarian rule. In 1991 privatization of agriculture was a top priority of the government. Land reform was initiated in the beginning of 1991, when the Law for Agricultural Ownership and Land Use (LAOLU) was approved by the Bulgarian parliament. Since the beginning of transition, a specific governing structure has evolved which dominates Bulgarian farming: this consists of a huge number of subsistence and small farms, the widespread use of integrated and cooperative modes, a strong reliance on large-scale personal relationships, the domination of grey structures, poorly functioning formal institutions, etc. (BACHEV, 2005).

The agricultural reform and restitution process has led to land fragmentation in Bulgaria. The country chose a restitution model for its land reform. The goal of the land reform was to return the land to the people who had owned it before collectivization. The reform of Bulgarian agriculture resulted in the most severe land fragmentation problem in comparison with other Central and Eastern European countries. Half of the land is used in units smaller than 5 ha, and there are more than 1.8 million landowners.

According to official data, there are 465,084 farms in Bulgaria (MAF, 2008). Furthermore, market adjustment and intensifying competition have been associated with a

significant decrease in the number of unregistered farms and cooperatives since 1995 (Table 1).

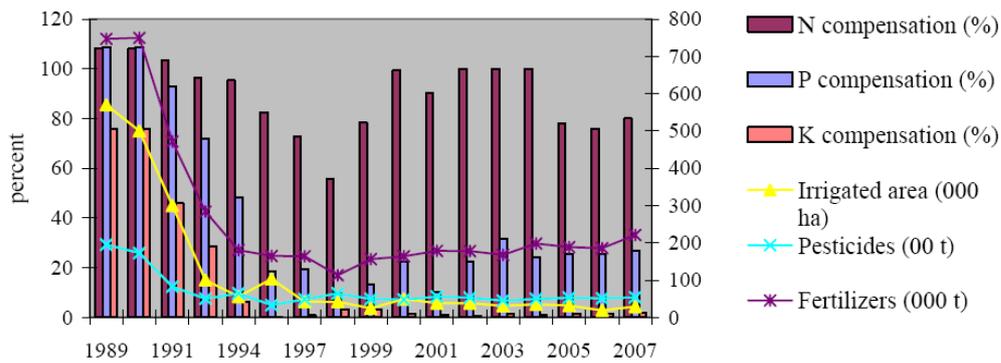
A significant amount of agrarian activity is organized according to different types of farms. The NIE provides a new insight into understanding the role and sustainability of the farm (BACHEV, PEETERS, 2005). The sustainability of a farm is characterized by the farm's ability to maintain itself over time. Since no economic organization would exist over the long-term if it were not efficient, the problem of assessing the sustainability of farms is directly related to estimating the factors and the level of farm efficiency.

**Table 1.** Number, size and importance of different types of farms in Bulgaria

	Public farms	Unregistered	Cooperatives	Agro-firms	Total
Number of farms					
1989	2101	1600000	na	na	1602101
1995	1002	1772000	2623	2200	1777000
2000	232	755300	3125	2275	760700
2005		515300	1525	3704	520529
2007		458617	1281	5186	465084
Share in number (%)					
1989	0.13	99.9			100
1995		99.7	0.1	0.1	100
2000		99.3	0.4	0.3	100
2005		99.0	0.3	0.7	100
2007		98.6	0.3	1.1	100
Share in farmland (%)					
1989	89.9	10.1			100
1995	7.2	43.1	37.8	11.9	100
2000	1.7	19.4	60.6	18.4	100
2005		33.5	32.6	33.8	100
2007		32.2	24.7	43.1	100
Average size (ha)					
1989	2423.1	0.4			3.6
1995	338.3	1.3	800	300	2.8
2000	357.7	0.9	709.9	296.7	4.7
2005		1.8	584.1	249.4	5.2
2007		2.2	613.3	364.4	6.8

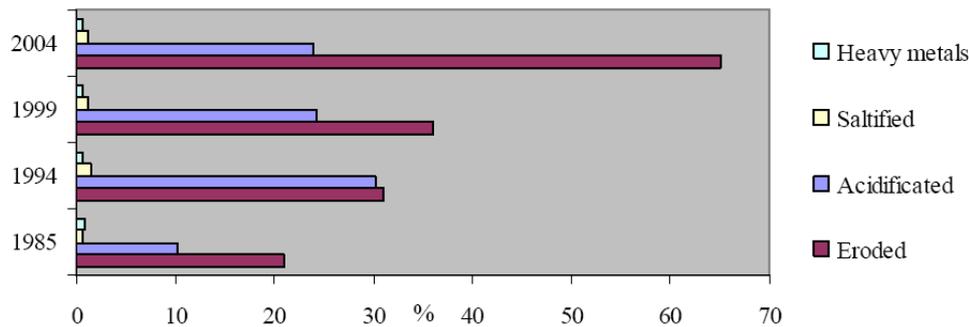
In the neoclassical framework, the farm is presented as a production structure, and analyses of efficiency are restricted to production costs. This approach fails to explain why, in any given country over a long period of time, there exist so many farms with different levels of productivity. In Bulgaria for instance, the level of profitability and productivity in cooperative farms was five times lower than in private farms.

The smaller size and owner-operated nature of the majority of farms avoided certain problems of the large public business from the past, such as lost natural landscape and biodiversity, nitrate and pesticide contamination, huge concentrations of manure, uncontrolled erosion, etc. Subsistence and small-scale farming has also revived some traditional and more sustainable technologies, varieties and products. In addition, the private mode has introduced incentives and possibilities for integral environmental management, which profits from interdependent activities such as farming, fishing, agro-tourism, trade, etc. A by-product of the domination of market and private governance was a considerable de-intensification of agriculture, and a general easing of environmental pressure and pollution compared to the pre-reform level (Figure 1).



**Fig. 1.** Irrigation, chemical application, and rate of fertilizer compensation in Bulgarian agriculture

There has also been a considerable increase in agricultural land affected by acidification (Figure 2).



**Fig. 2.** Share of degraded agricultural lands in Bulgaria

In the last few years before EU accession, the country's laws and standards were harmonized with the immense body of EU legislation. The Community Acquis have introduced a modern framework for environmental governance, including restrictions on protecting and improving the environment, preserving traditional varieties and breeds, biodiversity, animal welfare, etc. However, a good number of these new "rules of the game" are not well-known or clearly understood by the various public authorities, private organizations and individuals (BACHEV, 2008).

Significant EU funds for rural development will also be available, and will exceed 5 times the current level. These funds allow more and smaller farms to gain access to public support. New measures are financing essential activities such as commercialization/diversification of farming, organic farming, maintaining productivity/biodiversity on abandoned farmland, revitalizing mountainous agriculture, etc. This provides new opportunities to extend farms through more labor, inputs/service supply, and marketing of new products/services. Some cooperatives, group farms, and firms would specialize in new functions (environmental preservation, maintenance of farmland) and see their size expanded.

The Common Agricultural Policy (CAP) modernizes farm structures through widening the variety of contractual and organizational innovations - specific sorts of contracts, new types of producer associations, spreading vertically-integrated modes, etc. Special forms are also emerging, allowing agents to take advantage of large public programs that will specialize in project preparation, management, and execution; investing in relations capital or negative entrepreneurship; modes for lobbying and representation; coalitions for complying with formal criteria (e.g., minimum size of utilised agricultural area for direct payments, membership requirements for producers' organizations), etc.

The actual system of governance (management, control, assessment) for public programs is not likely to change soon. Therefore, funds will continue to benefit the largest structures, more abuses will take place, and CAP support will not contribute to diminishing divergence between farms and regions.

Some of the terms of specific contracts for environmental and biodiversity preservation, respecting animal welfare, maintaining traditions, etc., are very difficult or expensive to enforce and dispute. In Bulgaria, the rate of compliance with these standards will be even lower because of the lack of readiness/awareness, insufficient control, an ineffective court system, dominance of “personal” relationships and bribes. Correspondingly, more farms than would otherwise enrol will participate in such schemes (including the biggest polluters and offenders). Besides, costs for respecting requirements of agro-environmental programs (expenses/lost income) will vary considerably between farms. Keeping in mind the voluntary character of most CAP instruments, the biggest polluters and those noncompliant with quality, agronomic, biodiversity and animal welfare standards will simply not participate in them. Moreover, government is less likely to set up high performance standards because of the strong internal political pressure and possible outside problems with EU control on compliance.

## **4 Conclusions**

Within the framework of neoclassical economics with no transaction costs, there is only one mechanism for governing agrarian development. Free market prices effectively coordinate and stimulate the entire activity of resource owners, entrepreneurs, and consumers. Rare cases of market failure but a perfect government intervention are seen as remedies (BACHEV, 2007). In the real economy, there are additional important factors affecting individual choices and agrarian sustainability (namely institutions and transaction costs), and a great variety of effective governing mechanisms.

Analyses of transaction costs have identified an immense range of market failures associated with unspecified or badly specified property rights, an inefficient system for enforcement of absolute and contracted rights, high uncertainty and dependency of activity, and low appropriability of rights. The varied forms of public intervention have unequal efficiency; the most efficient one should be selected while taking into account the overall transaction costs and contribution to sustainable development. What is more, at the present time most public interventions increasingly require concerted action at the local, regional, national, transnational, and global levels. Another possibility is government failure, as well as inappropriate involvements, under or over-regulation, mismanagement, corruption, etc. Agrarian sustainability is significantly compromised when the market and private sector fail, and no effective public intervention takes place.

In Bulgaria, there is huge market and institutional instability as well as uncertainty and high transaction costs, which have blocked evolution of effective market and collective modes for risk protection. A great variety of private modes (internal organization, vertical integration, interlinking, etc.) has emerged to deal with the significant natural, market, private, and institutional risks faced by the farms and other affected agents.

Specific boundaries (size) of farms cannot be understood with technological determinants, but instead require the analyses of governance features. Furthermore, the actual efficiency of a particular mode for land, labor and input supply, financing, marketing, etc., can be properly estimated only by taking into account the total costs for governing a farm and household economy. This approach requires giving up traditional “production costs” models, sectorality, and disciplinary; analyzing the structure and enforcement of de-facto rights; and identifying the spectrum of agrarian and rural transactions as well as modes for their

organization. It also calls for new types of microeconomic data and a system of direct/quasi indicators for costs, critical attributes, and specific modes of transaction.

EU accession introduced and enforced a new order that presented implementation regulations, quality and safety standards, protection against market instability, and export support which will eventually intensify and increase the efficiency of agrarian transactions. Furthermore, EU funding, which agriculture has been receiving since 2007, is more than five times higher than the current overall level of support for farming. Hence, CAP implementation would improve funding opportunities and facilitate farm extension and modernization. However, accession to the EU found Bulgarian agriculture in a situation of uncompleted reforms. The effect on the environment and the support for agriculture in less-favored regions is relatively weak. Moreover, no significant changes have been seen in the socio-economic situation of rural regions. Developmental trends indicate that over the medium term, and within the framework of current CAP, Bulgarian agriculture will not be able to meet its potential. The main reason for this can be found in the disparities between Bulgarian farmers in terms of agricultural support.

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# Is Economics Part of the Problem? An Incomplete Review

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**Annotation:** Our present trajectory of, and obsession with, continual economic growth is clearly unsustainable. Is our conception of economic systems part of the problem or part of the solution? Consideration of economic systems as the outcome of socio-evolutionary processes strongly suggests that we are misconceiving their underlying natures. Markets in goods and services might be reasonably consistent with our micro-economic theory about comparative advantage and the gains from trade. But the obsession with consumption strongly suggests that markets are incomplete (at the least) as ways of managing with the limits of our planet. More importantly, there is no substantial consistency between capitalism, finance markets, and (hence) the all-important capital markets and an evolutionary stable (sustainable) strategy (ESS) for the planet. Since evolution happens by processes of trial and error, and is effectively blind about possible futures, we rather urgently need to re-consider our theoretical understandings of how these systems work and how we might better manage with them. Otherwise, we are in substantial danger of running out of room and time to make more mistakes.

**Key words:** Economic theory; sustainability; market and capitalist systems; evolutionary systems

**JEL classification:** B52, D01, D53, E44, G10, P19.

## 1 Introduction

We live in worrying times. Our bio-physical scientists are convinced that we, the human race, are in the process of destroying the capacity of our planet to carry the human race, at least in the style to which some 20% of us have become accustomed, especially as the other less fortunate 80% race to catch up. Our demographers tell us that we can confidently expect to have to cope with another 2 billion people, on top of the present 7 billion, by 2050. We appear to be running out of sufficient land and water and natural resources to cope, and we are in the process of warming up the planet as well, with largely unpredictable consequences.

Indefinite growth of consumption of material resources is clearly impossible on a finite planet. As Kenneth Boulding is reported<sup>1</sup> to have said, “*anyone who believes in perpetual physical growth on a physically finite planet is either mad or an economist*”. We will surely eventually exhaust our life support system – the spaceship earth - all other things being equal. While recycling might help, 100% recycling of waste defies the laws of thermodynamics, so cannot be our eventual saviour.

Yet, in the face of these fundamental problems, our economic systems appear to be fiddling while ‘Rome’ (the planet) burns. Not only are our economic and political leaders convinced that more growth is the only conceivable solution to our problems, but our principle economic systems – especially the finance markets (as the archetypical exhibition of the capitalist market system) – seem intent on making life even worse. Our finance systems are supposed (in simple economics) to do three things: to store wealth; to spread risk; to identify the most productive avenues for new physical and human investment (the capacity to deal with the uncertain future) more effectively. The only thing that the present systems seem to be doing is to spread risk – and then not in the way in which the textbooks regard as useful.

This paper re-considers the prevailing economic paradigm which underpins the predominantly western economic model, and the way in which this paradigm is explained. In

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<sup>1</sup> Quoted in *The Week*, 23.07.11, quoting *The Canberra Times*.

short, the economics which we teach, and which our leaders apparently take for granted, appears to be in a rather sad state – a conclusion apparent well before the recent credit crunch and ensuing mayhem.<sup>2</sup> The fact of the credit crunch and resulting recession, however, might make the story easier to tell and potentially more saleable. The essence of my argument is that we need to think of socio-economic and political systems as complex adaptive evolutionary systems, embedded within other social systems and co-adapting with the planet's natural eco and climate systems. If so, then the natural theoretical and metaphysical (epistemological) apparatus we need to use is that of evolution, as explored, for example, by Dennett (1995).

## 2 An evolutionary perspective on economics

Back in 1950, Alchian suggested that we re-phrase our economic parables as stories of an evolutionary process. *“The suggested approach embodies the principles of biological evolution and natural selection by interpreting the economic system as an adoptive (sic) mechanism which chooses among exploratory actions generated by the adaptive pursuit of “success” or “profits”* (p211). Alchian notes that the ideas of profit or utility maximisation as motivations for behaviour are sufficiently unrealistic as to be nonsensical, especially in the real, uncertain and complex world. As he says (p. 212), *“In the presence of uncertainty - a necessary condition for the existence of profits – there is no meaningful criterion for selecting the decision that will maximise profits.”* He goes on (p 213) *“This is the criterion by which the economic system selects survivors: those who realise positive profits are the survivors; those who suffer losses will disappear. .. Positive profits accrue to those who are better than their actual competitors, even if the participants are ignorant, intelligent, skilful etc. .. The greater the uncertainties of the world, the greater is the possibility that profits would go to venturesome and lucky rather than to logical, careful, fact-gathering individuals. .. Success (survival) accompanies relative superiority; and, second, it does not require proper motivation but may rather be the result of fortuitous circumstances.”* Alchian pursues this analysis by separating the elements of good fortune (luck) from conscious adaptive behaviour by considering a socio-economic environment which only adopts “appropriate” survivors (in the absence of any adaptive behaviour). This system is, in essence, the natural selection system, in which the single organism or gene has no discernable individual motivation or adaptation capacity whatsoever.

Providing that we know (or can make educated guesses about) the system's prerequisites for success, survival and replication, we can still predict the characteristics of the revealed successful firms (households), even if these entities have no individual motivation or adaptive capacities at all, even if the whole system is simply driven by chance actions. *“Individual motivation and foresight, while sufficient, are not necessary”*, *ibid*, p 217. Of course, motivation and conscious adaptive behaviour are human (if not also higher animal) characteristics. Alchian notes two behaviours in particular: imitation of apparently successful behaviours; innovation by conscious trial and error. As he says (p. 219), *“Adapting behaviour via imitation and venturesome innovation enlarges the model.”* In short (220), *“The economic counterparts of genetic heredity, mutations and natural selection are imitation, innovation and positive profits.”* As Winter, 1988, notes: *“natural selection and evolution should not be viewed as concepts developed for the specific purposes of biology and possibly appropriable for the specific purposes of economics, but rather as elements of the framework of a new conceptual structure that biology, economics and the other social sciences can comfortably share.”* (p 614).

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<sup>2</sup> See, for example, Harvey, 2004.

### 3 Initial Implications

The correspondence between natural selection and economic behaviour, if sensible, has two important implications. Firstly, the typical benchmark of pure economic competition is not a natural climax condition of the economic world. Competition, specialisation and trade thrive on and self-generate diversity, not homogeneity. Trade and specialisation (the foundation of economics) cannot happen in a uniform and undifferentiated world. A uniform world does not trade. A level playing field is a thoroughly misleading metaphor for the real world, despite its apparent rhetorical appeal. Economic competition is not athletic competition – it is not a race or a game, and the winner does not take all. The more differentiated and diversified become the products and the associated ideas, the more niches are established. The richer the ecology (and the economy), the more diverse are its ‘species’<sup>3</sup> and the more niches it contains. Winners do not and cannot take all in a sustainable evolutionary system. Indeed, the existence and prosperity of the ‘winners’ (those at the top of the food chain) may be an important indicator of the vitality of the whole system on which they depend. The supposed inefficiency of monopolistic compared with perfect competition should be seen as the price we pay to be different, to have options and thus exercise choice and associated loyalty. Perfect competition with homogenous products is indeed nasty, brutish and short, as marketing experts and consumers well know, and which producers, as well as policy makers and analysts, ignore at their peril. There is no real choice in perfect competition – evolutionary stable strategies in a perfectly competitive (and totally unrealistic) world are practically pre-determined, aside from mistakes and/or adventitious behaviours.

Secondly, the sophisticated calculus of our economic models representing the optimum allocation of scarce resources does not represent the actual behaviour of participants, a fact that our textbooks and erudite analyses frequently forget or ignore. The marginal conditions for an optimum, and the supposed production and utility functions to which they refer, simply define and derive from the conditions that characterise the best-fitted allocation. They are, if anything, severely reduced forms of the actual relationships and processes that produce these (so far) best possible outcomes. The underlying structural equations (even if they exist) are currently far beyond our ken, and we do ourselves no favours to pretend otherwise.

Blume and Easley, 2002, explore the mathematical logic of an evolutionary process of economic behaviour and development using an evolutionary general equilibrium model. Their theoretical model results are important. They find that profitable firms grow and unprofitable firms shrink if the economic environment is held constant, as Alchian (*op cit.*) argues and as Nelson and Winter (1982) explore in considerable and convincing detail. However, in a general equilibrium system, prices change as factor demands and output supply evolves.

Blume and Easley examine, first, a world without capital markets, where firms can only grow through retained earnings, and find that in this case, evolution favours profit maximization, again as Alchian argues and Nelson and Winter demonstrate. However, Blume and Easley do not find, even in their necessarily fairly simple model (e.g., with consumer preferences fixed) that dynamic equilibrium paths are necessarily Pareto optimal, or even have automatically stable steady states. In other words, even such a simple reflection of our general equilibrium system can be susceptible to cycles and to sustained depression – the Keynesian condition – echoing natural population cycles generated using the same ‘mechanistic’ principles.

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<sup>3</sup> We do not need, at this level of discussion, to be side-tracked into the actual mechanisms of evolution and the precise entities on which selection operates in socio-economic or cultural evolution – see, e.g. Nelson, 2005.

### 3.1 Capital Markets, Part 1

One might think that the addition of capital markets to this general equilibrium model would save our conventional economics in this evolutionary-logical world, and both stabilise it and ensure that it reaches Pareto optimality. First, Blume and Easley (*ibid*) suppose that all investors have rational expectations (which are, as a result, the same across all investors), in which case the market structure is dynamically complete. However, this *rational expectations* assumption proves to be practically tautological – non-maximising firms never get any investment, and so do not exist – there is no \$10 note on the pavement; if it was ever there, it has already been picked up by someone. There is no real evolutionary selection – the market gets it right from the outset and by assumption (as noted above for the perfectly competitive model).

In a more realistic example, where investors have differing expectations about firms' profitabilities, there is no guarantee that non-maximising firms will disappear. This will only happen if the investors who turn out to have the wrong expectations also disappear (become out-competed by those with better expectations). However, the accumulation of (accidental or erroneously based) wealth by investors can, in the Blume and Easley model, persist, and the wealth of irrational investors can grow, even if only by accident. In short, the addition of capital markets to the Blume and Easley model makes the correspondence between our conventional general equilibrium model's constrained optimality and an evolutionary system even worse. This result seems to echo Shleifer and Vishny (1997), who show that rational arbitrageurs can be forced out of the capital (finance) markets by a lack of liquidity. Asset price collapses reduce liquidity and leverage, hence exacerbating stock market crashes when they are triggered.

## 4 The nature of socio-economic evolutionary processes

Nelson, 2005, suggests that there are (at least) four critical differences between natural selection and cultural (socio-economic/political etc.) selection. First, humans are (or at least believe they are) intentional and intelligent – we think we know better and behave accordingly. Secondly, the selection criteria seldom relate directly to human survival and reproduction, but are more often concerned with persistence of ideas and practices, rather than survival *per se*. Third, the entity which evolves is a firm, group, community or network, which cannot be “*simply characterized as the aggregation of the population of traits possessed by individuals, but has a collective property*” (p12). Fourth, the processes of selection, replication and persistence (survival) are very different in many ways from those with apparently operate in the natural world.

I argue (e.g. Harvey, 2004 and 2008) that the critical difference between natural selection and human (cultivated or civilized) selection is even more fundamental. In cultural or socio-economic evolution, the selection criteria are *endogenous*, not exogenous. In biological evolution, the criteria for survival are pre-determined by the coherence and consistency of the chemical and physical processes and associated laws. Either a phenotype is sufficiently well adapted to the prevailing environment and competition that it can persist and replicate its genes, or it is not, in which case it and its genes will die. In social (cultural) evolution, *we (the people) get to choose*, and we make up and continually re-make the rules about what behaviours and outcomes are allowed to persist and what are not. To all intents and purposes, we are in charge of our own evolution, with or without the help of our gods (given outside determinants), depending on what we choose to believe. The echoes of the biblical account of the beginnings of the human race are strong – humans, gaining knowledge (though not, necessarily, understanding), are kicked out of the natural selection system (the Garden of Eden) and, in effect, told that: ‘if you think you are so smart, then get on with it and see how

you do'. And we are still wrestling with the problem, and are now running out of space and time to make many more mistakes.

Human (cultural) evolution depends on the rules we make and how we make them. We cultivate and try to civilise our own selection systems. Our institutions, the social codes, constructed realities and authorities (North, 1990) are the manifestations of the ways we choose to do this – our governance structures. We seek to practice civilized selection, and to do so with intent and purpose, albeit frequently misguided or mistaken. So what? Our economic choices are exercised through economic power as income and wealth, which (aside from government intervention) determine, or at least substantially influence further production and investment. In our conventional general equilibrium models, the sole driving motivation is consumption, which in turn is supposed to satisfy personal utility. Investment is only a means to an end – more consumption in the future. It is through consumer sovereignty that our general equilibrium takes care of the endogeneity of social choice in the socio-economic evolution of markets. Producers only get to survive and replicate if they meet consumers' needs and requirements. Consumers are in charge – but do they necessarily always want more? The richer we become, the less pressing are the apparent resource constraints and the greater appear our feasible sets of choice. We face the curious paradox: the poor have very little choice, survival is all; the rich have so much choice (and apparent security) that any given option typically carries very little salience, which makes actual choices both difficult and likely ephemeral.

Furthermore, the logic of the market encourages the agglomeration of resources and wealth, since markets are driven by rent-seeking behaviour. Adam Smith's free market relies on the freedom of individuals to pursue their own welfare, both as consumers and producers, competing with each other for necessarily scarce resources. The equilibrium outcome, under a freely competitive market, is supposed to be a Pareto optimal allocation of resources, given the initial distribution of these resources. However, even under this simplified system (absent any public goods and externalities, or complications of transactions and organisation costs, or information gathering and processing costs) the inevitable dynamics of the pursuit of an ever-changing equilibrium (as technologies and tastes change) must result in temporary accumulations of super-normal profits, as the signal for market adjustment. Super-normal profits manifest as pure rents in excess of transfer earnings, and accrue to the underlying resources (their owners and/or managers). Economic theory cannot explain initial endowments of wealth and capital (of all forms). Rather, it relies on the continual pursuit of profit and rent, and on the happy accidents of well-fitted inventions, each leading to temporary accumulations and differentiated distributions of wealth. These become augmented by life-cycle and inheritance effects - the accidents of birth. Blume and Easley show, if I read them correctly, that this accumulation (and subsequent exercise of the associated power of choice about what to produce and how to produce it) can lead to both socially (Pareto) sub-optimal outcomes, and also to dynamic instability. What a revelation – isn't that exactly what many of the critics of economics and market system have been continually telling us?

#### **4.1 Evolution of Political Economy**

An evolutionary perspective (see, e.g. Harvey, 2004a) suggests that the tendency for initial distributions of wealth (resources) to become more concentrated through the processes of both market and capitalist transactions is socially unsustainable. The rich become richer while the poor remain at least relatively poor. As Marx (1887) suggested, naked and unrestrained capitalism may well contain within it the seeds of its own destruction, though perhaps for different reasons that Marx advanced. In simple terms, we can expect that, eventually, the poor will try to do something about their condition, aided and abetted by sympathizers and social critics. Furthermore, it is to be expected that the rich will anticipate (or experience) the opposition of the poor, and will take steps to preserve their power by doing just enough to

dissuade the poor from doing too much. Competition for resources in the market place now becomes competition for the rights to social control – the rights to make the rules of social engagement - either as a means to individual prosperity and persistence/replication, and/or as a means of social enhancement.<sup>4</sup>

The anarchy of an ungoverned market economy is insufficient to be socially sustainable, for two major reasons. First, the long arm of the law is necessarily attached to Adam Smith's invisible hand: to protect the specie; to enforce market contracts; define and protect property rights; and outlaw theft, corruption and fraud (e.g. Bromley, 1997).<sup>5</sup> To implement and enforce authority, government must coerce society to conform to social laws and choices. As Dunn (1999) observes: "coercion is the core of states." Equal first, expectations are frequently frustrated and confidence in the market is misplaced, so we seek redress. Collectively, we try to manage the arbitrary distribution mechanisms of the market to achieve a more stable, sustainable and perhaps humane society.

In short, we choose whether or not to accept the social outcomes of trade and exchange, and their associated income and wealth distributions. These choices are necessarily made through the coercive state apparatus. We inevitably concede the power to make social or communal decisions (including the definition of property rights) to government. And, for the state to be sustainable, we have to respect this authority and its arbitration of disputes. Williamson (2000, p 598f) notes that the market theory of property rights, following Coase (1937), needs to take account of the costs and difficulties of organising and implementing the associated transactions. However, even these theories necessarily presume that the arbiters and organisers themselves have the confidence and trust of the people involved, otherwise neither the rules of the game, nor its various plays, will be legitimised by the participants. Our governing systems – autocracies, plutocracies, dictatorships, and (perhaps only when we have found the rest wanting) democracies and associated bureaucracies – all wrestle with the same fundamental problem – how to persuade their constituencies of the legitimacy and authority of the 'government' – our arbiter of our own cultural selection criteria. We choose which games we play, so long as we are rich enough to have the choice.<sup>6</sup>

If producers cannot win control over their market conditions, due to atomistic (perfectly competitive) structure, then they can be expected to pursue these ambitions through the political machinery of the state. Here, the marginal net returns to political action for producers are more concentrated than for consumers, because of specialisation in production. Consumer dominion over the market place is thus over-ridden by producer (or factor ownership) domination of public intervention in the name of fair and just distribution or of prudent economic management. Developed country agricultural policies are the archetypal examples (e.g. Harvey, 2004b), typically resting on arguments about just farm incomes or contributions to economic activity and trade balances, or, more recently, environmental (even social) care.

It follows that income and wealth distributions under any political economy general equilibrium, even under ideal competitive conditions, are determined by political influence and authority, typically manifesting as an uneasy balance between labour and the owners of capital. Left and right are thus natural manifestations of capitalist state politics. The right believes in the supremacy of the market, which apparently generates the factor incomes. Paid labour and atomistic sectors, on the other hand, are apparently at the mercy of the market and capitalists, and seek remedy through the political system. Arrow's impossibility theorem (see, e.g. Heap *et al.*, 1992, p 209ff) demonstrates that such systems, even if defined as

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<sup>4</sup> This assertion is little more than an extension of Becker's theory of social interaction (1974).

<sup>5</sup> Colman (1994) deals with the associated observation that many of our economic relations are also strongly influenced by *invisible handshakes* (Okun, 1981, p. 82) as well as by the invisible hand.

<sup>6</sup> See Barrett, S., 2003, for an exemplary exposition of the insights afforded by a game theory approach, especially to international environmental conventions and treaties.

perfectly as possible, will frequently generate inconsistent public preferences, and will thus cycle over different political control of the negotiating agenda, depending on rhythms of conviction about the social desirability of unrestrained markets. In short, the apparently neat and self-contained theory of general equilibrium is not self-contained. It requires and exploits government – the critical social construct and constraint on the animal magic of the invisible hand. Figure 1 illustrates the story so far – the structures of our social systems.

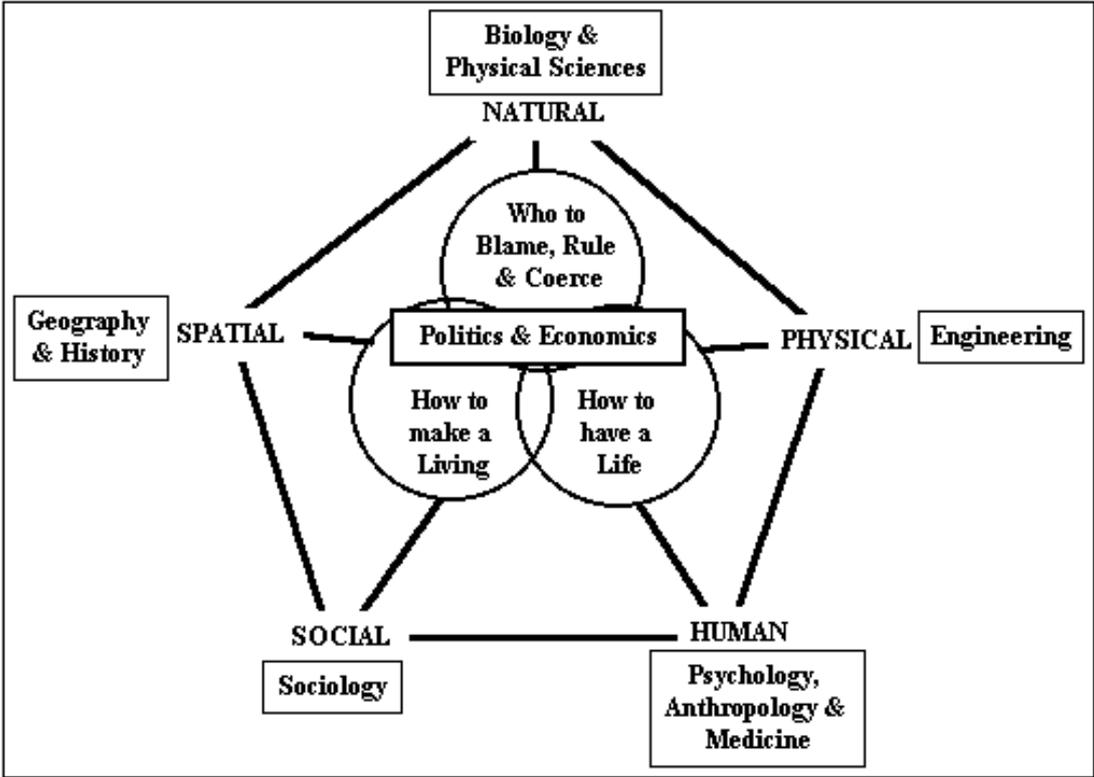


Fig. 1. The Structure of Social Systems – from an economic perspective.

This figure borrows heavily from the sustainable livelihoods literature (e.g. DfID, 1999, Ellis, 2000, Chambers and Conway, 1992). Our (scarce) resources can be categorised as natural, social, physical, human, and spatial.<sup>7</sup>

The development of our human systems for making our choices about how to use, abuse and accumulate or dissipate these resources is subject to a fundamental evolutionary logic – those that fit best with the surrounding social environments and political climates will survive, prosper, reproduce and perpetuate. The basic rule is: ‘do what you like, and see if you can get away with it’. Ill-fitted systems will fail to survive and replicate (at least to any great extent, or with any persistence). But the critical difference between social evolution and its natural counterpart is that we get to choose who lives and dies – we try to govern ourselves, rather than submit to the exogenous authority of bio-physical laws.

**Proposition 1:** *Teaching or preaching economics without including politics and recognizing the interactions with other social disciplines makes little sense and will continue to be misleading if not actually counterproductive;*

<sup>7</sup> The Sustainable Livelihoods framework does not separately identify spatial capital as a dimension of the overall resource base. Instead, it refers to financial capital. However, finance is the major means of converting both income streams and different resource bases into each other, rather than constituting a logically separate sort of real capital. Finance is a transformation system, while the remaining capitals are structures. Positional (spatial) capital, on the other hand, includes a critical feature of much of the resource base – where it is in relation to other people and other capitals, including its temporal relationships - where things and people are in relation to their histories.

*Corollary: our ‘specialisation’ in the (mathematical) calculus of economics is worthless unless and until we cultivate a more common story about how the world works. Otherwise, the necessary associated trade in ideas and concepts with our social science cousins is impossible.*

*Implication: until we develop a more common story about our social worlds, social science generally, and economics specifically will continue to be part of the problem rather than part of the solution.*

## 5 Capitalism.

There is, however, a clear but seldom remarked distinction between the free market, as envisaged in the general equilibrium story, and capitalism. Capitalism involves one important additional step in the argument. Capitalism arises through the divorce of the ownership of capital (assets) from its operation and deployment. Capitalism depends on trade (exchange) of capital stocks and assets, thus facilitating the transfer of value from the declining to the growing sectors of the economy, and the balance between savings and investment. The dynamics of these transfers of ownership and associated adjustments in the purchasing power of the assets generate additional agglomerations of wealth, and thus of economic power, as margins are shaved from the mere transfers of asset ownership and continual stock revaluations. Any economies of size in capital and organisation aggravate the agglomeration. The Blume and Easley (*op cit.*) results strongly suggest that these capitalist dynamics can themselves undermine the supposed social benevolence of the market system – a Marxist critique in definitively non-marxist style. The apparent coherence of an evolutionary system, which encourages fitness between competing entities in real markets involving exchanges of flows of goods and services does not, necessarily, translate to the exchange of ownership of physical stocks or their derivatives.

It is worth clarifying the concept of ‘capital’. For Marx, in essence, capital was embodied labour – the fruits of labour encapsulated in physical assets, plant and equipment, and in the paper (financial) assets derived from and based upon the values of these physical (and human) assets. From this perspective, property is, in effect, expropriated from an exploited proletariat and workers, who can be immiserised without penalty, other than outright revolution. However, as outlined above, this scenario is not the only, or even the most likely, result of capitalism. The immiserised can be expected to complain loudly and increasingly violently, and their more enlightened or humane capitalist employers (and exploiters) can be expected to take steps to reduce or even eliminate their complaints and make them more compliant.

For more conventional economics there are two distinct and rather separate ideas of capital. The general equilibrium version is, more or less explicitly, the physical plant and equipment used in the myriad of production (and consumption) processes, and accumulated/augmented by physical investment – the replacement and addition of new machines, plant, buildings etc. The rate of return earned by (the owners of) this physical stock of real stuff is sometimes known as the ‘rate of profit’. As the capital stock is increased, so, according to the law of diminishing marginal returns, the rate of return (profit) falls, other things being equal (which, of course, they never are). There is an inherent measurement problem in this concept. The value of the capital stock is the rate of profit times the physical stock of capital, but the physical stock of capital is made up of widely different and heterogeneous physical stuff, which cannot be reduced to commensurable units, other than by value. The valuation is necessarily circular – the rate of profit affects the ‘quantity’ of the physical stock of capital and *vice versa*. The ‘Cambridge Capital Controversy’ of the 1950s and 60s (see, e.g. Pasinetti and Scazzieri, 2008) was, at least in substantial part, about this aggregation/valuation problem. But this debate has been largely confined to an intellectual backwater since then.

However, it is centrally relevant to the arguments of this paper. From an evolutionary perspective, the equivalence of rates of return (marginal value products) with the price (value) of capital can only hold in an equilibrium state (which we might consider as the climax ‘vegetative’ state of the socio-economy). There is no substantive reason to suppose that these equilibrium characteristics and relationships have much meaning for the processes of getting to this state, any more than it is necessary to believe that each and every firm consciously maximizes profits to the best of its ability, or that each and every consumer consciously maximizes their utility.<sup>8</sup> For capital investment in plant and equipment to approach the supposed equilibrium, it is necessary that investors in physical capital which turns out to prove profitable are more likely to persist and prosper than those who invest unwisely. But, as Blume and Easley (*op cit.*) demonstrate, this is not necessarily true, even when investment is restricted to individual firms using only retained earnings, i.e. with no ‘capital’ market

Finance markets, as the second idea of capital markets, concern the invested and loanable funds accumulated through savings (everything which is not consumed), which are supposed to more or less balance with the demand (mostly by business) for new investment in physical assets through adjustment of “the rate of interest”. Through this mechanism, the rate of profit in the real world of physical assets and their employment might be supposed to balance with the rate of interest to be earned (or paid) in the financial markets, which simply exchange ownership of these assets. The circularity in the valuation of capital, however, is not removed in this process. It cannot be, since, according to the argument of this paper, it is simply a reflection of the endogeneity of the rules for selection of the fittest.

However, the rate of interest (as shorthand for a constellation of inter-related short and long term interest rates associated with varying levels of risk) is actually determined in the *money* market, rather than the *financial (asset)* markets. Government monetary policy (now largely delegated to central reserve banks) can either try to control the stock (supply) of money in the economy, or control the central bank’s base lending rate. Given that what is used as money is inherently fungible, its direct control is difficult if not impossible, and modern monetary policy centres on setting the central bank’s base lending rate. Since the central bank is the lender of last resort, the base lending rate effectively governs the interest rates. At this rate, the effective stock of money is determined as the total money balances the economy wishes to hold at this interest rate, rather than ‘invest’ the balances in other assets. This interest rate, in turn, affects the real economy of lives and work through its effects on savings and real investment rates, and also on the values of assets and wealth – since values depend on the opportunity cost of money – the interest rate.

The emergence of finance and stock markets – effectively markets in virtual, rather than real, assets, based entirely on expectations about the future (hence virtual) – is a ‘natural’ evolutionary step. Any persistent (i.e. successful, well-fitted) barter economy, as at least one of our ancestral cultures must have been, will find it necessary and useful to store assets (grain, precious metals etc.) as wealth, both for precautionary and investment (speculative) purposes. Records of these assets quickly became negotiable (exchangeable) in place of the actual commodity. Similarly, as technology evolves, so the idea of a joint stock company

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<sup>8</sup> An exactly similar argument applies to the value of labour, and also to the value of non-marketed environmental and ecosystem services. As, for instance, Heal (2000) remarks, in the case of ecosystem services: “Valuation is neither necessary nor sufficient for conservation. We conserve much that we do not value, and do not conserve much that we value. .. Providing the right incentives is not the same as valuing the services: we can provide the incentives without valuing the services, and we can value the services without providing incentives for conserving them. In fact, valuation may sometimes be a by-product of providing the incentives. If we manage to establish a market in an ecosystem service, then we have a price for it and thus a basis for valuing it. And markets are probably the best ways of providing conservation incentives. So logically incentives come before valuation: *Incentives are critical for conservation; valuation is not necessary for establishing the correct incentives*” (p 29, emphasis in the original).

emerges, which grants shares in the company's profits (and losses) to a number of (perhaps distant and rather disconnected) people, in order to access a greater volume of investment (speculative) finance necessary to operate the business. These shares also quickly become negotiable. As soon as a market develops for the exchange of these shares, enticing opportunities for 'getting rich quick' appear. All that is necessary is to be able to buy these shares when they appear underpriced and wait for their value to increase. Simple – except that judging when the price is cheap is difficult without knowledge, which in turn is difficult (expensive) to obtain (see, e.g. Stiglitz, 1985). So, specialists emerge, who make it their business to seek out information and either trade stocks on their own account or sell their advice on what to buy and sell to others, or manage the stock trading accounts of others.

One important aspect of stock markets and their derivatives, which is frequently forgotten or ignored, is that they are stock markets – which are permanently in disequilibrium. Equilibrium in a stock market would be characterized by a constant price for all stocks and no trades – each investor (including potential investors) being content to hold their current holdings of each stock, and no investor wishing to either sell or purchase any stock. The total supply in a stock market is, to all intents and purposes, fixed.<sup>9</sup> Purchases represent an exercise of excess demand on the part of purchasers, wishing to add to their present holdings at the going price. Sales represent a negative reservation demand on the part of the sellers, who are no longer willing to hold their existing holdings at the going price. Transactions can, and do, take place with no change in price. On the other hand, prices may change (as signaled by bid and ask prices moving together) without any trades occurring, if all participants agree about the conditions affecting their valuations of the stock.

Following this outline logic, Samuelson and Fama independently framed the “efficient market hypothesis” (EMH) in the 1960s.<sup>10</sup> An efficient market, in this context, is simply one in which securities prices reflect all available information, implying that every security traded in the market is correctly valued given the available information. If so, then a perfectly efficient (stock) market would be inherently unpredictable, since only new information could change prices, and new information is, by definition, unknowable *a priori*. Furthermore, in the absence of any frictions or imperfect information accumulation and transmission, adjustment to new information would be near instantaneous, and current stock prices would already incorporate fully the revised expectations about future earnings – there can be no unclaimed \$10 notes lying on the pavement. Playing the stock market then becomes no more than playing the casino. As Lo, 2008, says: “*individual investors form expectations rationally, markets aggregate information efficiently, and equilibrium prices incorporate all available information instantaneously.*” However, stock markets cannot be perfect in this sense, as Grossman and Stiglitz, 1980 argue. “*Because information is costly, prices cannot perfectly reflect the information which is available, since if it did, those who spent resources to obtain it would receive no compensation (and hence would be unable to survive and persist). There is a fundamental conflict between the efficiency with which markets spread information and the incentives to acquire information*” (p405).

Achieving efficient prices (in these terms) for existing stocks of physical assets, and their derivatives, has rather limited connections with the general equilibrium notion of efficient real (and new) capital investment. Efficient asset pricing refers to the average value of existing stocks, if anything. Efficient new physical investment ought to refer to the marginal values of new physical investments as additions to the existing stocks. Where, exactly, is the connection

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<sup>9</sup> Incremental additions to the physical capital stock over short time periods (1 year) are marginal compared with the total stock.

<sup>10</sup> Lo, 2008, provides a convenient and presumably authoritative summary, although the hypothesis still generates very considerable controversy, with at least some unwilling to grant much intellectual authority to others on the opposite side of the argument.

between the average and marginal values and how does it happen? Supposedly, it happens by venture capitalists – those specializing in finding profitable new investments – comparing their own returns with those to be earned by simply buying ownership of existing stocks, as practiced by the so-called investment bankers. In so doing, venture capitalists are expected to arbitrage between the marginal returns offered by new investments and the average returns being generated by existing capital stocks. But, the average returns on existing capital are dependant on the prices (values) of these stocks, which in turn are heavily dependent on what other people are currently willing to pay for them, which may or may not have much to do with their fundamental value (discounted expected future rents to be earned from them).

The efficiency of the capital market, in these terms, isolates the essential characteristics of the perfect competition paradigm. It identifies the characteristics of an ideal steady state, but says nothing substantive about the mechanisms for getting there, and even suggests that the state itself is a mirage – a ‘can’t-go-to’ future. Supposing that there is some mechanism by which savings are efficiently and effectively allocated to the most promising real investment opportunities, then one might suppose that, at some steady state, the associated capital market might appear as ‘efficient’ in these terms. But so what? While the perfectly competitive market ideal might perform a useful benchmark for the real goods and services markets, the EMH hardly serves even this purpose for the capital market. The EMH is an unattainable perfection. The hypothesis ignores the fact that the actors in the market are widely heterogeneous – perhaps rational within their own terms of reference, but with differing time preference rates, attitudes to risk, understandings and perceptions of information salience etc. Changes in the balance of any of these amongst the population of traders will affect stock prices. Furthermore, guesses about how these factors might change (or persist) in the market can also be used to rationalize investment behaviours – so long as enough investors believe values to be increasing, it does not matter what you think, go with the flow. Even better, bet on the flow.

More importantly, as a stock market, there is no natural counterbalance of supply adjustment to demand changes. Pure profits earned in the stock market are not competed away by new entrants on the supply side. Rather, they simply attract new entrants on the demand side, driving values even higher. There is no natural counterbalance, other than loss of faith and confidence. As Lo (*op cit.*) observes, in making the case for an evolutionary approach to finance market behaviour (the adaptive markets hypothesis): “*The extraordinary degree of competitiveness of global financial markets and the outsize rewards that accrue to the ‘fittest’ traders suggest that Darwinian selection – ‘survival of the richest’, to be precise – is at work in determining the typical profile of the successful trader. After all, unsuccessful traders are eventually eliminated from the population after suffering a certain level of losses.*”

Survival of the fittest in the natural world, and too in the real world of goods and services, becomes survival of the fattest in the finance and capital markets. What is missing from this account, however, is how society benefits from the perpetuation of these fittest traders - the richest and fattest traders. In the real world, fitness is determined by the extent to which entrepreneurs and businesses actually meet peoples’ demands (albeit that these necessarily reflect the riches of consumers). Pure profits are competed away by imitation, innovation and new entrants to the market. The pursuit of wealth in the real world is constrained by the reactions and responses of the market – consumers and users – who judge what is acceptable and what is not, albeit that advertisers and marketers try to persuade consumers to behave and consume in ways and at levels which they otherwise might not.

In the virtual financial world, however, fitness makes no direct reference at all to consumers or society, other than by accident. In short, it is almost perfect ‘natural’ selection – with money wealth the sole determinant of fitness, the more you have the more successful you are. But, it is only almost perfect. Perfect natural selection requires that fitness be replicated and passed on to successive generations. Can these successful traders persist and replicate? If

wealth is the only requirement for persistence, the answer appears to be yes. Unrestrained capitalism, according to this argument, can be expected to mimic natural populations – expanding until the carrying capacity of the environment is exceeded and then collapsing in natural cycles – a Marxian argument, though not in Marxist terms.

Over the long term, the stock market (and its derivatives) have surely to be driven by underlying real economic growth prospects, the so called long-term fundamentals – there is no other long-term driver. However, as Keynes and others have noted, in the short run (which is of indeterminate length, and in which we all live), stock prices are driven by the ‘animal spirits’ of investors. During economic booms, general expectations of future growth are strong, and may well become amplified in stock prices reflecting these expectations about future returns. In so doing, escalation of stock prices themselves become an important attractor of investment funds, and provide additional leverage with which to exploit rising prices on borrowed funds. As and when faith in these optimistic expectations falters, so stock prices begin to decline, which is frequently exacerbated by short-selling, declining leverage and credit recalls. As we have recently witnessed, such crashes can reverberate with serious consequences into the real economy.

## 5.1 Consequences:

The proximate and ultimate causes of the Credit Crunch 2007 – 09 are still being debated<sup>11</sup>. With no implied priority ordering, they include: the growth of massive leverage of debt to assets (of the order of 30/1); rapid securitisation of debts (mortgages); deregulation of finance markets, following powerful lobbying by financial market interests; naive views amongst regulators about the self-regulation and self-correction capacities of liberalised capital markets; sustained low interest rates and easy money, financed and legitimised by large developing country surpluses used to finance developed country deficits and debts through massive capital inflows; opacity of CDOs and related derivatives (described by Warren Buffet as “weapons of mass destruction”); banks’ unwarranted focus on residential & commercial mortgages and speculation, rather than productive investment; misunderstanding of risk and poor corporate governance, especially in the banks; belief in models (when all models are wrong); systemic interactions through ‘machine trading’ on wrong models; poor credit agency performance; consumerism, hedonism, greed, and excessive speculation, coupled with unwarranted and ungoverned bonuses.

Whatever, the world now demands that capital markets are better behaved in the future and that their governments should take urgent steps to ensure that they do. The *Financial Times* (09.03.2009) thundered: “*The great mistake was to rely merely on self-interest in as imperfect and as important a market as the financial sector. The huge profits bankers reaped reinforced their collective blindness to the illusory value of the assets they traded.*” But the same influential paper seems to consider that the only sensible way forward is through international (global) rules: “*As finance grew global, national rules could not prevent some companies from becoming too large for bankruptcy. We have discovered that to close down financial giants we must bail out their creditors or risk a global recession. At the same time, those too large to fail may also be too large for national governments to save, for fiscal and political reasons. Few countries can even afford to rescue truly global institutions. Taxpayers may in any case refuse to meet failed institutions’ liabilities to foreigners. The biggest question raised by the crisis is how to resolve this contradiction. The current mismatch of globalised finance and national governance is unsustainable. Either governance becomes more globalised or finance less globalised*” (FT, 13.04.2009). If these are really the only two options, then the future does not look good. International regulations are difficult to negotiate, and (perhaps) even more difficult to enforce. Less globalised financial markets imply costly,

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<sup>11</sup> See, for example, a brief synopsis at The *Financial Times* web site on The Future of Capitalism.

and probably ineffective (and perhaps even counterproductive) national regulations. In any event, we are likely to see a mixture of responses, with no consensus on the appropriate balance of measures: “Too big to fail sometimes seems too hard to solve” (Fingers in the Dike: what regulators should do now, *Economist*, 11.03.2010).

## 5.2 Implications

The conventional ‘efficient market’ perspective presumes that government (or governance) intervention is needed to cope with market imperfections and failures. Consequently, it tends to focus on regulation of otherwise predominantly self-interested behaviours, which ignore the externality or systemic effects of their own struggles for persistence and wealth accumulation. While the provision of better information and more systematic reporting of financial structures and instruments, according to pre-defined rules, is typically acknowledged by all as being useful and sensible, there is no agreement about the rules. Most suggestions about these raise counter-arguments about conditions in which the proposed rules would lead to counter-productive outcomes. More importantly, suggestions about increasing regulation of banks (and, therefore, other financial intermediaries such as pension funds and insurance companies) typically fall foul of arguments about the supremacy of markets versus regulation and intervention.

The ‘efficient market’ presumption dominates the discussion on both sides of the arguments. Either it is presumed efficient, in which case more regulation is inherently both costly and ineffective, or it is not, in which case it is presumed that the authorities necessarily know better. The arguments are sterile without a common understanding of what the markets actually do and behave, and quickly deteriorate into highly specialized arguments about the details, with no over-arching conception. It is frequently remarked that the ‘devil is in the detail’ – a remark which might equally have been applied to the failed experiment in central planning.

Perhaps, though, the devil is actually in the conception – with life providing the necessarily and inherently messy detail. Considering finance markets as part of an evolutionary system offer some insights missing from the conventional paradigm. Finance markets have evolved to become separate and largely independent of the system of trade and exchange which spawned them. The only remaining connection is the wealth they accumulate from and dissipate to the real economy, and the consequent waves and storms they generate in the real economy. They do not, except indirectly through channeling savings to real (physical and tangible) investment, generate real wealth. They only churn it. As the financial system grows and becomes both global in spatial coverage and near instantaneous in operation over time, it becomes more difficult to control. More importantly, since it attracts both the clever and the innovative, almost any attempt to control or regulate it is more than likely to generate mal-adaptations rather than benign consequences – the law of unintended consequences as a property of complex systems (especially those in which the participants consider themselves intelligent). Whether or not these systems are efficient is really beside the point – they exist, and we cannot do without them, much as our natural environment. If they did not already exist, we would pretty soon invent and discover them. But, like our natural environment, we need to cultivate and civilise them to be useful.

How might we do that? We need to do (at least) two things: first, discourage them from going wild; second, reconnect them with the real world. Going wild, in this context, means chasing market price movements in the hope of making money despite apparent long-run ‘irrationality’ of such price movements. This can only be achieved through relatively rapid transactions and more rapid churn. Part of the volatility of these markets arises from such short-run behaviour, exactly as happens in foreign exchange markets. Tobin (1978) suggested that a way of reducing this short-term speculative herd behaviour is to hobble the exchange of financial assets (originally, currency holdings) by imposing a transactions tax. This tax,

imposed at a marginal level (say 0.1%) on each and every transaction could remove the incentive to chase short-term market movements and encourage speculators to take a longer-term view. In addition, it would raise substantial revenues which could be used to alleviate hunger, assist the poor or act as a fiscal buffer against the counter-cyclical spending needed to avoid finance market generated recessions. However, McCulloch (2010) examines the evidence that such a tax would actually reduce ‘excessive’ volatility and finds it wanting – by reducing the liquidity of the markets, the tax might actually increase volatility. He suggests a more sophisticated tax, an induction<sup>12</sup> or ‘panic’ tax, which “*would tax transactions at a variable rate proportional to the rate of change of the aggregate market price – in contrast to the Tobin Tax’s small fixed rate. Sales and purchases would incur virtually no tax during normal times when the aggregate market movement is very small. But during crashes and booms they would face heavy penalties. Market participants expecting heavy taxation would be discouraged from making these trades thereby lessening the mania or panic.*”

How might finance markets – better, the major participants – be re-connected to the real world? The answer depends on the extent of and reasons for the disconnection. The foregoing arguments suggest that the finance world is virtual rather than real, and only loosely connected with the real world of investment in physical (and human and environmental) capital. Furthermore, the apparently expanding volume of derivatives implies ever more distant relations between the financial assets being traded and their physical counterparts (Figure 2).

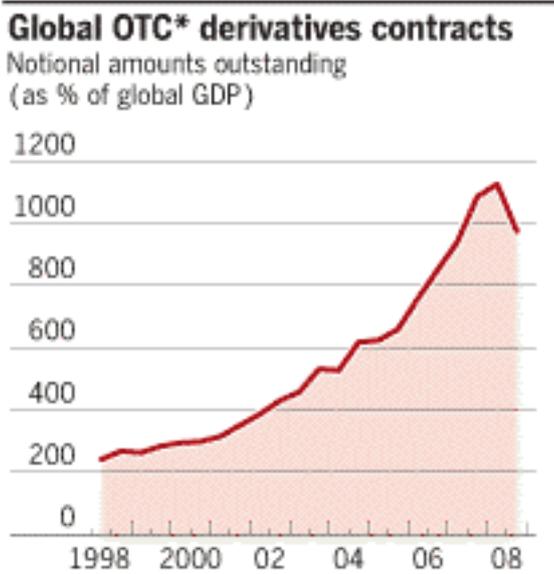


Fig. 2. Disconnect between finance and the ‘real world’?

\* OTC = Over the counter’ (i.e. not traded on a formal exchange). Source: Wolf, M, “This crisis is a moment, but is it a defining one? *Financial Times*, The Future of Capitalism Series, 19.05.2009.

Of course, the wealth generated (and dissipated) in the world’s finance markets does impact on the real world of pensions, insurance premia and sources of loanable funds for real investment, as well as generating substantial tax revenues (in addition to occasionally triggering substantial counter-cyclical fiscal stimuli). Superficially, the disconnect is a reflection of the massive domination of finance markets by exchanges of paper based on existing assets rather than the flow of funds into new investments. Profits (and losses) associated with such exchanges seem hardly to reflect genuinely productive activities. What, exactly, do these markets and their profit (or greed) driven participants actually contribute to

<sup>12</sup> So called because it uses the same principle as the induction coil used to remove undesired high frequencies in electronic circuits with ‘low pass filters’.

human welfare? More secure and stable savings opportunities, more intelligent and productive investments for our collective futures? One avenue worth more thought and analysis might be to adopt the commodity exchange concept of margin calls, where margins are deposited by owners of derivatives based on the relation between the derivative and the underlying physical assets – the weaker the link between the two, the greater the margin necessary.

Of course, these ambitions necessarily rely on judgments about an inherently uncertain future, and are necessarily subject to Knightian uncertainty – for which it is impossible to calculate reliable probabilities or risk assessments. There is no reliable or external algorithm through which appropriate actions can be taken. The only alternative is to make use of a ‘market’ – as an exchange of information and judgments, backed with purchasing power (willingness to pay) – which is what these finance markets do. Poorly though they may seem to perform at times, they are better than anything else we have yet discovered.

More fundamentally, the image of the ‘masters of the universe’ and the ‘greed is good’ philosophy which apparently underlies the workings of the finance markets gives extraordinary credence to the social criticisms and condemnation, not just of capitalism but of the whole foundation of economics as currently taught and practiced. Even conventional economics, at its simplest, argues that the profits earned from the ownership of assets, as opposed to their deployment, are rents accruing to existing assets and, as such, can be taxed for the greater good. As with land (which virtually no one is making anymore), the rent is simply a signal of relative scarcity – the appropriation of returns generated by the rents is, in the limit, irrelevant to the appropriate allocation of the resource (asset). Rents are certainly an appropriate score-card through which a market judges the efficiency of allocation, but the distribution of the returns is a more or less arbitrary consequence of the ownership pattern, and not a reflection of the marginal value product of the asset owner (as opposed to the asset itself). While returns earned on the real worlds of markets for goods and services can, perhaps, be justified as equitable in terms of the values of consumers, this case is difficult, if not impossible to make for returns earned by simply exchanging assets. The latter are likely to be judged inequitable, if not actually immoral by many, hence undermining the social and political legitimacy of both capitalism and the market philosophy.

So, one answer is to tax these ‘ill-gotten’ gains to the hilt – the ‘unearned income’ tax rates should be set substantially higher than earned income rates. Again, however, such an apparently simple answer raises more questions than it solves. Is the pensioner’s income unearned? Is the insurance payout unearned? Is the successful entrepreneur’s or entertainer’s wealth unearned? Are the returns of successful venture capitalists unearned? Furthermore, is the public sector (government) any more legitimate and equitable as a manager and organiser of the wealth than the ‘lucky’ (and perhaps perspicacious) capitalists?<sup>13</sup> Communism had at its heart the expropriation of private wealth for the public good as a core responsibility of the state. We have learned that, at least as it has been practiced by the former Soviet Union, this solution generates at least as many problems as it solves. The state cannot be relied upon to be generally more benign than private wealth, and perhaps no more accountable either.

The suggestion that the financiers are disconnected from the real world flies in the face of the recent announcement by Warren Buffet and the Gates (Bill and Melinda) of their Giving Pledge, encouraging the rich to pledge at least 50% of their wealth to charity.<sup>14</sup> In this, they

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<sup>13</sup> In this context, an interesting comment is provided by Dipankar Gupta, writing in the Indian Times (13.08.2010) about the Gates-Buffett factor. Gupta notes that philanthropy is not at all common amongst the present Indian super-rich, although this was not always so. In the past in India, “donors were assured that their money would be put to good public use. They were confident that corrupt administrators and politicians would not squander away their hard-earned wealth. This comfort factor, so necessary for charity to flourish, is missing in India today.”

<sup>14</sup> See, e.g. “The \$600 billion challenge, Fortune Magazine, 16.06.2010, and the Giving Pledge website. However, the response that this announcement generated has not matched its apparent generosity.

continue a well-established and laudable tradition of a number of past successful capitalists in establishing serious benevolent foundations (e.g. Ford, Rockefeller, Carnegie, Kellogg, Getty, Hewlett etc.). Clearly, at least some of the billionaires who have profited from the capitalist system are well connected with and cognizant of the real world and its major problems and challenges. While their own motives for this philanthropy are probably complex, and necessarily their own affair, their actions speak louder than the words. The effect of this pledge (already massively demonstrated by both Buffett and the Gates Foundation contributions to social benevolence) is to express both the recognition that personal wealth is at least in part a consequence of the socio-economic conditions and happy accident, rather than personal contribution, and also that wealth is not simply (or even) a right under any sustainable human code, but more importantly a major responsibility.

**Proposition 2:** *Capital markets are presently crude and primitive forms of cultural selection. [It is easier for a camel to pass through the eye of a needle etc.] These markets rely solely on the accumulation of money wealth for their selective pressure. As a consequence, they are socially unsustainable without further checks, balances and adaptation. They need governance.*

**Corollary a:** *Charity and/or paternalistic benevolence provides some legitimacy for capitalist riches, failing otherwise demonstrable contribution to social good. Coercion (regulation), however benign and well intentioned, is not sufficient and could well be counter-productive.*

**Corollary b:** *Pure wealth is socially unsustainable as a selection criterion, not only for capitalists, but also for the socio-economic system as a whole. Continual striving and strife for yet more consumption (the foundation of current economic theory) is self-defeating. It matters how we use our wealth, which is more a responsibility than a reward.*

## 6 So what? Implications for Sustainability

Economics is alone amongst the social sciences in purporting to tell a story about how the (socio-economic and political) world works. None of our sister disciplines try to explain how all the social transactions and interactions fit together into a coherent whole. Indeed, most other social sciences consider it madness to even try, and are derisory about those who do, pointing to the stupidly simplistic and quite unrealistic simplifications economists make. Economists have a strong tendency to believe that they are the ‘social physicists’ of social science – there are two sorts of science: physics and stamp collecting (Rutherford’s classic aphorism defining scientism). Our sister social sciences, rightly, repudiate such claims, pointing to the obvious deficiencies and simplicities of the economic picture of the world. Many economists, too, are more than fully aware of our own deficiencies and are seeking to deepen and extend our concepts of transactions, information accumulation and organization, political economy, charitable and not-for-profit activities and so forth. Yet, to date, and following the ‘defeat’ of Marxism, there is no competing paradigm which seeks to explain

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According to the Weekly Standard (09.08.2010), “the comments ran 2-to-1 against Buffett and Gates. The included 36 percent of who readers described the philanthropy plan as “a publicity stunt/dangerous/the work of socialists” and another 26 percent who said the money that Buffett, Gates, and the other billionaires were proposing to spend on charity should be spent in other ways – to pay off the U.S. debt, to help individuals, or reinvested in the creation of new businesses and job opportunities. Any number of readers wrote in to urge Buffett and Gates to remember that they were supposed to be capitalists. As one put it, “For all their vast wealth, these people don’t have a clue about how economies flourish and fail. Don’t give your money away. That’s called putting it in a bottomless pit. Invest it. Create some badly needed jobs by creating something called businesses with that capital.” It seems that whatever the rich do, they will be castigated by at least some of the rest of society.”

and understand our global condition, other than capitalism. The arguments of this paper strongly suggest that this paradigm continues to contain within it the seeds of its own destruction.

Meanwhile the world faces a major crisis – how to ensure that 9bn. people are able to live with reasonable prospects of increasing functional capability (Sen, 1999) in the face of increasing scarcity of natural resources and an increasingly less reliable and less benign climate. We need urgently to develop more sustainable systems. Up to now, our history, as a species, has been one of trial and error – the latest major one being the trial of communism and the discovery of its errors (at least as practiced, if not necessarily in principle). Our history also strongly suggests that humans are only capable of addressing major challenges and of making progress with the assistance of a guiding ideology or worldview. At present, capitalism is our global guiding ideology. Yet it is abundantly clear that this worldview does not command universal respect or admiration, and is even incapable of generating majority acquiescence.

I argue that we need rather urgently to develop and proselytize one, and that capitalism in its present form, and as mostly argued by its most ardent advocates, will not do. What, then, does the alternative look like? Hofstede (e.g. 2001), on the basis of extensive empirical research, proposes that different cultures solve their fundamental social problems of harmonising personal and social ambitions, with their associated attributions and transaction system mixes, in identifiably different ways. Hofstede detects five major axes of cultural difference, where differences can be measured according to the balance particular societies chose along these principal axes. Hofstede's principle axis – the balance between individual and collective ambition and aspiration – is fundamental, since for any society (of whatever form) “positioning itself between these poles is a very basic problem all societies face” (*op cit.*, pxx).<sup>15</sup>

In Harvey, 2008, I argue that we ought to be able to identify the principle *phyla* of our complex socio-economic and political transaction and negotiation systems by considering their real world exhibitions – the social science disciplines which seek to explore and understand them. In the natural world, evolution has generated a distinct and recognizable taxonomy of living systems, as species and genera and phyla. We should expect that social evolution would also generate such a taxonomy. Perhaps we are too closely involved with this taxonomy to recognize it. However, the survival and persistence of the major disciplines of social science strongly suggests that the appropriate taxonomy has already been exhibited in the nature of these disciplines. Of course, the ‘devil is in the detail’ as far as this simple hypothesis is concerned – the disciplines themselves cannot agree even what their own central focus is, other than as more or less meaningless generalities. An alternative perspective, however, is that ‘life is in the detail’, the devil is in the conception. Instead of searching within the current disciplines for the central, guiding pre-occupation of each in terms of specific transactions, perhaps we can identify these major strands by re-considering our history as a species.

In brief outline, the argument is as follows. Capra (1996) notes that biological life ‘minds and responds’ to its environment, in contrast to physical (and chemical) ‘simple’ existence and reaction. Human life, however, goes further. Humans (as Weber noted<sup>16</sup>) not only mind and respond, but also care and reply to their fellows and environments, and generate *consent*

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<sup>15</sup> The other four axes identified by Hofstede are: uncertainty avoidance (the extent to which society tries to control for or guard against the unknown and uncontrollable); power distance (the degree of inequality the society is prepared to accept and expect); male/female (a major emotional dimension of society's accepted practices); long term/short term (the extent to which society accepts delayed gratification of ambitions and is prepared to be patient and wait).

<sup>16</sup> See, e.g. Gerth and Mills, 1946; see, also, Swedberg, 1998

(Anthropology) as a major transaction system as a consequence. Further, we become cognizant, and recognize others as different from self, and relate to these others (including the environment). *Cognition* (as the second major transaction phylum – explored in detail by Psychology) leads naturally to rationalizing and reasoning about others behaviours and seeking to fit better (or fight) with those behaviours, developing *care* into a major transaction system as a consequence, as explored by Sociology. *Contract*, as specialisation and barter trade emerge, rapidly follows as a major transaction type, and Economics is centrally concerned with these transactions. As already outlined above, *coercion* and *convention* are necessarily co-inventions with contract, an exhibit as the disciplines of Law and Political Science. These ‘last’ three major transaction systems dominate the western common hegemony: *contract* – the liberal free trade and exchange systems; *coercion* – the rule of law, and their international institutions; *convention* – the politics, habits and practices of government. However, I argue that these three, on their own, are constitutionally incapable of securing our collective wealth, freedom, security and justice, illustrated in Figure 3 as the harmonisation of self and social (public) interest.

In particular, our social science understandings need to more thoroughly incorporate our arguably more primitive and fundamental transaction systems of cognition, care and consent, which typically manifest most completely in smaller, even closed, societies – i.e. at the local level, as evident in much of the practice of development studies. But, perhaps more importantly, this perspective strongly suggests that we are very far from reaching the ‘end of history’ (Fukuyama, 1992 and 1995). The end of history, in an evolutionary system, is the end of the future as well. There are, I suggest, further transaction systems we need to embrace to cultivate a more sustainable future.

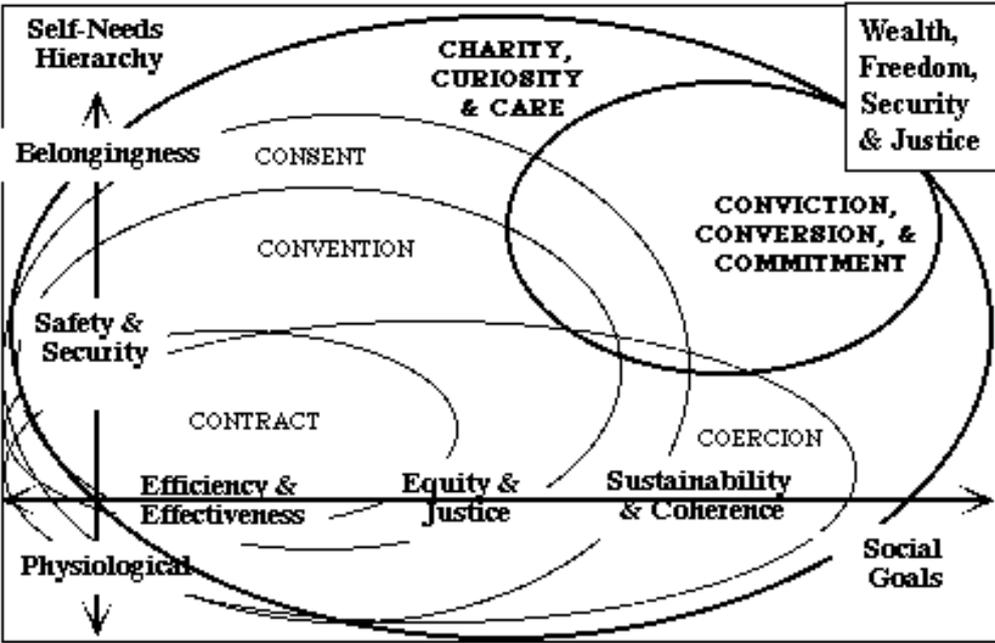


Fig. 3. A schematic representation of social systems

More sensibly, since evolution (as a chaotic system) is inherently unpredictable: what would we like our future to look like? If we can agree on a desirable future, it might be possible to cultivate it. Presumably, one world we are striving to create involves the development of genuine *commitment* to our social governance institutions, which implies not simply research and criticism of existing systems but development of new (or re-invention of old) transaction systems. These are only superficially covered under such maxims as ‘participation’, ‘accountability’ and ‘inclusion’. It requires a conversion of our present stories of the ways in

which the world works to be much more convincing as genuine, coherent and credible accounts of what we are trying to do, and how we come to be in our present condition.

Consider, for instance, an ideal, though dynamic, outcome in which the world's population can become convinced that all is for the best in this best of all possible worlds. In such an idealised state, one can imagine a fully *committed* population, willingly and enthusiastically merging their own self-interests with those of the community in near unanimous harmony - the communist ideal in a nutshell. Obviously, this condition is extremely difficult, if not impossible, to achieve.

However, suppose that we could achieve it. A penultimate phase of institutional evolution then becomes possible, in which a significant fraction of the population engages in creative *imagination* of how things might be even better and more harmonious, and is engaged in continual *re-creation* of the community and its environments, with the full support and commitment of the whole community in these endeavours. Such societies could reasonably be described as being driven by the pursuit of fun and *curiosity* - where imagination and re-creation appear as scholarship or as play. In short, such societies might be characterised as having a common faith in the ultimate benevolence of their communities and in the 'fitness' of their world views, and an associated freedom to doubt (and hence question and seek to change) the rules, rulers and power-bases, in the common belief and trust that such activity will be regarded as perfectly legitimate, respectable and socially benevolent. Note that there will never be unanimous consent that the ultimate has yet been achieved. What we might reasonably aspire to is near-unanimous consent that the principles and practices of the community systems in conjunction with all its associated environments is both capable of moving towards this state of perfect harmony, and that the whole population is committed to this pursuit above all others - in short *careful charity*. We could, perhaps, label such an institution as a sustainable **culture** (or a mirage).

An evolutionary perspective suggests that we need to cultivate and civilise our social transaction and negotiation systems to recognise that the selection criteria are of our own making - we need to make better rules and tools for our livelihoods. This is, primarily, a social science enterprise, yet our social sciences presently seem to be part of the problem rather than the resolution. Even within economics, there are factions arguing about the role of the state, the appropriate ways of representing the world's market systems, and the meaning of the evidence. We are not going to get rid of this, and nor should we, but we do need to be far more constructive than at present in trying to develop a metaphysical story on which we can broadly agree. Following this, we might then have reason to hope that we can indeed cultivate a more sustainable future.

## 7 Conclusions: Transiting from what to what?

The transition between centrally planned and communist inspired socio-economic management and more or less governed capitalist economic systems has produced some traumatic and bizarre outcomes. The social infrastructure embedded in the collectivist organizations has not yet been fully replaced with a welfare state. The 'privatisation' of many former state owned resources and assets has generated a number of oligarchs, especially in Russia and the Ukraine, who appear to the outside world to have been lucky enough (at the least) to capture their wealth without any obvious merit or desert. Although the economic performance of many of the former Soviet countries has improved dramatically since the fall of the wall, there is still good reason for many people to question the practical superiority of the capitalist system in the light of their experience.

While it is obviously important to learn from this transition experience, it is also important to realize that the next transition is still to be made. The communist experiment was supposed to be an alternative socio-economic system to provide for each according to needs

from each according to ability – a benign aspiration, though the devil was clearly in the detail. The details are the myriad of transactions and associated information exchange, which transmit willingness to pay (and hence some sort of value) from consumers to producers, and, in return, indicate some sort of estimate of the real costs of production and delivery back to consumers. The critical questions about who decides how to produce what and for whom are dissipated and democratized through the market. The market itself is, effectively, a massive organic and distributed computer system for organizing production and consumption – capable of evolving apparently without the need for any central guiding hand. It is the people who decide, continually and reflexively. The advantages of the market over central planning are not in dispute, as is being demonstrated in the growth of the Chinese, Indian and Brazilian economies.

But it is not so clear that the capitalist system is actually better-fitted to meet the future challenges facing us. Much of the Marxist critique, though not the Marxist analysis, still has considerable force. It is not difficult to find more or less extreme examples of capitalist stupidity and brutality, immorality and outright exploitation. Even in the better democracies, there are still strong and debilitating examples of alienation and exclusion. Have we really found a better ideology? Many answer: no. In addition, the major challenges facing the world clearly do now need a communal guiding hand – how to price fossil fuels and the natural environment, and how to co-ordinate global efforts to deal with major natural events and disasters, and their consequences. But, what provides the credibility and legitimacy of the guiding principles? Science, alone, is not enough. We need a coherent and believable creed – a second coming. History, however, suggests that we will not recognize such a second coming if it happens, and will conspire to crucify it if it does. The answer has to lie in our own hands. As (agric) cultural economists, we have the capacity to contribute to better answers, which are critical to the further transitions we need to make towards a sustainable future. To do so, we need to change our perspectives, not just our conditions or our tools and rules. Our present rules and rulers are insufficient – the challenge is to find better ones before it is too late. To do so, we need guided experiments – and therefore need a more coherent and sensible story about the way the world works than we currently have.

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# Private and Social Effects of Energy Production from Agricultural Biomass

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**Annotation:** Agricultural biomass used for energy (phytomass) will inevitably compete for land as the demand for food production will steadily increase. Current technologies allow to convert phytomass into energy source in several modes (direct burning, compressed solid fuels, liquid biofuels for combustion, fermentation of phytomass into methane, etc.) This paper is showing on a stylized example what are the potential effects of various bioenergy modes on the economic profitability of producers, on the energy production and also on the consumers spending by using a hypothesize area of one million hectares. These factors, in addition to environmental effects and governmental support are decisive for bioenergy to succeed on the market. The results show that there is a trade-off between economic profits and energy gains; 1% reduction in profit would result in 4.4% increase in net energy gains. Costs for consumers resulting from difference between conventional energy and bioenergy would be nearly 20 bil. CZK in the economic scenario and 5.5 bil. CZK in the most “consumer-friendly” alternative. Production of liquid biofuels from wheat and rape seed seems to be the least efficient alternative among considered as how to use the phytomass.

**Key words:** bioenergy, land allocation, biofuels, production optimization, phytomass.

**JEL classification:** C61, Q12, Q42

## 1 Introduction

Discussion about the increasing role of the energy from renewable sources (RSE) has intensified, particularly in the context of nuclear energy safety and a need to avoid sole dependence on conventional energy sources. Originally increasing the production and consumption of energy from RSE belongs among the so-called New Challenges of the EU<sup>1</sup>. These challenges correspond with the EU long-term objectives up to 2020 to increase the share of renewable sources in the total energy consumption to 20% (for the Czech Republic 13%) of which the share in the consumption of fuel for transport to 10% (EC, 2011). The assumed agricultural area for phytomass production could amount to 977 thousands ha without jeopardising national food security (MoA, 2010). Since there is not potential to increase supply of forest biomass from agricultural land is expected to cover demand for sources raised by energy sector. Solid fuels for co-firing, liquid fuels for engines and biogas for electricity represent potential final products from agricultural phytomass. The effects of energy biomass production on global food security, gasemissions, consumers spending or farmers' incomes are still ambiguous (Alterová, 2011; Gorter et al., 2010; Zah et al., 2007). Potential competition between food and bioenergy on scarce agricultural land with consequences on food prices have been intensively studied by several types of models (for example Walsh, 2003; Johannson and Azar, 2007; Morrow, 2008) including computable partial or general equilibrium models (e. g. McDonald, 2006). Solber et al. (2007) has done an overwhelming review of existing models which incorporated particularly liquid biofuels modules. Among other implications they concluded that prices of traditional agricultural commodities will increase due to energy crops cultivation and that a combination of models is

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<sup>1</sup> Initially targets were set at European Commission's White Paper in 1997, with recent review of progress done by EC, 2011.

best for analysing the complex issue of biomass trade including various biomass resources, bioenergy carriers and regions. However, domestically there are not many tools/models addressing bioenergy production distribution on agricultural land; the exemption is i. e. model Message latter developed also for the Czech Republic.

Enterprise' behavior is primarily driven by economic motivations. Yet it has been proved that following pure economic objectives often results in negative (social) effects<sup>2</sup>. This paper is trying to show by using a stylize modeling example what would be trade-offs between economic and energy "gains" resulting from the fact that prices of bioenergy often do not fully reflect real energy content (due to either market failures or policy distortion). An optimization model (denoted as "Agroenergy") with several production activities is used to determine ideal production structures under certain behavior conditions.

The following chapter 2 describes concept of the research and data sources followed by results discussion. Chapter 4 summarizes main findings and offers few recommendations.

## 2 Materials and Methods

Data used in the model comes from the following sources: Costs survey carried out in the Institute of Agricultural Economics and Information (yields, crop prices), technological parameters from the Research Institute of Agricultural Engineering (energy inputs, outputs, costs of fuel processing), market information from the Czech Statistical Office (consumer price of electricity and of conventional gas, fuel prices). Detailed data can be found in Jelinek et al. (2011).

A static optimization model at sector level is used to asses and identify the trade-offs between energy and economic outputs of different bioenergy production structures. Crop choice is primarily driven by a utility function which can have either economic meaning (profit maximisation, gross margin, consumption spending minimization etc.) or technical meaning (e. g. energy surplus maximization). The model represents sector of bioenergy with nine crops (five energy crops to be processed for co-firing, two crops for fermentation in biogas station (BGS) and the remaining two used as a biofuel source - see the chart 1). These are used for production of three energy modes (production chains and assigned as category "A", "B" and "C"): crop pellets used for co-firing, biogas converted into electricity in BGS and biofuel (bioethanol and methylester) used in combustion engines. These crops "compete" for land and other factors available and so the processing capacities must be utilized properly (land, individual crop requirements<sup>3</sup> and production capacities<sup>4</sup> were set as constraints). Multifunctional usage of single crop is not possible. Total available land was set at one million ha of agricultural land which is considered as a hypothetical area possibly exploited for energy crop cultivation in the Czech Republic. Theoretically, at the end any crop could occupy all available land provided it is not restricted by another limitation. Processing of raw material may be realized either in agriculture or in upstream sector depending on the product characteristics (however, two separate "accountings" are kept – production and processing). The whole framework is characterized in the following figure 1.

The model *Agroenergy* allows to set up either economic, energy or consumers preferences as the objective function. Hence, the model quantifies farmers or processors profit (=difference between total costs and revenues, area payment is considered, energy payment does not apply), energy flow (net energy gain=difference between total energy outputs and

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<sup>2</sup> In this paper the social effects are understood in wider sense: it relates to consumers and their spending on biomass as energy source.

<sup>3</sup> Indeed, some crops from group "A" are perennial but due to a static version "one-step" iteration makes modeling feasible and justifiable.

<sup>4</sup> Since the hypothetical land area (1 mio. hectares) of analysed production capacities were not restricted as the capacity of these plants (except distilleries) is significantly below the production potential of land available.

inputs) and potential costs or benefits for consumers resulting either from higher or lower, respectively bioenergy prices. These costs or benefits can be viewed as shadow prices of producing “clean” energy. Unfavorable effect to consumers is not always the case: negative consumers costs shows that consuming conventional energy is more costly and vice versa. Furthermore, observed difference may not be borne fully by consumers. In some cases as it is for example in biofuel production where higher costs can be compensated by tax released and thus lost for budget, not for consumers. Yet, producing “clean” energy in such a case is economically more costly. Therefore the important step is what kind of conventional product (price to which bioenergy alternative is compared) is considered; a conventional alternative for pellets is price of brown coal without taxes (VAT and consumption tax), for electricity produced in BGS average market price of electricity without taxes was used and for biofuels we considered price of conventional fuels (diesel and gasoline) also without taxes. Since biofuels and conventional fuels differ in their calorific values these were reflected in calculations. Relevant input parameters are given in the table 1 in appendix.

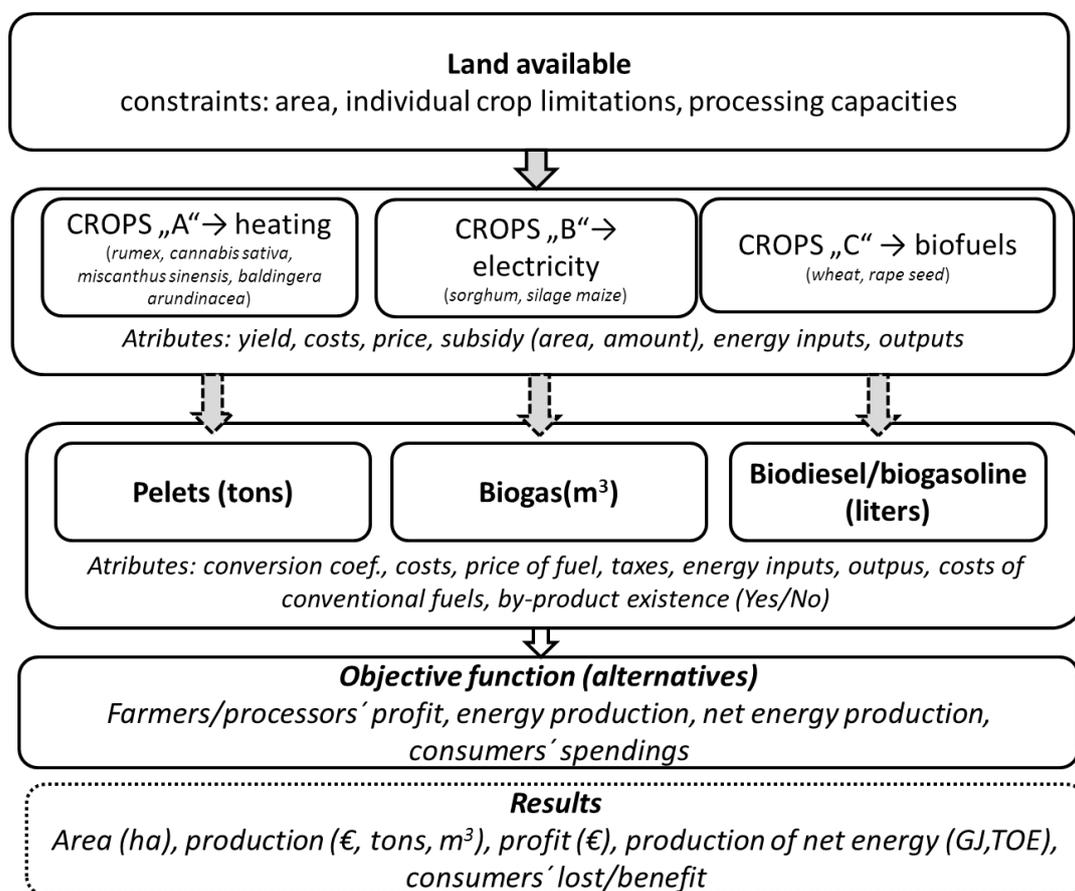
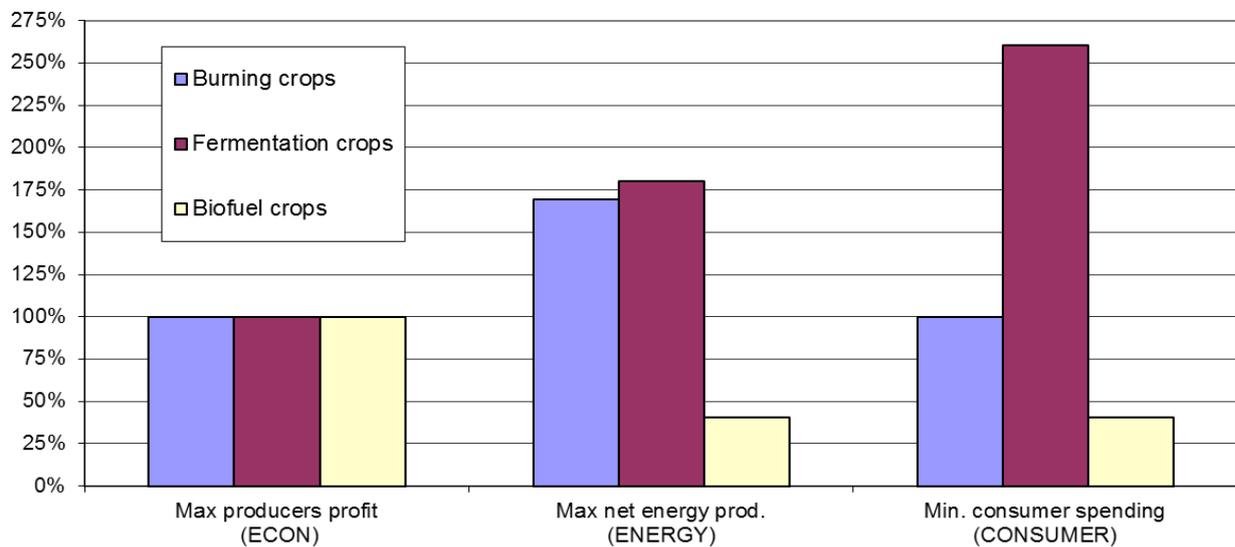


Fig. 1. Concept of the Agroenergy model

### 3 Results and discussions

Three options we looked at: the first one assumes maximizing farmers benefit (here the option is denoted as scenario “ECON”), the second one assumes maximizing net energy gain (denoted as scenario “ENERGY”) and the third one focusing on minimal (economic) impact on consumers (minimizing their spending on bioenergy in relation to conventional, denoted as scenario “CONSUMER”). Total area devoted to energy crops in the model is 28% of currently total utilised agricultural area of the Czech Republic. To illustrate the bioenergy potential such area could produce approximately the biomass representing either

1.2 mio. TOE<sup>5</sup> in liquid biofuels or 6.7 bil. m<sup>3</sup> of biogas (biomethane) or 9 mio. tons of solid fuels like pellets or briquettes. The above stated amount of liquid biofuels could fulfill around 16% of total liquid fuel consumption. Land used for phytomass and converted through fermentation into biogas production could produce around 14.5 ths. GWh of electric energy plus co-generation of heat. That is roughly 5 times more than assumed BPS capacities installed in 2020 (MoA, 2007).



**Graph 1.** Production structure according to different objective functions (producers profit maximization - scenario ECON=100%). *Source: own calculations*

Each alternative produced different outcomes regarding profitability and energy gains and impacts on consumers. As expected scenario maximizing total profit (ECON) is the best economic option particularly for farmers and producers; that would add to both farmers and processors revenues amounting to 49 bio. CZK plus area hectare payment. Worth to mention is that about 2/3 of the profit has been generated by farmers, the rest by processors. This option resulted in maximum area of biofuel crops that would occupy slightly more than half of land available. Crops intended for solid fuels (“burning” crops) and for biogas would account for 25% and 20% of land, respectively. Contrary to that the least private profitable option is that following the highest consumers’ benefits (CONSUMER). Notably, farmers would not be affected in this way, but processors would face the private profit diminishing. This is because of shift from biofuel production which would drop by half in favor of biogas production and that is the only activity that would not impose higher costs on consumers. The reason is lower production costs of electricity produced in biogas stations than is current price of conventional electricity<sup>6</sup>. If profit objective is followed the lowest product energy gain would be achieved; in other words the energy loss is the highest meaning that one hectare would produce slightly more than half of the potential net energy gain that would be otherwise achieved under “maximizing” energy option (ENERGY). Loss of net energy would amount to some 40 GJ per each ha of land considered which corresponds to 1/3 of the average crop energy content. A production mix that maximizes net energy output would consist of the lowest possible share of liquid fuels (25%) and the highest share of crops for solid fuels. That is to say the energy efficiency of producing solid fuels out of energy crops is the highest among the production modes considered. Graph 1 illustrates how structure of three groups of

<sup>5</sup> Tons of oil equivalent.

<sup>6</sup> There is administratively guaranteed price which basically determine consumers impact.

energy crops differs according to objective function (scenarios). Economic maximization has been set as reference option.

In fact, 1% of profit reduction would result in 4.4% increase of net energy gain. The shadow price of abandoning profit maximizing behavior (ECON) in favour of energy optimization would be about 36 CZK/GJ of net energy gain (private profit loss). That would be a case in which policy would like to focus on maximizing energy surpluses from the land allocated; such a policy however would have to be precisely coordinated within national energy strategy and to reshape whole energy mix. In the model the least optimal energy gains display bioethanol and biodiesel which are, however (under modeling assumptions) prioritized by producers and processors due to effects (profit) it would bring about, particularly to the processors. Due to positive energy gains of solid fuels (for burning), production of these crops is the highest (namely at technology limit) in the “ENERGY” option. Contrary to that biofuels production is due to unfavorable energy relation reduced. The option that “seeks” the best results to consumers – minimizing spending (CONSUMER) is characterized by maximum production of crops for biogas (specifically silage maize); in such a case consumers would “safe” up to 72% compared to the profit oriented option (ECON). Analogously, net energy gain would be higher by some 41%. Total profit, net energy, consumers expenditures in a scenarios breakdown are given in the Table A2 in appendix.

The option with the highest allocation of land (550 ths. ha) to producing liquid biofuels (ECON) would cover around 8-9% of domestic total liquid fuel consumption.

Farm price volatility has intensified in recent years, thus the effect on bioenergy sector is relevant not only to policy-makers but mainly to producers (those who bear business risks). Assuming 50% of price increase could clearly result in drop of processors’ profits bringing them into loss (on average up to 2 500 CZK/ha). Close link between agricultural price change and consumers’ spending change is due to significant share of biofuels in production structure. Also consumers’ spending would rise by up to 47% above the level existing before price increase.

## 4 Conclusions

The stylized modeling example clearly showed what are the consequences of bioenergy production on agricultural land. The following conclusions can be drawn from the analysis:

- if “long-term” average commodity prices and the existing conditions on the final energy market would keep up than producers and processors would be capable of generating fairly profit from bioenergy production;
- under existing oil prices private businesses would tend to concentrate on producing crops (wheat and rape seed) to be processed into liquid biofuels which are the least energy efficient;
- however, commodity price fluctuation affects particularly processors of liquid biofuels (already 50% increase in agricultural commodity prices put biofuels processors into loss); given the large investment resources in processing capacities this subsector is highly economically risky;
- there is trade-off between private profitability and net energy gains (results confirmed that following ENERGY scenario could add another 40 GJ/ha of net energy from employed agricultural land); setting either production limits or guaranteed prices to most energy-efficient production modes could be a solution. Obviously, that needs to be addressed within national energy strategy;

- impact on consumers (or state budget) could be tremendous due to higher prices which consumers would have to pay particularly for liquid biofuels whose consumption is currently guaranteed by minimum content required in total consumption; though that does not impose any guarantee for domestic producers.

There is no doubt that future composition of various bioenergy whose sources originate on agricultural land need to be centrally directed within the scope of national energy strategy but also in the context of food markets. Mutual (bioenergy and food production) relations are obvious. In addition to the modeling objectives (production costs and revenues, energy gains and consumers expenditures) it needs to be considered long term stability of the sector as a decisive factor for businesses start-up. Particularly attention needs to be paid to the existing or required additional infrastructure (existence of specific boilers, engines, distribution ways, storage capacities, etc.) and costs of these investments should be borne by private investors and public budgets appropriately. Absence of such infrastructure may easily preclude otherwise profitable and efficient bioenergy technology. That is true vice-versa; huge investment into down-stream infrastructure (demand side) may become sunk if energy sources are limited. Such situation is expected in the Czech Republic in already existing and planned heating plants that shifted from coal to biomass-based resources.

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## Appendix A

**Table A1.** Constraints imposed on the production

	Burning crops	Fermentation crops	Fuel crops
Minimum crop rotation requirements	5% of TAL	10% of TAL	10% of TAL (rape seed), 15% of TAL (winter wheat)
Maximum crop rotation requirements	30% of TAL	No limit, 40% of TAL (maize)	No limit
Calorific values	average 15,4 GJ/ton	average 21,5 GJ/1000 m <sup>3</sup>	26,8 GJ/ton (bioethanol), 37 GJ/ton (biodiesel)
Capacities	Not applied.	Not applied.	425 ths. tons (biodiesel), 292 ths. tons (bioethanol)

*Source: own calculations*

**Table A2.** Results from the optimizing of various decision objectives

<b>Basic module: RSE on one million hectares</b>				
Indicator	units	Sc. ECON	SC. ENERGY	Sc. CONSUMER
<b>Profit total</b>	ths CZK/ha	13.1	11.5	10.9
<b>Net energy gain</b>	GJ/ha	76.5	116.8	107.8
<b>Cost for consumers*</b>	bil CZK	19.9	8.6	5.5
- <b>solid fuels</b>	bil CZK	1.2	2.9	1.2
- <b>biogas</b>	bil CZK	-1.7	-3.0	-4.4
- <b>liquid biofuels</b>	bil CZK	20.4	8.7	8.7
<b>Crops for solid fuels</b>	%	25	40	25
<b>Crops for biogas</b>	%	20	35	50
<b>Crops for liquid f.</b>	%	55	25	25

*\*) Note: Negative figure refers to consumer surplus resulting from lower price of bioenergy.*

*Source: own calculations*



# Economic Consequences of Increased Value Added Tax on Food

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**Annotation:** While there might be effectiveness gains from introducing a single rate value added tax VAT, differentiation of the rates might address well some social equity issues. In the Czech Republic, value added tax has traditionally followed this social perspective, however, in connection to the reduction of the budget deficit and preparation of the pension reform, the value added tax system has been subject to reform. After the initial proposals of unifying both VAT rates to the current standard level of 20%, the government has approved a compromised version, with the single rate of 17.5%. This paper addresses the effects of increased VAT rate for food on the Czech economy. First a simple approach deploying directly own price elasticities is applied and later deeper investigations are made using the Czech national CGE model. Both direct and indirect effects are assessed. The direct effects are associated with the reduced consumer utility and weakened competitiveness of the food industry. The indirect effects reveal further repercussions translated to the sector of agriculture. It is showed that overall economic effects are small, and in terms of GDP positive.

**Key words:** VAT, consumer demand, CGE.

**JEL classification:** D11, D12, Q11

## 1 Introduction

This paper is a contribution to the analysis of impacts of value added tax (VAT) harmonisation to a single rate for all goods and services. The attitudes towards the appropriate level of value added tax and its uniformity have been diverse among economists as well as politicians. Some economists argue that a uniform rate (and particularly for the whole EU) is a superior instrument to maintain a high degree of economic efficiency, to minimise otherwise substantial compliance costs and to smooth the functioning of the internal market, while the others believe and show evidence that carefully designed reductions in VAT rates may improve member state and community welfare (EC 2007). Typically, left-oriented governments do not favour high rates as they impose elevated burden on socially weaker groups of society. In the Czech Republic, value added tax has traditionally followed this social perspective by allowing selected basic goods such as food to be charged with a lower tax rate, mitigating thus the inflationary effects of the VAT. However, in an effort to reduce the budget deficit and seeking for resources to finance the pension reform, the government has proposed to increase the value added tax revenue by abolishing the reduced rate. The initial proposal unifying VAT rates to the current level of 20%, however retained some exemptions for very basic food stuff. After a large criticism of the initial proposals for its inconsistency, excess burdens on consumers and possible threat to some businesses (e.g. publishing) the government has approved a compromised version with the standard level of 17.5% without further exemptions.

The research presented in the paper focuses at the effect of VAT reform on food consumption and consequently on food industry, agriculture and the whole economy. The objective of the paper is to quantify the effect of an increase of VAT charged on food on

various agents of the economy. Following the microeconomic theory, it is expected that the increase of the value added tax will negatively impact food consumption of households through the income and substitution effects. Furthermore, due to the price transmission system, negative effects on the whole agri-food industry are expected.

The paper is structured as follows: in the next chapter, a conceptual framework of the analysis is set up. This conceptual framework is first operationalised in a simple manner by deploying price elasticities obtained from literature (Chapter 2). This approach enables a straightforward assessment of short-term effects on household consumption. With the use of the Czech national CGE model (Křístková, 2010a), broader and also deeper investigations of impacts on the Czech economy are assessed in Chapter 3. Model simulations provide direct and indirect effects of VAT reform. The first effects refer to the loss of consumer utility and reduced domestic demand for food directly translated in the food industry performance. The indirect effects refer to the further transmission of reduced food demand and perhaps reduced household savings in the sector of agriculture and the rest of the economy. Although the CGE analysis provides long term impacts allowing the economic agents to adjust to new circumstances, it is important to understand that the presented analysis is still partial - addressing no benefits of the public debt reduction and pension reforms. The analyses are summarised in the final part of the paper and some conclusions on social implications as well as food industry and agriculture competitiveness are drawn.

## 2 Materials and Methods

### 2.1 Conceptual Framework

The VAT increase effect is conceptualised in Figure 1. Prices and quantities are pictured in relative terms with the current level of consumption and price being 1 (100 per cent). Demand is shown as the down slopping (gray) curve and supply as an upward slopping (black) line. The initial equilibrium is presented by the point I. The immediate effect of VAT increase is transmitted to a higher price which causes an increase in spending for food, represented by the point A. Since the price increase is not compensated by the equivalent increase of income, the consumers will have to adjust their spending for food. The food consumption will drop finally finding a new equilibrium in C with the consumption  $Q_1$  and price  $P_1$ . The resulting increase of tax revenue is illustrated by the grey rectangle.

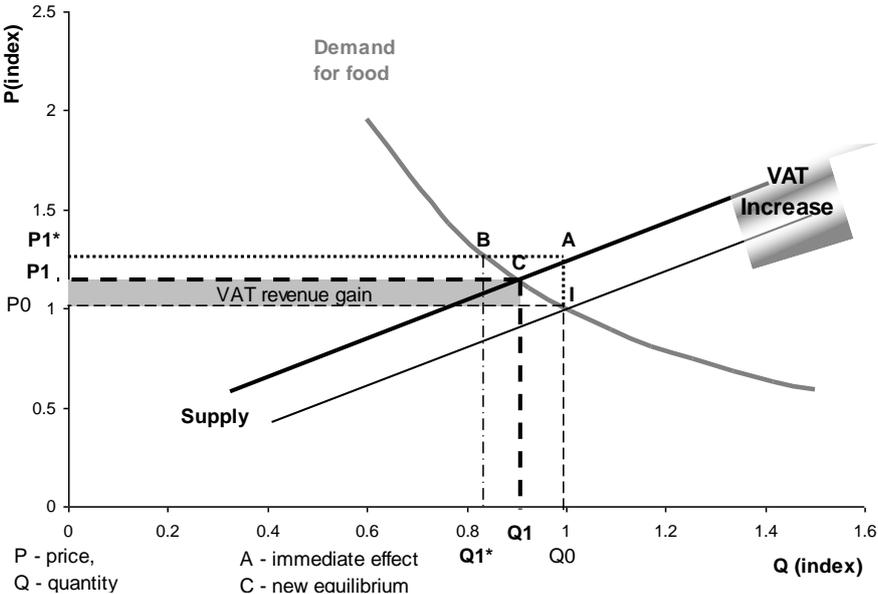


Fig. 1. The effect of VAT change on the demand for food.

The drop in the demanded food quantity will put pressure on the food supplier price; its decline is illustrated in Fig. 2. Note that the above explanation holds if food producers do not find export opportunities. If the export markets can compensate the loss of the domestic demanded quantity then the balance will be represented by point B in Fig. 1 and the actual price level without VAT will stay at P\$0 (Fig. 2).

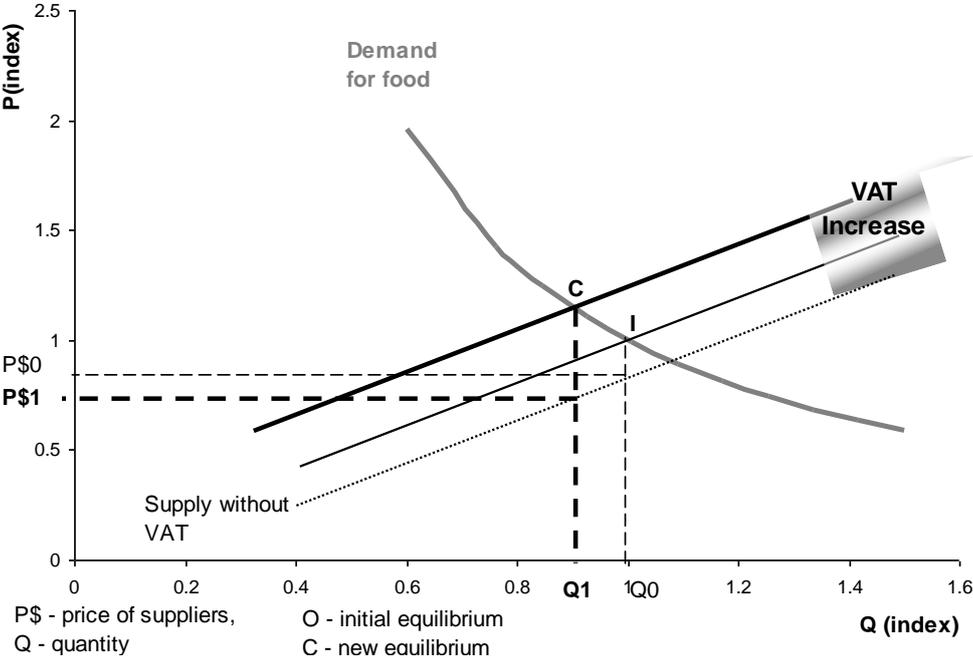


Fig. 2. The effect of the VAT increase on the price of food suppliers

The decline of consumption depends on the characteristics of the demand curve, the equilibrium also on the characteristics of the supply which is in the above illustrations significantly simplified.

This conceptual framework has been implemented in three modes: without taking into account any adjustment in consumption (point A), considering only consumption adjustments (point B) and finally the full implementation of demand and supply responses (point C). The first two approaches have been applied to consumption data from the Household Budget Survey of 2009 (CzSO, 2010a), while the last approach (the CGE model) is built upon the National Accounts for 2006 (CzSO, 2010b).

**2.2 Description of the applied CGE model**

The presented CGE model (CZNATEC) has been developed for the economy of the Czech Republic with a specific focus on the agricultural policy simulations. The national economy is disaggregated into 13 production sectors; of which 8 represent specific agricultural sectors and the other represent the sectors of industry and services (Table 1).

The production side of the economy is modelled following a standard CGE model structure (see Lofgren, 2002). It is assumed, that the total gross production is a fixed factor Leontief combination of intermediate consumption and value added under perfect competition and constant returns to scale, which can be expressed by a nested production structure.

**Table 1.** Production sectors in the CGE model

<i>Land employing sectors</i>		<i>Sectors without land</i>	
<i>Sector</i>	<i>Description</i>	<i>Sector</i>	<i>Description</i>
1	Cereals	9	Forestry and fishing
2	Fruits and vegetables	10	Food industry
3	Oilseeds	11	Other manufacturing
4	Sugar beet	12	R&D
5	Cattle	13	Other services
6	Pigs and poultry		
7	Milk		
8	Other agriculture		

*Source: Krstková, 2010a*

Two groups of production sectors are distinguished in modelling value added: agricultural commodity sectors 1-8 which use land as a production factor and sectors 9-13 deploying only labour and capital. Value added is formed by the combination of labour and capital-land bundle based on a CES (I) production function. For the sectors deploying labour, there is also a second stage, the optimal combination of capital ( $K_i$ ) and land ( $D_i$ ) again represented by a CES (II) production function. In both cases, the depreciation of capital is given as a fixed proportion of the current level of capital stock.

Two households are considered – agricultural households and other households. The standard Stone-Geary Linear Expenditure System (LES) has been chosen for modelling households behaviour. The households' consumption budget is determined by the net value of its income after taxation and transfers, reduced by its savings.

The government maximizes utility modelled by the Cobb-Douglas utility function subject to the disposable budget which is derived from incomes received on basis of tax collections. The closure of the governmental account is arranged by fixing a ratio of governmental consumption to GDP. Governmental savings are thus adjusted to the difference between governmental incomes and expenditures.

Total supply in the market is represented by a composite commodity consisting of the bundle of domestically produced goods supplied to domestic markets and imports. The composite commodity is a result of two simultaneous forces in the model, first the intention of producer to find the most profitable combination of supply between foreign and domestic markets, modelled with a Constant Elasticity of Transformation (CET) function, and the intension of the consumer to find an optimal combination of imported and domestically produced commodity, modelled with a CES Armington function. Two non-domestic institutions are assumed the EU and the Rest of the World (RoW).

The model considers six closure and factor market assumptions: i) supply of labour and land is fixed; capital stock grows at the rate of net investments; ii) capital is fully employed in all sectors, whereas land is employed only in agriculture; iii) labour unemployed is allowed and determined by the Phillips curve; iv) the model follows a standard macroeconomic balance of savings and investment; v) export and import prices are fixed; vi) both foreign sector closures (for the EU and the RoW) assume fixed foreign savings and endogenously adjusting exchange rates.

The dynamisation of the model follows a recursive form with a Tobin's Q investment function, which allocates investments to the sectors according to their ratio of profitability to the user costs. The expected growth rates of the exogenous variables were taken from various

official sources: the prediction of GDP EU is based on the Economic Forecasts of the European Commission (EC 2010); world prices and world GDP are taken from the IMF predictions (IMF, 2010); and the growth rates of the domestic exogenous variables, such as transfers or the GDP deflator, are taken from the Czech Ministry of Finance (MF 2010) (for more details on the dynamic model description see Křístková, 2010 b).

### 3 Results and Discussion

#### 3.1 The simple analysis of the effect on consumer demand

The requirement of the Food industry chamber was to make a quick assessment of the effect of the proposed VAT increase on food consumption early this spring. Due to the short time available, we decided to apply a simplified approach using only own price elasticities. The use of a simple approach was also supported by the fact that the government changed the proposal within the course of the analysis. Not much research has been carried out on consumers demand in the Czech Republic. The early attempts to estimate the demand for food were done by Ratinger (1995) and Janda (1995); the former applied Almost Ideal Demand System (AIDS), the latter the Linear Expenditure System (LES), both models can be found in Deaton and Muellbauer, (1980). The most recent comprehensive study was done by Brosig (1999), (also in Brosig, Ratinger, 1999) who applied Normalised Quadratic Systems of Consumer Demand (Diewert, Wales, 1987). The advantage of this functional form is that all theoretical restrictions can be imposed including the convexity of preferences. The estimated uncompensated own price elasticity for food and beverages is -0.76. For the other two aggregates, we have applied weighted averages of elasticities of goods and services considered by Brosig (1999); resulting elasticities are -0.4 and -1.2 for goods and services with the reduced VAT and goods and services with the standard VAT rate respectively.

**Table 2.** Estimated impacts of VAT reforms on the consumption, CZK per person and year, average household 2009

Položky	Current *) Expenditure	Fixed consumption (A)			Adjusted consumption (B)			
		Unification of VAT rates to 20%			Elasticity	Unification of VAT rates to 20%		
		Expenditure	Annual effect	Monthly effect		Consumption*)	Expenditure	Monthly effect
Food and non-alcoholic beverages	22222	24242	2020	168	-0.76	20687	22567	29
Other goods and services with reduced VAT rates	12314	13433	1119	93	-0.4	11866	12945	53
Food and other goods with reduced VAT rates	34536	37676	3140	262		32553	35512	81
Goods and services with the standard VAT rate	80773	80773			-1.20	80773	80773	
Total expenditure on consumption	115309	118449	3140	262		113326	116285	81

Položky	Current *) Expenditure	Unification of VAT rates to 17.5%			Adjusted consumption (B)			
		Unification of VAT rates to 17.5%			Elasticity	Unification of VAT rates to 17.5%		
		Expenditure	Annual effect	Monthly effect		Consumption*)	Expenditure	Monthly effect
Food and non-alcoholic beverages	22222	23737	1515	126	-0.76	21070	22507	24
Other goods and services with reduced VAT rates	12314	13154	840	70	-0.40	11978	12795	40
Food and other goods with reduced VAT rates	34536	36891	2355	196		33049	35302	64
Goods and services with the standard VAT rate	80773	79090	-1683	-140	-1.20	82792	81067	25
Total expenditure on consumption	115309	115981	672	56		115841	116369	88

Source: own calculation based on Brosig (1999) and the data from the Household Budget Survey (CzSO, 2010a)

The impact analysis with no change of consumed volume (point A in Fig. 1) is showed in the first (left) part of 2 and the adjustment of the consumption to the increased price level is presented in the second (right) part. It is obvious that the estimated overall impact of VAT reform is not critically dramatic in neither scenario.

In the VAT 20% scenario, the impact is about 3% and 1% increase of expenditure in the fixed consumption model and in the model with the consumption adjustment, respectively. However, for food the impacts are more pronounced: in the first model the increase of expenditure will be 9 percent, and when the consumption adjusted (drops by 7) the expenditure for food will increase by 2%. For non-food goods and services with the reduced

VAT rate, the drop of consumption will be less significant (these goods and services include a number of items where the adjustment will be more difficult) and the expenditure increase will stay relatively high (5%); in the fixed consumption model the expenditure increase will be at the same rate as in the case of food.

In the VAT 17.5% scenario, the overall impact of VAT reform will be marginal; an increase of 1 % in expenditure. It is interesting to look at the structure of the impacts. In the fixed consumption model there is still significant increase of expenditure for food, goods and services with reduced VAT rate (incl. food), which will be more or less compensated by the gain from lowering the standard VAT for the rest of goods and services. However, the different story will happen if we consider the adjustment of consumption. The food consumption will decline by 5% and the consumption of the other goods with the reduced VAT will decline by 3%. In contrast, consumption of the goods with the standard VAT rate will increase by 2%.

To conclude, food retailers can expect a decline of sales by 7% (VAT 20%) to 5% (VAT 17.5%) in volume and this can be transmitted to food processors and agriculture.

### 3.2 Using a CGE approach for the assessment of VAT reforms

As pointed out in the introduction, the focus of our research was more on the implication of VAT reforms on production sectors than on the social consequences. The advantage of the CGE approach is that it includes the adjustment of prices (shift to the point C in Fig. 1) and consequently the price changes along the supply chain.

To get the effect of 20% VAT reform, the respective scenario is compared with the Baseline considering the current VAT arrangement, i.e. 20% and 10% VAT rates.

**Table 1.** Long term effects of unifying VAT rate at 20 percent. Relative deviations from Baseline (the 2010 VAT rates)

	2012		2015		2020	
	Household consumption	Consumer price	Household consumption	Consumer price	Household consumption	Consumer price
Food and beverages	-9%	4%	-10%	4%	-10.3%	5%
	Gross output	Producers' prices	Gross output	Producers' prices	Gross output	Producers' prices
Food and beverages	-11%	4%	-12%	5%	-13%	6%
Agriculture	-7%		-8%		-9%	
Cereals	-6%	-3%	-8%	-2%	-9%	-2%
Oilseeds	-8%	-2%	-9%	-2%	-10%	-1%
Beef	-7%	0%	-8%	1%	-8%	1%
Pork and poultry	-11%	6%	-12%	7%	-12%	8%
Milk	-8%	-2%	-10%	0%	-11%	1%
Fruits&Vegetables	-5%	0%	-8%	1%	-8%	2%

*Source: own calculations*

The conducted model simulations (Table 3) show a lower food price increase that in the case of simply rising the price level by the VAT increase (it refers to the point C in Figure 1). However, the food consumption of households declines more than in the previous analysis when the consumption adjustment have been considered likely due to slightly different price elasticities resulting for LES calibration and considering cross price and income effects. Interestingly, the relative decline of food consumption in the effect of the abolishment of the reduced rate of VAT will continue in the longer future. Accordingly, food prices will tend to grow. The model simulations also indicate that domestic food producers will be hit (in relative terms) more than imports; food output will decline by 11% in 2012 and it will rise to

13% in 2020 (relatively to the baseline). Food prices follow more or less the consumer prices. Agricultural output declines by 7% (2012) to 9% (2020). There are differences in the impacts on agricultural commodities. Agricultural producer price changes vary considerably (there are small declines for cereals and oilseeds, almost no effect on milk prices, while a dramatic effect on pork and poultry meat prices). In contrast, the decreases of commodity productions converge in relative terms to about 8 to 12 percent in 2020.

The overall economic effect in terms of GDP is positive, the average annual deviation of the real GDP of the VAT 20% scenario from the baseline is 0.6%. The deviation steadily increases over time reaching 1% in 2020. The model analysis also confirms the slight positive effect of unifying VAT rates on the GDP growth – in the baseline the average annual GDP growth rate is 3.16% while in the 20% VAT scenario it is 3.27.

## 4 Conclusion

The analysis showed that while there will be a slight overall economic benefit of VAT reforms there will be significant losers too. The utility of households will go slightly down, but the most pronounced impact will be faced by food processors and agriculture because the demand for food will inevitably go down by about 7 to 9 percent in the case of the 20% VAT scenario (and by 5% in the case of 17.5% scenario).

Our analysis (B and C) showed there will not be a significant impact on household expenditure (about 1 percent, also because we considered budget constraints) much smaller than it is estimated by Dusek, Jansky, (2011) applying the model with fixed consumption - 3%.

Also using the CGE model we could show that the inflationary effect in the 20% VAT scenario will be on average (over 2012-2020) about 0.5 percentage points, likely even lower if the 17.5% rate is considered, which is in contrast to Fassmann and Ungerman (2011) who estimated it as 1 to 1.2 percentage points.

It has been showed that even in the case of a quick analysis it is worth to consider the elasticity of consumer demand. Obviously, there is a deep gap in the consumer demand research in the Czech Republic, since the most recent comprehensive investigation was carried out in 1999. The important implication thus rests in the need to stimulate research in the area of consumer behaviour and economics. It is urgent in the association of discusses economic reforms and it will be even more urgent if the provision of non market benefits as environment, health, security etc. are to be reformed in the future.

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# The Links Between Indigenous Crop Cultivation and Household Food Security in Kerewan, the Gambia

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**Annotation:** Indigenous crop cultivation has been suggested as a solution to decreasing malnutrition and increase in food security. This study determined whether the cultivation of indigenous crops has a positive impact on food security in Kerewan, The Gambia. Informant interviews and household surveys were used. Interviews explored causes of food insecurity, malnutrition, and constraints to agriculture development and interventions. The survey examined agricultural activities across households as a representation of the entire community. Results showed an increase in exotic crop cultivation and an increase in variety of cultivated crops. The majority of households cultivate crops for consumption; therefore the nutritive value of crops contributes to improvement in nutritional status and food security. Food insecurity is rife across the community due to poor crop production techniques and reliance on rain-fed agriculture.

**Key words:** crop cultivation, malnutrition, food security

**JEL classification:** Q01, Q18

## 1 Introduction

Recently there has been an encouraged return to indigenous crop and vegetable farming in developing countries, due to their nutritive value and low input costs. As agriculture remains the predominant source of food and income for people in The Gambia, it influences the food security status and nutritional status of the people. Though there are other factors influencing nutritional status, this study focuses on the effect of agriculture, and crop cultivation in particular, on nutritional status. As children are most vulnerable to malnutrition, the study proposes to determine the impact of indigenous crop cultivation on the nutritional status of children.

Household food security is a function of many factors ranging from the quality and availability of food to non-food resources, such as infrastructure, market access and basic services (Bouis and Hunt, 1999). The underlying causes of food insecurity and malnutrition are complex and often location specific. In low-income countries, the staple foods are cereals and tubers which are short on essential nutrients; the foods which are rich in nutrients, such as meat, dairy products, fruit and vegetables, are often prohibitively expensive. There is a big dependence on rain-fed subsistence agriculture in the country; two decades of drought, starting in the 1970s, contributed to limited increases in production, despite increased inputs and more land devoted to crops; and an increased dependence on food aid. As a consequence food insecurity amongst the general population is high, contributing to the elevated numbers of malnourished children.

The Gambia, located in West Africa is primarily an agricultural country, with 80% of the population depending on it for food and cash income. The food crops have been primarily cereals while the cash crops were peanuts (also known as groundnuts) and some cotton (Kuye et al., 2006). The area of land under cultivation increased by 30% from 1994 to 2001 (GOTG, 2001), but despite this increase the majority of farmers continue to be small holders with less than 3 hectares of land per farm. The variety of crops grown includes both indigenous and

exotic; though a third of the cultivated land is allocated to the production of groundnuts, an exotic crop which was introduced by colonists (Henning, 1998).

Gari (2004) also acknowledged that indigenous agricultural knowledge and practices are assets which have the potential to empower the rural poor in their struggle to eradicate food insecurity and improve nutrition. The National Research Council (2006) reiterated that there are untapped promise to be found among Africa's traditional food plants, and evidence has shown that many of them thrive in harsh conditions and provide significant nutritional benefits. Another advantage of some indigenous vegetables is that they can be harvested repeatedly because they mature quickly (Weinberger and Msuya, 2004).

However, the obstacles involved in cultivation should be noted. The immediate concern with regard to indigenous crops is the potential loss of knowledge. As Modi et al (2006) demonstrated in their study in a rural location in South Africa, the agricultural knowledge of leafy vegetables is not being transferred from older to younger generations. In addition, quality resources, such as seeds and fertilisers, are not always readily available or affordable to most smallholder farmers.

In The Gambia, the Ministry of Agricultural and Natural Resources has been conducting research into plant genetic materials and results have demonstrated that indigenous material excels in performance and stability. Due to these results the Ministry recommended to farmers to cultivate indigenous crops (Ministry of Agricultural and Natural Resources, 1995). The cowpea is an example of a crop native to The Gambia. An advantage the plant has is that it is highly adaptable and tolerates harsh conditions, high in plant protein and poor soils (McCrae and Paul, 1996).

This study explores the decisions behind the cultivation of indigenous crops by farmers in the village of Kerewan, The Gambia. The study assessed and established whether the decisions were influenced by the nutritive or economic value of the crops and vegetables. Following on from that, the study investigated the impact of the farmers' decisions on the food security levels of the household as well as the nutritional status of their children. The purpose of the investigation is to determine whether the cultivation of indigenous crops causes food insecurity or if the cultivation of indigenous crops and vegetables on the one hand has significant impact on access to local, domestic and international trade. The research was conducted from 19th of February to the 1st of May 2010.

The study was conducted in the Kerewan area - Dasilameh, Ndrammeh Joka, Darufodayea, Munyagen and Kerr Gumbo was hosted by the Agency for Development of Women and Children (ADWAC) established in 1996. The village of Kerewan is located on the North Bank Division of The Gambia and is the administrative headquarters of the division. It is approximately 60 kilometres from the capital Banjul. The area is principally used for farming, settlement and livestock grazing. The primary occupation of adults, and especially of women, in the area and the major source of income for them and their families is agriculture. Kerewan has one of the highest numbers of farmers in The Gambia and it has the biggest area planted by all crops except upland rice (Department of Planning, 2008).

## **1.1 The Gambian Agricultural Sector**

Agriculture has been practiced in The Gambia since recorded history and it is the most important sector in the economy. Historically, it was largely subsistence and based on a system of slash and burn. The clearing of land by massive felling of trees and destruction of virgin forests was a necessary precondition for cultivation; and once the job was done, the clearings were burned (Dunsmore et al., 1976). As a consequence there is little forestry left in the country. Although the farming was on a small-scale, the labour was intensive and manual, as everything from ploughing to weeding to planting was carried out using hand held tools. Very few resources were used in farming. Manure came from ash, dung dropped by cattle,

and domestic garbage that was applied mostly to land growing coarse cereals. It was believed by farmers that slash and burn was good for the crops, that it increased fertility and controlled weed growth. It was soon realised by the farmers that the fertility of the soil diminished after some years of cultivation and so they started to use a system of leaving land lie fallow for about twenty years, to be reclaimed by natural vegetation that regenerated its fertility (Gamble, 1949; Fyhri, 1998). The early farmers also practiced crop rotation and intercropping.

Crop production has mainly been for food and, with a secondary role, cash. The food crops have been primarily cereals while the cash crops were peanuts and some cotton (Kuye et al., 2006). Both indigenous and exotic crops were cultivated, examples of the indigenous included rice, millet and Bambara groundnut. Maize was introduced from the Americas in the nineteenth century, while peanuts were introduced by the Portuguese in the sixteenth century, and became widely cultivated in the country (Henning, 1998; Vermoen, 1994).

In 1924, agriculture became formalised in The Gambia when a department of agriculture was established. Initially exotic species of plants were tried for their suitability to the climate and ecology. As peanuts were known to thrive in the conditions, the colonial government made an effort to increase their production. Reliance on peanut production increased so much in the twentieth century that it took over as the major cash crop of the country (Kuye et al., 2006). In The Gambia today there is a mixed system of farming in place, with traditional and improved methods practiced alongside each other. Farmers are becoming more aware of the importance of fertilisers, pesticides and good quality seeds. Although the area of land being cultivated increased from 193,000 hectares in 1994 to 250,000 hectares in 2001 (a 30% increase) (GOTG, 2001), the majority of farmers continue to be smallholders with less than 3 hectares of land per farm family. With the increase in area of land being cultivated the fallow periods are being reduced resulting in soil degradation. The Gambia has great potential for irrigated agriculture, as fresh water can be attained from the River Gambia, rain water can be harvested, and fossil water can be drilled. The sector offers great potential for value added processing and transformation of all agricultural products, for both the local and international markets.

## **1.2 Crop Farming in The Gambia**

Crop farming predominates in Gambian agriculture, representing about 25% of GDP. The peanut or groundnut is the crop grown for cash; and about 116,000 ha of the cultivated land is allocated to its production (Access Gambia, 2010). It remains the country's main cash crop engaging directly or indirectly over 80% of the population, but since the 1980s there has been a dramatic decrease in exports due to low world prices, inconsistent sector management, and excessive government intervention (Integrated Framework, 2007).

Cotton is the second traditional export crop after peanuts. Cotton farming is concentrated in the eastern part of the country where it has been grown as a backyard crop for years. It is less popular western parts of the country, including Kerewan. A development project – called The Gambia Cotton Project - started the commercialisation of cotton in the 1970s in an effort to diversify the economic earnings of the country and lessen the dependence on peanuts, but the focus is still given to peanuts (Kuye et al., 2006). A radical restructuring of the cotton sector has been proposed due to a 93% drop in production since 1993 (Integrated Framework, 2007).

Maize, millet and sorghum are the cereal crops cultivated for food in the uplands. Rice is the nation's dietary staple and the farming of it is one of the women's roles in Gambian culture. In the Kerewan area it is cultivated in villages closest to the river. The ordinary small-scale rice farmer works the farm with either hand tools or draught animals, with hand tools predominating as they are more affordable for women (Jammeh, 2002; Sarr, 1990).

According to a report by Integrated Framework (2007) cashews appear to be a promising source of export diversification, with export levels having increased significantly in recent years. Traditionally cashews were produced in Guinea-Bissau by Indian traders but with excessive government intervention many have relocated to The Gambia. High-quality cashews, due to a larger nut size, are produced and have more value than those produced in Guinea-Bissau.

Sesame is a new crop introduced by the NGO Catholic Relief Services and promoted by the National Women Farmers Association (NAWFA). It appears well suited to Gambian conditions, world demand is growing, and it directly benefits many women engaged in its cultivation (IF, 2007). Though there is a need for private sector investment, new seed varieties and storage facilities for the industry to thrive.

### **1.3 African Indigenous Crops**

African indigenous crops are vegetables and plants that are native to a region, or crops that have been introduced and are integrated into a region over a period of time. There have been significant shifts in the consumption of indigenous crops over time caused by the introduction of exotic crops by colonists; changes in attitudes of locals towards the crops; and the renewed focus of government and non-governmental organisations towards their cultivation. This chapter demonstrates how a lack of resources such as good quality seeds and extension services are some of the constraints involved in indigenous crop cultivation. In addition, the chapter explores how the consumption of the crops is influenced by their availability and cost at markets. The Gambia is predominantly an agricultural country and examples of indigenous plants which are currently receiving more attention include the Cowpea and Baobab trees.

The consumption of fruit and vegetables in African society has changed significantly since pre-colonial days due to interaction with other cultures, changing dietary habits and attitudes to traditional foods. In more recent times indigenous crops and, in particular, wild leafy vegetables have been viewed as a poor man's diet and as such are more widely consumed by the poor sections of the population (Oniang'o et al., 2003). Research into the improvement of African vegetables has been a low priority due to the lack of awareness of their nutritional value and the notion that traditional vegetables are 'backward'. Research that has been conducted has shown results indicating the nutritional benefit of some indigenous foods, such as Black nightshade which provides good levels of protein, vitamin A and iodine, thereby contributing significantly to the dietary requirements of rural households (Modi et al., 2006). With the use of appropriate cultivation systems, they have the potential to benefit communities through their nutritional content as well as their economic value. The production of indigenous crops is particularly important for small-scale farmers because the production involves little monetary cost and relies strongly on family labour. Indigenous vegetables are also important because they often become more abundant at the time of year when there is a scarcity of food crops (Modi et al., 2006). Another distinct advantage of indigenous vegetables is that they can be harvested repeatedly because they mature quickly, for example leafy crops mature 21 days after planting, while okra can have up to 90 harvests per year (Weinberger and Msuya, 2004).

However, there are limitations to indigenous crop cultivation. The agricultural knowledge regarding indigenous crops and vegetables is under threat as it is not being transferred from the older to the younger generations; Modi et al. (2006) emphasised the importance of educating younger generations. Often the poor availability of quality resources such as seeds and fertilisers act as a hindrance to farmers. In addition, the lack of access to markets, market information and extension services creates a reluctance to diversify farm produce; for fear that new crops might not be a profitable enterprise. Some examples of indigenous plants grown in The Gambia include Cowpea, Baobab and Bambara Groundnut.

There is a variety of crops grown in the Gambia, including millet, groundnuts, sorghum, maize, rice, cassava and cotton. More than a third of the arable land is devoted to millet, with another third to groundnuts (Department of Agriculture, 2001). Groundnuts were introduced into the country by colonists as a cash crop and they have become an important source of protein, as will be explained later in this chapter.

According to the National Women's Farmers Association (NAWFA, 2009) small-scale vegetable production in The Gambia is predominantly dominated by women farmers. The association believe the potential for the horticultural society to support a sustainable economy for the country is vast despite the constraints affecting the sector (NAWFA, 2009). The constraints include poor soil and seed quality as well as inadequate use of fertiliser.

#### **1.4 The Causes of Food Insecurity**

The food security of an individual influences their ability to live from day-to-day. In order to meet their dietary needs and to lead an active and healthy life, they require access to safe, nutritious food in sufficient quantities. Access can be hindered by a number of factors including poverty and the environment; agricultural practices and lack of technology; as well as national and international policies and their effect on trade opportunities. Food insecurity is complex and can be described as chronic or transitory; the former is associated with continuing problems of poverty while the latter describes periods of increased pressure caused by an abnormality i.e. a natural disaster. Food insecurity is evident at the micro level – the individual or household level – or the macro level – national level. The strategies used to address food insecurity depend on the type being experienced and the level at which it is present. In developing countries food insecurity is predominantly a rural phenomenon. In The Gambia where agriculture is practiced by the majority of rural inhabitants, there is a focus on the introduction of improved seed varieties, soil fertility conservation, effective water management techniques and processing and preservation technologies.

Food security is a broad and challenging idea, encompassing issues related to the nature, quality, and security of the food supply as well as issues of food access. The underlying causes of food insecurity and malnutrition are intricate and often location specific. It may be related to natural disaster such as drought or crop failure, civil conflict, a diminishing resource base or limited access to productive resources (Ruel *et al.*, 1999; Chung *et al.*, 1997); but as Devereux and Maxwell (2001) highlighted food insecurity may be triggered by these stresses but long term economic factors such as market failures and poverty, political instability and institutional weakness also play a large role. A lack of access to nutritious food is not the only cause of food insecurity, and in order to address and eradicate it the many factors which contribute to its manifestation must be taken into consideration. According to Bouis and Hunt (1999) the nutritional well-being of people is influenced by the availability of non-food resources such as infrastructure, access to markets, and basic services such as clean water. Food security is a function of many factors that enable individuals to access nutritionally adequate and safe food in appropriate ways, including employment, education and community variables, such as community-based organisations (Riley and Moock, 1995). Many rural areas in developing countries do not have good roads and the residents do not have access to markets outside of their own villages, limiting the variety of nutritious food they can acquire and leading to food insecurity.

The food security of an individual has a big impact on how they survive on a daily basis; a lack of access to nutritious food affects their ability to carry out everyday activities including generating an income. When individuals are nutritionally compromised, they are not able to perform to their optimum level and a cycle of malnutrition and underperformance compromises their health. As a consequence, they are less economically productive in own-farm production and the labour market. The nutritional status of an individual is heavily influenced by the quality and quantity of nutrients they garner from their daily intake of food.

Foods that contain sufficient proteins and vitamins are often too expensive for poor people to purchase; thus they do not consume adequate amounts of these nutrients or have a balanced diet making them more vulnerable to malnutrition. It should also be noted that it does not affect people in communities, or even in the same household, in a similar fashion, with age, gender, and culture creating vulnerabilities.

Phillips and Taylor (1990) distinguished between two levels of food security – micro and macro – with the former describing the individual or household level, and the latter the national level. If an individual can afford and has access to a diet that is adequate to sustain an active and healthy working life, they are considered to be food secure; this is the micro-level. A similar definition holds true for the macro or national level, though at this level the subject is a nation and not an individual or household. Food security at the national level is best described by Thomson and Metz (1997) as a satisfactory balance between food demand and food supply at reasonable prices. This definition may appear to be vague, but it is intended to illustrate a situation where there have been no major disruptions in food markets in the recent past, where ample food is available and where most of the population have access to food (Thomson and Metz, 1997).

According to Sankareh and Cham (2010), The Gambia is not food self-sufficient and relies heavily on imports; this puts it at risk of macro and micro food insecurity. Kennedy and Haddad (1992) point out in their research that an increase in food production or supply at the national level may not necessarily result in an improvement in food security at the micro-level unless consumers can be assured of access to it. Thus it is clear that food security at one level does not imply food security at a lower level of aggregation. A country may be food secure at the national level, but have a considerable number of food insecure households, which will require Sectoral or targeted policy initiatives. Similarly, food security at the household level does not imply that all members of the household are food secure. Oniang'o *et al.* (2003) also noted the varying levels of food security within the one household.

## **1.5 Strategies addressing Food Insecurity**

When developing an appropriate strategy for enhancing food security, the nature and level of the food insecurity problems are identified, and the interaction between the different levels of food security is noted in order to devise an effective response. In an effort to combat food insecurity, a wide range of strategies have been implemented by governments and NGOs, including the diversification of crops, the promotion of home and community gardening, and the use of nutritional education. In addition, the role of women in agriculture and the nutritional status of the household has been recognised, thus there is more focus on women-centred projects (Smith *et al.*, 2003).

Poverty and food insecurity are predominantly a rural phenomenon, and for rural families agriculture continues to be their main source of income. Thus in developing countries, where agriculture is still heavily relied upon, and a growth in the sector is the keystone for overall economic expansion, strategies must be agriculturally focused. According to Garí (2002) agricultural diversification represents a key strategy to combat the food insecurity impact. Diversifying crops and adding new crops to the land ensure the provision of a wide range of food types and therefore a more nutritionally balanced diet. Crop diversification also allows for diffusing labour loads through time and assures the household of some crop yield in a drought situation. Garí (2002) believes that agro-biodiversity strategies must maximise the local food resources, diversify diets, improve micronutrient intake and support the roles of women in household nutrition.

The Gambia, extension efforts are focused towards more impact oriented strategies in attaining food security and thus alleviating poverty, which corresponds to the Vision 2020 agricultural objectives and the pivotal role of the crop sub-sector in the economic

development of the country. Nutritional status and the woman's role in the household are heavily interlinked, and it has been found that households are more food secure due to the presence of an income-earning woman, and according to Quisumbing *et al.*, (1995) income in the hands of women contributes more to the household food security.

## **1.6 Agricultural Practices and Technology**

Nyariki and Wiggins (1997) posits that the availability of resources such as land and labour plays an important role in food production in developing countries, such as The Gambia. An over reliance on rain fed agriculture, due to the frequency of drought, can be viewed as a major contributor to food insecurity (Alila and Atieno, 2006). When land is limiting, the labour resources of a household determine the income to be earned from employment to access food. The adoption of a particular technology will be influenced by the specific costs and benefits it offers, the needs and aspirations of the adopters, and the nature of the economic, political and social system into which technology is introduced (Jaeger and Humphreys, 1988; Spencer, 1995). In the last few years there have been sharp increases in agricultural commodity prices (FAO, 2008). There is increasing evidence of the shrinking of area under food grain due to the increase in land being given over to the production of biofuels. As Msangi reported in 2007, higher food prices, subsidies for biofuels, and environmental degradation will all be felt disproportionately by the developing world. Given the potential scale of the biofuel market, the question of implications on the food security of the poor requires immediate attention.

Markets are places where food can be accessed, but also act as a facility to sell produce – both food and non-food – in order to generate income. As Iram and Butt (2004) highlighted income as an important determinant of calorie intake, and higher income level groups can purchase more appropriately required nutritious food compared to low-income groups. The types, quantities, and quality of food accessed in markets will depend on the nature of the market, which is influenced by the infrastructure in place. Poor marketing facilities and institutions are some of the constraints to increased agricultural production. Often, it is the high transportation costs due to dilapidated roads, improper handling of produce, poor storage facilities and wastage, which are the major limitations. As a result there are fluctuations in both productions and incomes of farmers (Alila and Atieno, 2006). Opportunities to create trade are constantly being sought by farmers in order to alleviate poverty and food insecurity.

One such example is evident in The Gambia, where a promising prospect for generating foreign exchange earnings is horticulture. As long as the industry is given adequate support it has the potential to make a major contribution to the development of the agricultural sector as a whole and consequently help to meet the national needs of reducing poverty, increasing income, and improving household food security. In addition, it can directly support the development of the poorest and most vulnerable groups in Gambian society, particularly poor women farmers and producer associations like NAWFA (National Women Farmers' Association) can serve as an important outlet providing a guaranteed and fair price market for the women's produce and taking the risk off the women producers (NAWFA, 2009).

## **2 Methodology**

The methodology includes both quantitative and qualitative techniques. Both methods have different characteristics and Kumar (1999) posits that the two methods are distinguished by three criteria: the purpose of the study, how the variables are measured, and how the information is analysed. As one of the primary objectives in this study was to assess the impact of indigenous crop cultivation on the nutritional status of children; therefore qualitative techniques including informant interviews were employed to determine the impact as neither of the method is able to provide a satisfactory approach to the investigation (Ellis

1998). A mixture of convenience (Bryman, 2008) and criterion (Miles and Huberman, 1994) sampling techniques were employed in the study. The questionnaires were analysed using SPSS version 18.

### **3 Results and Discussion**

In this study, 58 female caretakers were chosen to partake in the surveys. The respondents live in five different villages in the Dasilami eco-zone in the North Bank West Region in The Gambia. The women ranged in age from 15 to 80 years, with the average age being 33 years. The husbands of the women interviewed ranged in age from 26 to 90 years of age, with the average age being 45 years. The average number of members per household in the survey was 11, with the largest household containing 32 people and the smallest 3 people. Household members included parents and children, grandparents, second and third wives, aunts, uncles and cousins. The sizeable households can be attributed to the practice of polygamy in the study area, with some men having several wives and up to twelve children. In addition, there is a tradition of having extended families residing in the same house. The average number of children in a household was 4, with 15 being the largest and zero being the smallest. Large numbers of household members contribute to food insecurity as there is increased pressure, with food needing to be divided up into many portions. The pressure is more acute in households with high numbers of children as they don't contribute to the household income.

#### **3.1 Crops Cultivated in Research Area**

This study compiled the list of the most commonly eaten foods, one or two members of selected households were asked to highlight which of the foods have been consumed in the household in a specified time period. Field-testing indicates that a diverse diet is a valid welfare outcome in its own right.

The number of crops cultivated by households surveyed ranged from 2 to 13, with the mean number being 4.78. As the standard deviation was high, it was more appropriate to use the mode, thus the most common number of crops cultivated in each household was 3. This low number can be attributed to the small farm acreage owned and cultivated by farmers; the bulk of smallholders in The Gambia own less than three hectares of land (GOTG, 2001). Also it is possible that farmers couldn't afford to invest in a wider variety of crops and stuck to the traditional crops for fear of a new crop failing.

The majority of the people surveyed cultivated indigenous crops, and the minority who answered no to whether they do, do not partake in any cultivation. Seventy-two percent of the crops cultivated were indigenous and 28% exotic. The crops that were cultivated by the majority of the respondents included millet, groundnut and maize. Millet and groundnut were the most popular crops cultivated, with 86% of respondents cultivating them. Groundnut was the main cash crop and a high proportion of producers who cultivated it do so in order to make an income. In addition it is suited to the soil in the study area. Millet and maize were widely cultivated as they were staples in the diet of respondents; 98% of the millet and 100% of the maize that was cultivated was also consumed. It is traditional for women to cultivate rice and it is done so in villages close to the river.

Onions were a relatively new in the study area, it has been found to be highly suited to the soil and to be profitable as the yields are high. Tomatoes were also new and have integrated well and were popular for trading purposes. Vegetables such as bitter tomato, eggplant, hot pepper and sorrel were cultivated because of the taste preference of the people in the community, while vegetables such as cabbage, lettuce and cassava were popular for trading purposes. Sesame was being promoted by the National Women Farmers Association (NAWFA) as it is suited to Gambian weather and soil conditions. Findo and sorghum were not popular in Kerewan though they were in other parts of The Gambia, this may be due to

their suitability to the soil. Though mint is popular to add to drinking tea, not many people in the study area cultivated it. Crops that were not cultivated by any of the respondents included sweet potatoes, mangoes and oranges. This was because sweet potatoes and oranges were not popular in the research area and mangoes grow wild so anyone can pick them and sell or consume them.

**Table 1.** Crops in Order of Most to Least Cultivated

<b>Crops</b>	<b># of respondents</b>	<b>% of respondents</b>
Millet	50	86
Groundnut	50	86
Maize	36	62
Onion	17	29
Okra	15	26
Rice	13	22
Bitter Tomato	11	19
Eggplant	11	19
Sesame	10	17
Sorrel	9	15.5
Hot Pepper	9	15.5
Tomatoes	8	14
Cabbage	8	14
Beans	7	12
Lettuce	5	9
Cassava	4	7
Watermelon	3	5
Pumpkin	3	5
Findo	3	5
Sorghum	2	3
Banana	1	2
Mint	1	2
Carrots	1	2
Sweet Potato	0	0
Mango	0	0
Orange	0	0

Vegetables were most often cultivated on a small scale in backyard gardens but some villages use backyard gardens more than others, for example they were not widespread in Ndrammeh Joka. It should be noted that though there was a wide range of crops cultivated by households (23), the majority of households did not cultivate a wide range, with three being the most common number of crops cultivated.

The mean weighted coping strategy figure was slightly lower for those who cultivated a majority of indigenous crops and slightly higher for those who cultivated a majority of exotic crops than the overall mean, indicating that more severe strategies were adopted by households that cultivated predominantly exotic crops.

### **3.2 Consumption and Trading of Crops**

The surveyed population mainly produced crops for home consumption and sold surplus produce locally. The results showed that 68.45% of households consumed the crops they cultivated. The decisions to grow specific crops were influenced by the economic value of the crops at the local *lumo* (market) as well as the availability of inputs and traditions. Table 2 shows the breakdown of the crops into percentages of consumed, consumed and traded, and traded.

**Table 2.** Breakdown of Crops Consumed, Consumed and Traded, or Traded

<b>Crop</b>	<b>Consumed (%)</b>	<b>Consumed &amp; Traded (%)</b>	<b>Traded (%)</b>
Millet	92	6	2
Groundnut	22	76	2
Maize	97	3	0
Onion	12	88	0
Okra	73	27	0
Rice	69.2	30.8	0
Bitter Tomato	82	18	0
Eggplant	91	9	0
Sesame	90	10	0
Sorrel	55	45	0
Hot Pepper	78	22	0
Tomatoes	62.5	37.5	0
Cabbage	50	50	0
Beans	86	14	0
Lettuce	60	40	0
Cassava	0	100	0
Watermelon	100	0	0
Pumpkin	100	0	0
Findo	100	0	0
Sorghum	100	0	0
Banana	100	0	0
Mint	0	100	0
Carrots	0	100	0
Sweet Potato	0	0	0
Mango	0	0	0
Orange	0	0	0

The results showed that a high percentage of each crop was solely consumed in the household, which was to be expected as production levels were low. There were exceptions which include groundnuts, onions, cassava, mint and carrots. Seventy-six percent of households consumed and traded groundnuts, which can be explained by its primary function as a cash crop. It was also popular in cooking. As groundnuts have high protein content (20%) and also contains carbohydrates, it is considered a complete food; its popularity and high consumption levels could be a reason for a reduction in malnutrition. The results found that 88% of households consumed and traded onions. Onions were introduced into the study area less than ten years ago, according to respondent 8:

*'If you go back to 3 years ago or 5 years ago, they were not doing it. A few people started and they were successful and now you have a large number of people (cultivating onions).'*  
(R8)

Cassava, mint and carrots were not very popular crops in the research area, with 7%, 2% and 2% of households cultivating them, respectively. The small number of households that did cultivate them had surplus produce and they are in a position to trade them for profit. 2% of households traded millet and groundnuts solely. Men in the research area focus their attention on cultivating cash crops such as groundnuts and, occasionally, rice. Women produced the majority of the food in the household for consumption purposes. As they were also charged with carrying out household chores they only had time to cultivate small quantities, therefore a high percentage of the crops and vegetables grown in the research area were for consumption purposes only. In addition, the farmers had small amounts of land,

which meant their production levels were low and produce surplus to what was required for consumption was also low. Crops that were popular for trading purposes include groundnuts, onions, sorrel, tomatoes, cabbage, lettuce, cassava, mint and carrots. The households that cultivated these crops may have had surplus produce due to good yields, increased inputs or increased popularity of crops at the market.

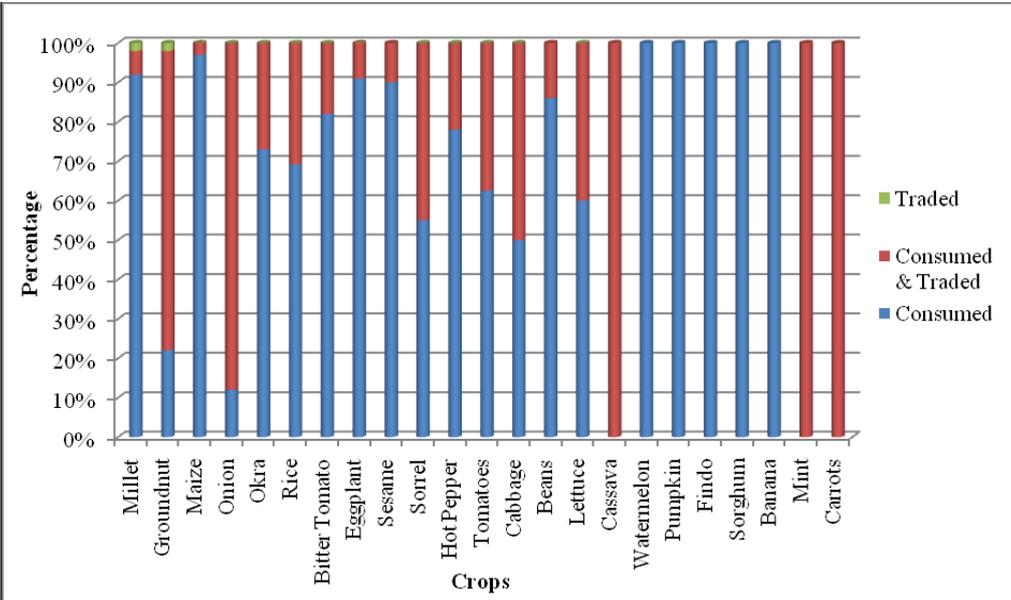


Fig. 1. Breakdown of Crops Consumed, Consumed and Traded, or Traded

### 3.3 Constraints Associated with Crop Cultivation

The informant interviewees highlighted constraints such as over-dependence on a single annual rainy season and poor soil conditions. In addition the lack of and expense of inputs were illustrated. A civil servant with extensive experience in farming, respondent 5, stated that the most expensive things with regard to production were fencing and water. The need for fencing in order to keep animals from trampling on and destroying crops was mentioned in reference to the school vegetable gardens as well. Quality fencing can be expensive and repairs must be carried out regularly. Some interviewees' comments referring to fencing included:

*'Animals come in and out, and tamper with the crops.'* (R2)

*'It requires constant repair, every week I go I have to repair something. These days' people used barbed wire which goes around the fence but animals were getting through.'* (R5)

The problem with water was about access. The wells present in villages were communal and were sometimes not conveniently located for farmers. In some cases villages were very dry, in particular those located further from the river. For larger farmers there was the added expense of pumps which required fuel. Comments regarding water problems included:

*'...growth is not good as the wells are not deep and you don't have enough water to water your garden. Places like Cheesay Majow (village north of Darsilami) whereby you can dig a well for 30 metres and the place is dusty, dirty.'* (R6)

*'I have a well too and a pumping machine which uses either fuel or diesel and this is very expensive. And that one is expensive and the building of the structure was very expensive.'* (R5)

The decrease in production is also attributed to environmental factors such as a depletion of nutrients from the soil, erratic rainfall patterns and salt intrusion into the soil, as well as non-environmental factors – lack of fertiliser and machinery.

## 4 Conclusions

The level of food insecurity among the respondents attributed to a reduction in crop production is due to lack of inputs, an unpredictable climate and poor soil quality. These reasons also contributed to people primarily cultivating crops on a small scale and for consumption purposes only. A number of exotic crops, such as tomatoes and onions, were successfully introduced into the study area in the past decade and they have become so integrated into the culture. The majority of crops and vegetables cultivated in the study area are indigenous. The reason for high indigenous crops cultivation is based on the prevailing gender traditions. For example, women are expected to provide the vegetables for the family; the trend is influenced by the economic value of the crop at the local market and the crop suitability to the environment. In other words, farmers did not have the luxury to choose crops or vegetables; they had to submit to the environmental conditions and traditions in order to provide food for their families.

With a growing world population, and sharp increases in agricultural commodity prices in recent years, there is an ever present concern for the food security of millions of people, particularly in developing countries. The insecurity is a consequence of many other factors, including poverty, poor infrastructure, insufficient funds for technology, and inadequate access to markets. All these elements create an inability to generate an income, which in turn restricts the purchase and consumption of adequate amounts of nutritious food. When an individual is unable to work to their full potential, their income is reduced, making it more difficult to purchase nutrient-rich foods, leading to food insecurity. Combating food and nutritional insecurity requires programmes which have multi-sectoral approaches, and take into account the social, economical, cultural, and ecological constraints at the local level. For an effective response there needs to be an investment in social enterprises such as the promotion of sustainable farming practices which utilise local resources.

The cultivation of indigenous crops has a positive impact on local farmers. Planting materials are readily available at no cost when compared with improved varieties that requires both expensive pre and post cultural practices to maturity. But as the constraints involved in farming are increasing both at the traditional practices and modernised methods, food insecurity remain prevalent rural farmers within the communities surveyed, regardless of whether indigenous crops are being cultivated or not.

There should be an increase of storage facilities made available to farmers. These can help overcome food shortages during the rainy season and also give farmers the opportunity to earn money by selling their produce at higher prices. The cultivation of a wider variety of crops that have varying harvesting times should be encouraged. This helps to safeguard against crop failure and unpredictable rainfall while rain water harvesting should be promoted in order to improve water supply to farmers, particularly in villages further away from the river. Inputs such as fertilisers and machinery should be made more accessible to small holder farmers in order for them to increase their productivity. In addition extension services should be improved in the study area.

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# The Effect of Issuer Optimism on IPO Pricing and Performance

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**Annotation:** Based on a textual analysis of IPO prospectuses, we obtain a number of important findings regarding the relation between issuer optimism, IPO pricing and subsequent operating performance. We find that greater prospectus optimism is significantly related to both offer price revision and underpricing. We further discover that prospectus optimism is warranted as proven by the firm's post-IPO operating performance. Specifically, we find that optimism is positively related to the firm's operating performance for the first two to three years following the IPO. We conclude that prospectus optimism contains useful information about IPO pricing and performance, even after controlling for the average level of issuer optimism prevailing prior to issuance as well as various firm and issue characteristics.

**Keywords:** Initial public offering (IPO), prospectus, soft information, issuer optimism, underpricing, offer price revision, operating performance

**JEL classification:** G12, G14, G24

## 1 Introduction

Investor sentiment and the extent to which the market is “hot” are popular issues in the initial public offering (IPO) literature (Ritter, 1984, 1991; Helwege and Liang, 2004; Derrien, 2005; Cornelli, Goldreich, and Ljungqvist, 2006; Ljungqvist, Nanda, and Singh, 2006). Much less work, however, has been done on the sentiment and optimism of issuers as it relates to IPOs. The extent to which management is confident about the success of its issue and the implications that such beliefs have on IPO pricing have been largely ignored in the literature. Rather, the literature emphasizes the demand for IPOs, with a focus on investor or market sentiment. This study addresses that limitation by examining issuer sentiment, specifically the optimism that issuers exhibit in the prospectus. Such an analysis will provide a more complete understanding of the role that behavioral considerations play in IPO pricing and complement existing studies of demand sentiment on IPO pricing and performance behavior.

To measure issuer optimism, we analyze the text contained in issuer prepared prospectuses. The prospectus is a critically important document during the IPO process. Issuers use prospectuses to communicate with potential investors about their firm's value. While the accounting numbers in IPO prospectuses are closely studied by investors, analysts, and others involved in the equity issuance process, the examination of textual or soft information in prospectuses is less common. This might be due to the difficulties in processing and interpreting this data. Academic studies are likewise sparse, largely limited to recent studies by Hanley and Hoberg (2010) and Arnold, Fishe and North (2010). The soft data contained in an IPO's prospectus can convey insights and potentially valuable information that is absent from traditional quantitative projections and measures. Soft information can offer context to financial numbers and share values, provide insight into managerial expectations, and identify important qualifiers or caveats that are absent from purely numerical data. Soft information can also complement or complete the quantitative analysis provided in the prospectus.

Issuers face conflicting incentives with respect to the degree of optimism they elect to demonstrate in their prospectuses. The degree of issuer optimism should be determined by the issuer's belief regarding the firm's future performance. But in the hope of decreasing the amount of “money left on the table,” an issuer has the incentive to be overly optimistic about

a firm's prospects. This optimism can reduce investors' concern regarding share value and consequently the amount of underpricing required. Because of their legal responsibility to issue a truthful prospectus, however, issuers will have an incentive to limit their optimism and provide a credible assessment of the firm's prospects. This implies that more underpricing might be necessary to ensure ultimate issue success.

Consequently, we pose as the central research question in this study the extent to which issuer optimism affects IPO pricing. If issuer optimism as revealed in a prospectus contains credible information for investors, then greater issuer optimism should result in more favorable pricing for issuers. Such a result has two implications. First, a higher level of issuer optimism should be related to greater offer price revision since offer price revision responds to the level of investor demand during the pre-issuance period, and greater issuer optimism should enhance investor demand. Second, increased issuer optimism should be related to less underpricing since it is likely to reduce uncertainty about firm value and increase investor demand. With greater demand for the offering, issuers will have less need to underprice to ensure a successful offering.

We determine that optimism contains useful information about IPO pricing, even after controlling for the average level of issuer optimism prevailing in the market prior to issuance as well as various firm and issue characteristics. We conclude that issuer optimism is a distinct phenomenon, separate from the market and investor sentiment that is present at the time of a security offering. This optimism contains information that is useful in understanding both the immediate and longer term behaviors of an IPO.

We organize the remainder of the study as follows. Section 2 describes the procedures for the construction of our optimism measure. We discuss our data and sample selection process in section 3. Section 4 presents our empirical findings. We conclude with a summary and a discussion of our findings in section 5.

## **2 Methodology and Issuer Optimism Construction**

Early studies that examine IPO prospectuses require the manual reading of prospectuses, typically the use of proceeds section. Beatty and Ritter (1986), for instance, find that a greater number of listed proceeds uses in the prospectus results in more underpricing. This suggests that more uses of proceeds proxy for greater uncertainty. Bhabra and Pettway (2003) find that financial and operating performance data contained in the prospectus has a limited explanatory power regarding the firm's post IPO performance. Leone, Rock, and Willenborg (2007) examine the relation between the use of proceeds data and IPO underpricing. They find that an increase in the specificity of use-of-proceeds disclosure is associated with lower underpricing.

The use of computer algorithm-based content analysis has been introduced into the finance literature only recently. Arnold, Fishe, and North (2010) employ this approach to examine the risk factors section of a prospectus. They not only count the number of risk factors disclosed in this section, but also measure the number of words used to explain each of the risk factors. They find that the soft information contained in the risk factors section is significantly related to both the initial and subsequent IPO returns.

Hanley and Hoberg (2010) examine the soft information content based on the word length of the entire prospectus as well as its four main sections: summary, risk factors, use of proceeds, and MD&A. They conclude that the word length of a prospectus can serve as a proxy for greater information disclosure and pre-market due diligence. Further, they determine that prospectus and section word length is related to more accurate offer prices and less underpricing.

This study complements these earlier analyses by explicitly investigating how the tones of words in a prospectus as well as their length convey information that is relevant for issue

pricing. To accomplish such an analysis, we use *Diction*, a language processing software package widely used in various disciplines. For instance, Ober et al. (1999) use *Diction* to analyze the MD&A section of EDGAR 10-K filings while Bligh and Hess (2007) examine the market response to Federal Open Market Committee releases, congressional testimony, and speeches by the Federal Reserve Chairman Alan Greenspan. More specifically, we use *Diction* to generate our measure of issuer optimism from the text contained in our sample prospectuses. Following Hanley and Hoberg (2010), we examine the entire prospectus as well as each of the four main sections: summary, risk factors, use of proceeds, and MD&A sections.

While investor optimism and hot markets have been an important subject in the IPO literature (Ritter, 1984, 1991; Helwege and Liang, 2004; Derrien, 2005; Cornelli, Goldreich, and Ljungqvist, 2006; Ljungqvist, Nanda, and Singh, 2006), issuer optimism has rarely been examined. We address this omission in the literature by creating a soft or non-quantitative measure of optimism based on the text of the prospectus. *Diction* defines optimism as “language endorsing some person, group, concept or event or highlighting their positive accomplishments”. The program generates an aggregate standardized score for *optimism* by counting words in defined categories and combining the standardized scores for each category according to the equation below<sup>1</sup>:

$$\text{Optimism} = 100 \times [(praise + satisfaction + inspiration) - (blame + hardship + denial)] / \text{total words. (1)}$$

Based on equation (1), we estimate separate measures of optimism for each section of the prospectus. We first estimate the optimism contained in the prospectus summary, which outlines the business of the company and offers a snapshot of what the proceeds of the sale will be used for. It also provides highlights of the income statement, balance sheet, and cash flow statement. We then calculate an optimism measure for the risk factors section which contains a list of the macroeconomic and competitive uncertainties the firm faces in conducting its business. Our third measure reflects the optimism contained in the use of proceeds section which details exactly what the firm will do with the funds it receives from the sale of equity. The next optimism measure is based on management's discussion and analysis of the firm's projected financial conditions and the likely results of future operations. Our last measure is constructed from the optimism estimated across the text of the entire prospectus and not just that of the separate sections.<sup>2</sup>

### 3 Sample Construction and Data

Beginning 1 October 1998, the Securities and Exchange Commission (SEC)'s Plain English Amendment became effective.<sup>3</sup> The purpose of this amendment is to enhance the readability, quality, and presentation of financial disclosure. Among its guidelines regarding the design of financial reports including prospectuses, the amendment requires concise sections and paragraphs, bulleted lists, and short explanatory sentences. Further, it emphasizes the need for active voice and jargon free exposition. Because our methodology emphasizes textual analysis, we begin our sample in 1999 so that all of the prospectuses are prepared under the same legal requirements regarding exposition and design. We terminate our sample period in 2005 to allow for an examination of the firm's long-term operating performance.

<sup>1</sup>Our normalization of optimism by total words is more intuitive and is consistent with the method used by Demers and Vega (2008), but normalization using the *Diction* program parameters provides similar results. Further, our approach excludes numbers and numerical tables in the count of total words. But we find that our results remain qualitatively identical when we include numbers and numerical tables in the total word count.

<sup>2</sup>A prospectus contains more than the four sections described above. Other sections that often appear in a prospectus include Capitalization, Experts, Management, Dilution, Dividend Policy, Shares Eligible for Future Sale, Description of Capital Stock, Legal Matters, Underwriting, Related Transactions, Principal Shareholders, Principal and Selling Shareholders, Material Tax Consequences, Certain Relationships, and Description of Securities.

<sup>3</sup>A plain English handbook can be downloaded at the website: <http://www.sec.gov/pdf/handbook.pdf>, and some description of the application of the new rules to offering prospectuses can be found at the website: <http://library.findlaw.com/1999/Jun/1/127259.html>.

Our initial sample of IPOs is obtained from Thomson Financial Securities Data Company (SDC)'s New Issues database. Consistent with Hanley and Hoberg (2010) and Arnold, Fische and North (2010), we exclude ADR/ADS's, units, REITs, closed-end funds, limited partnership, and IPOs with an offer price of less than 5 dollars. We also require each IPO stock to have data on the CRSP return file so that we can compute the issue's underpricing. We then manually download each of the IPO prospectuses for our sample firms from the SEC's EDGAR website. A few firms' prospectuses are insufficiently informative and thus are excluded, producing a final sample of 1,176 IPOs.

## 4 Results

### 4.1 Issuer optimism and offer price revision

In managing firm commitment IPOs, investment banks conduct road shows to promote the IPO and solicit feedback regarding the valuation of the IPO. Based on this feedback and assessment of likely investor demand, the issuer might decide to revise the offer price. Hence, offer price revision can reflect investor demand for the issue during the pre-IPO marketing period. To test whether optimism in the prospectus is able to generate more investor demand during the road show, we estimate the following regression model:

(2)

where *Offer price revision* is defined as the percentage difference between the midpoint of the filing price range and the offer price. *Controls* refer to the vector of control variables which consist of the log of the filing amount, log of total assets, sales/total assets, log of age, Carter-Manaster reputation rank, VC-backed binary indicator variable, binary indicator variables for pure primary offering, and stock exchange. We also include the Nasdaq return for the fifteen days prior to the offer date and controls for year and industry fixed effects.

Table 1 contains the results from the estimated regression between issuer optimism and offer price revision. Among the four main sections of IPO prospectuses, issuer optimism in the summary section has the strongest relation to IPO offer price revision. Column (2) shows that the coefficient for optimism in the summary section is positive and statistically significant. This means that a one standard deviation increase in optimism in the summary section is associated with a 1.4% increase in the offer price revision, which is about 18% of the average offer price revision in our sample. This finding suggests that optimism in the summary section of the prospectus is able to generate greater investor demand during the road show. It is also consistent with the argument of Hanley and Hoberg (2010) that the summary section in the prospectus is the most important section for marketing the IPO during the pre-issuance period.

Columns 3 through 5 of Table 1 show that the optimism in the other three sections of the prospectus is unrelated to offer price revision. Because only the optimism exhibited in the summary section is related to revision in the offer price, it is not surprising that the entire document's optimism is insignificantly related to offer price revision as shown in column (1).

**Table 1. Issuer Optimism and Offer Price Revision**

	(1)	(2)	(3)	(4)	(5)
<b>Dependent variable: Offer price revision</b>					
Intercept	-7.064	-7.334	-6.978	-6.715	-6.368
Optimism					
Aggregate prospectus	12.839				
Summary Section		2.812**			
Risk Factors Section			-1.661		
Use of Proceeds Section				-0.520	
Management Discussion Section					-4.129
Log( Filing amount )	-6.653***	-6.709***	-6.728***	-6.788***	-6.866***
Log(Assets)	1.469*	1.553*	1.499*	1.488*	1.508*
Sales/Assets	0.203	0.215	0.203	0.212	0.194
Log(1+Age)	-3.142**	-3.109**	-3.155**	-3.180**	-3.263**
Carter-Manaster rank	4.082***	4.044***	4.074***	4.113***	4.143***
VC-backed	3.542	3.466	3.475	3.424	3.433
Pure primary	-2.061	-2.289	-2.197	-2.159	-2.056
NYSE/Amex	3.049	2.990	2.985	2.983	3.230
Nasdaq return	99.968***	100.073***	99.865***	99.526***	99.645***
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Adjusted R <sup>2</sup>	0.203	0.204	0.202	0.202	0.204

## 4.2 Issuer optimism and underpricing

When an issuer is optimistic about its IPO, it has highly favorable expectations regarding the firm's future prospects. To the extent that this optimism is seen as credible, investors are likely to require less of a discount to subscribe to the issue. The demand for these shares will be higher than those of firms with less optimistic managerial forecasts. Hence, we hypothesize that greater issuer optimism is associated with less underpricing of its IPO. We estimate the following regression model to test this hypothesis.

(3)

*Underpricing* is defined as the percentage difference between the offer price and the market closing price on the first trading day. *Controls* refer to the vector of control variables which consist of the log of the proceeds, log of total assets, sales/total assets, log of age, Carter-Manaster reputation rank, VC-backed binary indicator variable, binary indicator variables for pure primary offering and the stock exchange, and offer price revision. We also include the Nasdaq return for the fifteen days prior to the offer date as well as year and industry fixed effects.

Table 2 presents a set of various regression estimates between optimism and IPO underpricing. We explore the relation between underpricing and optimism as measured across

the various sections of the prospectus. The most important finding is that greater optimism in the MD&A section is associated with less underpricing. The coefficient for the optimism variable in the MD&A section is negative and statistically significant. A one standard deviation increase in the optimism in the MD&A section is associated with about a 2.7% reduction in underpricing. This represents about 5.8% of the mean underpricing and 15% of the median underpricing. Because offer price revision is related to many of the firm and issue characteristics as shown in Table 1, we orthogonalize offer price revision with respect to the other independent variables as a robustness check. We report the results in column (6). The main results are qualitatively similar to those in column (5), with the coefficient for the optimism variable in the MD&A section negative and statistically significant. Our results are consistent with the finding by Hanley and Hoberg (2010) that the strongest association between the informative content of prospectuses and IPO pricing occurs in the MD&A section.

**Table 2.** Issuer Optimism and Underpricing

<b>Dependent variable: Underpricing</b>						
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-3.833	-4.062	-3.888	-3.645	-2.479	-15.741
Optimism						
Aggregate Prospectus	-12.202					
Summary Section		1.366				
Risk Factors Section			-5.070			
Use of Proceeds Section				0.049		
Management Discussion Section					-8.857*	-16.053***
Log(Proceeds)	-6.371**	-6.428**	-6.531**	-6.597**	-6.711**	-16.543***
Log(Assets)	0.595	0.660	0.680	0.667	0.543	2.568*
Sales/Assets	-0.498	-0.493	-0.491	-0.467	-0.508	-0.229
Log(1+Age)	-1.606	-1.589	-1.611	-1.637	-1.695	-6.827***
Carter-Manaster rank	4.950***	4.967***	4.971***	5.040***	5.116***	11.653***
VC-backed	11.176**	11.082**	11.049**	10.964**	11.050**	16.449***
Pure primary	11.273***	11.319***	11.254***	11.337**	11.351***	7.670***
NYSE/Amex	-1.397	-1.507	-1.481	-1.485	-1.573	3.805
Offer price revision	1.531***	1.529***	1.530***	1.528***	1.529***	
Offer price revision_r						1.621***
Nasdaq return	82.235***	81.737***	81.223***	81.672***	81.153***	245.027***
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R <sup>2</sup>	0.515	0.515	0.515	0.514	0.516	0.516

These results survive several other robustness checks which are not separately tabulated. First, we omit some potentially endogenous variables from the regression model, including the log of the proceeds, the Carter-Manaster reputation rank, and the binary indicator variables for pure primary offering and stock exchange. Second, we replace the underwriter's Carter-Manaster rank with the underwriter's market share as an alternative measure of underwriter reputation. Third, we replace the log of total assets with the log of the market

capitalization, which is measured as of the first trading day of the IPO. Fourth, we include the number of words in the entire prospectus as well as each section as additional regressors. Fifth, we winsorize the optimism variables at various levels. None of these adjustments alter our major conclusion and we continue to observe that optimism in the MD&A section is inversely related to underpricing.

## 5 Conclusion

Previous researchers such as Beatty and Ritter (1986), Arnold, Fische and North (2010), and Hanley and Hoberg (2010) establish the information content of IPO prospectuses for understanding IPO pricing. But this literature largely ignores soft or qualitative information that can be conveyed by the tone of the prospectus. We address this issue by examining the optimism revealed by the IPO issuer in the prospectus. In this study, we estimate the degree of optimism that an issuer reveals about the firm in its prospectus. We then examine how this optimism influences the pricing process of an IPO by calculating its effect on the price revision process and underpricing. We further test if this optimism has explanatory power for the firm's future operating performance.

Measuring issuer optimism across a sample of 1,176 IPOs from 1999-2005, we obtain a number of important findings concerning the pricing behavior of IPOs. First, greater optimism in the summary section of the prospectus is significantly related to greater offer price revision. This is consistent with the argument that the summary section is an important marketing tool during the road show. Second, greater optimism in the MD&A section of the prospectus is significantly related to less underpricing. Finally, we determine that a prospectus' optimism contains useful information about pricing even after controlling for the average level of optimism among issuers in the period immediately preceding an issue as well as various firm and issue characteristics. That is, optimism about an issue is unique and cannot be fully captured by the average sentiment of IPO issuers, nor by other firm and issue characteristics. We conclude that issuer optimism possesses explanatory power that is independent of other variables traditionally examined in the IPO literature.

Adding to the new and growing literature using text analysis, our findings have an important implication regarding future research on new issues. The soft information contained in a prospectus is useful for a fuller understanding of pricing in IPOs and the subsequent operating performance of IPOs. More specifically, we find that textual tone is an important dimension of soft information that should be incorporated in future studies of IPO behavior.

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# Positive and Negative Aspects of Financial Economic Development in Dairy Industry in the CR in 2007–2009 as Revealed by Spider Analysis and Economic Value Added

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**Annotation:** The dairy industry as an important part of the food sector markedly influences through its financial economic results development both in agriculture and in related links of the food chain. The objective of the contribution is to identify negative and positive aspects of results obtained in this branch in 2007-2009 and to reveal some risks that can retard the agriculture sector and/or to indicate positive trends that will lead to its development. Some segments – manufactures influencing the results of the food industry as a whole in a pronounced way were selected for analysis. The graphical model Spider Analysis was used for an expeditious and objective evaluation of results in the branch of food sector and their position within the studied sector for the given period. At the same time, the overall trend of development in this branch was volatile, particularly in profitability ratios and financing structure. To the deep analyses of development 2008-2009 was for dairy industry used year-on-year differences economic value added (EVA). Annual change EVA is improving, but is still minus. The continuation of such development in the next years could become risky.

**Key words:** Spider Analysis – dairy industry – profitability – liquidity – financing – assets - economic value added

**JEL classification:** Q18 - Agricultural Policy; Food Policy

## 1 Introduction

Manufacture of dairy products - CZ-NACE 10.5 is the key branch in food industry. This manufacture is joining with agricultural and supplies production on EU market and in another countries. The leading producer of dairy products in the EU it is France. Some firms in CR is in ownership companies from France. This branch needs to pay more attention. The team of authors is permanently engaged in analyses of the structure of food industry and its financial economic development in the CR. Some members of this team of authors investigated the development of business structure in this sector from retrospective and perspective aspects in the middle of this decade (Putičová, M., Mezera and J. Mejstříková, L. 2005). Methodological approaches and economic analyses used in agriculture both in the Institute of Agricultural Economics and Information (hereinafter IAEI) and at universities are applied and, first of all, economic indicators suitable for the processing industry are employed. Relevant database and quality-based knowledge from the business sphere are valuable sources. The crucial importance of economic analyses is based on the complicated economic situation and position of the agriculture sector when it is desirable to seek positive segments in this sector – branches and manufactures that would lead to an increase in effectiveness in the years to come. This paper analyses financial economic development in dairy industry in the framework food industry.

## 2 Materials and Methods

Statistical surveys carried out by the Czech Statistical Office (ČSÚ) are the basic database source for the analysis of food industry. Flow financial economic data are monitored by the quarterly statistical report ČSÚ-P3-04 for selected economic agents of sectors of manufacture (in industries, building industry, trade and selected services). Status and selected flow indicators are monitored by the quarterly report P6-04 on financial indicators. These are database files provided for analytical purposes on a contractual basis by the IAEI.

On 1<sup>st</sup> Jan. 2008, Czech Statistical Office (ČSÚ) introduced the international statistical classification of economic activities CZ-NACE, which replaced the Sector Classification of Economic Activities (OKEČ). Accordingly, the method of data processing was modified while the introduced classification allows for better international comparisons. In the present paper the food industry sector is classified according to the new structure, i.e. CZ-NACE, as mentioned above to Manufacture of Food Products (CZ-NACE 10). CZ-NACE 10 is classified into groups according to branches in our case it is CZ-NACE 10.5 Manufacture of dairy products.

On the basis on the given statistical data was applied model Spider Analysis. Despite its clear advantages this analysis is used very seldom. Blažková (2010) used it for evaluation of economic differentiation of subjects on particular processing stages within the wheat commodity chain in the Czech Republic with regard to agro-food market development. The graphical model Spider Analysis (Kubíčková D., Soukup J., 2006) was used in this paper to evaluate financial economic results of selected branches of manufactures in 2007-2009 and to compare them with the sector by means of ratio indicators.

This “spider” model presents ratio indicators in an objective way, allowing for an expeditious evaluation of effectiveness of the given branch in the framework of the food industry. Both used graphs are based on two curves: one curve of the first of these graphs shows the values of ratio indicators of the evaluated branch for a selected base year (2007 and/or 2008 = 100%) and the other curve shows these values for a current year (2008 and/or 2009) in order to make a year-on-year percentage comparison. In the other graph the values of ratio indicators of the given branch in 2008 (and/or 2009) (one curve) are compared with the values of the sector representing 100% (the other curve).

A year-on-year comparison of the used indicators was made in the Manufacture of Food Products (CZ-NACE 10). Either of the two graphs of Spider Analysis is divided into four basic parts that show profitability, liquidity, capital structure and asset structure. In this paper the authors also used their own knowledge from the analysis of financial economic performance and effectiveness of the Czech food industry (Mejstříková, L. and Mezera, J. 2006). The latest it was analysis of period 2007-2009 (Mejstříková, L., Mezera, J. and Plášil, M., 2011).

The following table (Tab. 1) shows the selection of particular indicators and their construction.

**Table 1.** Selected financial indicators and their construction

<b>Financial indicators</b>		<b>Construction</b>
Profitability ratios		
A1	Return on equity (ROE)	net profit/equity capital*100
A2	Return on assets	net profit/total assets*100
Liquidity ratios		
B1	Total liquidity	inventory + (financial assets + accounts receivable)/short-term liabilities + short-term credits
B2.	Quick ratio	financial assets/(short-term liabilities + short-term credits)
B3	Current ratio	(financial assets + accounts receivable)/(short-term liabilities + short-term credits)
Capital structure		
C1	Ratio equity	equity /total liabilities*100
C2	Debt-to-equity ratio	(foreign capital + other liabilities)/equity*100
Asset structure		
D1	Ratio of accounts receivable to assets	total accounts receivable/total assets*100
D2	Inventory turnover (days)	inventory/sales*365
D3	Accounts receivable turnover (days)	accounts receivable/sales*365

Outside the financial analysis with indicators in Tab. 1 was chosen in this paper also other methodical approach. As the other indicator was contained influential Economic Value Added (EVA). EVA is Net Operating Profit After Taxes (NOPAT) less money cost of capital:

$$EVA = NOPAT - WACC * K \text{ (capital cost)}$$

Calculating EVA:

$$(ROE - r_e) * EC \text{ (equity capital)}$$

ROE (see Tab. 1)

$r_e$  = alternative cost of equity capital (see rating model)

Formula of rating model:

$$r_e = \frac{WACC * \frac{BS}{A} - (1-t) * \frac{I}{BC+O} * (\frac{BS}{A} - \frac{EC}{A})}{\frac{EC}{A}}$$

WACC	= weighted average cost of capital
BS	= bribable sources (EC + BC + O), i.e. capital, which is need to pay
A	= assets total
EC	= equity capital
BC	= bank credit
O	= obligation
I	= interest
$\frac{I}{BC+O}$	= interest rate
t	= tax tariff

The indicator EVA was analysed with a few pyramidal analyses (steps) on partial factor and with the logarithmical method is express the influence of value of this partial factor on differences of value EVA by CZ-NACE 10. The completion solution (pyramidal analyses) exists (Mezera et al, 2010). This solution used system INFA (pyramidal analysis). This solution consists of creation production power, dividing EBIT (Earnings Before Interest and Taxes) and financial stability. According Aulová, 2010 defining the average cost of capital is a very important indicator for the individual companies. Similarly it is in branches. Many studies were devoted to this issue, e.g.: Vasilescu, L. G., Popa, A and Garboveanu, S. (2006). Economic Value Added (EVA) is and alternative to the traditional accounting profits that has fanatic advocators as well as opponents (Tsifora, E., Trivellas, P. 2008). Leading the long-term vision, EVA is at the top of this system (Tong, Y., Yao, Y, Xiong, X. T. 2010).

### 3 Results and Discussion

#### 3.1 Characteristics of manufacture dairy products

Manufacture of dairy products is another processing branch closely related to agricultural produce of animal origin – cattle raising. The EU dairy industry is very dominant in the world market (Tacken, 2009). A quota system has been used in milk until now in the framework of the EU Common Agricultural Policy. However, the domestic dairy industry does not purchase total milk production when raw milk transported for its processing to another country accounts for 17.5% (Kopáček, 2010). Domestic production of milk remains more or less stable in last ten years and moves round 2.7 bil litres a year.

According to Gebeltová, 2010 milk production is decreasing and a slightly growing milk yield will not maintain it. Advocating the development regarding milk quotas is not in place. Since the quota year 2006/2007, the Czech Republic has not totally spent the allotted amount of milk. Despite the fact that the validity of milk quotas runs until March 31, 2015.

Mach et al, 2010 pointed out that the survey analyses the intentions of dairy farmers over the next five years. The results imply growth in milk production, thanks to the farmers plans to increase their herd sizes by 10 cows/farm/year to an EU-average of 198 cows/farm by 2015. Dairy farmers planning to increase their herd size often face considerable limitations.

In the CR from the aspect of the ownership structure foreign companies participate in the dairy industry (approximately in 40 % enterprises, e.g. Groupe Bongrain, Groupe Danone LACTALIS, Müller Milch and other and achieve better economic results but the evaluated

period fell into an economically difficult period that had impacts on the European dairy industry as a whole. In innovation activity of firms and competition Zemplerova, A. 2010 indicates that if market concentration is a measure of competition then we can conclude that innovation is related to the competitive market structure.

The development in last time shows problems of dairy industry in production area. These problems they are joining with recession process. From 2007 to 2009 revenues for selling products and services in NACE 10.5 were drop dramatically. In part 3.2 is situation analysed in financial area because this topic is this contribution attend to above all.

### 3.2 The development of financial economic situation in assessed branch

We can state that year-on-year drop profitability of this branch in CR, as expressed by both ROE and return on liabilities, was pronounced in 2008 (Table 2), which was a negative trend. A more moderate year-on-year drop was recorded in all three ratios of liquidity. In the financing structure the share of equity of the branch decreased in the same year while the debt-to-equity ratio increased. In the asset structure the ratio of accounts receivable to assets decreased year on year in 2008 but inventory turnover lengthened while accounts receivable turnover shortened. In 2009 profitability rose year on year again, namely both ROE and return on liabilities, but they did not reach the 2007 level. An increase was recorded in all three liquidity ratios in 2009.

In the financing structure the share of equity increased and debt-to-equity ratio decreased markedly in the evaluated year. In the asset structure the ratio of accounts receivable to assets dropped, inventory turnover shortened in a pronounced way but accounts receivable turnover was moderately longer in comparison with the sector Manufacture of Food Products (NACE 10) the branch showed very low profitability in 2008 (Fig. 1) that however improved above the sector level in 2009 (Fig.2).

The branch markedly differed from the sector in quick ratio showing a higher value for the branch, and in debt-to-equity ratio, where the value of the branch was relatively high. The measures of dairy companies should be aimed at higher utilization of equity and the trend of a reduction in debt-to-equity ratio should continue.

**Table 2.** Year-on-year development of financial economic indicators in the branch Manufacture of dairy products (CZ-NACE 10.5) in 2007-2009 (% , p. b.)

Financial economic indicator	2007	2008	2009	Year-on-year	Year-on-year
				difference	difference
				2008/2007	2009/2008
Profitability ratios					
A1 - Return on equity (ROE)	28.23	2.99	16.51	-25.24	13.52
A2 - Return on assets	10.17	1.05	6.87	-9.12	5.82
Liquidity ratios					
B1 - Total liquidity	1.59	1.47	1.91	-0.12	0.44
B2 - Quick ratio	0.17	0.15	0.40	-0.02	0.25
B3 - Current ratio	1.20	1.04	1.50	-0.17	0.46
Capital structure					

C1 – Ratio equity	36.03	35.24	41.62	-0.78	6.38
C2 – Debt-to-equity ratio	177.58	183.75	140.29	6.17	-43.47

Asset structure

D1 – Ratio of accounts receivable to assets	36.27	31.28	30.95	-4.99	-0.33
D2 – Inventory turnover (days)	19.48	22.56	17.75	3.07	-4.81
D3 – Accounts receivable turnover (days)	52.18	46.51	47.82	-5.68	1.31

Source: Czech Statistical Office, own calculations

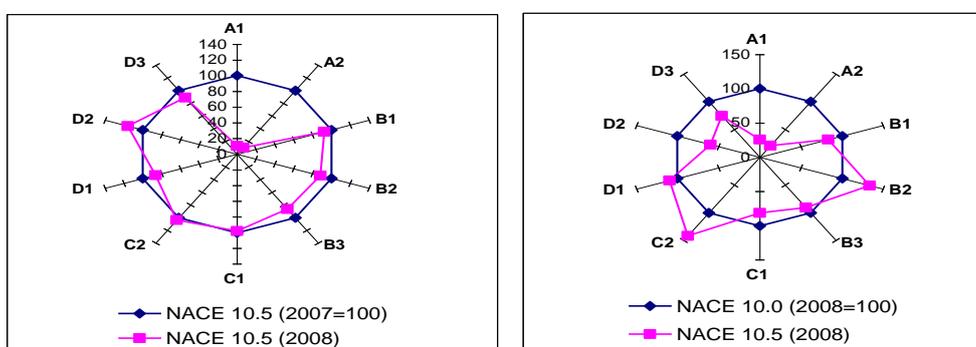


Fig. 1. Year-on-year development of financial economic indicators in the branch Manufacture of dairy products (CZ-NACE 10.5) in the framework of CZ-NACE 10 in 2007-2008

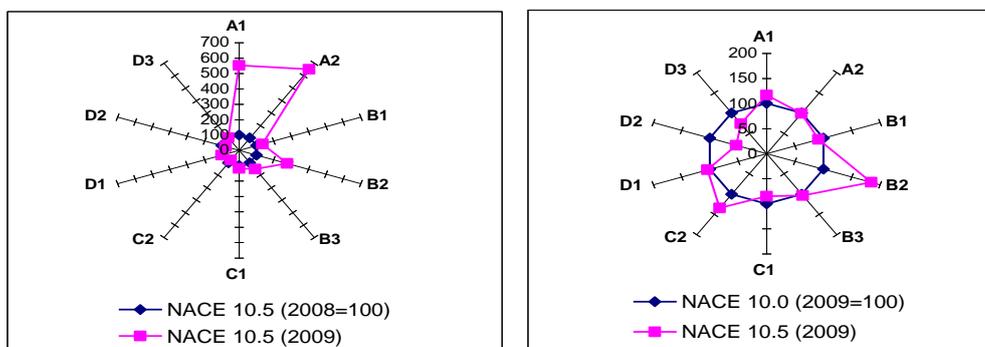
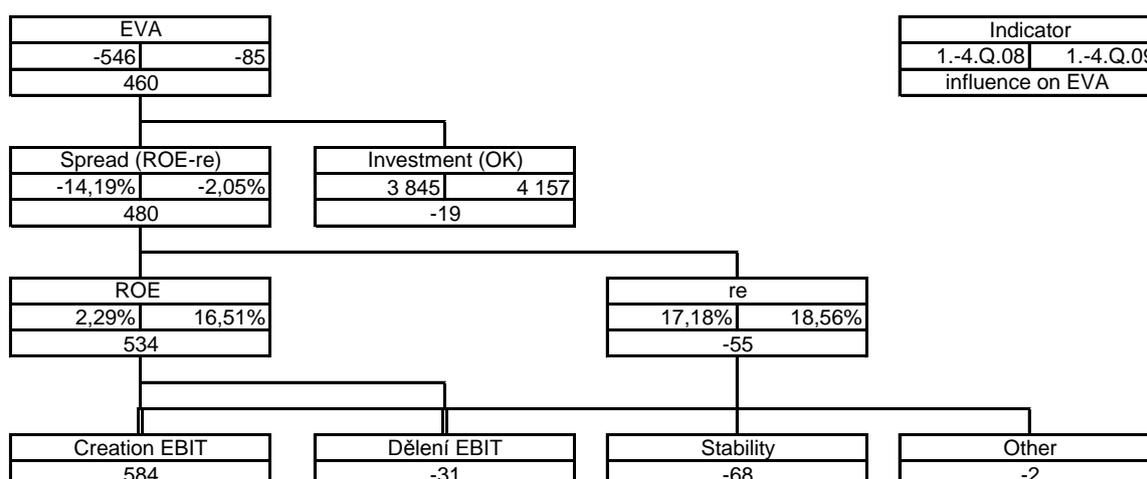


Fig. 2. Year-on-year development of financial economic indicators in the branch Manufacture of dairy products (CZ-NACE 10.5) in the framework of CZ-NACE 10 in 2008-2009

The pyramidal analyses of indicator EVA (year-on-year differences 2008-2009) by CZ-NACE 10.5 shows improving in 2009 (from -546 to -85) but its value is still minus and effectiveness (spread from -14,19 % to -2,05 %) too. There was improved return on equity (2,99 % to 16,51 %). That is evident by CZ-NACE 10.5 shows improving but is not certain that it is long-term trend. The indicator ROE shows expressively growth in 2009 (see Table 2). The alternative cost of own capital re is in 2009 is a little bit better thus risk is moderated. The problems they are staying first of all in the area dividing EBIT (Diagram 1 in simplified version).

## Diagram 1- Year-on-year changes EVA by CZ-NACE 10.5

### Total



## 4 Conclusion

As for the manufacture of dairy products, financial analyses shown that the development of debt-to-equity ratio, which record relatively high values, was less satisfactory in the given period. On the contrary positive is that the quick ratio in 2009 leaved critical value.

In comparison with the sector Manufacture of Food Products (NACE 10) the branch showed very low profitability in 2008 that however improved above the sector level in 2009.

The indicator EVA shows improving in 2009 which it is positive trend, but do not exists the guarantee that this trend is stable. Permanent shortage of capital exists especially with firms without foreign participation.

The dairy industry is so much influenced of world and domestic factory. The future work is necessary oriented more completely in the context the whole supply chain of milk. Among the priorities for national and European policies is food availability and quality. Extra it is valid for dairy production. It could be positive moving.

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# Concentration Analysis of the Hungarian Mangalica Pig Stock

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**Annotation:** In the animal raising sector of Hungary the indigenous and special Hungarian product called mangalica pig has a special significance. Some descriptions were made about the species but the concentration of branch population has not been examined so the aim of our study is to analyse the concentration of the mangalica population on the basis of various statistical methods in the last ten years.

In the examined period we could see three sharply devided periods: the years before 2005, years after 2005 until the beginning of the worldwide economic crisis and the years from the crisis until now. 2005 was a turning point in the lives of producers since in the year the targetprogram for the keeping of animals representing a high genetical value and being indigenous. The certain concentration indexes were the following: the concentration ratio, the Lorenz-curve, the Gini-coefficient, the Herfindahl-index and the redundancy index.

Through the analysis we realised that from 2000 a kind of concentration started, which in case of the concentration ratio, the Lorenz-curve and the Gini-coefficient was in 2001 and 2003 of the highest ratio. The Herfindal-index and redundancy index showed that the years 2000 and 2002 were the most significant, because of a number of large-scale producers started their activities or developed their stocks in these years.

On the basis of the results it can be stated that in the years before the application and after the recession the concentration of the stock was instable, while at the beginning of the support period until the crisis the appearance of large-scale firms became equal but basically according to every index the concentration in the examined years was approximately average.

**Key words:** concentration indexes, mangalica pig, stock concentration, Lorenz-curve

**JEL classification:** L11, Q13

## 1 Introduction

The definition of the concentration is different in the distinct areas of science, but it's meaning is similar: massing, focusing, merge of something. Both in chemistry, in economics, in medical and psychological literature it is an often used concept. In statistical meaning it is known many kinds of definition depending on the available data and the aim of the analysis. The concentration analysis is an often applied method in the agriculture, with which both the Hungarian and the foreign special literature treated for a long time (Jarrett, 1968; Bethlendi and Kerékgyártó Gy-né, 1970; Hajdu, 1986). The examination of Hungarian agrarian sector is always seasonable, because the national economy importance of the Hungarian agricultural sector according to Kovács's (2010) establishment is still considerable despite the negative trends of last years. The animal husbandry within the pig-breeding represent has an important position in the Hungarian agricultural sector. One of the criterion of the pig-breeding is the stock concentration (Udovecz, 2009). Popp and Nyárs (2009) have written, that concentration and fragmentation are typical of the Hungarian pig sector. The 90 percent of pig-breeder had been keeping less than 10 animals in 2005-2007, and 99 percent had been keeping less than 50 pigs. Statements of Szabó et al. (2009) almost 60 percent of animal stock is found in 1 percent of pig-breeder. The importance of the theme is, that the concentration of mangalica

sector – as an independent animal-husbandry sector - has not been analysed, for all that it would be a breaking point for the Hungarian agriculture. In consideration of in all sector and department in the world – e.g. industry, trade, agriculture or demography – are in progress significant concentration processes. Because of this we feel it necessary to find on the basis of available data, that in this little segment happened similar processes. The analysis didn't perform worthy back for several decades, because from the Second World War to the period before 2000 wasn't substantial the Hungarian mangalica pig stock, but from the millenium the number of pedigre stock started continuously increase, so we performed our measuring from this period.

## 2 Materials and Methods

In our study we analysed the concentration of mangalica stock the National Association of Mangalica Breeders (NAMB) collected by national database between the years 2000 and 2009. The data in regard to the stock and the breeds were available for us according to farm size. The measuring were performed by different statistical methods, which were the concentration ratio (CR), the Lorenz-curve, the Gini-coefficient, the Herfindahl-index and the redundancy index. These indexes are the generally used and accepted in the economy, this is why we consider to present and interpret of this measuring important. The special literature mentions many kinds of concentration-analysis methods (Hubbell and Welsh, 1998; El-Osta and Morehart, 2002; Crespi and Marette, 2006; Mitton, 2008), which are used often in agriculture. Their application depends on several factors, such as on the aim of the analysis and the available statistical data (Juhász et al, 2004). The Lorenz-curve and the Gini-coefficient are in close connection with each other, because the Gini-coefficient means the ratio of the area between the diagonal and the Lorenz-curve over the triangular area under the diagonal (Németh, 2005). The formula is:

$$G = \frac{1}{2\bar{x}n^2} \sum_i \sum_j |x_i - x_j| \quad (1)$$

where:  $x_i$ ;  $x_j$  = feature as distribution ratio in the  $i^{\text{th}}$  and  $j^{\text{th}}$  number category;  $\bar{x}$  = the mean of  $x_i$ ;  $n$  = the total number of farms. The Gini-coefficient ranges between 0 and 1. According to the United Nations methodology (Nyárs, 2005) we can speak, if:

- Gini > 0.90: very high concentration
- 0.90 > Gini > 0.60: high concentration
- 0.60 > Gini > 0.40: moderate concentration
- 0.40 > Gini > 0.30: low concentration
- Gini < 0.30: very low concentration.

One of the most widely accepted and common used concentration index is the Herfindahl-index (Mitton, 2008). The maximum value is 1, that means the total concentration (Kerékgyártó Gy-né et al, 2008; Jaud et al, 2009). It's measuring is the following:

$$HI = \sum_{i=1}^N \left( \frac{x_i}{s} \right)^2 = \sum Z^2 \quad (2)$$

where:  $x_i$  = the sow number of the  $i^{\text{th}}$  number category;  $s$  = the total number of sows. To determine whether an agricultural sector is concentrated, the Herfindahl-index gives following guidance:

- HI > 0.18: concentration is high

- $0.1 < H < 0.18$ : concentration is moderate
- $HI < 0.1$ : concentration is low (Blank and Persson 2004).

The redundancy inequality index is derived from the entropy, and it measures the inequality in the distribution structure of criterion values (Hajdu, 1986). Complete equality occurs when  $R_z = \log N$  (Németh, 2005). It's formula is:

$$R_z = \log N - \sum_{i=1}^N Z_i \log \frac{1}{Z_i} = \sum_{i=1}^N Z_i \log NZ_i \quad (3)$$

(Hunyadi et al. 1996).

### 3 Results

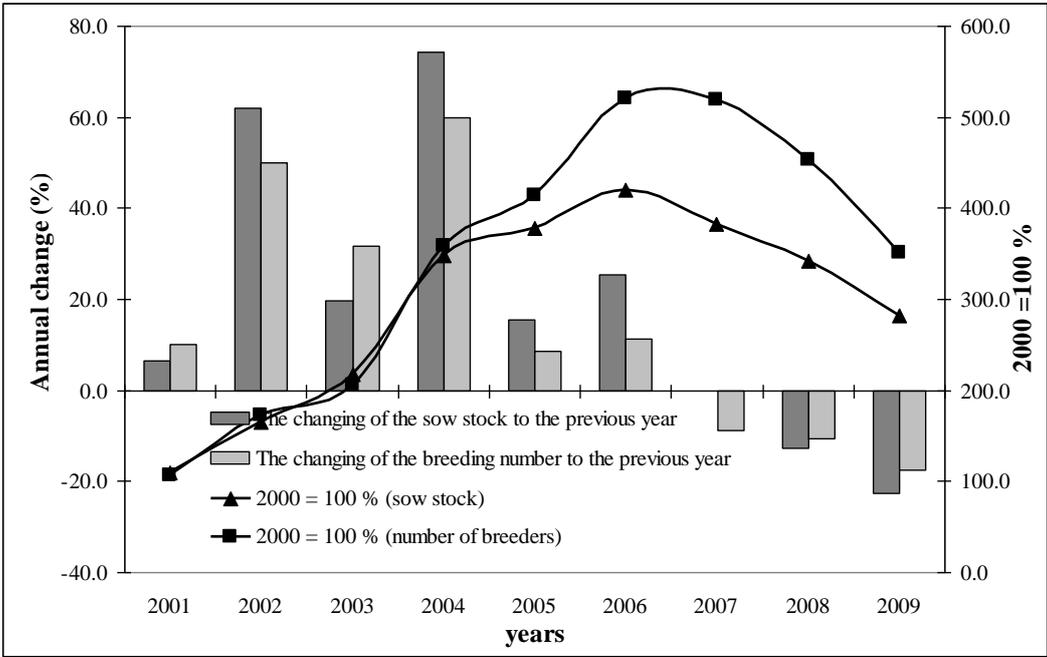
#### 3.1 General sectoral description

The mangalica not only in Hungary but also in other countries can be found, however it is just in our country indigenous species. In Austria there are 70 breeders, who keep about 300 sows and there is not one, who has more than 50 animals, therefore we can't talk about high production. In Switzerland, similarly to Austria, there are about 300 registered sows, where is breeding organization of the sector too. There can be found mostly swallow-bellied variety of the mangalica pig. In our neighbouring countries, like this in Serbia, in Romania and in Slovakia – mainly in beyond the frontier with Hungarian population areas – there are altogether maximum 1000 breeding animals, which is 10-15 percent of native numbers. In Europe attend the mangalica as product in Spain, where is produced the world-famous Serrano ham. Beyond the sea is bred, in America there are about 1000 mangalica, which products are served mainly in elegant restaurants. The largest importer is Japan from mangalica, which market claim Hungary unfortunately can't fulfil for the present.

In the first six years of the period under survey the stock grown more than fivefold and attained almost 9.000 animals, with which the mangalica market was seen culminate. This sow-number resulted in 60-80.000 mangalica pigs for slaughter each year. The increase of market demand was not proportional to growth of pedigree stock. The oversupply kept back the prices and by means of decrease of profitability influenced unfavourably the productivity. From 2005 ensued a strong climbing in the mangalica sector, which reason was the targetprogram for the keeping of animals representing a high genetical values and being indigenous (MRD, 2004). The subvention was in force to 2009, after all from the third year of the application continuous decline can we observe, that was attributed to drastic increase of feed costs. Because of this and the effect of global economic crisis a lot of farmer constrained to stopped the breeding and liquidated the livestock. The price of corn and wheat approached 60.000 HUF per ton, which the concentrate fed pig, especially the mangalica couldn't tolerate. Examining the data of the national average sow can be observed mild fluctuation in some years, the average sow number was the least in 2003 (39 animals), but in 2007 was the highest (56 animals). The first year of the analysis the average sow-number was 41, that was only less than in two years, in 2001 and 2003. Contrary to all of the amount of pedigree stock, in the average sow-number was the largest rate of growth from 2005 to 2006, about 13 percent, that remained stable still the year after. But in 2008 ensued a considerable decline, it is expressly due to that the enterprises couldn't cover the disbursements no longer, the economic crisis marked with theirs activity and several farmers quitted the market. At the breeders increased the number of farmers engaged mangalica the early 40 animals to 168 in 2006, it represents more than fourfold gain.

Hungary's total number of breeding animals and the breeds are shown quite fluctuation from year to year. For the year of EU accession about 70 percent rise have happened in the number of livestock compared to the previous year. The farmers trust in EU's subventions

have increased their stock and at the same time the number of farms have grown proportionately. Till 2004 was almost the same their ratio compare the year 2000, then after the application period was the increase of the breeds larger than the stock. This expansion stopped to 2007, although after this it was still three-, fourfold of the 2000 year data. Similar products can we find, if we look at the chain relative, that 2007 was the year, when the number of sows and the farms was less than the previous year (Figure 1). As regards of the chain- and the base relatives it is perceptible the effect of the crisis, after 2007 it can be observe decline every year. But in that year the recession of the number of breeders was a larger extent, then from 2008 the sow-stock decreased a larger measure.



**Fig. 1.** The change of sowstock and the number of breeders in 2000-2009

*Source: On the basis of NAMB's data (2010) own calculation (2011)*

### 3.2 The results of concentration analysis

A high degree of fragmentation was characteristic of the operating structure still in 2000, because the rate of farms below 50 sows were nearly 80 percent of the total within the breed, but they possessed only 33 percent of the total livestock. As opposed to it the farms with 101-250 sows kept more than half of the stock. In that year we couldn't speak really large farms in this sector, farms over 250 sows resided in 2005 almost 3 percent, who held 20 percent of the total stock. At this time begun a significant concentration in the mangalica breeding, that resulted in drastic decrease of the small farms and the proportion of there kept pigs, but because of application of tending to indigenous species subvention increased the breeding behalf and entered some large farmer to the production. The number of small-scale producers reduced to almost 30 percent in a short time, and 60 percent of the largest stock farms (300-500 sows) finished the production to 2009. From 2010 began new chronology in the farmers, who keep indigenous animals, because it began further subventional period, which will hold to 31. December 2014. The aim of the subvention to conservation and keeping in breeding the genetic stock of protected indigenous and endangered agricultural species with low number (MRD, 2010). This program has stopped the decline, and even to the end of the application period assumed more than half of the farmers 50 percent growth in the sow number, but 40 percent chosen the level keeping.

According to Nyárs's (2005) establishment describe the animal husbandry sectors considerable inequality, which result can be the strengthening concentration. One of the

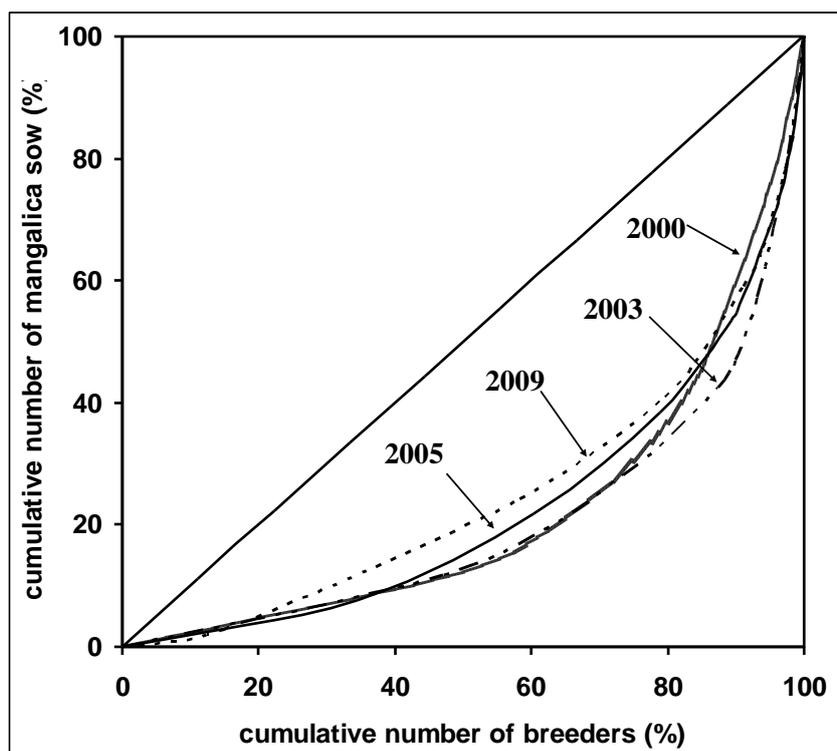
simplest measuring method of the concentration analysis is the concentration ratio (CR). On the basis of the Table 1. it can be told, that observe the CR-s have happened a slight concentration in the ratio of mangalica number, that was the largest in 2003. In case of m=1 we have considered the stock ratio of the largest farm, by m=2 the amount of the first two largest farms ratio, and by m=3 the first three largest farms. It seems good, that it was the slightest the value of this index in each three case in 2000, so in that year the number of large farms has been low. However in 2003 the large farms held 43 percent of the total livestock. In the following years the large farm's share was even lower, and the sow number didn't increase considerably by the farms over 150 sows after the application.

**Table 1.** The concentration ratio in 2000-2009

	if m=1	if m=2	if m=3
CR (2000)	0.0 %	0.0 %	24.3 %
CR (2003)	0.0 %	19.2 %	42.8 %
CR (2005)	7.3 %	21.6 %	30.4 %
CR (2009)	17.3 %	17.3 %	34.6 %

*Source: own calculations, 2011*

The stock concentration is most illustrated by the Lorenz-curve. The horizontal axis of the curve shows the cumulative relative frequency of breeders, the vertical axis shows the cumulative sum of the values of the mangalica sowstock. The analysis applies to the period between 2000-2009. The following figure is presented the four years data, because 2005 was the first year of the application, so we divided the examination into two parts. The first part was the period before the subvention, the second was after it. We supposed, that the granted subvention influenced the breeding behalf and with it the stock concentration. The diagonal line, or the egalitarian line represents the perfect equality in the unit square. If the curve coincides with this line, it means that each breeder keeps the same livestock, which is the case of the perfect equality. In the case of perfect inequality of the stock, the Lorenz-curve coincides with the sides of the square, which implies that all animal is bred by only one farmer. It follows from this, that the growing of the space between the line and the curve announces high-class stock concentration. It can be seen from the Figure 2 that in each year had a moderate concentration, but there can be observed little differences. In the first year of the analysis the 70 percent of the farmers owned the quarter of the total mangalica number. This ratio changed below 3 years, that the 80 percent of the farms held about third part of the total livestock. That shows the halfway point, which can be read about the line touching the Lorenz-curve paralell with the diagonal. In that year was the curve the nearest to the side of the square, that means at that time was the largest concentration. The cause of it, that the large farmers entry and the number of the small-scale producers declined. It can be proved, that from 2003 to the first year of the subvention reduced the concentration area, so the number of the large-breeders slightly slowed down. After the application it can be told clearly from the figure that the breeding behalf has increased and the headway of the small-scale farms has been the typical. The reason for this is, that in 2009 – in the first quarter of the square – the concentration curve moved away from the curves of the earlier years and it stayed above the curve of the 2005. The large-scale farms owned still significant volume of the livestock, for all that several breeders stopped their activity on the effect of the global economic crisis and the aridity damage in 2007. It can be satisfied as to the facts, that analyse the past years in 2009 was the concentration the slightest in the sector, which represents the concentration area.



**Fig. 2.** The Lorenz-curves in the four significant years

*Source: own calculations, 2011*

These results are supported by the values of Gini-coefficient, because if the index is  $G=1$ , then the livestock and the production will concentrate by one farmer, but if  $G=0$  the production will distribute equal among the farms. The results show, that the stock concentration was the highest in 2001 and 2003, but the lowest was in 2008. The reason of it was the global economic crisis, when some farmer contended with liquidity problems, that's why they are liquidated their agricultural holdings. In the other years it can be seen different fluctuations, after all it is worth to observe that in the period under survey the value of the coefficient changed between 0.49 and 0.58 (Figure 3). Similarly to the Lorenz curve it can be proved that the concentration was moderate considering the results of the Gini-coefficient.

The previously mentioned Herfindahl- (HI) and the redundancy-index are suitable for the measuring of the stock concentration. On the basis of the HI-index's classification the mangalica stock concentration can be considered moderate every year, except the years 2000 and 2002, when the index passed the 0.2 value. It means, that it was the concentration high in the sector. It can be stated moreover, that from 2004 to 2007, the beginning period of the application the verticum was stable, but from 2007 it can be seen increase again. The cause of it was, that the previously mentioned corn price risen and at the same time the farms was liquidated. The redundancy index shows similar tendency to the HI-index, as it increases it's value, it also increases the concentration. Before the subvention the process broken in two cases, in 2001 and 2004, thereafter it followed the earlier described.

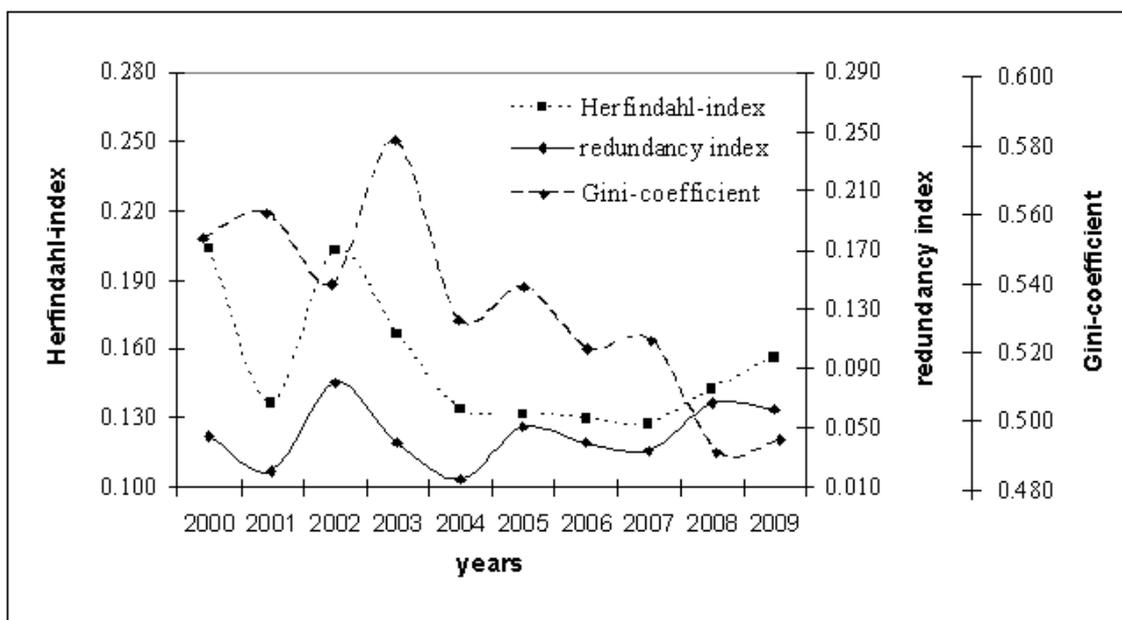


Fig. 3. The values of Herfindahl-, the redundancy- and Gini indexes in 2000-2009

Source: own calculations, 2011

## 4 Conclusions

Through the analysis we realised that from 2000 a kind of concentration started, which in case of the concentration ratio, the Lorenz-curve and the Gini-coefficient was in 2001 and 2003 of the highest ratio while the Herfindal-index and redundancy index showed that the years 2000 and 2002 were the most significant. This is thanks to the fact that a number of large-scale producers started their activities or developed their stocks in these years. In the period after the support the number of animals reached the peak and at the same time the ratio of large farms was gradually decreasing. This recession took place as a result of the effects of the sharp increase of feeding cost in 2008 and mainly of the global economic crisis starting simultaneously. The economic crisis had a significant effect on the farmers (small and large at the same time) selling off their farms and only the mid-sized farms kept their production, because they had other activities, so they remained stable financially.

The non-refundable grant had a positive effect on the concentration of mangalica stock and the headway of large farms came to the front, but it could be observe a contrasting process because of the drastic increase of the feed prices in 2008.

In regard to the future based on past experiences increase is expected due to the following application period, that we hope will not prevent a further rise of the feed price or an another recession.

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# Less Favoured Area Payments in Germany– Impacts on the Environment

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**Annotation:** In the European Union, the support of Less Favoured Areas (LFA) has a long tradition as part of the Common Agricultural Policy (CAP). Nearly all EU countries subsidise such areas. Less Favoured Areas are characterised by comparatively poor natural conditions for agricultural production. This can result from poor soil quality, or, in mountainous areas, from the prevailing altitude and slope. Above all, it is the objective of the subsidies to maintain the agricultural production in these areas. At present, the funding is implemented within the framework of the Programmes for the Development of Rural Areas 2007 to 2013. The support of affected agricultural businesses shows significant impacts in mainly four areas. One such area is the income of affected farmers. Payments compensate them for differences in income resulting from the natural disadvantages that may force them to abandon farming. The other areas relate to maintaining a continuous land use, to impacts on the rural society and to effects on the environment. The latter are subject of this article. Research has shown that agricultural practices within Less Favoured Areas are more environmentally friendly than in other areas. Environmentally friendly in this regard means e.g. lower use of fertilizers and pesticides, but also a higher participation rate in agri-environmental measures. More detail is given for various such regions in Germany. While the results presented in this paper relate mainly to Germany, information on European level is also taken into consideration. Finally, based on these investigations, recommendations for the revision of the funding programmes following 2013 are given.

**Key words:** Less Favoured Areas, Land use, Environment, Agricultural Policy, Germany

**JEL classification:** Q 15, Q 18

## 1 Introduction

In the European Union, the support of Less Favoured Areas (LFA) has a long tradition as part of the Common Agricultural Policy (CAP) (Tietz 2007). Nearly all EU countries subsidise such areas (Figure 1). Less Favoured Areas are characterised by comparatively poor natural conditions for agricultural production. This can result from poor soil quality, or, in mountainous areas, from the prevailing altitude and slope. Applied criteria for designation for most EC countries can be found in the report of the IEEP (2006). In Germany there are three types of LFAs; mountainous areas and two types of “other” LFAs. The types correspond to Articles 18, 19 and 20 of Regulation EC 1257/99 (European Commission 1999). The geographical distribution of LFAs in Germany can be seen in Figure 2 at the end of the paper.

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The support of affected agricultural businesses shows significant impacts in mainly four areas. One such area is the income of affected farmers. Payments compensate them for differences in income resulting from the natural disadvantages that may force them to abandon farming. The other areas relate to maintaining a continuous land use, to impacts on the rural society and to effects on the environment. The latter are subject of this study.

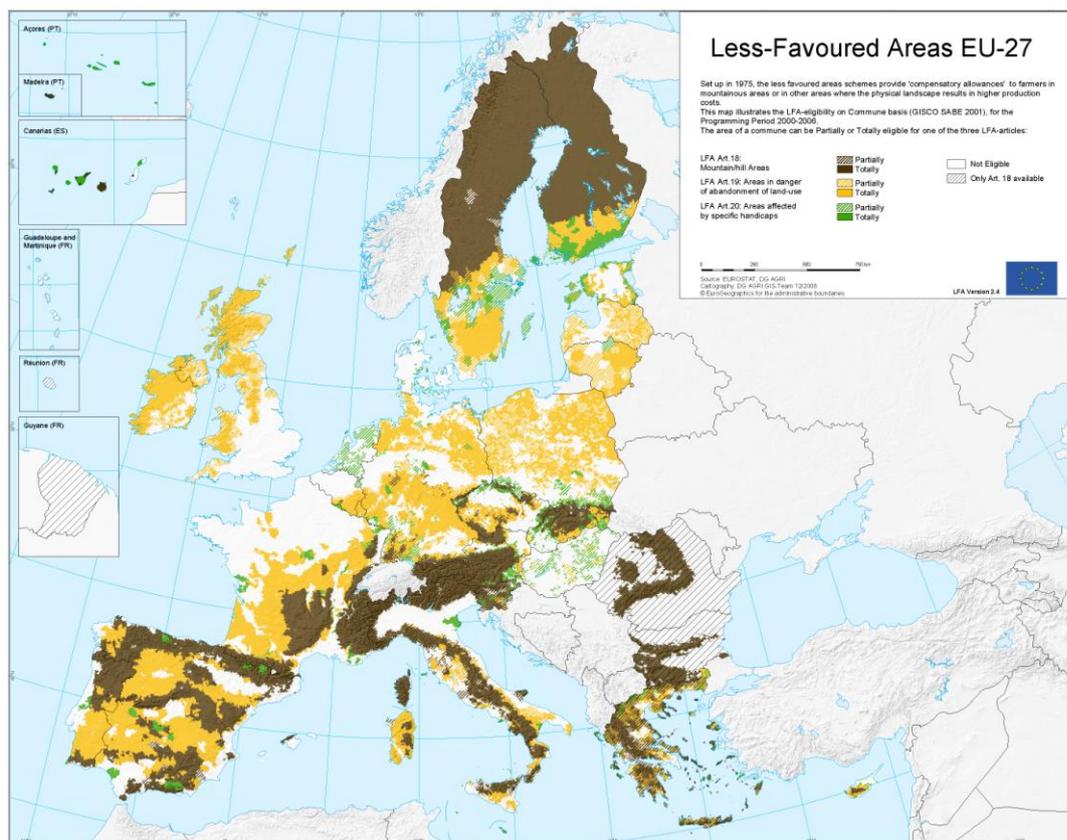


Fig. 1. Map of LFAs in Europe.

## 1.1 Environmental Issues in Less Favoured Areas

In recent years, Less Favoured Areas, like other agricultural areas, have been confronted with certain environmental problems. One such problem is for instance the species decline in flora and fauna. It is suspected, that the change in the way agricultural land is cultivated is one possible cause of this decline. The change in cultivation can be caused for instance by an intensification of the agricultural production. But also a lower intensity of use (e.g. reduced livestock numbers) or the abandoning of areas in marginal locations can cause negative changes in terms of biodiversity (Plankl, Rudow, Klockenbring 2004).

Above and beyond, Less Favoured Areas often contain, from an ecological point of view, particularly sensitive areas worthy of protection. One case study area in Allgäu, Germany (Region no. 9 in Figure 2) encompasses for example alpine wetlands, moist areas, various other habitats, a particular diversity of the natural environment, as well as a high structural and biodiversity of the landscape (Plankl, Rudow, Klockenbring 2004). Another case study in the area of Vogelsberg, Germany (Region no. 8 in Figure 2) showed, that parts of the study area, that are graded as valuable in terms of species and habitat protection, are located within Less Favoured Areas (Daub 2008).

In their evaluation of LFA payments, the IEEP come to the conclusion, that in terms of Less Favoured Areas the key objective has to be to continue maintaining an appropriate type of agricultural management to counter the main threats of abandonment, marginalisation and intensification, which often lead to a loss of biodiversity and landscape value (IEEP 2006).

## 1.2 LFA Payments: Theoretical Possibilities to Take Influence

Agriculture has an impact on the environment, on soil, air, water biodiversity, habitats and landscape. This impact is a result of farming systems and practices. Environmental impacts can be both positive and negative depending on the intensity of farming systems and the type

of farming management practices adopted. Factors such as grazing regimes, type of livestock, grassland management, crop varieties, crop rotation and the use of pesticides and fertilizers, are all important in determining whether agriculture has a positive or a negative impact on the natural condition in a specific area. This chapter studies the possible means of funding in Less Favoured Areas, and in how far they are able to influence the impacts of agriculture on the environment.

### **Cross Compliance Regulations**

In order to be eligible for direct agricultural support payments, farmers have to, since 2005, meet the Cross Compliance requirements. Cross Compliance involves complying with 19 European regulations known as Statutory Management Requirements (SMRs) covering the environment, animal and plant health, food safety and animal welfare. It also involves maintaining land in good agricultural and environmental condition. The Cross Compliance regulations do not contain specific provisions for Less Favoured Areas, but since farmers in Less Favoured areas in general receive direct agricultural support payments, Cross Compliance requirements are also applied in Less Favoured Areas (European Commission 2011).

### **Good Farming Practice**

Already since 2000, farmers have to comply with Good Farming Practice (GFP), in order to receive LFA Payments. This requirement was introduced under Council Regulation 1257/99 (European Commission 1999). The regulation states, that farmers receiving LFA payments must “apply usual good farming practice compatible with the need to safeguard the environment and maintain the countryside, in particular by sustainable farming”. GFP regulations are drawn up by the member states of the European Union; farmers have to undergo inspections to determine compliance with these standards. As the standards of the GFP are different between the member states their effectiveness in protecting the environment is also different. Main issues covered by the GFP regulations are the use of pesticides and fertilizers, soil management, pasture management, biodiversity and landscape.

### **Eligibility Criteria**

A more specific possibility to influence environmental impacts through payments are the detailed provisions of funding programmes. Possible options are e.g. the configuration of funding limits for certain agricultural practices, managements systems, types of uses or crops etc. There is also the possibility to take influence if certain agricultural operations or processes or uses are excluded from receiving LFA Payments.

### **Impact of Natural Conditions**

It is also conceivable that positive environmental impacts of agriculture in Less Favoured Areas are caused by the natural conditions in such areas. Examples are e.g. reduced intensity of use due to poor soil, reduced livestock numbers or more extensive agricultural practices such as grazing or mowing by hand on steep slopes. Forgoing the draining of land and abandoning land consolidation can also lead to reduced intensity of use in Less Favoured Areas.

## **2 Material and Methods**

This paper examines in which way and to what extend the LFA payment fulfils its environmental objective according to Regulation 1698/2005 (European Commission 2005b), which is to maintain and promote sustainable farming systems. To this end, a comparative analysis is conducted, which brings together the results of various studies and completes the picture with new analysis. In the analysis, indicators are used that are classified as relevant for the evaluation of the LFA payments by the European Commission. Further indicators are

added that go beyond those of the Commission. In general, a with/without comparison is applied to find differences between Less Favoured Areas and areas outside LFAs. Furthermore, knowledge is gained through interviews with environmental experts and case studies. Insights thus obtained are complemented by own considerations.

## 2.1 Indicators Used

When evaluating the Programmes for the Development of Rural Areas also the environmental impacts of LFA Payments were investigated. To this end, the Commission provided a set of indicators that was to help understand the relevant effects on the environment. These indicators differ between the two programme phases of 2000-2006 and 2007-2010 (European Commission 1999, 2005b), which can be seen in Table 1. In addition to the given indicators listed above the evaluators of the LFA Payments set additional indicators that were expected to indicate the environmental impacts of the LFA payments (Deimer, Heyer, Lüdigg 2008, FMAFEWM 2010, Hochberg et al. 2008, Plankl et. al. 2008, Plankl, Rudow 2008). In the scope of this paper, only selected indicators can be looked at in detail in Chapter 3 below.

**Table 1.** Own Compilation of Indicators Measuring the Environmental Impact of LFA Payments based on Deimer, Heyer, Lüdigg 2008, European Commission 1999+2005b, FMAFEWM 2010, Hochberg et al. 2008, Plankl et. al. 2008, Plankl, Rudow 2008.

Indicators relating to EC 1257/99	Indicators relating to EC 1698/05	Further Indicators
Share of UAA under environmentally benign farming systems:	Areas under successful land management contributing to biodiversity and high nature value farming	Proportion of areas with agri-environmental measures
- Of which used for organic farming	Successful land management is defined as the successful completion of land management actions contributing to:	Grazing livestock units
- Of which used for integrated farming or integrated pest management	Improvement of biodiversity (protection of wildlife species or groups of species, maintain or reintroduce crop-combinations, safeguarding endangered animal breeds and plant varieties)	Use of fertilizers and pesticides
- Of which used as pasture with less than 2 LU/ha (or a specified regional variant)	Avoidance of marginalization and land abandonment	Extensive grassland proportion of agriculturally used land in businesses that receive LFA payments
Share of UAA used for arable farming where the quantity of nitrogen applied (farm manure + synthetic) is less than 170 kg/ha per year		Indicators that measure the intensity of cultivation
Share of UAA used for arable farming where the quantity of pesticides applied is less than a specified threshold		

## 3 Results

### 3.1 Analysis of Indicators

#### *Indicators According to Regulation EC 1257/99*

Studies for selected regions in Germany show that the share of land in Less Favoured Areas that is cultivated in an environmentally friendly manner is indeed higher than in non-Less Favoured Areas (Table 2) (Plankl et. al. 2008). This finding is representative for nearly all German Federal States. There are however differences from region to region that are less favoured. This is due to, inter alia, the varying proportion of grassland/pasture in such areas. In German LFAs, the share of grassland is about 28%, outside LFAs it is 13 % (Plankl et. al. 2008). Generally, environmentally friendly practices are more wide spread on grassland areas.

**Table 2.** Share of Utilised Agricultural Area (UAA) under Environmental Friendly Farming Inside and Outside LFAs in Selected German Regions (Federal States) in 2005

	LFA	outside LFA
Hesse	35,1	11,6
Saarland	37,1	29,0
Baden-Württemberg	70,9	53,4
Brandenburg	44,5	18,7
Saxony	59,0	39,2
Saxony-Anhalt	48,9	35,8
Thuringia	58,5	20,8

*Source: Own compilation based on Plankl et al. ( 2008).*

Also when looking at the indicator "organic farming" it becomes evident that the share of farms that farm organically in Less Favoured Areas is nearly double of that in non-Less Favoured Areas. Also the proportion of UAA that is farmed organically is considerably higher in Less Favoured Areas than outside of such areas (Table 3).

**Table 3.** Share of UAA and Farms under Organic Farming Inside and Outside LFAs in Germany in 2005

	outside LFA	LFA
Share of organic farms (%)	2,6	4,5
Share of UAA under organic farming (%)	2,9	6,4

*Source: Own compilation based on (Plankl et. al. 2008).*

Regarding integrated farming there is no reliable data available in Germany that is divided into Less Favoured Areas and non-Less Favoured Areas. In addition to that, integrated farming is applied more frequently in fruit and vegetable production and this rarely occurs in Less Favoured Areas. Also, intensive cultures such as fruit and vegetables are not eligible for LFA payments in Germany.

For the indicator "LU/ha on pastures" there is also no separate data available for Less Favoured Areas and areas outside LFAs. One reason for this is that the threshold of 2 LU/ha has to be adhered to in any case, according to Council Directive 91/676/EEC of 12 December 1991 that is concerned with the protection of waters against pollution caused by nitrates from agricultural sources. Because of this Directive it is assumed that the set limit is adhered to on all areas. As a special case, a study for identifying a 1.4 LU/ha regional threshold was undertaken in Baden-Wuerttemberg. It became evident that on approx. 25% of grassland areas in Less Favoured Areas stock levels are below the 1.4 LU/ha limit. In non-Less Favoured Areas this percentage is only half as high, approximately (Plankl et al. 2008).

In terms of the indicator "Nitrogen applied less than 170 kg N per ha and year" there is again no nationwide data available for Germany, for both Less Favoured and non-Less Favoured Areas. Also for this indicator the Council Directive 91/676/EEC applies. It can therefore be assumed again that the set threshold is adhered to on all areas. A case study in Thuringia conducted by the Thuringian State Research Centre for Agriculture (Thüringer

Landesanstalt für Landwirtschaft-TLL) analysed the applied nitrogen on arable land in less favoured areas. It became evident that on more than two thirds of the arable land the nitrogen applied is significantly less than 170 kg N per ha and year. The average amount was 128 kg N (Hochberg H. et al. 2008).

The use of pesticides is regulated in the Good Farming Practice and Cross Compliance regulations (no danger to humans, fauna and ecosystem). Concerning this indicator, data for Less Favoured Areas is only available from case studies. In Thuringia, it was found that on two thirds of the examined areas pesticides are used to such a level that sustainable agricultural practices can be maintained, with particular regard to the requirements of environmental conservation (Hochberg H. et al. 2008). In Saxony-Anhalt a case study using a reference farm ascertained that the use of pesticides was well below the standard. As a special characteristic of Less Favoured Areas the studies identified that certain products (in particular herbicides) were not used. In addition, large areas, in particular grassland, were excluded from the use of pesticides (Deimer, Heyer, Lüdigk 2008). In sum therefore it can be observed that, taken the various indicators, agricultural practices in Less Favoured Areas are more environmentally friendly than in non-Less Favoured Areas.

#### ***Indicators according to Regulation 1698/05***

As a particular case for Less Favoured Areas and due to the currently being undertaken new designation there is no data available for the indicators according to Regulation 1689/05, as the indicators of the previous evaluation were continued.

#### ***Other Indicators***

In addition to the EU indicators, further indicators were used in order to measure the environmental impacts of the LFA payments. Some results are summarised here. In Austria, for example, the evaluators identified the share of agricultural businesses that receive LFA payments and also take part in agri-environmental measures. It became evident, that this proportion is very high. In 2006, 90% of agricultural businesses receiving LFA payments also took part in agri-environmental measures (FMAFEWM 2010).

A further indicator is the number of livestock units per hectare in Less Favoured Areas. Analyses in Germany and Austria have revealed that the numbers of livestock units per hectare in Less Favoured Areas are well below those outside of such areas (FMAFEWM 2010, Plankl et al. 2008).

### **3.2 Impacts Due to the Design of the Funding Scheme**

As already outlined in the introduction, conditions attached to a funding scheme can influence the environmental impacts of agriculture. Good Farming Practice and Cross Compliance regulations are not only requirements for payments in Less Favoured Areas, but apply to all farmers. Because of this, the steering effect of both these measures in terms of the cultivation practices in Less Favoured Areas is rather limited. More influence can be expected due to the design of the LFA funding programme. Examples here are e.g. the exclusion of wheat and maize from funding as applied in Germany. The cultivation of wheat and maize is generally associated with high levels of fertilizers. In addition, the cultivation of maize encourages soil erosion due to late germination. This and the fact that higher levels of pesticides are used can lead to greater contamination of ground water. By excluding these two crops from funding, the known negative impacts of their cultivation on areas receiving LFA payments can be avoided.

Also positive is the increased rate of funding for grassland in comparison to the rate for arable land, which is also applied with the German funding scheme (for actual examples see Table 4). In that way the LFA payments contributes to a reduction in the yield gap between these two uses and makes it less economically attractive to convert grassland into arable land.

Another positive outcome for the environment can be expected due to the fact that, in Germany, land with direct payment taken out from agricultural production is excluded from receiving LFA Payments. Among environmental experts, the environmental benefit of such areas in good agricultural and ecological condition (GAEC-areas) is disputed. To a small degree however, GAEC-areas can positively influence biodiversity. Problems arise only if agricultural land is not cultivated anymore on a large scale. Nevertheless, in certain sensitive areas the continuation of agriculture can be the deciding factor for conserving biodiversity. Examples here are plant communities that can only be preserved through grazing or repeated mowing.

**Table 4.** Subsidies Actually Paid in Less Favoured Areas According to Different Types of Land Use in Selected German Regions (Federal States) in 2006

	LFA Payments for Grassland	LFA Payments for Arable Land
Hesse	68 €	34 €
Baden-Württemberg	102 €	51 €
Brandenburg	53 €	27 €
Saxony	79 €	35 €

*Source: Own compilation based on (Plankl et. al. 2008).*

## 4 Conclusions

The foregoing analyses have shown that the environmental impact of agriculture is, measured against the above indicators, better in Less Favoured Areas than outside of such areas. Environmentally friendly practices are used more and more often. Nevertheless, it is the question, whether it is the LFA payment that drives this development or whether it is the given natural conditions. Also because of the considerable overlap of LFA payments with agri-environmental measures it is difficult to clearly distinguish the effects of the LFA payments alone.

At EU level the steering effect of the payment is presumably in any case low, because there are no specific environmental conditions attached to the LFA payments. As already demonstrated, also the effect of CC and GFP on agriculture in Less Favoured Areas is rather limited.

One option for an improved steering of impacts consists in, e.g. supplementary conditions or a more specific design of the funding system, as is the case in Germany for example. It can be assumed for instance that in order to maintain grassland an increased premium paid for grassland use in comparison to the premium paid for arable crops will have a positive effect. To exclude land that is not cultivated anymore from funding through LFA payments can be another way to influence the impacts of agriculture to fit the specific requirements of Less Favoured Areas. The exclusion of such areas appears reasonable also from an economic point of view.

In conclusion it is commended to give greater consideration to the specific environmental concerns of Less Favoured Areas when revising the funding programme for the new funding period.

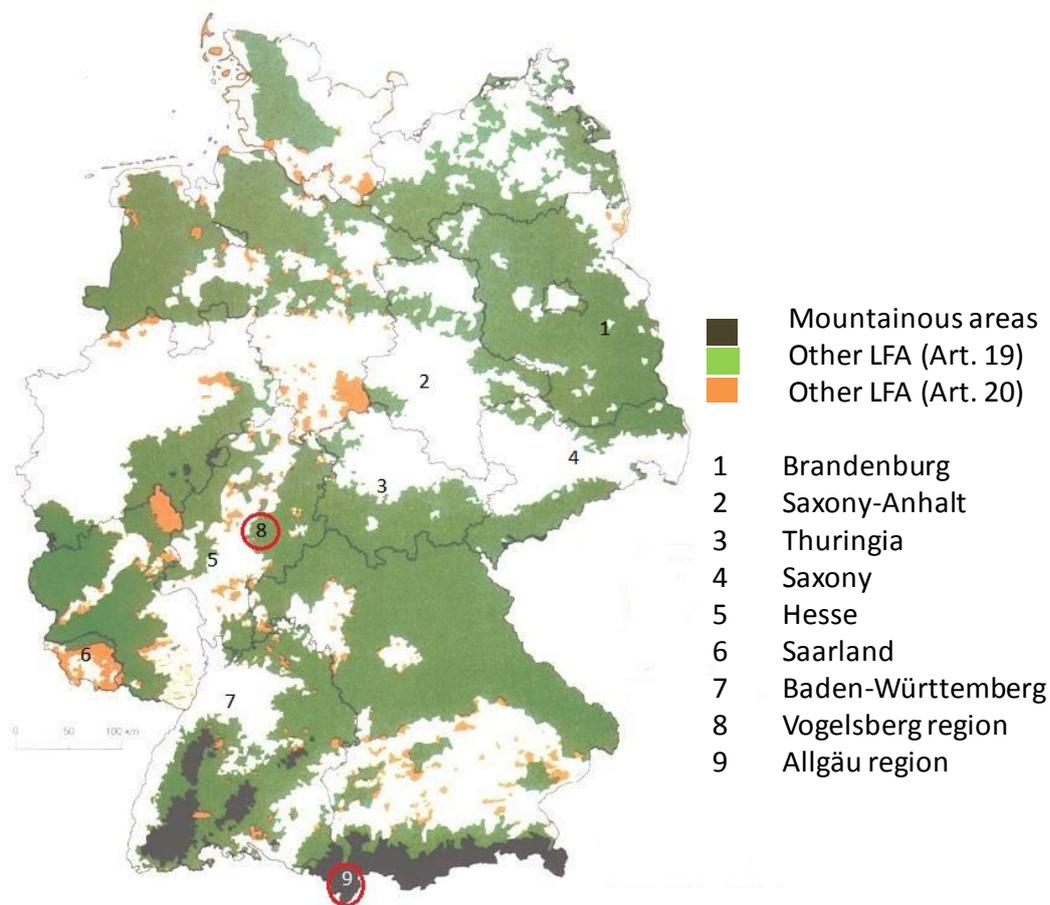


Figure 2: Map of LFAs in Germany and Regions Investigated

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# Trends of Biotech Crops in Food, Feed, Fiber and Fuel

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**Annotation:** The paper is aimed on the problematic of biotech crops planting (GM crops). The main aim of this paper is to analyze the trends in the main biotech crops planting groups in the main producer countries in the sense of their use for food, feed, fiber and fuel in the future. The selected groups of biotech crops analyzed in this article are soybeans, maize (corn), cotton and rapeseed (canola). The main world producers are USA, Brazil, Argentina, Canada, India and China. The used methods are chain and basic indexes and regression analysis of times series/ trend data (for predicting on next 5 years). The trends are able to determine the necessity of implementation the biotech crops planting into the agricultural systems everywhere (also in EU) and it is without the questions if the impact are mainly positive or negative. The dependence of world agricultural commodity market on the biotech crops is undeniable and the prediction acknowledges that the importance is increasing.

**Key words:** biotech crops, GMO, trends, production, food, feed

**JEL classification:** Q00, F10

## 1 Introduction

Crop biotechnology has been the most rapidly adopted agricultural technology in history. In the United States, 93 percent of the soybean crop, 92 percent of cotton and 86 percent of field corn (maize) are now bio-engineered, known as genetically modified organisms, GMOs<sup>1</sup>. (James, 2010). For the first time in 2009, biotech soybean occupied more than three-quarters of the 90 million hectares of soybean globally (in 2010 already 81%), biotech cotton almost half of the 33 million hectares of global cotton (64% in the year 2010), biotech maize over one-quarter of the 158 million hectares of global maize (29% in 2010) and biotech canola (also called rapeseed) more than one-fifth of the 31 million hectares of global canola - 23% in 2010 (ISAAA Releases 2009). This information is significant argument for the propagators of biotechnologies. The results of the reports all around the world about the trends of biotechnology in agriculture are clear – the share of GMO (genetically modified organisms) is increasing in each indicator, in the amount of hectare, in the amount of volume and also in the amount of consumption and of the share on the foreign trade. Across the globe, experts Galvão (2010) and Parente (2010) expect to see a marked increase in corn (maize) and canola GMO varieties in the next few years, which currently make up 30 and 23 percent of those crops, respectively. Developing nations, including China, India, Brazil, Argentina, South Africa and Mexico are now using GMO varieties in nearly 62 percent of their acreage. With further dramatic growth of GMO use predicted in these countries, the use of GMOs worldwide is projected to grow at a much faster rate in the next five to 10 years than in the United States. In China, for instance, hundreds of new biotech companies have recently emerged (Zhu et al., 2009). Adoption of plant biotechnology continues to grow worldwide as confirmed by the International Service for the Acquisition of Agri-Biotech Applications (James 2010) announcement that 15.4 million farmers in 29 countries grew biotech crops on 148 million hectares in 2010. This is a 10 percent increase over 2009. This represents 9.4% of the world's arable land, an area equivalent to over five times the size of the UK. The majority of existing commercial genetically modified (GM) crops have been designed to express

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<sup>1</sup> in this contribution is term biotech crops equivalent GMO crops

transgenic proteins with a limited spectrum of biological activity, e.g. insect resistance and herbicide tolerance (Codex, 2003), (Chassy et al., 2004) and (Chassy et al., 2008).

Genetically modified crops – primarily canola, cotton, maize and soybeans modified for insect-resistance and herbicide-tolerance – presently widely used have earned the label of sustainable intensification in global agriculture through the vital role of science (Raven, 2010). Ruttan (1999) has developed a simple three-stage classification of the goals of agricultural biotechnology development starting with stage one where the goal is lifting the yield ceiling of cereals. The second stage focuses on enhancing the nutritive value of cereals such as golden rice, which increases the Vitamin A intake, and reduces child blindness. The third stage focuses on the development of plants as nutrient factories to supply food, feed and fiber. The critics of biotech crops include Altieri (2001), Greenpeace, Oxfam, Global Justice Ecology Project, Vandana Shiva, Zerbe (2004). Critics emphasize the potential health and environmental risks and the dominance of multi-national corporations in research and decision making in developing countries.

The European Union (EU) is one of the small group of countries standing against these trends. The European Commission is strictly for high level of control in this field of agricultural sector. The single steps in legal regulations are the clear proof. In the EU, seven countries (Spain, Czech Republic, Romania, Portugal, Germany, Poland and Slovakia) planted MON 810, a genetically modified maize variety from Monsanto, on a commercial basis in 2008. The total acreage for the seven countries increased from 88,673 hectares in 2007 to 107,719 hectares in 2008 (James, 2008), with Spain being by far the most important adopting country in Europe (Gomez-Barbero et al., 2008 a,b). However, in 2009, the EU acreage decreased by 9 % compared to 2008, partially due to a German ban on MON 810. According to James (2009) the decrease was associated with several factors, including the economic recession, decreased total plantings of hybrid maize and perceived disincentives due to onerous reporting of intended plantings of MON 810 (Kaphengst, 2011) In France and Germany, national cultivation bans for genetically modified Bt maize (MON810) were enacted in 2009. Both countries have suspended the approval issued according to EU law. In the meanwhile, stricter co-existence regulations apply in almost all EU member states (GMO Compass, 2009).

## **2 Aim**

This paper analyses the current situation in the biotech crops sector: acreage in the industrial and developing countries and adoption rate (plantings of GMOs in major countries as % of total acreage). The main aim of this paper is to analyze the trends in the main biotech crops planting groups in the main producer countries in the sense of their use for food, feed, fiber and fuel in the future. The partial aim is to analyze the impact on world agricultural commodity market in the possibility to operate without these crops. The selected groups of biotech crops analyzed in this article are soybeans, maize (corn), cotton and rapeseed (canola).

## **3 Materials and Methods**

Data used in this paper comes from the following sources: ISAAA Briefs No. 1-42: Global Status of Commercialized Biotech/GM Crops: 1996-2010 (author Clive James), National Agricultural Statistics Service (NASS, 2010) - Agricultural Statistics Board, U.S. Department of Agriculture, FAOSTAT database (2011, direct access), CÉLERES AMBIENTAL (Brazil database) and FEFAC Statistical Yearbook 2009: Feed & Food.

The first used statistical methods are the 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 second used statistical method is simple regression analysis of times series/ trend data, for predicting on next 5 years. Linear prediction is a mathematical operation where future values of a discrete-time signal are estimated as a linear function of previous samples. Linear regression can be used to fit a predictive model to an observed data set of  $y$  and  $x$  values. Simple linear regression predicted values of one variable.

The data are pairs of independent and dependent variables  $\{(x_i, y_i): i=1, \dots, n\}$ . The fitted equation is written  $y = ax + b$ , where  $y$  is the predicted value of the response obtained by using the equation. Regression coefficient represents the rate of change of one variable ( $y =$  million hectares) 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.

The trends are able to determine the necessity of implementation the biotech crops planting into the agricultural systems everywhere (also in EU) and it is without the questions if the impact are mainly positive or negative.

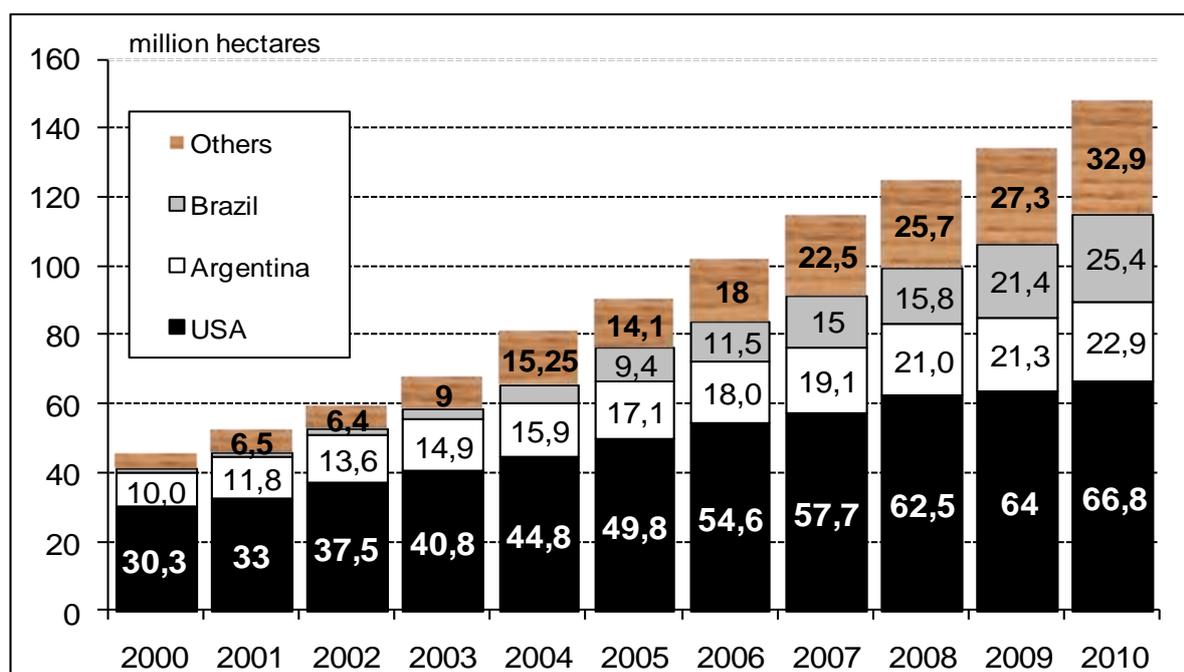
## **4 Results and Discussion**

### **4.1 Basic overview**

The growth from 1.67 million hectares of biotech crops in 1996 to 148 million hectares in 2010 is an unprecedented 87-fold increase, making biotech crops the fastest adopted crop technology in the history of modern agriculture. Global acreage of biotech crops continued its strong growth in 2010 for the fifteenth consecutive year – a 10%, or 14 million hectare increase, notably the second largest increase in 15 years, reaching 148 million hectares, – up significantly from a 7% growth or 9 million hectares increase and a total of 134 million hectares in 2009 (James 2010). For the first time the top ten countries each grew more than 1 million hectares; in decreasing order of acreage they were: USA (66.8 million hectares), Brazil (25.4), Argentina (22.9), India (9.4), Canada (8.8), China (3.5), Paraguay (2.6), Pakistan (2.4), South Africa (2.2) and Uruguay with 1.1 million hectares.

There is considerable potential for increasing the biotech adoption rate of the four current large acreage biotech crops (maize, soybean, cotton, and canola), which collectively represented almost 148 million hectares of biotech crops in 2010 from a total global potential of 315 million hectares; thus, there are approximately 150 million hectares for potential adoption (James 2010). Developing countries grew 48% of global biotech crops in 2010 and will exceed industrial countries acreage before 2015. Biotech growth rate was much faster in developing countries, 17% or 10.2 million hectares, versus 5% or 3.8 million hectares in industrial countries. The five lead developing countries in biotech crops are China and India in Asia, Brazil and Argentina in Latin America, and South Africa in Africa.

**Graph 1.** Area (million hectares) GM crops in main producing countries



Source : *Global status of commercialized biotech/GM crops: 2000-2010. ISAAA Briefs, ISAAA: Ithaca*

Total world area of GM crops is divided into main producing countries; it is illustrated in Graph 1. Till the 2009 were two states with the largest acreage USA and Argentina, from this year is on the second position Brazil. Brazil is perceived as the driving force for biotech crop investment in the future. From the view of share, in the year 2000 the USA produced nearly 67% of biotech crops, Argentina around 22% and Brazil was almost around zero % - all other countries around 11%. The share of the USA at the total biotech crops area is decreasing – in 2010 45%, the same situation is in Argentina – in 2010 15,5%, but other countries share grew to nearly 40% (from this group is important Brazil – more than 17%, Canada – around 6%, India – 6% and China – 2,4%; other countries – Paraguay, Pakistan, South Africa and Uruguay have each less than 2%). From the view of the growth rate the rapid increase in share can be seen only by Brazil and by some states from the group Others – for example India.

The distribution of the global biotech crop area for the four major crops is illustrated in Table 1 for the period 1996 to 2010. It clearly shows the continuing dominance of biotech soybean occupying 49.5% of the global area of biotech crops in 2010; the entire biotech soybean acreage is herbicide tolerant RR®soybean. Biotech soybean retained its position in 2010 as the biotech crop occupying the largest area globally, occupying 73.3 million hectares in 2010, 5.9% higher than 2009 and biotech maize had the second highest area at 46.8 million hectares and also had the second highest year-to-year growth rate for any biotech crop at 12%. Biotech cotton reached 21 million hectares in 2010 and grew at the highest of all biotech crops at a rate of 30.4% between 2009 and 2010. Rapeseed reached 7 million hectares in 2010 with an 9.4% global growth rate and planted in Australia for the first time in 2009.

**Table 1.** Distribution of Biotech Crops, by Crop, million hectares

	1996	2008	2009	2010	Crops 2010 : structure in %
Soybeans	0.4	65.8	69.2	73.3	49.5%
Maize	0.5	37.3	41.7	46.8	31.6%
Cotton	0.8	15.5	16.1	21	14.2%
Rapeseed	0.2	5.9	6.4	7	4.7%
Total	1.67	125	134	148	100%
Soybeans : Chain Index	x	12.3%	5.2%	5.9%	x
Soybeans : Base Index	x	164.5	173	183.25	x
Maize : Chain Index	x	6%	12%	12%	x
Maize : Base Index	x	74.6	83.4	93.6	x
Cotton : Chain Index	x	3.3%	3.9%	30.4%	x
Rapeseed : Chain Index	x	7.3%	8.5%	9.4%	x

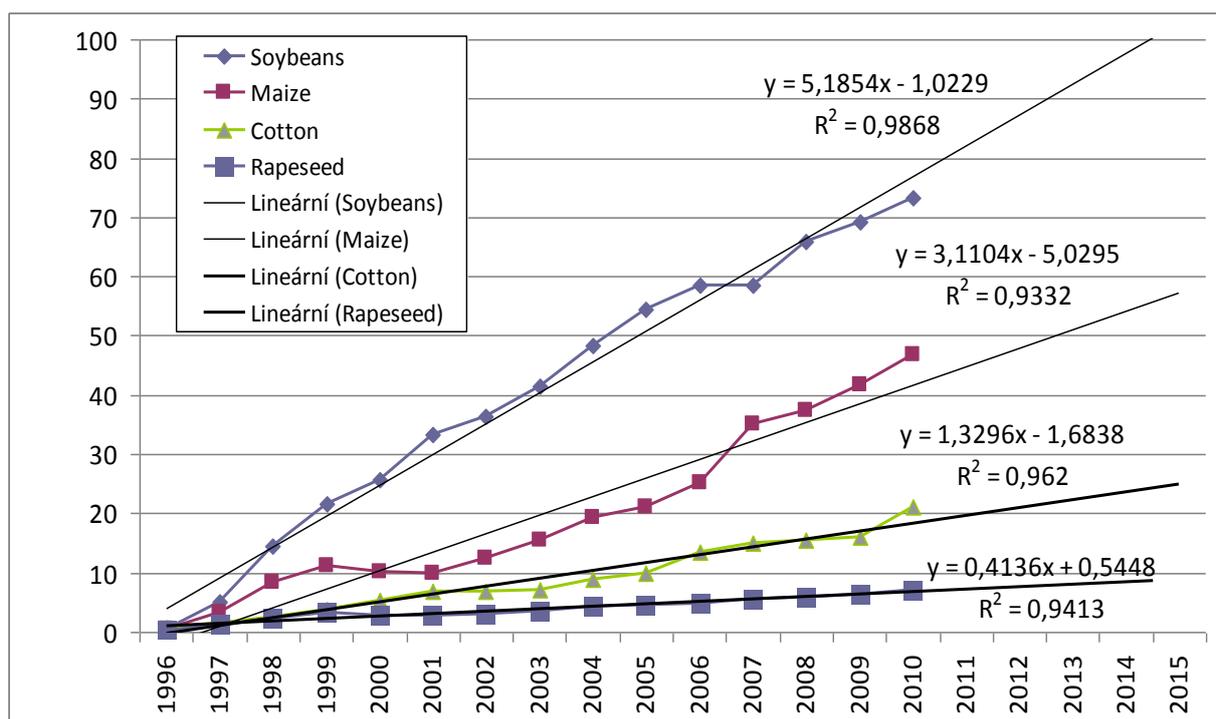
*Source : Global status of commercialized biotech/GM crops: 2010. ISAAA Brief No.42, ISAAA: Ithaca, NY Fefac (2009). Based on USDA; IAAS; CÉLERES AMBIENTAL® Brazil, own calculation*

Table 1 shows the Fixed Base Index Numbers and Chain Base Index Numbers of described GMO crops. The share is increasing for each commodity, but the important is the dynamic in last three years (2008 – 2010), because it shows the trend for next years. The Chain Base Index Numbers is higher for maize (12%) than for soybeans (nearly 6%). Soybeans are also single crop with falling dynamic in last three years. Other two crops are also increasing – rapeseed slowly (the main reason is given by approach to GMO rapeseed in the most of states where it is planting) and cotton with big jump in last year (30.4% against 2009). The limits which can determine the dynamic of growth is partially possible to see in the graph 3.

Sugarbeet is an important relatively new biotech crop first commercialized in the USA and Canada in 2007, and an increased adoption rate of 59% in 2008, and 95% in 2009 when acreage reached 0.5 million hectares – this makes it the fastest adopted biotech crop since the genesis of commercialization in 1996. RR alfalfa, first grown in 2006, occupied 102,000 hectares equivalent to approximately 5% of the 1.3 million hectare seeded in the USA in 2009, with no further planting taking place in 2009 until the restraining order on planting is rescinded in the USA. Small acreage of biotech virus-resistant squash and papaya continue to be grown in the USA and China also grows about 4,500 hectares of PRSV resistant papaya and 447 hectares of Bt poplar.

Regression line, calculate in the Graph 2 is linear ( $y = ax + b$ ) and the regression coefficient is the constant (a or Beta). Regression coefficient represents the rate of change of one variable ( $y =$  million hectares) as a function of changes in the other ( $x =$  year); it is the slope of the regression line.

**Graph 2.** Distribution of Biotech Crops, by Crop, million hectares, regression analysis of times series



Source : Global status of commercialized biotech/GM crops: 1996-2010. ISAAA Briefs, ISAAA: Ithaca, NY, own calculation, comment:term "lineární" means linear

The highest value of regression coefficient includes soybeans line, Beta = 5.1854, i.e. year-to-year prediction growth is 5.1854 million hectares. In 2015 can be achieved 102.68 million hectares of biotech soybeans (see Table 2, paragraph: Year 2015 prediction).

**Table 2.** Main statistical characteristic of Biotech Crops distribution

	Absolute term	Beta coefficient	p-value (Beta coef.)	F (1,13)	Year 2015 prediction	- 95 % prediction	-95% prediction
Soybeans	-1.02286	5.18536	0.00000	969.65	<b>102.68</b>	98.10	107.27
Maize	-5.02952	3.11036	0.00000	181.49	<b>57.18</b>	50.82	63.54
Cotton	-1.68381	1.32964	0.00000	329.15	<b>24.91</b>	22.89	26.93
Canola	0.54476	0.41357	0.00000	208.52	<b>8.82</b>	8.03	9.61

Source : STATISTICA 10 Software, Data :Global status of commercialized biotech/GM crops: 1996-2010. ISAAA Briefs, ISAAA: Ithaca, NY

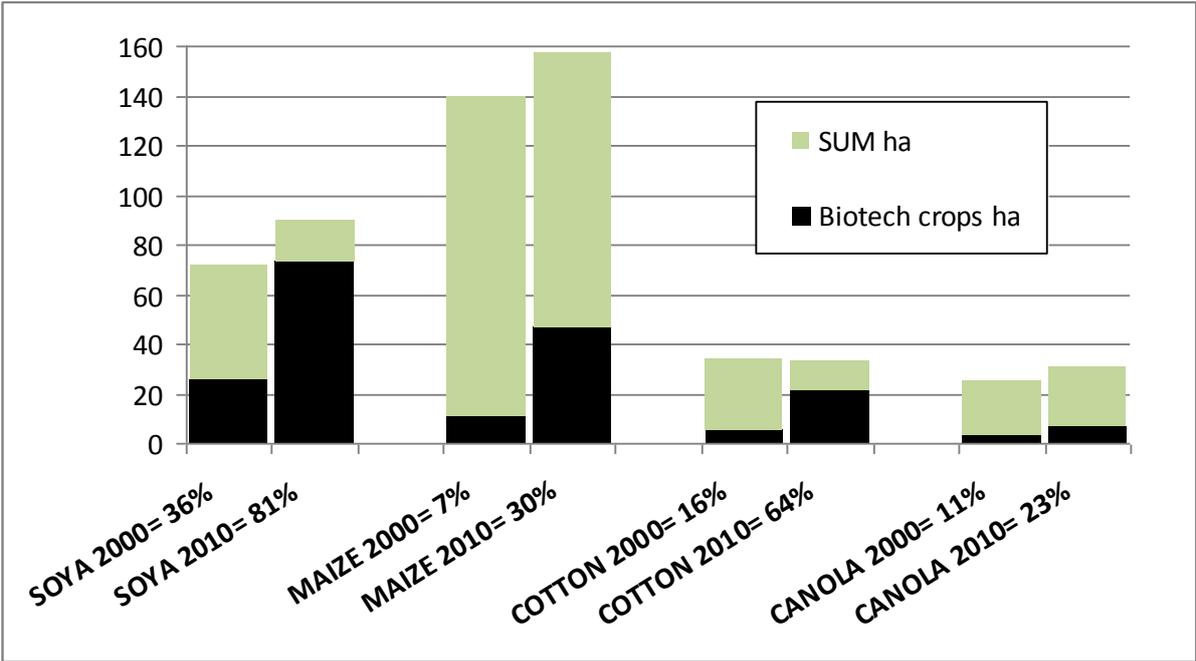
Note : In statistical significance testing, the p-value is under 0.015 by all Biotech Crops. The results are statistical significant.

The second highest value of regression coefficient includes maize line, Beta = 3.1104, i.e. year-to-year prediction growth is 3.1104 million hectares. In 2015 can be achieved 57.18 million hectares of biotech maize. The third highest value of regression coefficient includes cotton line, Beta = 1.3296, i.e. year-to-year prediction growth is 1.3296 million hectares. In 2015 can be achieved 22.89 million hectares of cotton. The lowest value of regression coefficient includes rapeseed (canola) line, Beta = 0.4136, i.e. year-to-year prediction growth is 0.4136 million hectares. In 2015 can be achieved 8.82 million hectares of rapeseed (canola).

The conclusions made from simple linear regression are statistically significant and correct, but there is necessary to compare the linear trends to real world situation. How it is written bellow, the important is the total acreage and the share of biotech crops. For example to achieve the 100 million hectare of biotech soybeans in 2015 means to exceed the total present acreage. But it is relatively possible (see part 4.1) and there is also second significant reason for exceed acreage of biotech soybeans – the positive approach to GMO in the main world producing countries. Growth of soybean is thus determined by fulfilled capacity in USA, Argentina and Brazil. From these reasons the realistic is prediction by corn and cotton. Growth in biotech rapeseed is determined by EU politics, EU is main world producer of rapeseed.

The share of biotech crops on total crop acreage is illustrated in the Graph 3 and Table 3.

**Graph 3.** Global Adoption Rates (%) of Main Biotech Crops (million hectares), 2000 and 2010



Source : Global status of commercialized biotech/GM crops: 2010. ISAAA Brief No.42, ISAAA: Ithaca, NY, own calculation

According to database FAOSTAT, in the 2010 total area harvested of soybeans reached 99.5 million hectares. Main producer were USA (30.9 million hectares, 31 percent of soybeans world area), Brazil (21.75 million hectares, 22 percent), Argentina (16.77 million hectares, 17 percent), India (9.8 million hectares, 10 percent) and China (9.19 million hectares, 9 percent of soybeans area). In the 2010 total area harvested of maize reached 158.6 million hectares. Main producer were USA (32.2 million hectares, 20 percent of maize world area), China (31.2 million hectares, 10 percent), Brazil (13.8 million hectares, 9 percent), India (8.3 million hectares, 5 percent) and Mexico (6.2 million hectares, 4 percent of maize world area). In the 2010 total world area harvested of cotton reached 33.1 million hectares and total area harvested of rapeseed reached 30.9 million hectares (Fefac, 2009).

**Table 3.** Plantings of GMOs in major countries as % of total acreage

	2002	2007	2008	2009	2010
USA: Soybeans	74	92	92	91	93
USA: Maize	32	60	80	85	86
USA: Cotton	71	87	86	88	92
Argentina : Soybeans	95	99.5	99.5	99.5	99.5
Argentina : Maize	30	65	83	85	85
Brazil : Soybeans	60	64	65	71	76
Brazil : Maize	n.a	n.a	12	43	74

Source : Fefac (2009). Based on USDA; IAAS; CÉLERES AMBIENTAL® Brazil

## 4.2 Biotech crops for food and feed

In the world, 29 % of soybean production is used as food and industry, 71 % is used for livestock feed. The increased volume of imported soy entering Europe primary comes from Argentina and Brazil. In 2007, Argentina and Brazil supplied nearly four-fifths (79.3 percent) of the 32.3 million metric tones of imported feed going to the EU. While these two countries are the key exporters, a large share of the exported soybeans grown in Paraguay and Uruguay are shipped through the soybean export terminals.<sup>2</sup> Average EU consumers, who eat 41 kilos of pork, 22 kilos of poultry and 9 kilos of beef annually, consume almost 56 kilograms of hidden biotech soy.

Soybeans, soymeal, maize, wheat, rapeseed and rapeseed meal are used in livestock feed. Yet not all the ingredients for livestock feed used in the EU, either prepared by commercial firms or on-farm, are solely sourced within the EU market (Nowicki, P. et al. 2010). Among the imported ingredients are maize and soy as well as the products derived from them (e.g. maize gluten feed and soy meal). The import of protein feed is a particularly sensitive issue where countries (including EU Member States) do not have the capacity to meet domestic needs of either soy or/and maize, and therefore depend on the capacity of a few key suppliers.<sup>3</sup> Among those countries/regions are the EU but also China, which together represent over half of world demand for imported livestock feedstuffs.

During the last three marketing years (2007/08 to 2009/10), the EU imported on average 34.1 million metric tons of soymeal equivalents<sup>3</sup>, which accounted for 30% of the total tradable amount in the world market. As regards maize, the EU imported on average 7.9 million metric tons per year and over the same period - 9% of the total tradable amount (USDA-FAS, 2010a and 2010b).<sup>4</sup> The global demand of crop protein, however, is being amplified around the world by the rapid economic growth of developing countries, which are catching up to the more mature economies (e.g. China imports of soybean increased by 43% during the last three marketing years; see USDA-FAS, 2010a and 2010b). It is in this context that the prospect for EU demand is to be considered.

European feed imports surged since the WTO went into effect. Since 1995, soy meal imports from outside the European Union to the 15 member states prior to 2004 (EU-15) grew 57.1 percent to 20.2 million metric tonnes in 2007. Total maize imports nearly doubled to 21.6 million metric tonnes. Soy exports from Latin America fueled deforestation. Four-fifths

<sup>2</sup> Eurostat. "Food: From Farm to Fork Statistics." 2008 at 13.

<sup>3</sup> Argentina, Brazil, Paraguay, Serbia, Ukraine and the USA are the primary EU sources for soy and/or maize.

<sup>4</sup> USDA-FAS (2010a). Grain: World Markets and Trade. Circular Series FOP 9–10, September 2010.  
USDA-FAS (2010b). Oilseeds: World Markets and Trade. Circular Series FOP 9–10, September 2010.

of EU soymeal imports came from Brazil and Argentina. The demand for more soybeans has been a key catalyst for clearing 44.5 million acres of forests in these two countries.

### **4.3 Biotech crops for fuel and fiber**

Cotton is the main biotech crop produced for fiber. Leaders in this regard are the USA, India and China. In India, field area rose from 7.6 to 8.4 million hectares. In 2009, 87 per cent of Indian cotton production was based on GM cotton. (GMO Compass, 2009)

The USA were for a long time the main world producer of GM cotton, around the year 2004 the other world production was exceeded USA and from this time till now is great increase in biotech cotton worldwide – for example in 2000 was USA share 72%, in 2008 17%. In 2010 the share of cotton on the whole area of GMO crops was around 14.2% - area of 21 mil ha. (ISAAA Brief, 2008)

Brazil is good example of fast adoption of biotech cotton in the agricultural production. Generally is the total area in time decreasing, but the yield is growing up (nearly 2 million ha in 1990 and now less than 1 million ha, but total production from around 0.7 million MT in 1990 – the lowest was in the middle of nineties (around 0.3 mil MT) – to nearly 1.5 million MT presently. There is no possible to make the result that the total production is increasing on the ground of increasing the share of biotech Cotton. How is in Kaphengst report (2010) in each of five analyzed countries is the yield of biotech cotton higher than in conventional cotton, but the differences are significant – less than 1% in USA till 50% in India. The Bt cotton is in Brazil used from 2004 and today it is on the area of around 0.2 mil ha.

This crop is also the object of one of the first studies about the influence of planting GMO on soil quality. The Navdanya study (2009) is the first that has looked at the long term impact of Bt cotton on soil organisms is a wake up to regulators worldwide. It also shows that the claims of the Biotechnology industry about the safety of GM crops are false. The soil, its fertility, and the organisms which maintain the fertility of soil are a vital aspect of the environment, especially in the context of food and agricultural production. A recent scientific study carried out by Navdanya (2009), compared the soil of fields where Bt-cotton had been planted for 3 years with adjoining fields with non GMO cotton or other crops. At this rate of described soil degradation, in a decade of planting with GM cotton, or any GM crop with Bt genes in it, could lead to total destruction of soil organisms, leaving dead soil unable to produce food.

Generally for fuel can be used all described crops in this article. The principles of biofuels are based on liquid extracts from the crops – the oil for biodiesel and the ethanol for bioethanol, Nowadays there is no GM crop planting especially for burning. The use of GM crops is thus for combustion motors. The main share of planted biotech crops processed on fuel is in the USA. The biofuels are widely supported in developed countries (the natural conditions only in the same type of country as for example is Brazil let get enough energy from the crops (sugar cane) for successful competition of biofuels with fossil fuels) and thus the consumption is mainly in these countries. From this reason is relevant example of using biotech crops for fuel the USA. The highest share used for biofuel has maize (and 86% of maize acreage is GMO), around 21% in domestic market, but more than 17% is exported and there is also potential for fuel production. From the total domestic soy consumption (soybean oil is the main feedstock for biodiesel production in the USA) only 3% are used for biodiesel, but from the domestic soybean oil consumption is the share of 14% (and 93% of maize acreage is GMO). (Food&Fuel, 2008)

## 5 Conclusion

In the context of the main trends in world production of analyzed crops, the question of EU ability to protect the consumption of food, feed, fiber and fuel against the biotech crops is important. For example: the EU is depending on soya import, mainly for feed – it is the result of agrarian policy without the signals of any change of this situation in the near future – so, EU has to import soybeans and soybean meal, and if they will probably be worldwide in next few years nearly from 100% GMO, there will not be any other possibility for EU than to accept biotech crops as the standard part of agricultural production. Now, around 75% of soy import to EU is from Brazil and Argentina. In the field of crops for feed, the dependence of EU on the import from GMO acceptable country is significant. The second important part of agrarian commodity import is for fuel – the import from Brazil is the most fundamental (sugar cane for bioethanol, but it is not GMO yet), as well as the import of soybeans and other oils, but the segment of biodiesel is based on rapeseed produced in EU (about 65%), the share of soya oil is about 14% and palm, sunflower and other oils (each less than 10%) (Gelder at al., 2008). The question of biotech crops for fiber is the question about cotton – this part in the relation of import to EU is not solved in this contribution, but the presumption is that it is imported in the processed form as textiles and clothes. The impact of world biotech crops production in the field of food in EU seems to be not significant presently, because of strict EU policy against GMO, but in this field is valid also the presumption from the beginning of this conclusion.

Worldwide, in the near future the development in biotech crops is expected mainly in Africa (South Africa, Egypt) and in some states in Asia (Pakistan) and Latin America (Brazil, potential in Mexico) – it relates to the share of biotech crops on total acreage in these countries. ISAAA predicts the doubling of acreage of biotech crops (more than 300 mil. ha) and the share in arable land in the world of about 20%. The amount of GM crops has also been increasing – new types of rice, sugar cane, sugar beet, potatoes, etc.

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# World Food Problem and Its Economic Context

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**Annotation:** The aim of the essay is the characteristic of the food problem and the explanation of the basic problems of food security in the times of economic globalization. The world is endangered by the rising prices and diminishing supplies of food commodities which might create a new world food crisis. Until recently, the world cereal stocks were at a much higher level than during the stock crisis in 2007 and 2008. The rapid economic growth and the fears of higher prices, however, have led to their rapid depletion. There is also a considerable speculative influence; given the fact that the commodity prices started rising rapidly, they have attracted short-term investors, what in turn still more supported the prices further growth. The expensive commodities are then driving up the inflation. In December 2010, the Eurozone inflation rose to 2.2 percent, while the target is 2.0 percent. Due to the lack of agricultural commodities and also to their increased trade exchange among countries, there is also endangered the food safety and quality. As an example of this on the agricultural commodity market, there could be mentioned the problem of German supply of eggs into the Czech market as this commodity is from 80% controlled by two competing duopolies of the Czech Eggs CZ and the Golden Eggs, Inc. The imported products may not always meet the criteria for safe consumption, as it was evidenced by the dioxin affair in agricultural production which broke out in Germany at the turn of the year. Previous inspections have not identified, however, any increased incidence of food containing cancer-causing dioxins on the Czech market. Consumers should pay more interest to the origin of food in the stores and they should prefer domestic products. The result of the examination is to identify the relation between the stock of food commodities, their prices and food safety.

**Key words:** safety – foodstuffs – quality of foodstuff – price of foodstuff – food price index

**JEL classification:** Q18

## 1 Introduction

The world food problem is generally considered as one of the most significant problems of a contemporary world. “Addressing the world food problem in a rational and sensible way can help promote global economic development, help ease the pressures on the natural resource base...” (Schuh, 1995) The food problem is a source of tension and represents a serious threat to further development of society. Due to rising prices and lowering supplies of food commodities, the world is threatened by a new food crisis. Prices of groceries on world markets are steeply increasing. Will perhaps a food crisis from 2008, when outbreaks of hunger seized countries from Haiti to Egypt, be repeated?

## 2 Materials and Methods

American economist Kenneth Ewart Boulding is one of the leading specialists dealing with the issue of sustainable development in the setting of world globalization. Especially interesting statements about environmental economy and sustainable development are mentioned in the fifth chapter of his noted publication “*Towards a New Economics: Critical Essays on Ecology, Distribution, and Other Themes*” (Boulding, 1992), where he also develops ideas on topics such as energetics, economic expansion, cybernetics and many others.

The methodology of work is based on a multicriteria analysis of the food problem investigation in the world. It comes from the fact that the food sufficiency in the world is determined by the availability of basic agricultural products as well as by the number of inhabitants of countries for which these commodities are intended. The question of the availability of basic agricultural products is given by two factors:

- Product price that is determined to a big extent by their trading (supply and demand) on world commodity stock markets, and it can also be influenced by speculations.
- Production of agricultural commodities that is influenced to a substantial extent by natural conditions of grown crops; there are considerable vicissitudes in the height of the harvest (floods, droughts etc.) as a consequence of climatic changes in the world.

Thus, these partial factors can substantially influence the food availability particularly for inhabitants of developing economies if there occurs their parallel functioning. To what extent these influences also operate in advanced market economies (on the contrary to developing ones) is possible to illustrate on the example of a selected country, in our case the USA. In case of similar considerations about the food situation in developing countries, it would also be necessary to take into account the growth of population in a particular country. To analyze given problems there will be used theoretical studies dealing with the creation of prices, rents etc. (Model of creating prices...) and also the statistics surveys of renowned international organizations (FAO) and partial information acquired from specialist media.

## 2.1 Model of creating prices of a unique factor of production

If someone owns a certain piece of land, no one can own the same one. A unique factor of production is a factor whose supply is constant and cannot be changed. Such factors of production are usually natural resources as “nature gifts” (land, natural minerals, water resources and others), as well as human abilities. These factors cannot be produced and are only used in the process of production. The supply of all these factors of production is fixed, independent of the height of the factor’s market price. It is theoretically represented by a vertical curve of offer  $S_x$ .

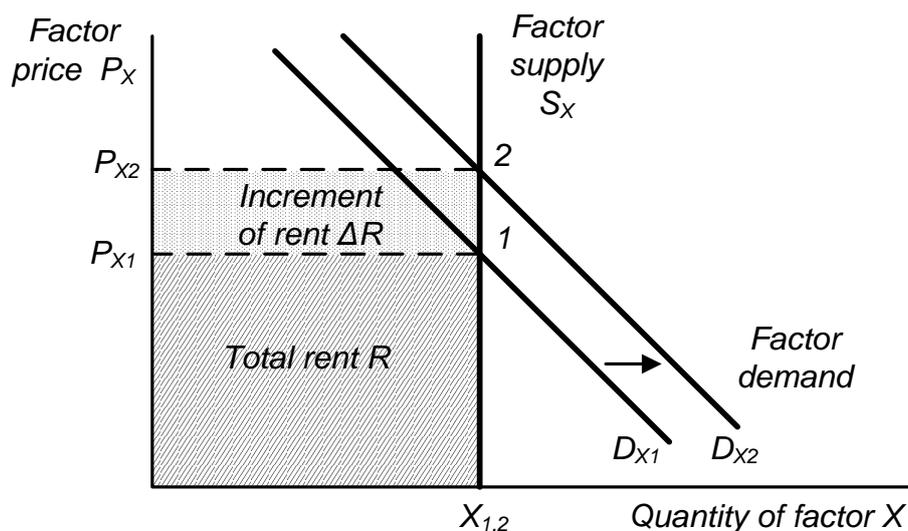


Fig. 1. Soil market and the origin of ground rent

The equilibrium market price of land factor  $P_x$  is formed only by conditions of demand for factor  $D_x$  (decreasing function of income from a marginal factor of production), it is not influenced by conditions of a land offer. The supply of production land factor is fixed no

matter whether the demand (and therefore also the market price) for it is high or low. A balanced amount of the factor is on the other hand determined only by conditions of a constant supply. It was not necessary to spend any economically significant cost in order to create the factor, and that is why every market price of land will be higher than the costs of its creation “by nature”  $P_x > MC=0$ . Therefore each payment for the factor ( $P_x$ ) has the form of a ground rent ( $R$ ). If the offer of this factor is for some reason limited (reasons could be natural disasters, low production efficiency, etc.), restriction of agricultural production results.

### **3 Results and Discussion**

It is possible to observe two main contradictory displays of the food problem. The first is the lack of groceries in general, affecting a large portion of population which then suffers from famine and associated diseases. This problem is typical of developing countries. The second display is excessive food consumption and unsuitable diet composition that results in obesity and different civilization diseases. This is characteristic for developed countries. Well-developed countries make about 50 % of world food production. However, only less than 20% of world population lives in these countries. Number of inhabitants in developed countries is stagnant, while population growth in developing countries continues. Food production per inhabitant in developing countries is 3.5 times lower than in developed countries. (Jeniček, 2003) The objective of this paper is to characterize the food problem and to clarify theoretical ways of creating food prices in the setting of economic globalization.

#### **3.1 Food crisis and FAO**

The Food and Agriculture Organization (FAO) of the United Nations announced at the beginning of this month that its index of food prices climbed in December 2010 to a new maximum (at least since 1990) to a value of 214,7. At the same time, it warned that a rapid growth of petroleum prices could lead to further increase in food prices. The growth of the mentioned index was in the last month caused mainly by prices of corn, which is in the USA more and more used to produce gasoline imitation of ethanol. “Food crisis stems from a long-term cycle of fossil-fuel dependence of industrial capitalism combined with current biofuel offsets and financial speculation...” (McMichael, 2009) High prices of cereals invoke fear and supplies are now quickly being depleted. FAO has long been pointing out the necessity to increase productivity and investments in agriculture.

World supplies of cereals were till recently at much higher level than supplies in the critical years 2007 and 2008. However, quick economic growth and worries about high prices led to the fast reduction of supplies. Large purchases have been lately done by countries from north Africa and the Middle East that want to calm down their stirring domestic situation caused among others also by expensive groceries. South Korea or Mexico are also increasing their supplies by purchases on the market.

FAO asked developed countries to reassess their strategies of biofuel support as these strategies significantly contribute to the food crisis by subvention of growing crops intended to be used in fuel production instead of crops to be used as food. This policy moves 120 million tons of cereals a year from the world of groceries to fuel production.

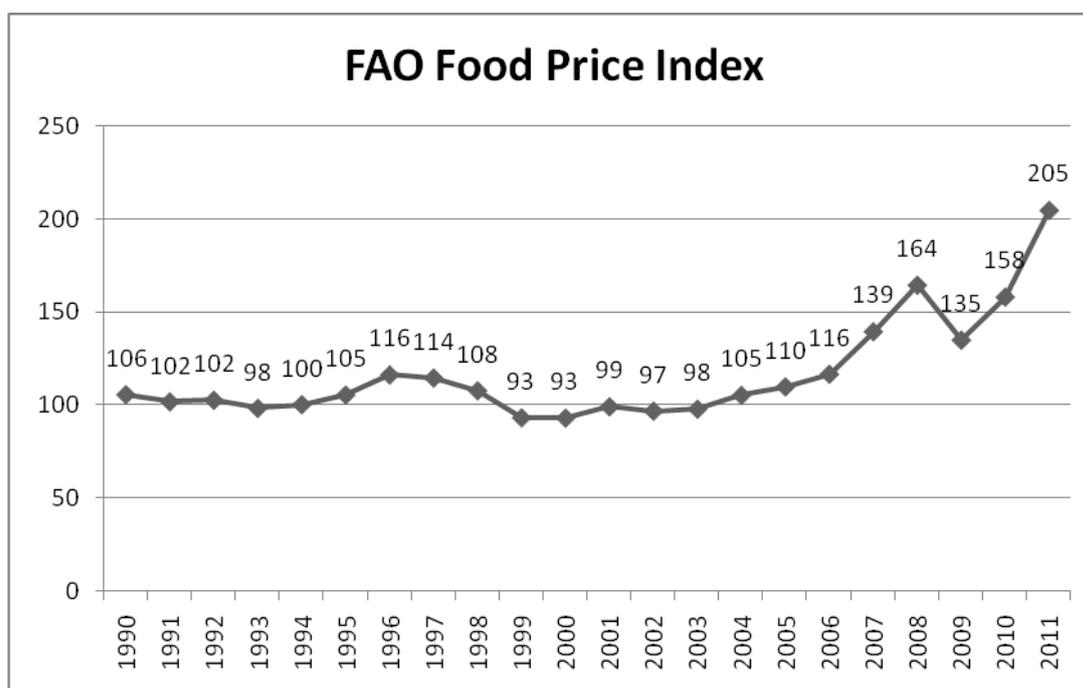


Fig. 2. FAO Food Price Index

Table 1. Economic analysis of wheat production in the USA

Year	Planted acreaage [million acres]	Harvested acreaage [million acres]	Production [million bushels]	Yield [million bushels]	Weighted- average farm price [dollars per bushel]
2001/02	59.43	48.47	1,947.45	40.2	2.78
2002/03	60.32	45.82	1,605.88	35.0	3.56
2003/04	62.14	53.06	2,344.42	44.2	3.40
2004/05	59.64	49.97	2,156.79	43.2	3.40
2005/06	57.21	50.10	2,103.33	42.0	3.42
2006/07	57.33	46.80	1,808.42	38.6	4.26
2007/08	60.46	51.00	2,051.09	40.2	6.48
2008/09	63.19	55.70	2,499.16	44.9	6.78
2009/10	59.17	49.89	2,218.06	44.5	4.87
2010/11	53.60	47.64	2,208.39	46.4	5.65
2011/12	58.02	48.04	2,043.15	42.5	6.80-8.20

For investigating economic characteristics of wheat production in the world we have chosen the example of one of the most developed economies in the world - the USA owing to the fact that commodity markets in this country could be considered advanced and stabilized. If we investigate the character of indicators development of planted acreage and harvested acreage, their mentioned difference undoubtedly shows the influence of a natural factor on a higher crop; in our case of the USA, there is up to 20% of planted areas negatively affected by the influence of natural factors every year. From the point of view of above planted acreage, we have also to take into consideration the willingness of farmers to plant agricultural land with the wheat owing to its prices on the market (in alternation with other crops). Then in a production indicator we can express the final effect from the point of view of the time sequence (million bushels). Except for the years 2002/03 and 2006/07, relatively balanced development of the production around 2.0 to 2.5 million bushels can be noticed. In mentioned years the influence of the amount of the crop was reflected in the average price of production.

In comparison of years 2001/02 and 2002/03 there was year by year accrual of the wheat price 28% from the amount 2.78\$ to 3.56\$ per wheat bushel. Similarly, the same price shock can be also noted in the period of years 2005/06 and 2006/07 when farmer prices of wheat increased by 25% as a result of natural influences (crop area was in the same range in both compared years). However, from the analysis of a harvested amount and the prices of the wheat in the USA from the point of view of the time sequence of an indicator, another fact is interesting. If we compare the prices of the wheat by means of the Weighted-average farm price indicator in the year 2003/04 when the yield was 44.2 million bushels with the development in 2009/10 when it was 44.5 million bushels, we can state that the farm price of the wheat increased in the mentioned meantime from 3.4\$ per bushel to 4.87\$ per bushel. These price changes also include supply shocks caused for instance by the growth of farmers' costs as a result of the growth of fuel prices etc. For stating an objective influence of some of the factors on the final price, it is necessary to compare the weighted-average farm price of American farmers with prices on world stock markets. Then these are influenced not only by the crop in other parts of the world but also by speculations on stock markets as mentioned further.

### **3.2 Growth of food prices in the world**

The prices of groceries have been growing around the world in the last few months and the Czech Republic is not an exception. The index of the United Nations (UN) organization for nutrition and agriculture shows that the world food prices increased between years by 34.2 % for February 2011 and by 28.4 % for January 2011.

World food prices measured by FAO index reached even a higher value at the end of the year as compared to half of the year 2008. That was shortly before the commodity bubble burst after the financial crisis broke out. The growth applies to other commodities as well which, however further presses also food prices. (FAO, 2010) Increasing volatility in the agriculture commodity prices creates uncertainties to farmers to meet the rising demand for agricultural food commodities, and to consumers to manage their future spending plans. (Onour et al, 2011)

Most affected will be energetically demanding domains such as baking production, first of all due to increasing prices of energy and fuels, but also due to poor crops last year and by that caused growth of prices (e.g. of cereals) on the stock market. Fluctuation in yields can also be considered as one of the causes of increasing food prices.

Concerning last years yields, the biggest difficulties for food producers were caused by drought in Russia and heavy rains in Pakistan and Canada. Food prices in Australia could due to floods in the state of Queensland increase by as much as 30 %; growth in prices can have an effect on food prices in Asia as well. The floods interfered with 50 % of all crops, one fifth was totally destroyed by water. The floods could therefore lower the growth of GDP in Australia by 0.4 %. In addition, fast growing economies of large population, like China and India, have contributed to dramatic rise in food demand. As the globalization of agricultural product trade intensifies, climate change impact on food production may affect both food exporting countries and importing countries. (Lee, 2010)

As a result of the increase of the world's food prices for January and February between years by cca 30 %, we now face a threat of extreme poverty for millions of people in Asia. Weakening the economic growth in the region represents another risk. Higher prices were expressed as 10 % food inflation in many Asian economies. This – according to the Asian Development Bank – means that 64 million people can fall under the poverty level. It will also lower the living standard of families that already live in poverty. If higher prices of groceries and petroleum remain for the rest of the year, they can lower economic growth of Asia by as much as 1.5 percentage points.

Some countries will be hit by this situation more than others. For example, inflation in Singapore is very sensitive to groceries because a city state must import most of the food. South Korea, on the other hand, where groceries form relatively a small portion of the consumption basket, will deal with the situation easily. In the worst situation is India. It is tormented by the biggest food inflation; for example prices of vegetables increased between years by 70 %. Humanitarian organizations are also trying to mitigate hunger.

Fast growth of food prices is a serious brake of the region, which quickly recovered from the world economic crisis. Inflation of food prices will in Asia have an impact especially on poor families because they spend up to 60 % of their income on groceries. Two thirds of the world's poor live in developing countries in Asia, about 600 million people who have 1.25 dollars per day or less. FAO warned that food aid will be needed in 29 countries in Africa, Asia, the Middle East and Latin America. (FAO, 2010)

Food prices are increasing due to more expensive petroleum, drop-outs in production after bad weather and because of limited export of several producer countries. „Analysts attribute the rising volatility in the food commodity prices to a number of factors, among them the speculations in future commodity markets.“ (FAO, 2010). There is, however, also a substantial speculative influence; owing to the steep growth of commodities prices, short-term investors were attracted which further supported the increase in prices. Under the pressure of low interest rates and inexperience of share purchases, investors were looking for ways to valorize money.

First fiddle is therefore played mainly by speculations; prices of corn and soya are now breaking new records without any significant ongoing weather influences. But the growth of commodities prices is also driven by increasing optimism. People are expecting economic growth during this year, so they get fully involved even in risky businesses. Optimism caused pronounced economic growth of Germany (GDP of the biggest European economy added 3.6% last year), as well as the prognosis of the International Monetary Fund (IMF) that expects a global growth of 4.2 % this year.

However, expensive commodities are causing growth of inflation. For example, the head of the European Central Bank Jean-Claude Trichet stated that the bank registered short-term inflation pressures. Inflation in euro area increased to 2.2 % in December 2010, while the goal is at 2 %. The inflation was drawn a lot by Germany, where prices rose from previous 1.6 to 1.9 % in December 2010. December inflation in the Czech Republic, measured by consumer price index, increased to 2.3 %, dragged mainly by growth in food prices.

At the same time, central banks are taking a careful approach towards growth of interest rates that would slow down inflation – economies are not yet in explicitly good state and increasing interest rates could stop their growth. (FAO, 2010)

### **3.3 Food safety risks**

The major food safety risks are not eating a healthy diet and failure to avoid food-borne illnesses. Over one billion people in the world suffer from food insecurity and malnutrition. (Chassy, 2010) *“Many risk factors, such as agricultural chemical residues, residual veterinary drugs, mycotoxins, food additives, and carcinogens produced during food processing may be present in foodstuffs.”* (Mochizuki, 2011) Due to lack of agricultural commodities and therefore even their higher exchange among countries, safety and quality of foods are at risk. An example of threatened food safety on agricultural products market can be a delivery of German eggs to the Czech market with this commodity, which is from 80 % controlled by two duopoly competing companies: Czech Eggs CZ, Inc. and Golden eggs, Inc. Pervasion into a market sector controlled in such a way is very difficult and can be done above all by mediated import of commodities from abroad into chain stores that are owned by the capital of country of origin of the estate. However, imported products do not always have

to meet the criteria for safe consumption, as proven by the affair with dioxin occurrence in agricultural production which broke out in Germany at the turn of the year.

It was revealed that a producer of feeding fats in Germany was using substances intended exclusively for technical purposes in their production. This producer supplied the market with almost 3,000 tons of dioxin-contaminated fats that could infest up to 150,000 tons of feedstuff for livestock. German tests then confirmed occurrence of this dangerous substance in eggs and meat of laying hens and pigs. But the German dioxin affair was spreading further. Federal Ministry of Agriculture found another feedstuff producer suspected of occurrence of poisonous carcinogenic dioxin in his products. Another 934 companies were therefore additionally closed in Saxony, among them 110 poultry farms, 403 piggeries and 248 facilities for raising piglets. Suspicious foodstuff was also exported to North Rhine-Westphalia, Brandenburg and Bavaria. More than 1,000 farms and poultry farms were already closed earlier because of occurrence of dioxin in eggs and meat. Suspected producer did not report his supplier relations to the authorities. "I was getting repeated assurances from the Saxony side that provincial offices responsible for control of foodstuff and groceries production have implemented all needed measures," announced federal ministress of agriculture Ilse Aigner and called for punishment for responsible agents.

Thus, about 11 tons of eggs from Germany being sold in Penny Market stores in the Czech Republic are suspected to possibly contain poisonous dioxins. The State Veterinary Administration of the Czech Republic announced that 200 000 eggs are being pulled back from the stores because their origin was not correctly stated during the import to the Czech Republic. The importer defends himself and states that all requirements were met and the eggs went through an approved screening plant. The eggs were marked with a veterinary authorizing number of a screening plant in Germany, which is however not noted on the official list of authorized facilities. German eggs were imported to the Czech Republic by the company Czech poultry which according to veterinarians did not have a registration as directed by the veterinary law.

Czech veterinarians also succeeded in finding and suspending the sale of about one fifth of altogether 4,500 kg of pork meat that was at the turn of last year imported from Germany and could have contained carcinogenic dioxin. Samples from this pork meat were sent for analysis to the laboratories of the State Veterinary Administration of the Czech Republic. About half of these 4,500 kg of pork meat originating in the German farm that uses foodstuff containing dioxins was directed mainly to catering establishments in central-Bohemian region. "*Such processes are not only limited to the application of new technologies, such as the introduction of genetically modified crops to agriculture and human health; but also to the increasing power of supermarkets over consumers and farmers.*" (Lopez-i-Gelats et al, 2010)

However, existing controls have not discovered occurrence of groceries with higher carcinogenic dioxin content on the Czech market. Nevertheless, we all have dioxins and other substances in our bodies – by means of respiration because air contains dioxins in trace amounts. (FAO, 2010)

### **3.4 Results of analysis**

- Concerning last years yields, the biggest difficulties for food producers were caused by drought in Russia and heavy rains in Pakistan and Canada. Food prices in Australia could due to floods in the state of Queensland increase by as much as 30 %; growth in prices can have an effect on food prices in Asia as well.
- Price of agricultural production is determined to a big extent by trading with agricultural crops on the main world commodity stock markets, and it can also be

influenced by speculations. It can be proven for instance in this year 2011 when prices of corn and soya are now breaking new records without any significant ongoing weather influences.

- World supplies of cereals have been till recently at much higher level than supplies in the critical years 2007 and 2008. However, quick economic growth and worries about high prices led to fast reduction of supplies. Large purchases have been lately done by countries from north Africa and the Middle East
- Food prices are increasing due to more expensive petroleum, drop-outs in production after bad weather and because of limited export of several producer countries. Most affected will be energetically demanding domains such as baking production, first of all due to increasing prices of energy and fuels.
- Expensive commodities are causing the growth of inflation. Inflation in euro area increased to 2.2 % in December 2010, while the goal is at 2 %. The inflation was drawn a lot by Germany, where prices rose from previous 1.6 to 1.9 % in December 2010. December inflation in the Czech Republic, measured by consumer price index, increased to 2.3 %, dragged mainly by growth in food prices.
- Due to the lack of agricultural commodities and therefore even their higher exchange among countries, safety and quality of foods are at risk. An example of threatened food safety on agricultural products market can be a delivery of German eggs to the Czech market with this commodity
- It is also necessary to mention that we find a considerable difference between main advanced countries of the world from the point of view of the production and trade with food where these commodity markets are stabilized from the point of view of both the amount and prices, and between developing countries where markets with agricultural crops are substantially influenced by not only weather swings but also by the political situation, sharp growth of population etc.

Above mentioned aspects, which influence the main commodity markets with food, are necessary to be considered in a complex way as the system of many causes that influence the food problem in the world very significantly. *“Advances in food production, processing, and trade have substantially strengthened food availability, stability, access, and utilization in past decades. Yet, at the beginning of the twenty-first century, achieving food security for all is a far-reaching goal.”* (Braun, 2009)

## 4 Conclusion

Food prices in the Czech Republic will more likely further increase. The Federation of the Food and Drink Industries of the Czech Republic (FFDI) estimates that food prices will grow by 10 % this year. Czechs already experienced a rise in prices in December 2010 when prices rose between years by 5.6 %. Food producers have longer not been able to absorb growth of input prices, so chain stores will not be able to keep current prices. Considering that these chain stores will probably not want to lower business margins, rising food prices will be felt by consumers as well. In spite of this, people should be more interested in the origin of groceries in stores and should prefer domestic products. It is possible to significantly step up control mechanisms, but it will never be possible to completely cut out failure of human element. Therefore, probable results are even slightly safer but also much more expensive products. Everyday contact of a human with dangerous substances and organisms also increases his immunity; an individual brought up in completely sterile environment would without immunity have problems even with an ordinary flu.

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# Influence of Global and European Commodity Prices upon Development of Consumer Prices in the CR

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**Annotation:** This paper analyzes the development of prices in the world, European and Czech food markets. The goals of the paper are to identify general developmental trends of food prices in individual markets, subsequently compare these trends to each other, and then especially to study the relationship between the global and European Union market. The following analysis enables us to understand price developments in individual markets and shows the development of prices of chosen commodities in the global market (meat, milk, wheat, petroleum products, sugar). Emphasis is placed on the development of food prices in the Czech market. In the chosen segment of food commodities (pork, milk, eggs, butter, bread, etc.), the development of prices over the last 12 months is presented, which shows an overall increase in global markets. The results of the analysis show that the Czech market reacts to the growth of prices in the global as well as European markets. Of all the analyzed prices of commodities in the European and world markets, wheat and oilseeds are the most sensitive. In the EU 27, the prices of oilseeds, grains, milk and vegetables are most sensitive.

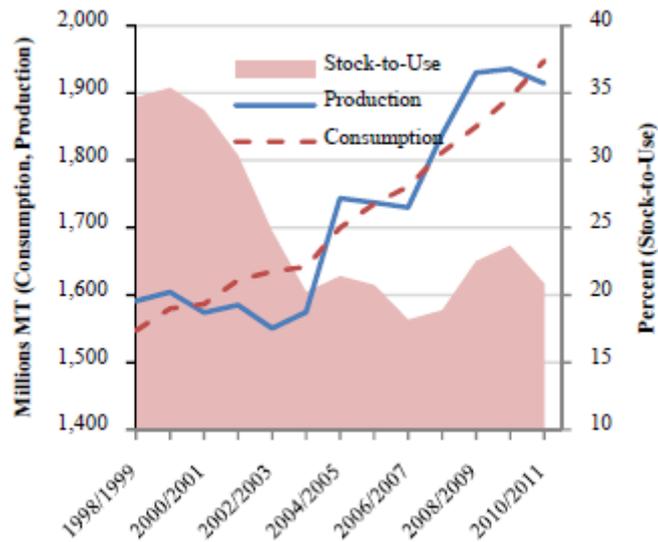
**Keywords:** consumer prices, food, agricultural products, analysis, correlation, elasticity, development

**JEL classification:** D4, Q1

## 1 Introduction

Agriculture plays an important role in our society. The importance of the agricultural sector was well known by the ancient Greeks. Xenophon, a Greek philosopher, argued two thousand years ago that “Agriculture is the mother of all arts. When it is conducted well, all other arts prosper. When it is neglected, all other arts decline.” (Diouf, 2004). The agrarian market, volume of agrarian production and development of prices influence the stability of every economy. Almost 7 billion people depend on agriculture (Jeníček, 2010). Nevertheless, it is important to emphasize that even though the volume of agricultural production is going up (Kuna, 2010), roughly 1 billion people suffer from starvation. From 1960-2008 agricultural production more than doubled – the average value of the inter-annual growth rate of agricultural production was 2 % (Smutka, Miffek, Steininger, Škubna, 2009). The volume of production growth through global grain production, which rose between 1998 and 2010 from 1.6 billion to 1.9 billion tons (World Bank, 2011), is clearly demonstrated in Graph 1. The growth of global production is stimulated by growing global demand for food and agricultural products (Svatoš, 2008). In general, world demand for food grows more dynamically than the volume of agrarian production, which can be clearly seen by the decline in grain stocks (see Graph 1).

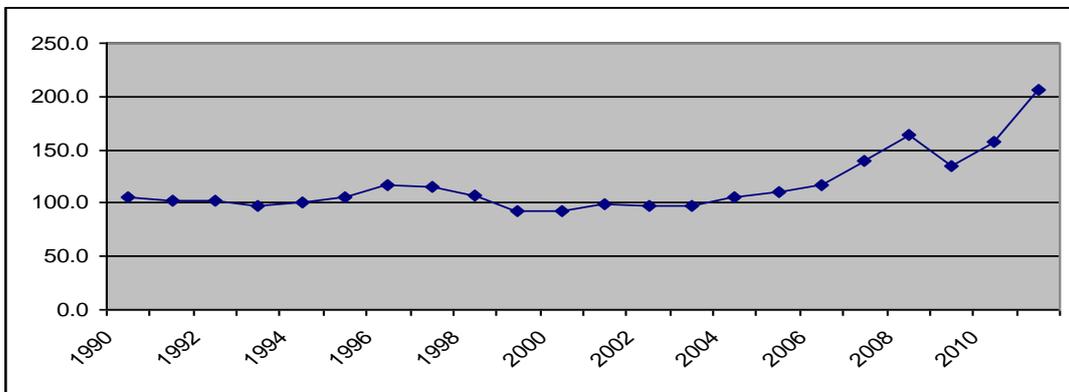
**Graph 1.** World grain production, consumption and stock-to-use



Source: World Bank, 2011

The growing demand for agrarian and agri-food products has influenced the development of global prices (see Graph 2); between 2000 and 2011 in particular, prices grew steadily – the only exception was the year 2009, because of the financial crisis (World Bank, 2011). It is important to emphasize that the general growth in food prices has been influenced by a number of factors.

**Graph 2.** World food price indices development (2002 – 2004 = 100)



Source: FAO, 2011, own processing

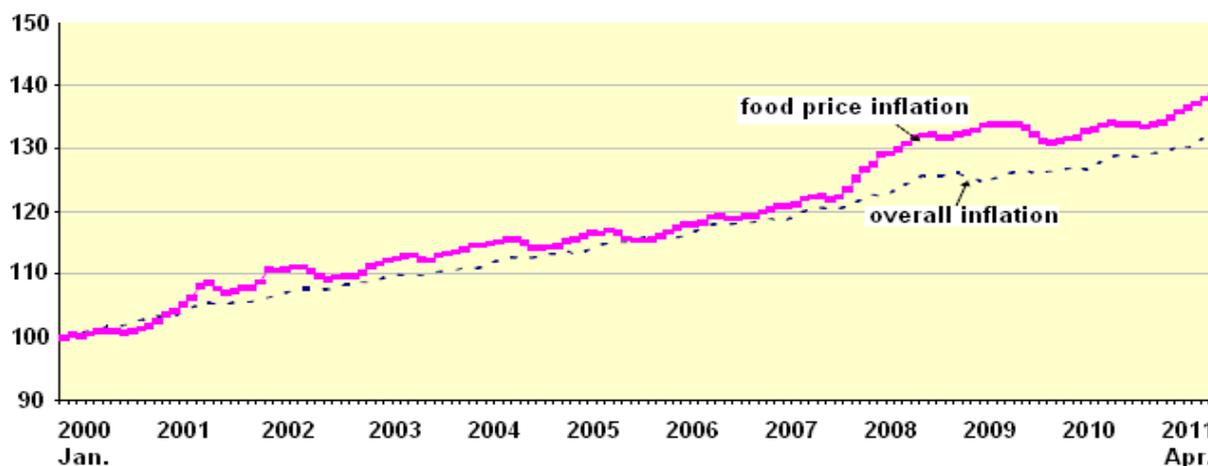
According to Kain (2011) and some other authors, the following factors can be identified:

- 1) Developing countries are getting wealthier and their people are changing their consumption habits. There is a shift from grains to meats, whereas meats are more energy demanding. (Horská, 2011)
- 2) Expensive fuel and biofuels support. This is causing growth in agricultural producers' input prices (fuel and fertilizers). Due to biofuels, 15% of global grain production ends up as fuel. (Svatoš, 2009)
- 3) Speculators are causing rapid changes in food prices through billions worth of investments. (Wahl, 2008)

- 4) Weather changes manifested as fires in Russia, droughts in China, and floods in Australia and Pakistan caused prices to go up by tens of percentage points last year. Due to low inventories, this was immediately reflected in prices. (Clarke, Friel, 2008)
- 5) Monetary policies of central banks cause money to flow into economies. The U.S. FED itself has pumped almost 2.5 trillion dollars into the economy, thereby also increasing the prices of agricultural commodities.

The growth in prices has influenced most economies. The fewest benefits were seen in developing countries, who are net importers of agricultural production (FAO-OECD, 2011). In the case of the EU-27, it can be argued that prices of agricultural products have responded to the growth in prices in the global market, even though the EU-27 is isolated by the Common Agricultural Policy (CAP). While prices in the global market have more than doubled (both in nominal and real terms, see Graph 2), prices in the European agrarian market have gone up by only 30 percent (Graph 3).

**Graph 3.** Overall and food price inflation in the EU (January 2000 to April 2011, January 2000=100)



Source: Eurostat, 2011

This is probably due to the CAP, where the price differentials between the global and European market diminished between 2000 and 2010. The European as well as the Czech market has reacted to the growth in prices (Graph 4).

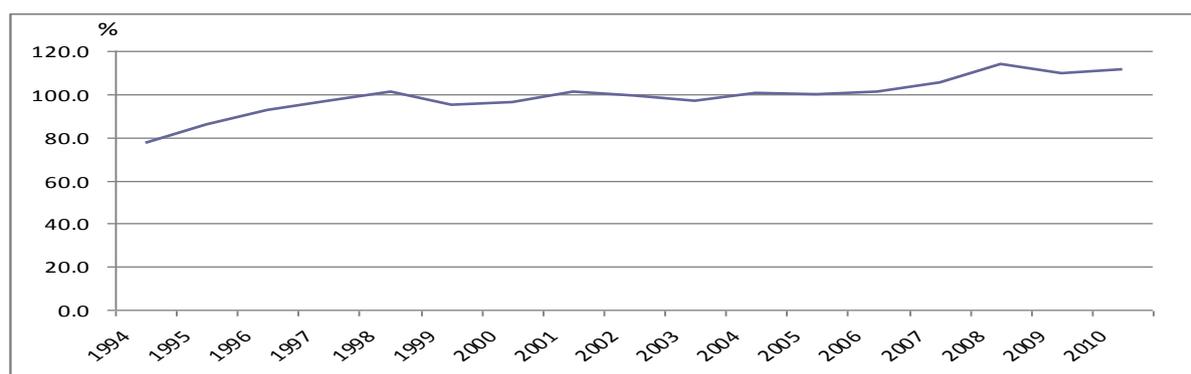
Mutual analyses of developmental trends in the prices of real food and agricultural products in the global, European, and Czech markets demonstrates a strong correlation of price developments in individual countries, even though unit prices of traded products are different (Table 1).

**Table 1.** Consumer prices development in the period 2000-2010  
(World, EU and Czech Republic - mutual correlation)

Variable	Significant correlations are highlighted ( $p < .05000$ ), N=9				
	Average	Standard deviation	World	Czech Republic	EU
World	113.4808	23.80532	1.000000	<b>0.795937</b>	<b>0.975597</b>
Czech Republic	104.5556	9.46746	<b>0.795937</b>	1.000000	<b>0.796953</b>
EU	110.8222	9.34609	<b>0.975597</b>	<b>0.796953</b>	1.000000

Source: own processing, 2011

**Graph 4.** Development of agrarian and food prices in the CR between 1994 and 2010



Source: CZSO, 2011, own processing

## 2 Materials and Methods

The goal of this paper is to analyze the influence of price developments in the global food and agricultural markets on consumer prices in the Czech Republic. It is necessary to identify those products that enjoyed the most massive increase in consumer prices, as well as those products whose increase was marginal.

The introduction showed that there are significant mutual relationships in the area of price development between the global and European markets. Given the rise in world market prices since 2002 (except for 2009), the development of prices for food commodities in the years 2010 and 2011 is analyzed. The most significant increase in prices can be observed in the case of following commodities: sugar, oilseeds, milk and meat (see Table 2).

**Table 2.** FAO food price index

year		index	meat	dairy	cereals	oils and fats	sugar
2000		<b>90</b>	96	95	85	68	116
2001		<b>93</b>	96	107	86	68	123
2002		<b>90</b>	90	82	95	87	98
2003		<b>98</b>	97	95	98	101	101
2004		<b>112</b>	114	123	107	112	102
2005		<b>117</b>	120	135	103	104	140
2006		<b>127</b>	119	128	121	112	210
2007		<b>159</b>	125	212	167	169	143
2008		<b>200</b>	153	220	238	225	182
2009		<b>157</b>	133	142	174	150	257
2010		<b>185</b>	152	200	183	193	302
2010	May	<b>170</b>	152	209	155	170	216
	June	<b>168</b>	152	203	151	168	225
	July	<b>172</b>	151	198	163	174	247
	August	<b>183</b>	156	193	185	192	263
	September	<b>194</b>	153	198	208	198	318
	October	<b>205</b>	158	203	220	220	349
	November	<b>213</b>	161	208	223	243	373
	December	<b>223</b>	166	208	238	263	398
2011	January	<b>231</b>	167	221	245	278	420
	February	<b>238</b>	171	230	259	279	418
	March	<b>232</b>	175	234	251	260	372
	April	<b>235</b>	181	229	265	259	346
	May	<b>232</b>	183	231	262	259	311

Source: FAO, 2011, own processing

The article analyzes the development of prices in the CR between August 2010 and May 2011. Selected commodities sold in the most important retail chains in the CR (Tesco, Interspar, Kaufland, Lidl, Penny, Billa, Albert) are analyzed. The following commodities are analyzed: pork, poultry, eggs, milk, butter, cheese, yogurt, flour, rice, bread, sugar, oil and coffee. Point price elasticity is calculated, showing the percentage change in global food prices (Tvrdoň, 2006).

$$E = \frac{X_2 - X_1}{X_1} : \frac{P_2 - P_1}{P_1}$$

X – domestic consumer price  
P – world or EU consumer price

The results are compared with developmental trends in the EU and world markets. Global, EU and CR markets are analyzed using a base index (Graphs 2-4). Elasticity is calculated using unit prices of monitored products in CZK. The data were collected between August 2010 and May 2011.

### 3 Results and Discussion

Data analyzing developmental trends of food prices have been used at the Czech, European, and global levels. Correlation analysis has been done to confirm a correlation exists (see Table 1). It is apparent that prices in the EU remain behind global price developments (FAO, 2009). The European Union depends, however, on the evolution of global prices. Nevertheless, the level of correlation between consumer prices in the CR and the EU is much lower than the correlation between the EU and world markets. Hence, a certain degree of autonomy can be observed in the CR. Consumer prices in the CR, in general, do not directly copy price trends in the global market. A certain lag in price development is apparent, while for some products it is clear that a rise in global prices has nothing to do with a rise in domestic prices. This can be explained by the CAP as well as competitiveness in the Czech market (retail chain pressure on agricultural producers to keep prices low).

The following tables, Table 3 and Table 4, provide us with basic information about price elasticity in the Czech food market, in relation to developments in world market prices. Table 3 provides an overview of long-term price elasticity for the period 2000-2009 (data for the analysis come from the Czech statistical office database). Table 4 provides us with basic information about developments in Czech food prices for selected periods of the years 2010 and 2011 (analyzed data is the result of the authors' personal field research).

**Table 3.** Price elasticity of selected food products in relation to world price developments (in constant prices, 2000)

items	vol.	2000	2009	elasticity (%)
				average 2000-2009
bread	1 kg	14.8	18.77	0.59
bakery products	1 kg	26.69	33.87	1.24
wheat flour	1 kg	7.9	9.09	1.24
pasta	1 kg	27.58	31.24	0.27
rice	1 kg	18.55	35.15	0.98
potatoes	1 kg	7.02	9.15	4.40
beef	1 kg	74.75	86.39	0.85
pork	1 kg	123.76	103.63	1.66
chicken	1 kg	61.65	56.18	2.84
fish	1 kg	118.99	132.79	1.11
butter	1 kg	91	111.99	1.08

animal fat	1 kg	55.1	53.92	1.41
plant oils	1 l	42.43	41.37	0.89
milk	1 l	12.54	15.32	0.85
cheese	1 kg	112.12	114.91	0.99
eggs	1 piece	2.89	2.72	2.17
sugar	1 kg	22.21	19.1	1.53
coffee	100 g	11.92	10.93	2.16
tea	100 g	38.8	48.23	0.59
chocolate	100 g	17.74	21.91	0.56
apples	1 kg	15.51	21.68	3.80
beer	0.5 l	7.61	9.1	0.42
wine	1 l	57.43	57.18	1.06
mineral water	0.33 l	5.59	19.11	4.79

Source: CZSO, 2011, own processing

Table 1 and Table 3 demonstrate the mutual correlation between world price developments and food price developments in the Czech national market. The correlation between both variables is positive (Table 1), and in the case of the majority of analyzed food products, a positive elasticity between Czech national market prices and world market prices was proven. A non-elastic relationship was demonstrated only for the following products: bread, pasta, beef, milk, tea, chocolate, and beer.

The period 2010 – 2011 is quite a specific period. According to world food price statistics, the price of food products for just the periods of August 2010 and May 2011 increased by 50 percentage points (Table 2).

**Table 4.** Characteristics of consumer price development for selected food products in the analyzed time period

	August 2010 (price in CZK)	May 2011 (price in CZK)	Variation between monitored periods in %	The elasticity of domestic consumer prices in relation to a one-percent change in world food market prices (in %)
Butter (Jihočeské máslo) - 250 g	32.90	36.07	9.63	0.190962
Chilled chicken (standard) - 1 kg	58.47	57.90	-0.98	-0.01939
Coffee (Jihlavanka standard) - 250g	40.73	44.40	9.00	0.178592
Plain yogurt (Hollandia) - 500 g	16.83	17.40	3.37	0.066788
Pork chop (including bones) - 1kg	109.64	98.29	-10.35	-0.20536
Milk (durable – fat 1.5 %) - 1l	12.04	14.47	20.17	0.400095
Bread (šumava) - 1200g	14.92	25.90	73.59 <sup>1</sup>	1.460074
Edam 30% - 1kg	121.56	113.96	-6.26	-0.12411
10 eggs M	22.04	24.90	12.96	0.257161
Sunflower oil – 1l	42.40	61.15	44.22	0.877358
Bohemian flour - 1kg	7.90	9.90	25.32	0.502278
Long-grain rice (Bask) – 1kg	34.30	34.65	1.02	0.020245
Caster sugar (Korunni) – 1kg	16.90	19.90	17.75	0.352189

Source: own processing and research, 2010, 2011

Despite the mentioned price developments in the world market, the Czech national market seems to be independent (the Czech national market is isolated from the world market's direct influence through EU Common Agricultural Policy, the existence of a single market, and a high level of competition among domestic retailers). Data from Table 4 show that whereas world prices were increasing significantly, Czech national market prices (in the case of the analyzed products) were almost stable (there are some exceptions). Elasticity between the

<sup>1</sup> The price rose steeply because in May 2011 the price of bread briefly increased, on account of a 25% rise in grain prices.

developments in world and Czech food prices is very low (the mutual relationship is non-elastic).

Given the results presented in Table 4, several categories of products can be distinguished. A decrease in prices is seen for pork (pork meat), Edam cheese and chilled chicken.<sup>2</sup> Prices of plain yogurt and long-grain rice did not change. Lastly, some products such as oil, bread, flour, coffee, eggs, and sugar, enjoyed a rise in price. The strongest dynamics are apparent in the case of oil, flour, and bread (these results correspond to global market developments).

## 4 Conclusions

Results of the analysis of price developments in the global, European and Czech markets show that:

Prices of food products have significantly risen in all markets. Between 2002 and 2011 (May) prices of food products increased by 110% in the global market, 30% in the EU-27 market and 15-20% in the Czech market. It is important to mention that the growth in prices in the EU was regulated by the CAP, which has worked as a shield against the general growth in world prices.

Due to the rise in the global market, differences between the analyzed markets have slowly diminished (this result was also confirmed by the FAOSTAT database, 2011). An important aspect of the growth in markets has been the rise in prices of primary agricultural products (grain seeds, sugar and oilseeds). While this has been fully reflected in the global market, the EU market has been affected only partially.

**Table 5.** Change in EU consumer prices for food (% , April 2011 compared to April 2010)

	All-items HICP	Food	Bread and cereals	Meat	Fish and seafood	Milk, cheese and eggs	Oils and fats	Fruits	Vegetables	Sugar	Other food
EU	3.2	3.2	4.1	2.2	3.8	2.9	7.1	5.8	0.3	5.1	1.1
CZE	1.6	3.9	8.7	0.8	0.3	5.9	16.9	2.9	-1.3	3.2	1.7

*Source: Eurostat, 2011*

**Table 6.** Change in EU agricultural commodity prices (% , April 2011 compared to April 2010)

	Soft wheat	Durum wheat	Corn	Barley	SMP	Butter	Cheese (Edam)	Beef	Pork	Poultry
EU	98	69	68	83	1	31	19	8	16	19
CZE	114	-	93	99	29	39	12	1	14	11

*Source: Eurostat, 2011*

Table 5 and Table 6 show, for example, that while the price of wheat has gone up by 100 %, the price of wheat products has gone up by only 4 %. A similar trend can be seen in the CR as well. This can be explained by the fact that price growth in primary commodities was absorbed by other market players such as processors and distributors (wholesalers and retailers). With respect to developments in the Czech market, it is possible to argue that prices of food products are strongly correlated with global and European market prices. Global price growth was also reflected in the CR. However, it is important to emphasize that prices in the CR copied EU prices in particular, meaning that the rise in consumer prices has been much smaller than for the global market. For food products, this is shown in the case of wheat and

<sup>2</sup>It is important to mention that chilled chicken and pork meat were subject to some sales events. Only Edam cheese was not subject to any sales event, apart from a mass discount. It is possible to argue that given the percentage decline, a decline in average price cannot be verified.

oil plants. The prices most sensitive to changes in global prices are those of bread (bakery), as well as vegetable fats and oils. In the case of other agrarian products, it can be argued that consumer prices are inelastic with respect to developments in global market prices. With respect to the relationship between the Czech Republic and the EU, it can be argued that oilseeds, grains, milk and vegetable-based products are the most sensitive. The rise in prices, particularly for grains and oilseeds together with processed products, is fully consistent with the increase in demand for the non-food use of these commodities, such as in biofuels, for example.

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# Influence of Time Series Frequency on Price Transmission Analysis – Case Study of Pork Meat

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**Annotation:** The paper deals with the problem of the time series frequency and its impact on the results of empirical analysis explaining the price transmission in selected agri-food chain. The paper is focused on position and relationship between farmers and wholesalers within the pork agri-food chain in the Czech Republic and the nature of its price transmission. Moreover, the analysis discusses the impact of the time series frequency based on example of the price transmission between farm-gate price and wholesale price in pork agri-food chain in the Czech Republic. The analysis is based on monthly and bi-weekly data of farm-gate price and wholesale price in period from July 2002 to October 2010, provided by Ministry of Agriculture and State Agricultural Intervention Fund. The time series of monthly data contain 100 observations while the time series of bi-weekly data contain 200 observations. The main hypothesis was defined and verified subsequently using the selected methodological tools. The Vector Error Correction Model (VECM), an econometric model suitable for application of multivariate time series analysis, is employed to describe and explain vertical price transmission in selected agri-food chain. The analysis shows the similarities and differences in outputs of empirical analysis based on the time series containing data of different frequency. Finally, the author suggests some advices and precautions to avoid bias conclusions concerning the selected topic. The aim of the paper is to demonstrate risks of data for the time series analysis. The researcher should be very careful when selects the time series for empirical analysis.

**Key words:** Price transmission, time series, frequency, VECM model, pork meat.

**JEL classification:** Q13

## 1 Introduction

The analysis of agri-food chains is usually based on the time series analysis. For such analysis several features should be considered and examined. Firstly, the nature of the selected time series based on the main statistical characteristics of the time series should be examined as well as the short-term and long-term components of the time series. Then, own price transmission should be examined and described. For the price transmission analysis of the agri-food chain, it is also crucial to know the main characteristic of the analysed chain.

Pork meat sector, the sector selected for the following analysis, belongs among the most important agri-food chains not only in the Czech Republic. Many authors show its importance for national economy as well as the whole world. The importance and the features of the pork meat agri-food chain was processed and published e.g. by Babović et al. (2011).

The time series of prices are crucial for the price transmission analysis. Matošková (2011) says that the significant price volatility has been observed in the world agri-food markets. She also mentioned that price is a motivation power of the supply and demand development in the world markets. She also mentioned that supply of agrarian markets can be characterized through the low elasticity to the realized production. Furthermore, the production is changed every year pursuant to the variable weather conditions. In general, demand for basic agri-food commodities has been increased steadily in compliance with the population growth and it does not indicate a higher flexibility. The low demand elasticity of agri-food products causes the fact that a relatively small production volume variability can

induce significant changes (so-called shocks) in supply and demand, and consequently in price levels. The volatility in prices of food products was analysed also e.g. by Onour, Sergi (2011). Among others Clark, Čechura (2011) say that the examination of the time series features might be crucial for the time series analysis. Some seasonal components might influence the results as well as cyclical components or unexpected shocks.

Vertical price transmission analysis of selected agri-food chains is introduced and applied in e.g. Peltzman (2000), Goodwin, Harper (2000), Bojnec (2002), Lloyd et al. (2004), Bakucs, Fertő (2005), Vavra, Goodwin (2005), Jalonoja et al. (2006), Bunte, Vavra (2006), Lechanová (2006) or Jensen, Møller (2007).

## 2 Materials and Methods

The aim of the paper is to examine whether the choice of the time series frequency influences the results of the price transmission analysis. The aim is fulfilled based on the hypothesis verification – the hypothesis to verify is defined as following:

*H: The choice of the time series frequency may influence the results of the price transmission analysis.*

This hypothesis is based on assumption that some specific features of individual time series may influence the nature of the price transmission. For instance some frequency of the time series may show seasonal or cyclical component while the other frequencies do not. This assumption is verified as case study of pork agri-food chain in the Czech Republic. If the hypothesis is accepted for the pork agri-food chain then the same results might be anticipated for the other agri-food chains.

The analysis is based on comparison of the nature of selected time series and the nature of the price transmission for both monthly data and bi-weekly data. The features of the selected time series are examined in the following steps:

- i. description of main statistical characteristics of the selected time series;
- ii. evaluation of extreme values of the selected time series;
- iii. examination and description of the long-term tendency of the time series;
- iv. examination and description of the short-term variation of the time series.

Then, the price transmission analysis is employed and compared in the following steps (for both monthly data and bi-weekly data):

- i. the selection of maximal lag using Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC);
- ii. examination of time series stationarity using Augmented Dickey-Fuller test (ADF) and Phillips-Perron test (PP);
- iii. detection of long-term relationship between selected variables using cointegration analysis;
- iv. description of long-term relationship between selected variables in case that this relationship is proven; for this purpose Vector Error Correction Model (VECM) is employed in the following form:

$$\Delta X_t = \eta + \Pi X_{t-1} + \sum_{s=1}^p C_s \Delta X_{t-s} + U_t ,$$

where  $C_s = 0$  for  $s > p$ ,  $X_t$  is a  $k \times 1$  vector of variables which are supposed to be integrated of order 1,  $(I(1))$ ,  $u_1, \dots, u_t$  are  $nid(0, \Sigma)$  and  $\Pi$  is a matrix of the long-run relationships;

- v. description and explanation of the nature of the price transmission based on coefficient of price transmission elasticity.

The analysis is based on the time series of farm-gate price and wholesale price of pork meat in the Czech Republic in period from July 2002 to October 2010. The time series contains monthly data as well as bi-weekly data of the selected variables. The time series of monthly data contain 100 observations while the time series of bi-weekly data contain 200 observations. The data were provided by Ministry of Agriculture and State Agricultural Interventional Fund.

The calculations were done using the econometric software RATS 6.35 and CATS 2.0, produced by Estima.

### 3 Results and Discussion

The price transmission might be analysed based on the time series of prices on different levels of the chain. The question is whether the nature of the data employed influences the results of such analysis. For this purpose farm-gate price and wholesale price of pork meat of different frequencies were selected to verify the hypothesis stated. Generally, we may assume that the frequency of the time series should not influence the results of the price transmission analysis; however, some authors have already impeached this assumption in connection to different research topics. The following analysis should reply the doubt about the relationship between the nature of the time series and the results of the analysis.

#### 3.1 Description of selected time series

The main statistical characteristics of analysed time series are shown in table 1. Mean value of farm-gate price in case of monthly data equals 38.95 CZK/kg while in case of bi-weekly data 39.40 CZK/kg. The mean value of wholesale price in case of monthly data reaches value 87.89 CZK/kg while in case of bi-weekly data 88.35 CZK/kg. Based on the table it is clear that the variation in farm-gate price time series is higher than the variation in wholesale price time series in both cases - variation coefficient of farm-gate price time series in case of monthly data equals 10.21 %, in case of bi-weekly data 11.01 %, variation coefficient of wholesale price time series reaches value 7.24 % and 8.26 % respectively.

**Table 1.** Statistical characteristics of selected variables

Monthly data				Bi-weekly data			
	Mean	Std. deviation	Variation coefficient (%)		Mean	Std. deviation	Variation coefficient (%)
FP	38.95	3.98	10.21	FP	39.40	4.34	11.01
WP	87.89	6.37	7.24	WP	88.35	7.30	8.26

*Source: own calculation*

Table 2 shows minimal and maximal values of both farm-gate price and wholesale price of pork meat in analysed period in case of monthly data as well as bi-weekly data. The table shows slight differences between monthly and bi-weekly extreme values. However, these differences are not fundamental. Minimal value of farm-gate price equals approximately 29 CZK/kg in both cases while the maximal value reaches approximately 48 CZK/kg. Extreme values of wholesale price shows bigger differences than farm-gate price extremes. The minimal value of wholesale price in case of monthly data equals almost 75 CZK/kg while its

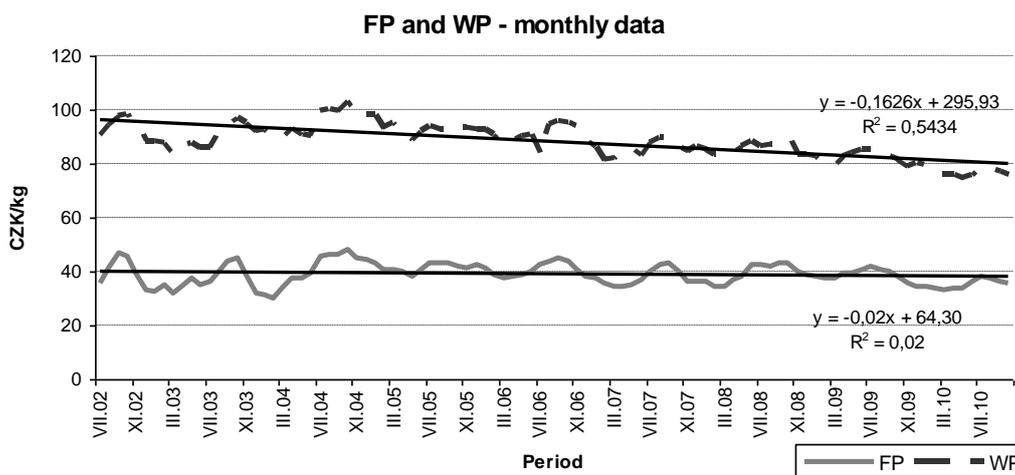
maximal value equals approximately 103 CZK/kg. The minimal value of wholesale price based on bi-weekly data equals approximately 73 CZK/kg while its maximal value equals almost 107 CZK/kg. Moreover, these extreme values were reached in approximately same periods. The minimum of farm-gate price in case of monthly data was reached in February 2004, the minimum of wholesale price in May 2010. Maximal values of both farm-gate price and wholesale price in case of monthly data were reached in October 2004. Then, minimum of farm-gate price in case of bi-weekly data was reached in March 2004 and minimum of wholesale price in April 2010. Maximum of farm-gate price was reached in September 2004, while the maximum of wholesale price in October 2004. These results again show small differences in extreme values of the selected time series.

**Table 2.** Minimal and maximal values of selected time series

Monthly data			Bi-weekly data		
	Min. value	Max. value		Min. value	Max. value
FP	29.70	47.88	FP	29.23	48.62
WP	74.64	103.02	WP	72.61	106.74

*Source: own calculation*

The time series of monthly data wholesale price show slightly decreasing tendency in analysed period (see figure 1). The long-term tendency of the farm-gate price is almost stable. The long-term tendencies of the analysed time series are describe by the linear trend functions.



**Fig. 1.** Time series of monthly data

The time series of bi-weekly data wholesale price show also slightly decreasing tendency in analysed period (see figure 2). Also in this case the long-term tendency of farm-gate price is almost stable. The basic long-term tendencies of the farm-gate price as well the wholesale price are described by the linear trend functions.

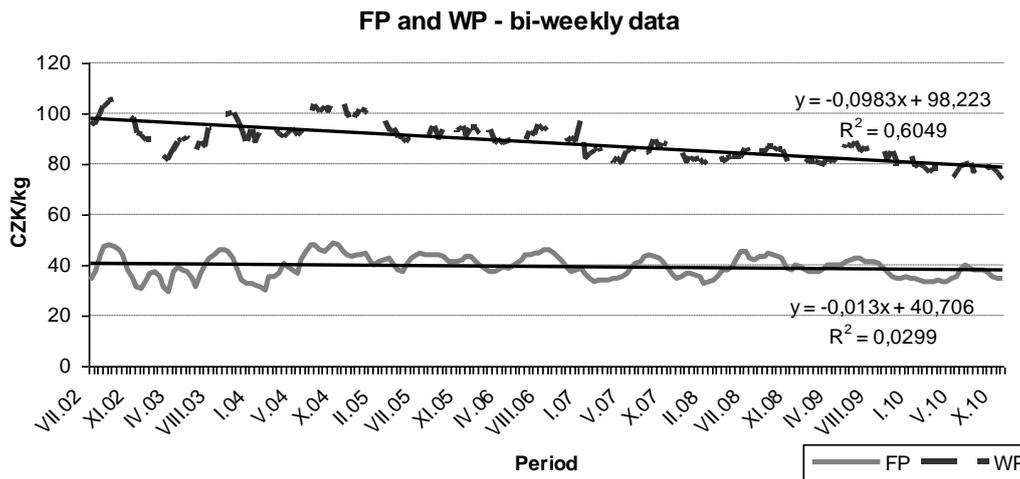


Fig. 2. Time series of bi-weekly data

Then, the short-term behaviour of the time series should be analysed. Based on the Autocorrelation function (ACF) and Partial autocorrelation function (PACF) the seasonality of the time series might be detected. Figure 3 shows ACF and PACF of farm-gate price in case of monthly data and figure 4 shows ACF and PACF of wholesale price for the same frequency. According to these functions seasonal variation occurs in the time series of farm-gate price. The same frequency and the same amplitudes of ACF confirm this statement. Nevertheless, the seasonal component in the time series of wholesale price was not detected. The variation in this time series may contain cyclical pattern which is not obvious in the analysed period.

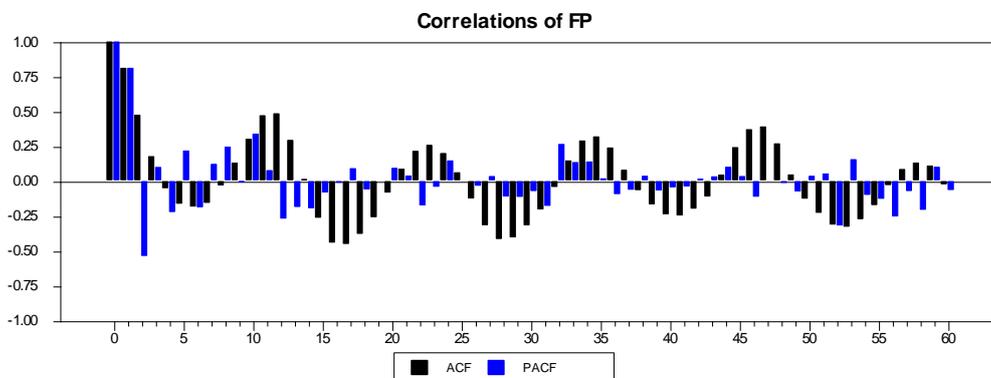


Fig. 3. ACF, PACF of farm-gate price – monthly data

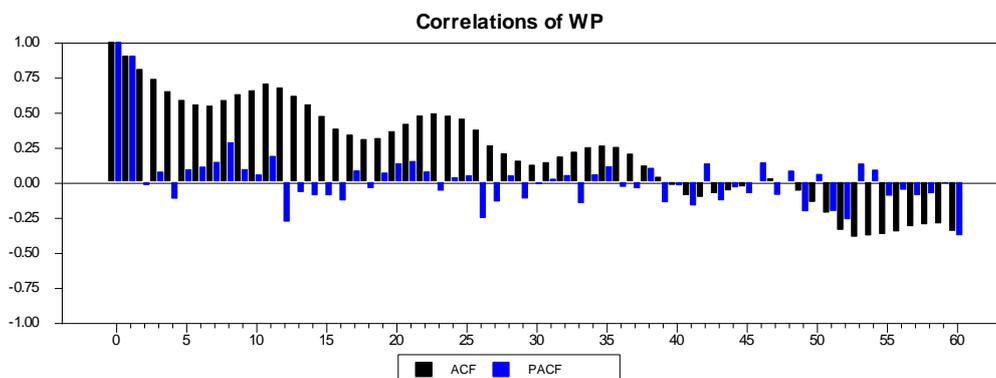


Fig. 4. ACF, PACF of wholesale price – monthly data

Figure 5 and figure 6 contain ACF and PACF for the time series of farm-gate price and wholesale price in case of bi-weekly data. According to the graph the time series of farm-gate price contains seasonal component. ACF function again shows repetitive frequency of the variation and pattern in amplitudes of correlation coefficients. Similarly, to the case of the monthly data the time series of wholesale price in case of bi-weekly data does not contain the seasonal pattern. Moreover, in this case more differences are obvious compared to the time series of the farm-gate price.

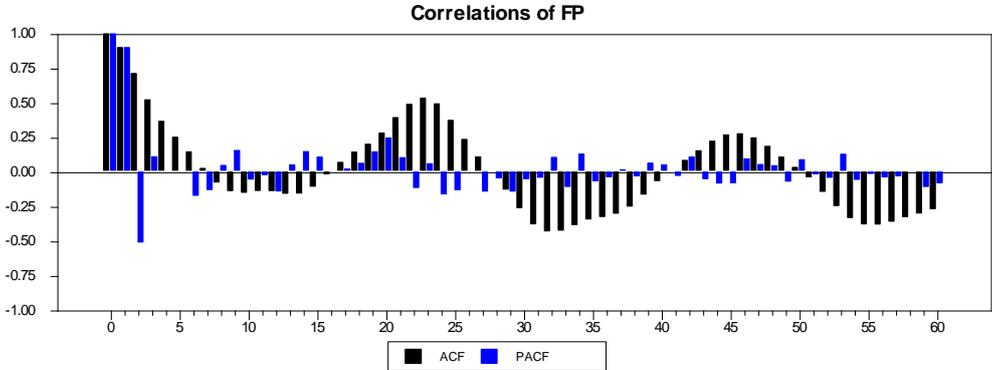


Fig. 5. ACF, PACF of farm-gate price – bi-weekly data

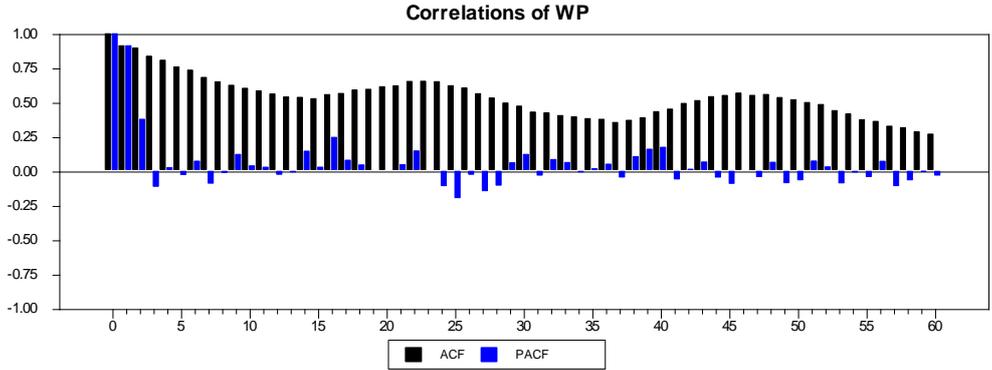


Fig. 6. ACF, PACF of wholesale price – bi-weekly data

To conclude, the long-term tendency of the selected time series shows similar development in analysed period. Also the main statistical characteristics do not shows significant differences. Nevertheless, small differences in the nature of the time series in short-term view-point might be seen (i.e. differences in seasonality that might be described by individual time series). Even small differences were detected, it may be concluded that the nature of the time series in case of monthly data and bi-weekly data is comparable.

**3.2 Price transmission analysis in selected agri-food chain**

Table 3 contains the results of Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC) – the criterions to suggest significant lagged values of each time series. The results of these criterions provide divers results. Then, the maximal lag is selected partly based on these suggestions and partly based on the knowledge of the pork market. The author decides to employ 4 lags as maximal significant lagged values in case of monthly data and 10 lags in case of bi-weekly data. Again these results are very similar and show similar features of the inputs to the consecutive price transmission analysis.

**Table 3.** Significant lag of selected variables

Monthly data			Bi-weekly data		
	AIC	SBC		AIC	SBC
FP	16	5	FP	16	7
WP	4	4	WP	10	1

Source: own calculation

Table 4 and table 5 contain the results of Augmented Dickey-Fuller test (ADF) and Phillips-Perron test (PP) – the tests to verify whether the time series is stationary. Table 4 contains the results for the time series of monthly data while table 5 contains the results for the time series of bi-weekly data. The time series of monthly data are analysed based on 4 significant lagged values while the time series of bi-weekly data based on 10 significant lags. Both tests (ADF as well as PP) shows all selected time series as nonstationary and integrated of the first order, i.e. I(1). It means that long-term relationship might be analysed consequently.

**Table 4.** Results of ADF and PP test – monthly data

Variable	ADF test			PP test		
	A	B	C	A	B	C
FP	-0.3070	-3.3678	-3.4631	x	<b>-3.7899</b>	-3.9005
diffFP	<b>-5.4179</b>	<b>-5.3794</b>	<b>-5.3865</b>	x	<b>-6.5689</b>	<b>-6.5562</b>
WP	-0.9023	-1.5230	-3.0938	x	-1.8216	-3.6897
diffWP	<b>-5.4319</b>	<b>-5.4591</b>	<b>-5.5073</b>	x	<b>-10.3238</b>	<b>-10.3400</b>

A = without intercept and trend; B = with intercept and without trend; C = with intercept and trend. Italics = significant on significance level 5 %; bold = significant on significance level 1 %. Lag length for ADF and PP test = 4.

Source: own calculation

**Table 5.** Results of ADF and PP test – bi-weekly data

Variable	ADF test			PP test		
	A	B	C	A	B	C
FP	-0.1821	<b>-3.7932</b>	<b>-4.0561</b>	x	<b>-3.7773</b>	-3.9458
diffFP	<b>-4.9593</b>	<b>-4.9419</b>	<b>-4.9555</b>	x	<b>-8.0235</b>	<b>-8.0238</b>
WP	-0.9303	-1.2910	-3.1979	x	-2.3754	<b>-5.1252</b>
diffWP	<b>-4.8378</b>	<b>-4.8894</b>	<b>-4.8685</b>	x	<b>-22.0873</b>	<b>-22.0773</b>

A = without intercept and trend; B = with intercept and without trend; C = with intercept and trend. Italics = significant on significance level 5 %; bold = significant on significance level 1 %. Lag length for ADF and PP test = 10.

Source: own calculation

Table 6 and table 7 contain the results of cointegration analysis. Table 6 contains the results for the time series of monthly data while table 7 contains the results for the time series of bi-weekly data. According to the Trace test and Eigenvalue both relations contain one cointegrating vector. It means that long-term relationship does exist between farm-gate price and wholesale price in both cases.

**Table 6.** Results of cointegration analysis – monthly data

H0:r	p-r	Eigenv.	Trace	Trace*	Frac95	P-value	P-value*
0	2	0.193	21.067	20.062	15.408	0.006	0.008
1	1	0.005	0.513	0.508	3.841	0.474	0.476

Source: own calculation

**Table 7.** Results of cointegration analysis – bi-weekly data

H0:r	p-r	Eigenv.	Trace	Trace*	Frac95	P-value	P-value*
0	2	0.082	17.509	17.509	15.408	0.023	0.023
1	1	0.006	1.159	1.159	3.841	0.282	0.282

*Source: own calculation*

Table 8 contains the Beta transposed vector – the vector which shows the nature of long-term relationship between farm-gate price and wholesale price in case of monthly data as well as bi-weekly data. The values included in these vector show slight differences, however, the price transmission in both cases show very similar characteristics. The coefficient of price transmission elasticity reaches value 0.171 % in case of monthly data and 0.224 % in case of bi-weekly data. According to these values the pork agri-food chain might be considered as oligopsonic in both cases (the coefficient of price transmission elasticity is lower than 1). It means that the position of farmers is not as strong as the position of the processors or retailers. Moreover, the relationship between farm-gate price and wholesale price is inelastic. Thus, the producers of pork meat might be considered as price takers and pork agri-food chain might be considered as demand-driven.

**Table 8.** Nature of price transmission

Monthly data		Bi-weekly data	
FP	WP	FP	WP
1.000	-0.171	1.000	-0.224

*Source: own calculation*

## 4 Conclusions

The aim of this paper was to verify the assumption whether the time series frequency may influence the results of the price transmission analysis. For this purpose time series of farm-gate price and wholesale price of pork meat were analysed. The selected time series contain both monthly data and bi-weekly data in period from July 2002 to October 2010. Firstly, the main features and statistical characteristics of these time series were examined. Then, the price transmission analysis was processed for both monthly data and bi-weekly data. Finally, the results of the analysis were compared and discussed. The results of the analysis showed slight differences in almost all cases. Several substantial differences were detected as well, however, these factors are not so important and then, they should not influence the results of the price transmission significantly. Thus, the hypothesis which says that the choice of the time series frequency may influence the results of the price transmission analysis was not confirmed. However, researchers should be careful and they should choose the time series for empirical analysis cautiously. General conclusions about the nature of the time series and the price transmission seems to be the same, however, detailed results might be dissimilar. For instance the case of the price transmission elasticity as an important aspect of the price transmission: the level of price transmission elasticity in case of monthly data differs from the price transmission elasticity in case of bi-weekly data. However, the result about the market structure remains the same. To conclude, the differences in general price transmissions results are not significant while some detailed results might be marked as significant.

Contrary, the previous research showed in some points of view small differences in results and in some points of view considerable differences in results of the price transmission analysis (e.g. Čechura, Šobrová (2008), Šobrová, Čechura (2008), Čechura, Šobrová (2009)). It was probably the main impulse to process this analysis and verify it. However, these differences might be caused by different factors than just frequency of the time series employed. May be, one of such factors might be the fact that the analyses were processed for

different time period, even the differences were not so big. Another reason to get these results may be the choice of the data aggregation.

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# Weather Derivative Design and Valuation in Agriculture

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**Annotation:** Risks in agriculture can be generally grouped into three categories - normal, marketable and catastrophic. The paper deals with weather derivatives as the potentially new tools for management of systematic risk in agriculture (especially drought). Weather derivative represent an innovative financial risk management tool related to the conduct of the weather. The aim of the paper is to point out some problems of index estimation for the purposes of weather derivative valuation considering the particularities of agriculture. Assessment of the sensitivity of barley to weather over 40 years has been the basis for the design and valuation of weather derivative in the Czech Republic (The South Moravian Region). The analysis is based on linear regression modeling using monthly temperature index (as the most suitable independent weather variable) and barley yield (as dependent variable). The burn analysis based on parametric bootstrap is used as the method for the valuation of weather derivative contract, namely the call option. It can be concluded that the burn analysis is suitable for weather derivative valuation in agriculture, but only if the basis risk has been minimized. With the effective bootstrap tool, the burn analysis may easily be processed and the uncertainty about the pay-off and other statistics can be effectively determined. Nevertheless, the results of the analysis reveal a significant adverse impact of basis risk on the quality of agricultural weather derivative in the Czech growing conditions. The article outlines the scope for use of weather derivative as the reinsurance tool in regions with frequent occurrence of systematic weather risk.

**Key words:** Weather derivative valuation, agriculture, risk management, basis risk, burn analysis.

**JEL classification:** Q14, G32

## 1 Introduction

Weather hedging can be theoretically appropriate risk management strategy for all companies whose earnings or cash flows are negatively affected by weather. A financial weather contract is a weather contingent contract whose pay-off will be determined by future weather events. The contract links payments to a weather index that is the collection of a weather variables measured at a stated location during an explicit period (Dishel et al, 2002). Underlying “asset” of weather derivative are most often air temperature, rainfall, wind speed etc.

Financial weather contracts can be traded either in the form of weather derivative in the OTC (over-the-counter) markets and exchanges or through index insurance which is currently the most common way in agriculture. Trading in weather derivatives has developed since the second half of 90 of the 20 century. Dynamic growth in the number of traded contracts came after 2003, when the CME (Chicago Mercantile Exchange) offered clearing service center for weather derivatives. In the future, increasing interest in weather derivatives is expected, namely due to the development of energy production from renewable sources (solar power, wind, water), whose performance is dependent on the weather.

Recently, weather derivatives have received considerable attention in the literature as potential risk management tools for agricultural production (Turvey, 2001; Martin, Barnett and Coble, 2001; Dishel et al, 2002; Vedenov and Barnet, 2004; Woodard and Garcia, 2008). All authors highlight both the benefits and problems of weather derivatives in comparison to conventional insurance products. Financial weather contracts reduce transaction costs as pay-offs are based on objectively measured index, so the farm-level loss adjustment is not needed. Weather derivatives and index insurance are free of moral hazard and adverse selection because market participants can not affect the index variable. Moreover, weather derivatives

are suitable for transfer of systematic risk, because the higher spatial correlation of index variables determines the more liquid financial contract which makes it easier to trade on the exchange market.

The major disadvantage of weather derivatives is basis risk. Basis risk refers to the potential discrepancy between actual loss and contract pay-off. Differences arising from the imperfect correlation between underlying weather variable and crop yield. The relatively larger geographic area, the highest basis risk can be observed. Nevertheless, weather derivatives are better to design for a relatively large area, because such contracts are easily marketable and more attractive to investors.

Weather derivatives are suitable for areas with most homogeneous production conditions, where farm income is significantly spatially correlated and spatial differences in the impact of weather on vegetation are low (Hess, 2007). The land relief affects the spatial distribution of precipitation and air temperature. The Czech Republic is characterized by heterogeneous production conditions. Relatively more homogeneous areas are the fertile lowlands of South Moravia, Elbe valley and Haná. These areas are also most at risk of more frequent drought. On a global scale, greater homogeneity of the production conditions is in the most intensively agricultural region of the U.S. Corn Belt than in the EU.

This paper aims to assess the effectiveness of agricultural weather derivative in conditions of the Czech Republic. Since various combinations of weather variables, crops and weather stations create a huge number of potential weather derivatives, the scope of this paper enables only the weather derivative design and valuation of one crop in one region. Assessment of the sensitivity of barley to weather has been the basis for the design of weather derivatives in the South Moravia which represents relatively homogeneous agricultural region. The weather derivative is designed for barley as one of the most significant crop planted in the Czech Republic.

## **2 Materials and Methods**

### **2.1 Data**

Temperature and precipitation are most important weather factors of yield variability. Weather data were obtained from the Czech Hydrometeorological Institute (CHMI). The analysis is based on daily / monthly average air temperatures and daily / monthly rainfall. The reference period is 40 years (1970-2009), which is sufficient time series to assess the dependence of yield on the weather. Monthly weather data are spatial averages of data from meteorological stations in the South Moravian Region. Daily weather data was purchased from reference meteorological station Znojmo - Kuchařovice (334 meters above sea level).

The series of barley yield in the South Moravian Region was obtained from the Czech Statistical Office. Since 2001 there has been new delimitation of regional boundaries in the Czech Republic, so the average yield of barley prior to 2001 have to be adjusted to reflect the new regions. Adjustment of yield time series to the new territorial self-government structure is made using data at the district level.

In order to account for temporal component, a simple detrending procedure is implemented by fitting the most suitable trend model (quadratic trend). We reveal the dependence between the barley yield and past weather using Pearson correlation coefficient. To avoid possible omission of non-linear dependence between yield and weather variables, we also use Spearman rank correlation coefficient as an alternative indicator. Statistically significant correlation coefficients help to determine the critical month for yield formation of barley.

We adopt following weather indices – air temperature (°C), rainfall (mm) and drought index<sup>1</sup>  $S_i$  (combination of air temperature and rainfall). The underlying weather index with the highest correlation coefficient is the best index of weather derivative because it effectively reduces the basis risk.

## 2.2 Methodology

In order to achieve the highest possible correlation between yield and weather variables, we set weights to the critical month of vegetation. The weights are optimized using the MS Excel Solver to find the highest value of correlation coefficient between yield and weather variable during the critical period of vegetation. So the final index is a weighted average of the weather variables in the critical months of vegetation.

The weather derivative contract triggers (starts to pay) whenever the index gets below (rainfall) or above (temperature) a specified strike level. To clearly find the strike, we analyze the relationship between yield and index using simple linear regression. We set the strike as expected post-harvest price (P) and regression coefficient ( $\beta$ ). In order to choose multiple linear regression or polynomial regression, the strike cannot be clearly determined as it varies in different parts of the non-linear regression curve.

The regression function needs to be tested for autocorrelation (Durbin-Watson test at the significance level of 0.05, 40 observations, 2 predictors in the regression including a constant) and heteroskedasticity (parametric Goldfeld-Quandt test at the significance level of 0.05, Spearman rank correlation between independent variable and squared residuals).

In order to formally evaluate the efficiency of weather derivatives in reducing production risk, a particular contract layering and contract value must be set. Contract layering is based on the frequency and severity of risks which the farmer is not willing to accept and which he intends to share with other market participants. Firstly, we assume that farmer is willing to accept the decline in barley yield by 10% compared to the expected value (five-year average excluding the maximum and minimum).

In most cases, weather derivative pricing is based on actuarial method. Easy but effective actuarial method is burn analysis (or simply “burn”). Burn is based on the idea of evaluating how a contract would have performed in previous years (Jewson, Brix and Ziehm, 2005). Burn analysis in this paper is enhanced by distribution fitting and Monte Carlo simulation.

The probability distribution of the independent variable (index) is estimated from the real data (1970-2009) using MLE method (Maximum Likelihood Estimation). As defined by Vose (2008), the maximum likelihood estimators of a distribution type are the values of its parameters that produce the maximum joint probability density for the observed dataset  $x$ . Consider a probability distribution type defined by a single parameter ( $\alpha$ ). The likelihood function  $L(\alpha)$  that a set of  $n$  data points ( $x_i$ ) could be generated from the distribution with probability density  $f(x)$ .

$$L(X|\alpha) = \prod_i f(x_i, \alpha), \text{ i. e. } L(\alpha) = f(x_1, \alpha) f(x_2, \alpha) \dots f(x_{n-1}, \alpha) f(x_n, \alpha) \quad (1)$$

The MLE is then the value of  $\alpha$  that maximizes  $L(\alpha)$ . It is determined by taking the partial derivative of  $L(\alpha)$  with respect to  $\alpha$  and setting it zero:

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<sup>1</sup> Since agricultural drought is a complex of many factors that cannot be included in one indicator, we use a drought index  $S_i$  as an indicator of meteorological drought. The index  $S_i$  can be formulated as  $S_i = \Delta_T/\sigma_T - \Delta_R/\sigma_R$ . It presents a difference of monthly anomalies of temperature ( $\Delta_T = t - t_n$ ) and precipitation ( $\Delta_R = r - r_n$ ) to their standard deviations  $\sigma_T$  and  $\sigma_R$  (Potop, Türkott and Kožnarová, 2008).

$$\left. \frac{\partial L(\alpha)}{\partial \alpha} \right|_{\hat{\alpha}} = 0 \quad (2)$$

Distribution fitting using MLE method is processed automatically<sup>2</sup>. The probability distribution is tested simultaneously with three goodness-of-fit tests at the significance level of 0.05 - Anderson-Darling test (A-D), Kolmogorov-Smirnov test (K-S) and  $\chi^2$  test.

It is very helpful to use bootstrap tool (Efron, 1979) for improving burn analysis. Bootstrapping allows for easier estimation of uncertainty surrounding the estimate of mean and standard deviation of pay-off. We estimate the payoff uncertainty using the parametric bootstrap that requires the extra information about the probability distribution. The procedure of parametric bootstrap is as follows (Vose, 2008):

1. Collect the dataset of  $n$  samples  $(x_1, x_2, \dots, x_n)$ .
2. Determine the parameter(s) of the distribution that best fit(s) the data from the know distribution family using maximum likelihood estimators (MLE).
3. Generate  $B$  bootstrap samples  $(x_1^*, x_2^*, \dots, x_n^*)$  by randomly sampling from this fitted distribution.
4. For each bootstrap sample  $(x_1^*, x_2^*, \dots, x_n^*)$ , calculate the required statistic  $\theta$ . The distribution of these  $B$  estimates of  $\theta$  represents the bootstrap estimate of uncertainty about the true value of  $\theta$ .

The contract pricing is based on an estimate of a "fair" price, i.e. price at which the expected profit for both contracting parties is zero. Contract price (in this case of an option) is the average expected contract pay-off. Nevertheless, the seller of the option would probably expect a reward for taking on the risk of having to pay out, and hence the premium would probably be slightly higher than the expected payoff by a risk loading. We set the risk loading as 20 % of the standard deviation of the payoff of the contract (Jewson, Brix and Ziehm, 2005).

Efficiency of weather derivative to reduce risk is quantified by comparing the distribution of revenues from barley sales including hedging and without hedging. If the farmer does not buy a weather derivative contract, he would realize the revenues  $R_0$  (Weber et al, 2008)

$$R_0 = \frac{\int Q_T(I_T)P}{(1+r_f)^n} \quad (3)$$

$Q_T$  denotes barley yield (t/ha) being a function of stochastic variable  $I_T$ .  $P$  is expected postharvest crop price (CZK/t). Since the expected pay-off ( $Q_T \cdot P$ ) is related to the beginning of the contract period (usually 1 year), it should be discounted using risk free rate  $r_f$  (e. g. 1-year PRIBOR rate at 30<sup>th</sup> July 2010 was 1.72 %).

If the farmer buys a weather derivative contract per 1 ha of crop, he has to pay the premium to the seller ( $F_0$ ). On the other hand, farmer may collect a pay-off from the contract ( $F_T$ ) if a weather variable exceeds the strike (Weber et al, 2008). The payment is a function of underlying weather index  $I_T$ .

$$R_1 = R_0 + \frac{\int F_T(I_T)}{(1+r_f)^n} - F_0 \quad (4)$$

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<sup>2</sup> The probability distribution of risk factors is estimated using the software module BatchFit Oracle Crystal Ball 11.1.

The effectiveness of hedging is assessed by comparing the coefficient of variation of revenues with and without using derivatives. Calculation is performed using Monte Carlo simulation method with 10 000 iterations at the significance level of 0.05. The degree of basis risk is quantified by comparing simulation without standard error (without basis risk) and including standard error in regression estimate (including basis risk).

### 3 Results and Discussion

#### 3.1 Design of weather derivative contract for barley

Table 1 presents the results of correlation analysis between barley yield and weather. The table lists the most significant correlation coefficients, including the test of statistical significance. As might be expected, statistically significant moderate relationship had occurred between the yield of barley and air temperature in April, May, June (and July). Precipitations are local, so the risk of lack or, conversely, excessive rainfall has a systematic character. In addition to the sensitivity of barley to the lack of precipitation in spring, inverse relationship shows between yield and rainfall during the pre-sowing soil preparation. The correlation between barley yield and precipitation at the regional level is rather weak.

**Table 1.** The most significant correlation between barley yield per hectare and the average characteristics of weather in the South Moravian Region (1970 – 2009).

Region/station	Temperature (°C)	Precipitation (mm)	Drought index $S_i$
South Moravia	-0,64 (6, $p < 0,0001$ )	0,36 (4-6, $p = 0,0218$ )	-0,60 (4-6, $p < 0,0001$ )
	-0,64 (5-6, $p < 0,0001$ )	0,33 (4-5, $p = 0,0387$ )	-0,56 (5-6, $p = 0,0002$ )
	-0,63 (4-6, $p < 0,0001$ )	-0,32 (3, $p = 0,0439$ )	-0,49 (4-5, $p = 0,0012$ )
	-0,55 (4-7, $p = 0,0002$ )		-0,47 (6, $p = 0,0020$ )
	-0,54 (5-7, $p = 0,0003$ )		-0,47 (5, $p = 0,0021$ )
Station Znojmo-	-0,60 (6, $p < 0,0001$ )	X	-0,61 (4-6, $p < 0,0001$ )
Kuchařovice	-0,59 (5-6, $p < 0,0001$ )		-0,57 (5-6, $p = 0,0001$ )
	-0,58 (4-6, $p < 0,0001$ )		-0,53 (6, $p = 0,0005$ )
	-0,51 (4-7, $p = 0,0008$ )		-0,48 (4-7, $p = 0,0015$ )
	-0,50 (5-7, $p = 0,0010$ )		-0,47 (4-5, $p = 0,0021$ )

Notes: Data before round brackets are correlation coefficients. The figures in brackets denote critical months for yield formation, and p-values test the two-tailed statistical significance of the correlation coefficient. The term "X" indicates no statistically significant correlation (Pearson, Spearman) at significance level 0.05. We put a maximum of 5 most statistically significant correlation coefficients.

*Source: Author.*

Due to the systematic effect of air temperature and drought on barley yield at the regional level were put following weather indexes to the regression analysis:

- weighted average air temperature from May to June (T 2)
- weighted average air temperature from April to June (T 3)
- weighted drought index  $S_i$  from May to June ( $S_i$  3)
- weighted drought index  $S_i$  from April to June ( $S_i$  3)

Table 2 summarizes the results of testing the effect of various weather indices on barley yield. Results of correlation analysis indicate that the most appropriate index (i.e. index with

minimum basis risk and highest correlation) for the weather derivative in the Southern Region is weighted average temperature from April to June. The largest weight (65.7%) is assigned the average air temperature in June, the smallest weight the month of May (14.9%). Dependence is statistically significant both at the 0.05 and 0.01 significance levels.

Relationship between barley yield and selected index is expressed by the regression functions in table 3.

**Table 2.** Relationship between the barley yield and weather indices in the South Moravia

Example	T 2	T 3	S <sub>i</sub> 2	S <sub>i</sub> 3
Month (weights)	5 (0,264)	4 (0,194)	5 (0,500)	4 (0,271)
	6 (0,736)	5 (0,149)	6 (0,500)	5 (0,307)
		6 (0,657)		6 (0,422)
Pearson r	-0,666 (p < 0,0001)	-0,688 (p < 0,0001)	-0,592 (p < 0,0001)	-0,645 (p < 0,0001)
R <sup>2</sup>	0,443 (p < 0,0001)	0,473 (p < 0,0001)	0,350 (p < 0,0001)	0,416 (p < 0,0001)

*Source: Author.*

**Table 3.** Results of the regression analysis for barley

Region/station	Linear fit	R <sup>2</sup>	Adjusted R <sup>2</sup>	D-W test	p-value
South Moravia	y = -0,3623x + 9,5613	0,473	0,460	1,840	< 0,0001
Station Znojmo-Kuchařovice	y = -0,3052x + 8,7431	0,405	0,390	1,840	< 0,0001

*Source: Author.*

Linear trend explains fluctuations in barley yield in the critical months of the year of around 47%. Choosing non-linear trend does not dramatically improve the quality of fit (e. g. 4-order polynomial trend has the R<sup>2</sup> of only 0,483). Neither Spearman rank correlation nor Goldfeld-Quandt test revealed the existence of heteroscedasticity.

According to Anderson-Darling goodness-of-fit test, residuals come from the normal distribution<sup>3</sup>. Standard error is 0.442. This information is used to quantify the effectiveness of contract involving basis risk.

Three goodness-of-fit tests of weather index (A-D, K-S,  $\chi^2$ ) indicate that selected weather index comes from logistic distribution with mean 15.02 and scale 0.62. P-value of Anderson-Darling test (0.776) is satisfactory.

Considering the above regression equation for the contract to barley, the expected yield of barley 4.1 t/ha can be achieved when the weighted average air temperature in April-June exceeds 15.07°C. We also suppose that farm is willing to accept the decline in barley yield by 10% compared to the expected value. The critical value of yield is then 3.7 t/ha which can be reached at the critical temperature of 16.18°C. The probability of exceeding this critical temperature (strike) is approximately 14%. So this weather derivative will cover high-risk low-probability systematic event of high air temperatures.

<sup>3</sup> Anderson-Darling test = 0.15, p-value = 0.957.

Option price is set by burn analysis using parametric bootstrap. Average pay-off ranges from 109 to 117 CZK per contract (the mean is 113 CZK) with a probability of 95%. The standard deviation of the pay-off ranges between 359 and 383 CZK per contract (the mean is 371 CZK) with a probability of 95%. The price of option contract is thus possible to set of CZK 113 + 20% (risk loading) of 371 CZK, i. e. ca 190 CZK.

Based on the results of correlation and regression analysis and following the selection and testing of an appropriate index, it is possible to determine the structure of the contract. Table 4 contains the specification of weather derivative for barley in South Moravia.

**Table 4.** Structure for specific-event contract (barley, South Moravia) – call option, long without capping

	Specification
Contract type	Call option
Contract size	1 ha of barley
Index	Weighted average air temperature (°C)
Location/station	South Moravia/average of stations (CHMI)
Accumulation period (Weights)	April (0,194), May (0,149), June (0,657)
Strike	16.18°C
Fixed price	3 700 CZK per tonne of barley
Tick	1 341 CZK per 1°C above strike
Contract period	1 year (July 1 <sup>st</sup> , 2010 – June 30 <sup>th</sup> , 2011)
Premium	190 CZK per contract incl. risk loading

*Source: Author.*

**Table 5.** Pay-off statistics (CZK per 1 contract)

	Without basis risk		Including basis risk	
	Without hedging	Hedging	Without hedging	Hedging
Trials	10 000	10 000	10 000	10 000
Mean	14 946	14 876	15 006	14 932
Median	14 958	14 768	15 007	14 866
Standard Deviation	1 478	1 269	2 181	2 046
Skewness	0.0540	0.8545	0.0087	0.1921
Kurtosis	4.25	4.17	3.18	3.12
<i>Coeff. of Variability</i>	<i>0.0989</i>	<i>0.0900</i>	<i>0.1453</i>	<i>0.1370</i>
Minimum	7 361	13 259	6 858	7 948
Mean Std. Error	15	13	22	20

*Source: Author.*

In case of hedging, the effectiveness of weather derivative contract is relatively low - farmers could reduce the variability of revenues only by 5.7 % if we take basis risk into account. Analysis revealed a very high basis risk, which may result in both excessive and poor pay-off.

If we consider no basis risk, the contract could help reduce the variability of revenues by 13.8 %. However, the basis risk really exists.

These results confirm the findings by Vedenov and Barnett (2004), Weber et al (2008), Manfredo and Richards (2009) emphasizing in particular disadvantages of weather derivatives as primary crop insurance instruments. Nevertheless, the aggregation effect suggests that the potential for weather derivatives in agriculture may be greater than previously thought, particularly for aggregators of risk such as reinsurers (Woodard and Garcia, 2008).

## 4 Conclusion

The results revealed a significant adverse impact of basis risk on the quality of parametric products. The effectiveness of weather derivatives as risk management instruments could be higher in areas with more homogeneous production conditions (than in the Czech Republic) and more light sandy soils, where rainfall directly determines the flow of water to plant roots and water gets quickly into the lower soil layers being out of reach for plant roots.

The main limitation on the use of weather derivatives in the Czech Republic are heterogeneous production conditions that reduce the correlation between rainfall and crop yields at regional level. Unavailability of data at the district level makes impossible to make in-depth analysis of the smaller territorial units. Conversely, the main opportunity for use of weather derivatives in the Czech Republic is a dense, high-quality network of meteorological stations with long-term data availability, which creates an appropriate basis for further research of other crops and regions.

The use of weather derivatives should be of interest mainly to the regional agricultural organizations and associations through which they can manage the systemic risks of weather. If we assume the potential of weather derivatives as reinsurance instrument, it is important to clarify the legal and institutional aspect of the income risk management in agriculture using weather derivatives, especially regulation and possible areas of cooperation between the public and private sector.

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# The Role of Public Support of Risk Management in Agriculture

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**Annotation:** Agricultural insurance is subsidized from public sources in many countries of the world. The system of agricultural insurance is usually considered as an important component of agricultural policy. That is very significant for the crop insurance system in the USA. Various approaches to agricultural insurance have been applied in the countries within the European Union. There are compulsory systems of agricultural insurance, various cooperation between the private and public sectors in agricultural insurance or reinsurance or solely on a private basis offered insurances. The differences in risk management for agriculture arise from the different natural conditions for agriculture in various European countries.

The OECD is engaged in the monitoring of risk management in agriculture and the role of state intervention in this connection. Agricultural risks are divided into normal, marketable and catastrophic. State intervention is desirable in the case of catastrophic risk, justified in supporting the development of market of risks and counterproductive when attempting to limit impacts of normal risks.

The subsidisation of agricultural insurance is required because of the higher risk in agriculture compared to other business sectors and by the necessity of maintaining rural viability and continuous agricultural production as well. Similar conditions of insurance protection are essential for the comparative competitiveness of agricultural producers from different countries. The paper compares the situation in the Czech Republic and other selected countries and tries to evaluate it and to outline some possibilities for its future development.

**Key words:** risk management, agricultural insurance, state supports

**JEL classification:** Q10, Q14, G22

## 1 Introduction

Agricultural insurance is an important risk management tool in the Czech Republic, and is part of the insurance offer of several commercial insurance companies which is supported from public sources, especially through the program "Support of insurance" provided by the Support and Guarantee Agricultural and Forestry Fund (PGRLF). This paper describes the current approaches to risk management in agriculture and analyzes the situation of agricultural insurance in the Czech Republic compared with the OECD recommendations and with the situation in other countries.

Crop insurance with a 90% share of agricultural insurance premiums, plays a significantly more important role than the livestock insurance (4% share) worldwide (Iturrioz, 2009). This is because compensation for the ordered destruction of animals in the case of an outbreak of dangerous diseases is usually legally mandatory<sup>1</sup> from public sources. The possibilities of control strategies of contagious diseases were analyzed for the EU conditions by Mourits et al. (2010).

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<sup>1</sup>In the Czech Republic it is the Act No. 166/1999 Coll., Veterinary Act, § 67, 68.

## **2 Materials and Methods**

The method for identifying possible positive and negative impacts of agricultural risk management tools is the holistic approach. The holistic approach means examining individual sources of risk factors and risk management tools in agricultural businesses. The risks are divided into normal, marketable and catastrophic in the holistic approach. Marketable risks are designated as those risks whose effects can be eliminated or effectively reduce by the purchase of private insurance or futures contracts. Catastrophic risks generally affect a large number of farms throughout the region. They are usually not solvable by using some private insurance, and thus government intervention is required. State aid can also serve to effectively develop the private market of risk management tools. Thus, support for insurance should be only temporary and after market stabilization should be reduced gradually. It is generally recommended not to use state intervention in the cases of normal risks, which should be managed at the farm level. The negative effects of such measures lies in displacing other proactive measures at farm level, such as the suppression of differentiated appropriate activities and sources of income. In this respect the exception are the measures used in the assessment of income tax, mainly consisting of the possibility of averaging income over a period of several years (OECD, 2009).

In the area of agricultural risk management cooperation between the private and public sector is generally recommended. Governments, in general, should to try reducing the ad-hoc assistances for the agricultural sector. On the other hand, private insurance sees some risks in agriculture as by its nature systematic and therefore commercially uninsurable. Data of the PGRLF and the Czech insurance association (ČAP) was used for evaluations of the Czech agricultural insurance market.

The aim of these analyses is to find the significant characteristics of agricultural insurance systems. Then follow the comparison of the situation of risk management in Czech agriculture and recommendations for its further development.

## **3 Results and Discussion**

### **3.1 Forms of insurance for crop production**

The oldest type of crop insurance is the hail insurance. It covers the losses caused to the insured crop by hail. Hail represents the potential risk of losing a substantial part of the crop production, especially for small farms. There is relatively low incidence of occurrence and usually over the limited area, which result relatively low premium rates at least for most of the field crops. Hail insurance can be extended to including other natural hazards (especially fire, flood, storm, landslide, damage through the winter or spring frost). The principle of calculating the damage remains the same - i.e. finding the actual damage caused by the insured risk. The premium for such insurance is proportionately higher. Generally, such insurance can be termed as crop loss insurance.

Another principle of insurance is the crop yield insurance. The object of insurance is to achieve the insured production volume, either for the entire farm or for an insured crop or group of crops. The determination of compensation is based on the actual reached yield, if the insured yield is not achieved. Such insurance was applied in the former Czechoslovakia in the years 1986 - 1990 as "The comprehensive crop yield insurance", which was part of the mandatory insurance for agricultural holdings (Vilhelm 1990). Crop yield insurance is also broadly applied in the U.S.

A different approach to crop insurance represents insurance based on weather indexes (weather insurance) or weather derivatives. In this type of insurance a desired weather characteristic is selected (e.g. rainfall over a defined period) and if the agreed threshold is not

achieved, there is a graduated payment according to how much the actual result drops below the agreed threshold. This system appears as promising in areas with homogenous natural conditions where fluctuations in income are caused almost exclusively as a result of drought. The low transaction costs are an advantage because it is not necessary to identify any actual damage or yields. The indemnity is entirely based on the exact data measured at the meteorological station mentioned in the contract. The base risk is connected with the incomplete correlation of actually yields obtained with the values of selected meteorological parameters measured at the meteorological station. This system was theoretically studied for conditions in northeastern Germany (Musshoff and Hirschauer, 2007). OECD (2010a) recommends such an approach as an effective tool for risk-management of drought in Australian agriculture. Conversely, for heterogeneous landscape conditions that are characteristic in Czech agriculture, such an approach does not seem promising.

The efficiency of future sales contracts of crop production described by use of stochastic simulation Musshoff and Hirschauer (2008).

### **3.2 United States of America**

The current system of crop insurance in the United States was established in 1938. The most often insured crops are corn, soybeans, and wheat, about 80 % of the total area is insured (2008). The total value of premiums in 2008/09 was almost \$ 10 billion. The insurance coverage is 50% of the average yield and 55% of the expected crop prices in the basic CAT (Catastrophic) program. This basic coverage is fully subsidized by the state. Farmers can buy a higher level of insurance coverage with the Buy Up program, where it is possible to arrange insurance from 50% to 85% of the average yield and from 55% to 100% of the expected price. The premium depends on the actual production history (APH) on the farm. In the case of price insurance the Risk Management Agency provides price forecasts. The government pays the administrative costs of agricultural insurance and secures the reinsurance (Latham, 2010).

The implications of this system are analyzed in many studies (e.g. Coble et al., 2000). They are some critical assessments from the point of view of moral hazard (Horowitz and Lichtenberg, 1993) or adverse selection (Just et al., 1999).

### **3.3 Agricultural Insurance Systems in European Union**

In the European Union, individual states use very different systems of agricultural insurance (Špička 2010). The diversity of approaches and institutional arrangements to agricultural risk management is given by the heterogeneity of risks which threaten Europe's farmers. In general, the higher risk of crop damage occurs in southern European countries, with particularly high risks of drought and other significant effects of extreme weather events. There are of state established institutions which provided compulsory agricultural insurance in Greece and Cyprus. Hail plays an important role in the Central European countries and with regard to climate change more frequent occurrences of drought and local torrential rains are predicted. In contrast, countries in North Europe are less threatened by drought or hail. Therefore a consistent willingness to have a common risk management approach is improbable in the European Union.

In most countries private agricultural insurance is supported by the public sector. Such a system is used in the Czech Republic, the Slovak Republic, Poland and Austria for example. In Austria 50% of the premium for crop insurance is subsidized from public sources (half from the state disaster fund, the second half from individual federal states). Unlike the situation in the Czech Republic the insurance subsidy is directly paid to the Austrian hail insurance company. Insurance covers more than 80% of agricultural land, of which more

than 60% is insurance against more risks - freeze, hail, storm, flood, drought and other risks (Weinberger 2009).

Spain has had a complex system of agricultural insurance based on the cooperation of the public and private sectors, with special institutions for its operation and development and state reinsurance, for more than thirty years. The system is financed by both the central Spanish government and from regional budgets (OECD, 2010b). Total sums insured for crop and livestock insurance under the system increased from about 3 billion Euros in 1991 to almost 11 billion Euros in 2008 and total support for insurance premiums increased over the same period from 90 million to 450 million. The share of the insured value of the total production was 72% for cereals, 76% for fruit and 79% for livestock (Toraño, 2010).

On the other hand, in some countries, the agricultural insurance system operates on a purely commercial basis without government interference (e.g. in Germany, Great Britain and the Scandinavian countries). In some countries, such as France and the Netherlands, the state plays a significant role in providing insurance funds, created in part by compulsory contributions from farmers. In the European Union is not yet an insurance solution covering fluctuations in prices of agricultural commodities offered unlike the situation in the United States.

The European Union, under the Common Agricultural Policy (CAP) allows support for agricultural insurance, up to 80% of the premium, from national sources. The CAP Health Check measures in 2008 (article 68) allow to retain up to 10 per cent of national ceilings for direct payments to provide support for agricultural insurance or mutual funds for animal and plant diseases. The support may be paid up to 65% of the insurance premium, while the share of EU CAP can be up to 75%.

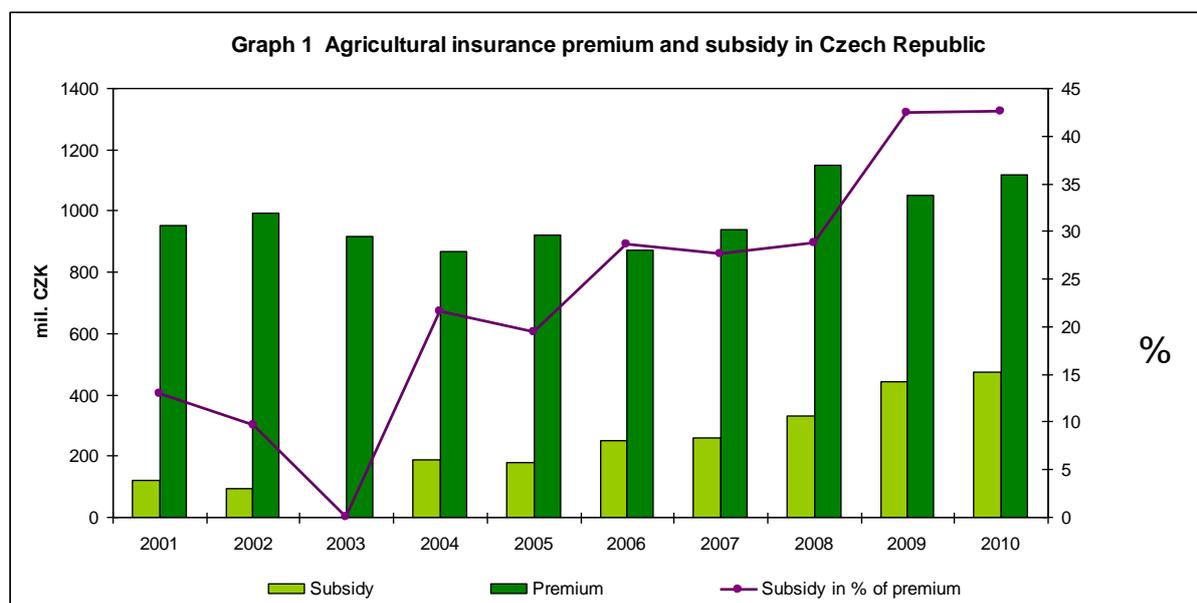
### **3.4 Agricultural insurance in the Czech Republic**

Agricultural insurance has operated on a voluntary basis in the Czech Republic since 1991. Formerly, the agricultural insurance had the form of mandatory insurance for all agricultural holdings (i.e., especially agricultural cooperatives and state farms) and was operated by the state insurance company until 1990. Four commercial insurers offer agricultural insurance actively on the market now. According to the Insurance Act agricultural insurance can be offered by any commercial insurance company licensed by the Czech National Bank and issued relevant insurance conditions. State reinsurance does not exist in the Czech Republic, unlike in Spain or United States. Creating a state reinsurance company for the reinsurance of agricultural risks was one of the proposals when deciding the optimal form of state involvement in agricultural insurance.

Agricultural insurance had no state support in the years from 1991 to 1999. The Ministry of Agriculture began support through the No. 8 subsidy program - the animal contagious diseases fund and subsidies for agricultural insurance from 2000. The subsidy for agricultural insurance was conditioned by the non-spending of financial resources for superior subsidies. No subsidy for agricultural insurance was paid for this reason in 2003. The state-owned Support and Guarantee Agricultural and Forestry Fund (PGRLF) introduced instead a new program "Support of insurance" in 2004. This support of insurance was implemented as the retroactive reimbursement of premium costs paid by the insured farmer for crop insurance (insurance against hail, fire, storm, flood, landslides, spring frost or frost) and livestock insurance (insurance against death or being killed as a result of a natural disaster, or other dangerous diseases of an infectious or parasitic origin). The purpose of this support is to make insurance protection for farmers more accessible. The support from 2004 increased from 30% of the premium for crop insurance and 15% of the premium for livestock insurance to 50% for both types of insurance since 2009. Subsidy is available for small and medium holdings and it

is provided only for insurance premium, that was really paid, which implies, that the real share of support on premium written is less than 50% - see graph 1.

Graph 1 shows the development of the total volume of premiums (written) and subsidies of agricultural insurance in 2001-2010 (data for 2010 is preliminary).



Source: Zpráva o stavu zemědělství ČR (Report on the State of Agriculture in CR) 2009, PGRLF, own calculations

Table 1 shows the overall development of agricultural insurance in 2001 - 2010.

**Tab. 1 The development of agricultural insurance in the Czech Republic 2001 - 2010 (mil. CZK)**

Year		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
crop insurance <sup>1)</sup>	premium	530,8	566,9	542,1	534,4	594	538,5	620,2	777,8	675,2	741,1
	loss indemnity	622,8	649,9	333	238,7	281,8	495,6	518,3	661,5	1084,2	567,8
	loss ratio %	<b>117</b>	<b>115</b>	<b>61</b>	<b>45</b>	<b>47</b>	<b>92</b>	<b>84</b>	<b>85</b>	<b>161</b>	<b>77</b>
livestock insurance <sup>1)</sup>	premium	422	426	373,4	335,2	325,2	326,4	293,5	294,6	266,7	249
	loss indemnity	219,3	219,5	204,7	156,8	156,4	129,3	99,7	79	127,1	128
	loss ratio %	<b>52</b>	<b>52</b>	<b>55</b>	<b>47</b>	<b>48</b>	<b>40</b>	<b>34</b>	<b>27</b>	<b>48</b>	<b>51</b>
agricultural insurance total <sup>1)</sup>	premium	952,8	992,9	915,6	869,6	919,2	864,9	913,8	1072,3	941,8	990,1
	loss indemnity	842,1	869,4	537,7	395,5	436,4	624,9	618,1	740,5	1211,3	695,8
	loss ratio %	<b>88</b>	<b>88</b>	<b>59</b>	<b>45</b>	<b>47</b>	<b>72</b>	<b>68</b>	<b>69</b>	<b>129</b>	<b>70</b>
agricultural insurance total <sup>2)</sup>	premium	953	993	916	870	919	870	940	1 150	1 050	1 120
	loss indemnity	842	869	538	396	436	630	640	800	1 350	790
	loss ratio %	<b>88</b>	<b>88</b>	<b>59</b>	<b>45</b>	<b>47</b>	<b>72</b>	<b>68</b>	<b>69</b>	<b>129</b>	<b>70</b>

<sup>1)</sup> Data for member of the Czech insurance Association (ČAP) - without the data for the Agra pojišťovna insurance which isn't a member of ČAP and the data in such structure doesn't provide.

<sup>2)</sup> Data including the estimation for Agra pojišťovna according supplies for subsidy from PGRLF (since 2006).

Source: Zprávy o stavu zemědělství ČR (Reports on the State of Agriculture in CR), ČAP, PGRLF, own calculations

The crop insurance premium volumes increased and the estimated premium value for all insurers was approximately CZK 850 million in 2010, which was 160% of the premium volume in 2001. The fluctuation of loss ratio was relatively high. The losses paid were higher than the premiums in three of these ten years. Livestock insurance showed a steady decline. The loss ratio in livestock insurance was relatively low and stable. A higher loss ratio (at most 55% of total premiums in 2003) was seen in the years from 2001 to 2003, particularly in connection with cases of Bovine spongiform encephalopathy (BSE). The overall downward trend in premiums corresponds to the decreasing numbers of farm animals.

Tab. 2 shows the sums, the annual means, the standard deviations and coefficients of variation of the parameters of agricultural insurance in the Czech Republic in last ten years, which illustrates the above mentioned characteristics:

**Tab. 2 The evaluation of agricultural insurance in the period from 2001 to 2010 in the Czech Republic**

parameter		sum (mil. CZK)	annual mean (mil. CZK)	standard deviation (mil. CZK)	coefficient of variation
crop insurance <sup>1)</sup>	premium	6 121	612,1	90,4	0,15
	loss indemnity	5 454	545,4	243,4	0,45
livestock insurance <sup>1)</sup>	premium	3 312	331,2	60,3	0,18
	loss indemnity	1 520	152,0	49,1	0,32
agricultural insurance total <sup>2)</sup>	premium	9 780	978,0	98,9	0,10
	loss indemnity	7 291	729,1	274,5	0,38

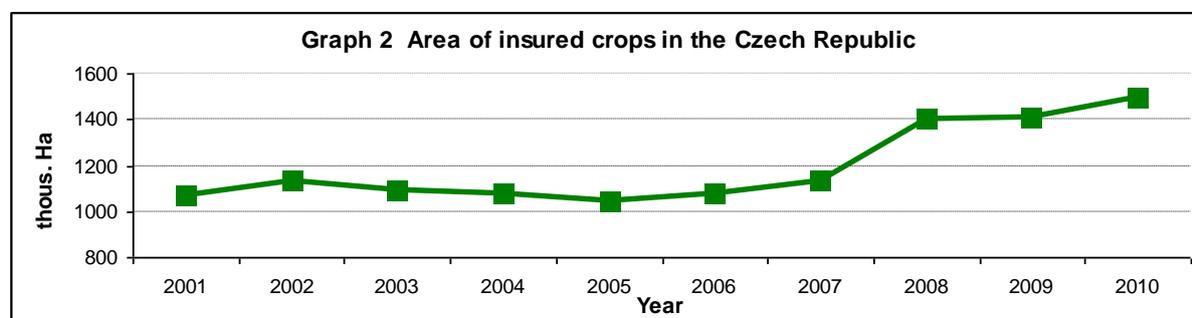
<sup>1)</sup> Data for member of the Czech insurance Association (ČAP) - without the data for the Agra pojišťovna insurance which isn't a member of ČAP and the data in such structure doesn't provide.

<sup>2)</sup> Data including the estimation for Agra pojišťovna according supplies for subsidy from PGRLF (since 2006).

Source: Zpráva o stavu zemědělství ČR (Reports on the State of Agriculture in CR) , ČAP, PGRLF and own calculations

The share of insured livestock was estimated at 80%. Private insurance refers as well to cases of emergency slaughter of animals by the outbreaks of dangerous diseases which are compensated by the state according to the Veterinary Act. Compensation by the state together with the indemnity of the affected farmer's private insurance contract usually covers the damage not only of the lost animals but also the damage caused by the disruption of animal production. Unlike this solution the private business interruption insurance is offered for such cases in some other EU countries. The epizootic diseases are usually a standard exclusion in private livestock insurance in many countries.

Graph 2 shows the positive effects of insurance subsidies on the evolution of the total acreage of insured crops from 2001 to 2010. The data refers to crops grown on arable land, vineyards, hop gardens and orchards. In 2010, the acreage of insured crops reached 1.5 million hectares. The share of the insured area was 48%, taking the total area of arable land, vineyards, hop fields and fruit orchards from the Czech Institute of Surveying, Mapping and Cadastre (ČÚZK). The share was 58% according to data from LPIS, which is related to the registered users of agricultural land and better represents the market potential for crop insurance.



Source: Zpráva o stavu zemědělství ČR (Report on the State of Agriculture in CR) 2009, Czech insurance association and own calculations

On the basis of the development of crop insurance penetration it can be noted that the premium subsidy has met its purpose and helped to develop the agricultural insurance market, especially crop insurance. This argument is valid only for actual insurable risks. Commercial insurance does not cover some important risks to crops in the Czech Republic; in addition to price risk, the risk of drought particularly but also the risk of rains at harvest time. The risk of draught, especially, has a much more systematic character than most of the present commercially insurable risks<sup>2</sup>. This should lead to more government attention in this area. There are various possibilities for further development. The relatively high support of commercial insurance could lead to the extension of the insurable risks in agricultural insurance products, as in Austria. Another possibility is the creation of a public fund as a financial instrument which would allow farmers to be compensated for uninsurable risks. The

<sup>2</sup> For losses caused by drought was paid 5 billion CZK in form of ad hoc state aid in 2000.

Agricultural Association of the Czech Republic suggests in this connection the creation of tools for risk and crisis management, with particular emphasis on coverage of uninsurable risks in the CAP after 2013<sup>3</sup>.

## 4 Conclusion

The diversity of approaches to risk management in agriculture in the world and the countries of the European Union reflects various risks that farmers face in different countries. For the current period the major sources of risk are the growing impacts of climate change and globalization of markets. They bring, in the first case more frequent extreme weather events, and in the latter case, fluctuations in commodity prices and less dependence on the local production. Cooperation between the private and public sectors is generally considered the optimal way to offer more effective tools of risk management. Normal risks, marketable risks and catastrophic risks specify the role of risk management at farm level, private market level and state intervention. The boundary between insurable and uninsurable risks is vague and different in various countries. For example, drought is often considered to be a systematic risk and therefore uninsurable, which is the case of the current Czech agricultural insurance market. A similar conclusion applies to the risk of dangerous animal diseases. In this case the risk in the Czech Republic is generally insurable.

The Czech experience shows that support from public sources has helped to develop the agricultural insurance market. It would be desired to use the public sources for the heretofore uninsurable risks and to find the possibility for its insurability or to create a fund for such losses. In the case of livestock diseases the subsidized insurance covers also such cases which are indemnified by state according the Veterinary Act. A better solution would be to replace current livestock insurance by business interruption insurance for animal production.

At present, it would be appropriate to focus attention on the creation of state co-financed instruments, possibly linked to the EU Common Agricultural Policy, which in the event of or catastrophic losses would replace the ad hoc state aid efficiently and effectively.

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# **Management and Entrepreneurship**



# Human Resource Management in Relation to Corporate Culture in the Knowledge Economy

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**Annotation:** The global society is looking for a way out of the current crisis with the help of the knowledge economy. Human potential development, depending on the human resource management and corporate culture, is essential for future human capital creation. This paper deals with the human resource management in selected enterprises of the South Bohemia region. The most valued assets are human resources, whose development is increasingly considered to be the key competitive advantage within the new global environment. The aim of this research is to evaluate the current status of the human resource management and to assess the functioning of the human resource management in relation to the desired corporate culture. Primary data were obtained from 60 small and medium-sized enterprises with the use of the questionnaire method. This study is a part of the research project GAJU 068/2010/S titled "Process Management and its possible implementation in small and medium-sized enterprises". The results confirm the growing importance of developing human potential in the surveyed enterprises. Finally, we can say that human resource management is dealt with in most of the surveyed enterprises, but it seems that continuous human resources development is usually hindered by insufficiently developed corporate culture.

**Key words:** human resource management, corporate culture, human resource development

**JEL classification:** M5

## 1 Introduction

Nowadays, most organizations are operating under the conditions of the globalized world and they are exposed to a high pressure of the constantly accelerating pace of technological changes. They are also forced to work in a world of uncertainty, changing market conditions and growing demands of customers (Ulrich, 2009). The dominant view today is of a global knowledge-based economy, driven by the application of new technologies, accelerating the shift to high-skilled, high-waged European economies (Brown et. al., 2008). We define the knowledge economy as production and services based on knowledge-intensive activities that contribute to an accelerated pace of technical and scientific advance, as well as rapid obsolescence. The key component of a knowledge economy is a greater reliance on intellectual capabilities than on physical inputs or natural resources (Powell, Snellman, 2004).

In recent years, many concepts for change but also for organizational excellence have put greater emphasis on employees (Zink, 2008). Human resources are the determining factors for economical growth and development. Under the knowledge-based economy condition, human resource management is important in an enterprise's status (Yu, Zhang, Cao, 2006). The human resources should not be viewed as a simple labour tool at the time of the knowledge society, but as a human capital of an organization, which is the main source of competitive advantage (Krninská, 2002). The intellectual capital consists of the stocks and flows of knowledge available to the organization. These can be regarded as intangible resources which, together with tangible resources (money and physical assets), comprise the market or total value of a business (Baron, Armstrong, 2007). People are the most valuable and also the most expensive source used in the enterprises. This source usually determines an organizations's

prosperity and competitiveness. That's why the modern concept of human resource management is the core area of management (Koubek, 2009).

Human resource management means a strategic and coherent approach to the management of an organization's most valued assets – the people working there who individually and collectively contribute to the achievement of the desired objectives (Armstrong, 2009). The overall purpose of human resource management is to ensure that the organization is able to achieve success through people. People management aims to increase organizational effectiveness and capability – the capacity of an organization to achieve its goals by making the best use of the resources available to it (Armstrong, 2010).

The ability of an organization to use its human capital as a core competency depends in part on the corporate culture. Corporate culture consists of the shared values and beliefs that give members of an organization meaning and provide them with rules and behavior (Mathis, Jackson, 2010). Corporate culture determines the basic aims, principles, forms and methods of the human resource management. It also sets criteria for the level of acceptability and ways of leadership (Bedrnová, Nový et al., 2009).

The corporate culture is the main source of the organization's identity and is therefore clung to with a vengeance, just as adolescents cling to their budding identities (Schein, 2009). Central to corporate culture are values that are inherent in the ways organizations and their members treat people both inside and outside the organization. Corporate culture should be seen as the climate of the organization that employees, managers, customers and others experience. This culture affects service and quality, organizational productivity, and financial results (Mathis, Jackson, 2010). Corporate culture exerts impact on strategies of human resource management by means of influencing life values, thinking patterns and behavioral modes of executive managers and employees. Only when organizational culture and strategies of human resource management supplement each other, can the strategies exert their effectiveness and then form their competitive advantages (Guo, 2007). Effective corporate culture is a clear determinant of innovation strategy. Managers should pay more attention to their organization culture if they pursue innovation strategies (Naranjo-Valencia, Jimenez, Sanz-Valle, 2011).

## **2 Materials and Methods**

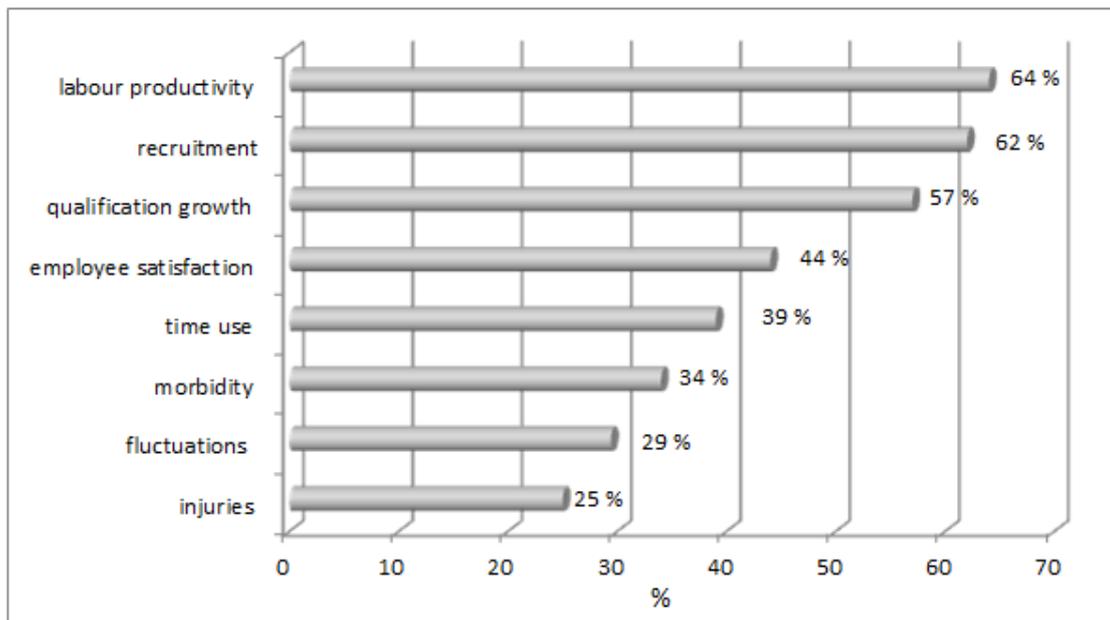
The aim of this paper is to evaluate the current status of human resource management in the South Bohemia's small and medium-sized enterprises by assessing the key human resource indicators which are essential for such enterprises (labour productivity; working time use; fluctuations; qualification growth; morbidity; injuries sustained at work; recruitment; employee satisfaction). This is followed by an assessment of the functioning of human resource management in relation to the desired corporate culture. This paper is a part of the research project GAJU 068/2010/S titled "Process Management and its possible implementation in small and medium-sized enterprises".

Primary data was obtained during November 2010 – February 2011 on the basis of a questionnaire survey of 60 small and medium-sized enterprises operating in the South Bohemia region. Stratified random sampling was used for respondents selection. The criterion for creating the homogeneous groups from which respondents were chosen was the business area according to the CZ-NACE classification of economic activities. The following groups (business areas) were selected for this research: manufacturing; wholesale and retail trade; building construction; agriculture.

### 3 Results and Discussion

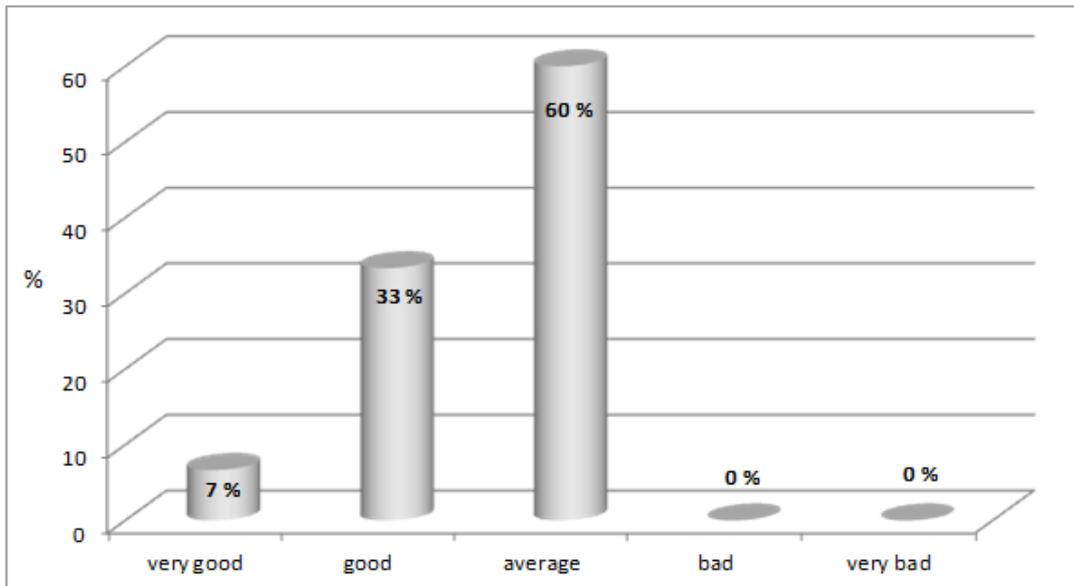
The observed results indicate that 93% of the management boards of the chosen enterprises pay attention to human resource management. The organizations are aware that ignoring the current human resource management trends would be a serious mistake. Managers must formulate a logically structured complex of demands on employees, which can be used effectively in the corporate culture.

The management must also assess the strengths and weaknesses of workplaces. This can constitute a considerable potential for achieving business goals on the one hand and, on the other hand, it can be an insurmountable limit to its implementation. If companies approach new trends related to the knowledge-driven economy, it is also necessary to transform the whole corporate culture. The growing importance of linking the corporate culture with human resource management is apparent.



**Fig. 1.** Monitored indicators of human resource management in surveyed enterprises

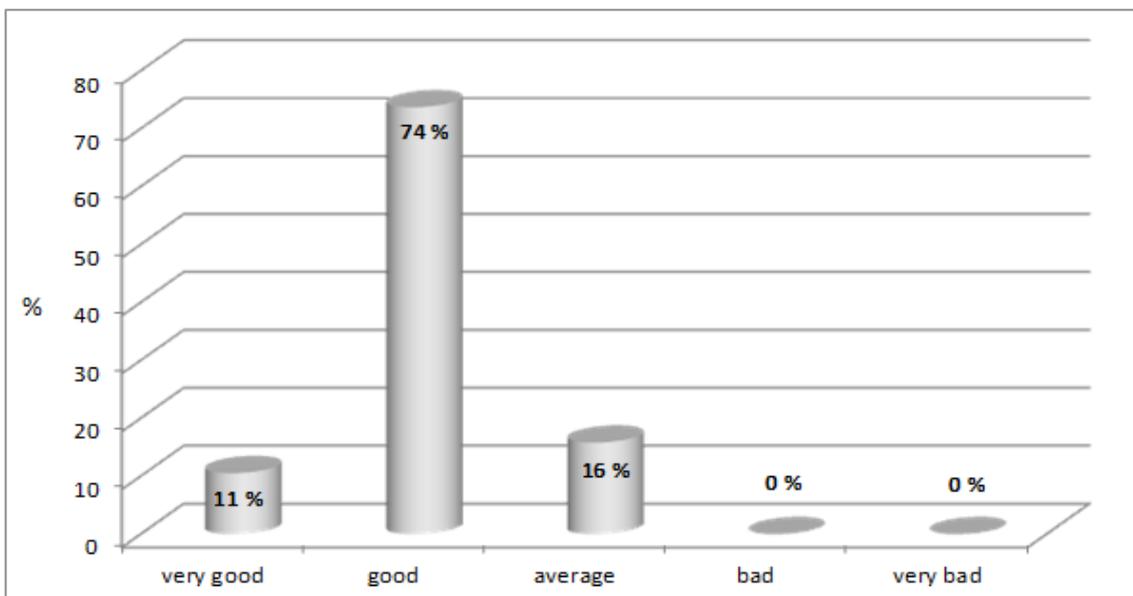
The personnel indicators which are currently viewed as essential in the surveyed enterprises are seen in Fig. 1. It is primarily the labour productivity which is an essential criterion for the enterprises' management (64 %). For 62 % of the organizations, an effective selection of new employees is the most important. Recruitment depends mainly on formal qualifications and work experience of the job seekers. The third most important personnel indicator is the qualification growth. This indicator is a fundamental area for developing a modern human resource management strategy, associated with an emphasis on continuous training and qualification growth. It is confirmed by the findings in 57 % of the organizations. Employee satisfaction is important only for 44 % of the surveyed enterprises. Such an attitude of management may have a negative impact on the competitiveness of the organization. It is clear that well-motivated and satisfied employees produce a better output. Other reported personnel indicators, which are not emphasised by the enterprises, are as follows: working time use, morbidity rate, or fluctuation.



**Fig. 2.** Current status of qualification growth in surveyed enterprises

As mentioned above, only 57 % of the surveyed organizations concentrate on the skills development of their human resources. These enterprises agree that the current state of qualification growth is at an average level (60 %). Other companies assess the current situation of qualification growth development as good (33 %) or very good (Fig. 2).

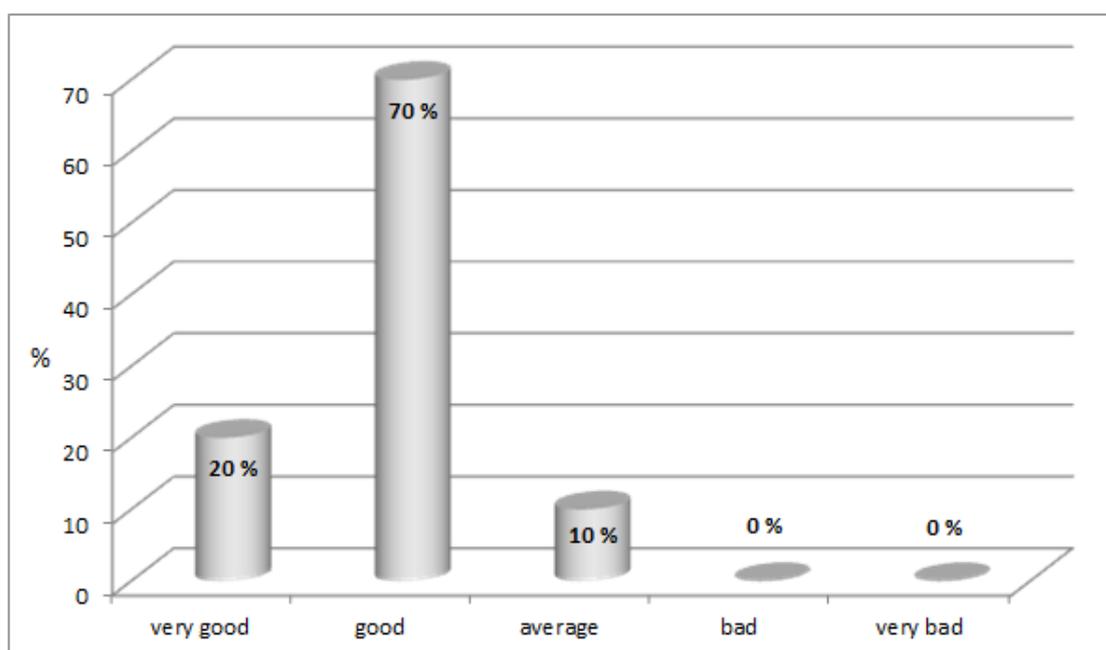
We can say that the most important indicator related to the knowledge economy is promoted in almost two thirds of surveyed enterprises. According to Bedrnová and Nový (2009), a strong corporate culture is a result of the learning process, whose origin lies in the interaction between the external environment and internal coordination. The solutions, procedures, rules and standards are assessed particularly in relation to the stated business goals and priorities, and subsequently lead to the strengthening, modification or rejection. The corporate culture is changing continuously and its specific content is deliberately adjusted to achieving business goals as well as contributing to this process.



**Fig. 3.** Current status of labour productivity in surveyed enterprises

Nearly three quarters (74 %) of the surveyed enterprises assess the current situation of labour productivity as good. They perceive this indicator as very important for the evaluation of business performance. 11 % of the surveyed organizations are absolutely satisfied with the current state of labour productivity. The average rate of labour productivity is claimed by 16 % of the enterprises.

The survey gives a positive result in the sense that none of the enterprises perceive labour productivity as bad or very bad (Fig. 3). If the enterprise focuses only on productivity, it can actually impair the organization's profit-making process due to creating barriers which prevent the organization from achieving its business goals. These barriers include resistance to change and lack of loyalty and engagement. Armstrong (2009) argues that an effective corporate culture can act in favor of the organization by creating an environment which is helpful when it comes to improving business performance and positive changes in management. It may be perceived by organizations that a radical reshaping of their corporate culture is required to effectively manage knowledge (Standing, Benson, 2002).



**Fig. 4.** Current status of employee satisfaction in surveyed enterprises

According to 70 % of the surveyed enterprises, the satisfaction of their employees is good. In 20 % of the enterprises it is even viewed as very good. However, only two-fifths of the enterprises (Fig. 1) reported the importance of employee satisfaction as a key indicator in the human resources development. The management must create a corporate culture that would become a motivating factor and help raise the level of the internal climate and thus the satisfaction of the employees as well as productivity itself. According to Mládková (2007), important factors forming a desirable corporate culture are trust and cooperation. This situation can be expressed by the cultural dimension of a small power distance between superiors and subordinates (Hofstede, 2005). The way to change culture is not first to change how people think, but instead to start by changing how people behave. Integrating quality, support and ownership into the job is vital (Shook, 2010). Inherence to traditions (associated with a high power distance) may be a brake of the corporate culture development in some cases (Dědina, Malý, 2005). A better way is to compare the company levels with the best companies (benchmarking) and to assume their positive experience that will support the right corporate culture. This corporate culture will correspond with business strategy innovation and also with the current knowledge economy.

## 4 Conclusion

The results confirm the growing importance of human resource management in the surveyed small and medium-sized enterprises. Almost all chosen enterprises deal with the human resource management process. However, small and medium-sized enterprises often underestimate the increasing importance of systematic and continuous development of human capital. The management focuses mainly on labour productivity, which is obviously the most important indicator of business performance for the surveyed enterprises. Human resource management can play an important role in the organizations by helping them create a culture that stresses productivity and competitiveness. Corporate culture as a tool of human resource management is becoming an actual challenge and opportunity considering the continuous human potential development.

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# Eco-Behaviour and Why Do We Continue to Drive?

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**Annotation:** This paper addresses two things: firstly, who do people continue to drive vehicles that are less 'green' than others, and secondly whether feedback devices [telematics] might encourage drivers to drive in greener ways. An attitude survey questionnaire was completed by respondents in the UK and Czech Republic and 8 focus groups were conducted in the UK. Attitudes factored into four: energy-saving, general energy/environment concerns, don't care and price/convenience motivation; differences in these and other measures were found between Czech and UK drivers. The focus group findings indicated some use for telematics devices, either to present drivers with targets and challenges or in relation to feedback-informed insurance premia for younger drivers. Overall, it was found that concern for the environment was relatively unimportant to most respondents and did not influence their choice of vehicle or driving style. These findings are discussed in relation to the need to provide drivers with incentives to drive in greener ways and in relation to attitude theories.

**Key words:** Eco-driving, sustainability, driver behaviour, attitudes.

**JEL classifications:** D81, R40, R41, Q01, Q56

## 1 Introduction

Sustainability is increasingly on the agenda, as we talk about climate change, use of fuels, the environment. It is in everybody's interests to improve our use of fuels and to reduce CO<sub>2</sub> emissions. This general interest spans domestic, commercial and industrial use and includes everything from heating, domestic and commercial processes to driving behaviour.

The continued use of personal vehicles has been challenged constantly in many areas of the scientific literature, to the point for example that new designs for towns and cities try to incorporate car-free zones and encourage walking, cycling etc. in addition to public or community-shared transport. However, it is possible that it will be very difficult indeed to get drivers away from their own vehicles as they see considerable convenience, security, personal control, time-saving and comfort advantages which largely override the costs, especially as some of the alternatives can be apparently even more costly: for example, a 'standard return' from Newcastle to London by train booked to travel on the same day would be €128 to €227 and €294 for first class: this is for a 440km journey. The petrol/diesel for the equivalent car journey in the UK [where fuel taxes are higher than most] might cost €60.

These data appear to support, in direct cost terms, the preference for use of private cars for many journeys in the UK. However, most people do not add up the indirect [running or standing] costs of journeys: replacing oil, brakes, tyres, suspension, cleaning the car, insurance, road tax and depreciation may come to €6900 per annum or €133 per week in the UK (AA, 2010). Nevertheless, a train journey for 4 people as above would cost between €500-900, which is a lot towards these indirect costs. Oddly enough, another gas-guzzling alternative, a flight, may be cheaper than rail at €90 return per person, [or more, depending on departure etc].

Since alternative travel modes may cost more and be less convenient than travelling by car, so it becomes even more important if driver behaviour can be improved to reduce fuel and CO<sub>2</sub> emissions. There is already evidence that providing dynamic advice to drivers can yield approximately 10-20% in fuel and lower CO<sub>2</sub> emissions without a significant increase in travel times (Barth and Boriboonsomsin, 2009; Kamal et al, 2010); the savings have been

found to be greatest in severe rather than less congested scenarios, so the implications for this in an urban environment such as Newcastle or Prague look promising, particularly if it can incorporate traffic sensing and telematics to provide the driver with advice in real-time. There are other studies into eco-driving support that are also suggesting improvements (e.g. Satou et al, 2010) by attempting to motivate eco-driving by the provision of instant fuel consumption displays.

The various attitude theories, such as reasoned action and planned behaviour, emphasise the importance of non-sustainable aspects in achieving sustainable behaviours, so for example, those factors mentioned above, such as convenience, comfort, purpose or travel [e.g. multi-purpose], safety, may all play a significant part in travel mode choice (e.g. Ajzen, 1991) but in addition other variables are important: self-identity and group membership have been found to affect intention (Fielding et al, 2008; Whitmarsh and O'Neill, 2010), and car ownership is strongly bound up with these two variables, acting in many symbolic as well as practical ways.

Part of this paper is based on a current investigation into whether providing real-time advice to drivers from pre-installed telematics can achieve better driving [Foot-LITE]; there is also a recent survey into eco-driving where we are able to compare Czech and UK drivers; the remainder of the paper is based on a recent review of attitudes and perceived risks in relation to sustainability.

## **2 Materials and Methods**

For the data collection in the two current investigations, it was considered important to obtain rich data through talking to people plus wider attitudes of a larger number of people [including fleet drivers] to eco-driving. Therefore a series of focus groups were undertaken plus an attitude survey.

### **2.1 Focus group study**

Eight focus groups covered in all 35 people, comprising 20 from various organizations including Local Authorities, Insurance Companies, Energy-saving interest groups, with interests in planning, fleet management, road safety, eco-driving, risk and insurance and a further 15 fleet drivers. The focus groups ranged in size from 1 to 6 respondents and seven were conducted person to person, the remaining one being by telephone. All the focus groups were recorded and transcribed and analysed so that the most salient and commented-on themes could be identified and reported here.

The fleet drivers' focus groups need to be considered in light of the drivers being 'trialled' using the Foot-LITE devices. The devices were fitted to vehicles for a month to allow a habituation period to allow for a possible 'Hawthorne effect'. Next, the drivers were briefed about 'smart' driver behaviour, which was done using a powerpoint presentation built around good driving principles, derived from information from several sources, including the Institute for Advance Motoring [IAM]. Drivers were given copies of the slides and also practised accessing the feedback provided at the end of the day through website and text messages. For a month, drivers were able to access information from the website and were sent text messages using up to five 'stars' to indicate how well they were performing on the various indices of accelerating and decelerating, braking, idling and coasting. The focus groups took place around the time the devices were being removed, so the discussions were partially directed around the feedback and whether it affected their driver behaviour. It must also be noted that these drivers had vehicles to which "trackers" had already been fitted, and this potentially could change their views of real-time feedback devices, and thus might influence the discussions in the focus groups. In addition, the vans had speed limiters set at

56mph (90km/hr). Both of these had been in the vans for some time, well before the test devices were fitted.

## **2.2 Eco-driving questionnaire**

A questionnaire on eco-driving was compiled, consisting of 26 Likert-style items, each on a 7-pt scale from strongly agree to strongly disagree, with a not-sure midpoint and covering issues about eco driving, attitudes to the environment, saving fuel or energy, motivation to save energy or fuel, costs of saving or not saving energy. The questionnaire also included driving history, annual mileage, use of public transport, other eco-behaviours such as using energy-efficient products, concern about sustainability, the extent to which they personally tried to conserve energy and how well fuel and energy are saved at work, and demographics including gender, age groups, fleet driver, occupation. 274 people replied to the questionnaire, 220 from the UK and 52 from Czech respondents in Prague and surrounding area. In terms of data reduction, the Likert items were factor-analysed, the scree plot implying that four factors be rotated, so the scores for the items in each factor were aggregated to create a factor score in each case; additionally the eco-behaviours were aggregated to create a score called 'EcoAgg'.

The findings reported below combine where possible the results of the statistical analyses of the questionnaires with the themes and issues emerging from the focus groups.

## **3 Results**

### **3.1 Attitudes to environment and eco driving**

The scree plot in the statistical analysis showed that four factors could be derived from the Likert questions in the questionnaire: F1 energy-reducing motivated; F2 general energy/environmental concern, F3 don't care and F4 price & convenience motivated; these are shown in Table 1. These factors, particularly the first three, are robust and reliable, having Cronbach's alphas of .753, .729, .706 and .601 for F1, F2, F3 and F4 respectively. Where an item loaded on two factors, the most appropriate in terms of maximising alpha was chosen.

One item, question 14, about concern that fuel will run out, did not load on any factor, so is excluded. The aggregated factor scores are used in the report to compare different groups of drivers and to see whether various measures such as annual mileage are correlated with them.

It was evident through all the focus groups that the environment was rated as much less important than other considerations. If more eco-driving is to be encouraged, then it needs to address this as a matter of importance. Some examples can clarify this: 'drivers who are short of time will drive faster and accelerate more', or 'planners [necessarily] put commercial interests to generate economic activity before a green agenda', such that 'drivers of greener vehicles may get little or no priority anywhere'.

The 20-60-20 rule (derived from the normal distribution; Harvey, 2005) suggests that only 20% of drivers would respond to initiatives related to greener driving, 60% are relatively complacent and 20% are quite resistant. The findings here from the focus groups show clearly that the positive initiatives that may encourage better fuel economy and greener behaviour all work in relation to those 20% who are already the most responsive in any case- so driving more carefully, driving more safely, using public transport, walking more, using bicycles, etc are all likely to be taken up by the same 20% of the population, who are also likely to be more amenable in principle to feedback designed to enhance their driving, or to training to be better drivers. It is the other two groups, the 60% and the 20% at the other end who need to be addressed and who are least likely to respond positively to more ecological initiatives, and

even if they do, there is not likely to be a big 'spill-over' effect from one type of greener behaviour to another (Whitmarsh and O'Neill, 2010).

**Table 1.** Factor analysis: factor loadings of <.3.

Factors	F1	F2	F3	F4
<i>F1: Energy-reducing attitudes</i>				
1 Save E at home	.617			
10 Check own car mpg	.628			
11 Buy next with better km/ltr [mpg]	.455			
15 Cheapest E as possible	.496			
16 Try to reduce E consumption	.772			
18 Switch off lights	.730			
22 Wasting E annoys	.634			
<i>F2: General concerns</i>				
2 Better ways to produce clean E	.302	.520		
4 Energy guzzling society		.600		
5 E issues over rated		-.631		
6 Own contribution could be better		.330		.440
7 Bad for environment		.641		
8 Don't see how to reduce		-.439		
12 E prices must rise		.502		
20 Fumes bother me	.303	.343		
21 Support congestion charge		.671		
24 Won't use cars less		-.585	.433	
<i>F3: Don't care</i>				
3 At work don't care			.741	
13 Change habits only by force			.573	
17 Only save if incentive			.758	
26 Care about home more			.657	
<i>F4: Price and convenience motivation</i>				
9 Travel PT if cheaper				.640
19 Journey as quick as possible				.551
23 Travel PT if convenient				.700
25 Eco Car if no higher price		-.316		.565

Notes: E is an abbreviation for energy, PT for Public Transport, mpg for miles per gallon

The four factors from the survey were tested to see whether the 22 fleet drivers scored differently to other drivers, and no differences were found in this respect, nor were any sex differences found. However, fleet drivers were significantly less concerned about the country moving towards sustainable energy and, predictably, they drove a lot more than non-fleet drivers; this type of response is a classical example of dissonance used to drive down concerns in order to justify higher mileage. The fleet drivers used fuel more economically than other drivers, but not significantly so, and their other eco-related behaviours were no different to those of other drivers.

Those who had undertaken advanced driving training [N=48] showed a few differences to those who had not: they were a little more concerned about conserving energy themselves, and scored more highly on F1 energy-reducing, but these were both only marginally significant. They obtained no better fuel consumption, although did drive 50% more than those without this training. The most likely reason for these findings is that the interpretation of advanced driver training is related much more to safety than to saving fuel, which the focus groups of fleet drivers also felt was an issue when joining fast and heavy traffic on highways. The presentation to the fleet drivers had included the Foot-LITE notion of 'smart' driving that is both safe and green (Young et al., 2010), but nevertheless the fleet drivers in the focus groups interpreted this as the speed limiters [set at 53 mph] creating problems of safety even

thought the limiters were deliberately intended to create fuel economy. In that sense, if green driving meant limiting speed, they were interpreting it as unsafe.

The mean rating for concern for sustainability [7.33] was significantly higher than that for whether the respondents actually tried to conserve energy themselves [6.25]; this is typical insofar as when invited to express concern, people do so but this concern rarely matches their behaviour. How well fuel and energy were saved in the workplace was rated even lower [4.57]. So in effect we have concern expressed, so to speak, but behaviours at home and, lower still, at work, hardly reflecting these concerns, presumably generating some dissonance that may then affect attitudes. Indeed, saving fuel and energy at work was not correlated with either concern for sustainability or whether the respondent bothers to save energy.

Table 2 shows correlations between the factors, the ratings driving measures and eco-product usage. Of the four factors, F1 is the one factor that relates directly to the respondent attempting to save energy, and is clearly related to concern for sustainability and conserving energy personally. Factor 2 is one of more general concerns, and is even more strongly related, but in addition also to annual mileage, such that those driving less are more concerned. Trying to conserve energy can be seen to be related to eco-product use and improved fuel consumption but not to annual mileage.

**Table 2.** Correlations for the four factors, concern and conserve ratings, EcoAgg and mileage measures

	F1	F3	F2	F4	Concern Sust	Conserve energy	Save E at work	EcoAgg	Km pa
F3	.157*								
F2	.253**	.045							
F4	.293**	.090	-.047						
ConcSust	.423**	.063	.590**	.078					
ConserveE	.417**	-.009	.794**	-.034	.454**				
Save E Wk	.007	-.217**	.048	-.013	.036	.256**			
EcoAgg	.207**	-.129**	.353**	-.016	.377**	.333**	.144*		
Km pa	-.002	.019	-.227**	.020	.002	-.090	-.022	-.093	
Km per litre	.100	-.024	.033	.037	.131	.211**	-.047	.009	.258**

*Note: \* refers to  $p < .05$  and \*\* to  $p < .01$ ; all correlations are Spearman's*

Comparing the two countries on the attitude measures, UK vs. CZ, some significant differences were found: Czech respondents score less highly for F2 general concern but also for F4 being price and convenience motivated, and higher for F3 don't care, than the UK respondents. These are shown in Table 3.

**Table 3.** Significant mean score differences UK versus CZ

	Mean scores		F	prob
	UK	CZ		
F2 general concerns	52.31	49.32	4.496	.0351
F3 don't care	21.02	22.80	9.802	.0020
F4 price and convenience	18.92	17.40	4.520	.0346

The reasons for these more positive attitudes by the Czechs may be a matter of geography in terms of being more centrally placed in Europe where attitudes have historically been more 'green' than the UK, or may reflect the use of different power sources than the UK [such as Temelin, whereas the UK relies a lot on gas] and possibly higher levels of self-sufficiency. On concern for sustainability the Czechs scored lower; this may be because so many of them live in or around Prague which has driving restrictions and a good public transport system, arguably a lot better than that in most UK cities: thus the unsustainability of driving may be less of an issue; this is also reflected in their very significantly lower mileage than UK respondents.

Engine size of vehicle was correlated with several energy measures, and was more significantly related to these for the CZ drivers: all the correlations were negative, suggesting that the higher the cc, the less strongly they felt concerns about the environment or sustainability, particularly for F1 which reflected energy-saving attitudes. For the UK, there was no such significant relationship, implying a dissociation between choosing a higher cc-engined car and any thoughts about the environment. In that sense, the CZ drivers are either purchasing lower-cc engines because they are cheaper to buy and run, or because they care more about the environment, whereas this is just not true for the UK drivers: this may be partly due to the Czechs being mainly under 35, whereas only 65% of the UK drivers were in this age category, but this age difference is perhaps not a full explanation for the findings.

### 3.2 Providing feedback

We found no evidence to support the use delayed driving feedback in any form, for example being accessed at end of day as with the Newcastle trial. The fleet drivers, whilst changing their driving to a small extent following the installation of the devices, virtually never used the website feedback, and only rarely addressed the text messages, although when they did, it was usually related to a 'target' of certain fuel consumption. This raises two issues: first, the importance of immediate and constructive feedback to encourage better driving, well known in the literature on learning and training, and second the value of targets as a challenge to motivate drivers. There was some liking of the 'stars' approach and the score, e.g. 1.5 out of 5, that some got as feedback and they might then try to beat it. However all 3 fleet driver focus groups were clearly uncomfortable that the feedback was much later than the actual driving performance to which it related. In addition, when they felt that any changes in their own driving behaviour did not appear to result in an improved score [e.g. *"I could never get the score above 1.5, however hard I tried"*], then the value of having a target to aim at quickly diminished. Again, the evidence in the literature on goal-directed behaviour would suggest that targets must not be too easy or too difficult if they are to be effective, and this was clearly a problem with some of the metrics, such as braking.

It is difficult from the focus groups to provide a full explanation for the inconsistent and mixed improvements in 'green' driver behaviour found from the data taken from the devices: there can be more than one reason for any changes found, and possibilities include:

- [1] the IAM-related training information that targeted easy-to-understand specific behaviours such as coasting, heavy acceleration, using brakes to decelerate, idling, copies of which they were all given.
- [2] the Hawthorne effect of knowing the devices were there, even though we had tried to mitigate this by incorporating a desensitising period.
- [3] the fact that the devices were not part of any controlling management activities, such as the trackers and speed limiters, which were already there and unpopular as they were perceived as relating to low trust by management.
- [4] that it was 'University' research they were participating in, for which they had volunteered and which was based on their own goodwill, and that they had met the University researchers.
- [5] that some of the 'hints', for example about coasting, about which many were unaware, seemed reasonable enough to action the changed behaviour both at home and at work

It is not possible here to partial out the effects of these five possible reasons for the inconsistent but slightly improved performance that have been noted from the report containing the driver behaviour feedback from the devices. Three fleet drivers [out of 15] in the focus groups believed that their driving had not changed at all, but as the devices were installed anonymously, it is not possible to verify whether it was these particular three who

showed no improvements. What was more apparent from the fleet driver focus groups was that the improvements were not consistent for either drivers or for the metrics, and no drivers were prepared to say that their own driving had improved dramatically, although several did say that they had changed some facets of their driving, such as idling and less heavy accelerating and braking, although again it is not possible to match their stated changes to performance changes as recorded by the devices.

From the fleet drivers, it would seem that the novelty of the text messages wore off, as the texts and website were mainly only looked at in the early days. It must of course be borne in mind that the course was an hour-long presentation with powerpoint slides to take home, plus the ability to get feedback via texts or the web. Had the course been longer and more interactive and the feedback real-time, then it is possible that more sustained improvements might have been found, as in other studies: for example Beusen et al (2009) found a 5.8% average fuel consumption fall for four months after a course, although some drivers tended to fall back into their original habits.

Some cars already have feedback systems that may provide similar information to the device used here. These were mentioned in several focus groups, along such lines as designers could incorporate feedback into the design of vehicles in a similar way as the Toyota Prius, with green histograms, fuel consumption and green cars to show the battery charging, or the Nissan Leaf where the tree grows with better driving. The fleet driver focus groups quite liked the star approach for feedback, so this is another alternative for presentation of information to the histograms, green cars and growing trees.

The presentation of feedback information needs to be immediate if drivers are to learn from it and change their driving behaviour, but in addition, we need to consider what information should be provided, how much of it, and what form it should take. A first rule is that it should be fairly limited in amount, otherwise the driver becomes overloaded. A second rule is that it should relate to something that can result in a fairly quick and visible improvement in the metric, and this would imply that current fuel consumption is probably the best metric in the first instant, plus for current vehicles something that reflects idling and coasting. Finally, warnings that provide a red sign of some sort for over-heavy use of accelerator or braking might be helpful. Beyond these simple metrics, most drivers would not relate to anything more complicated or that were not immediate in providing feedback about their [improved or worsened] driving behaviour. The fleet drivers focus groups said nothing at all about understanding the different types of acceleration events, and the giving of advice about accelerating being firm and steady, not too much but also not too little, was difficult to explain as there are no absolute values to refer to. So the message from all this is to keep the feedback simple, challenging, immediate and likely to yield a quick and clear response to changed behaviour.

### **3.3 Uses for a feedback device and barriers**

The focus groups identified the main use as being a value to inform other agencies, such as insurers, of the good driving or otherwise in order to reduce what may become even more prohibitive insurance premia for young men especially.

When asked whether or not they would be prepared to pay extra for a feedback device in their own [domestic] car, one respondent said only if it was less than €220 in cost; this response may well be typical amongst the majority of drivers who do not have massive insurance premia. It may be that younger drivers would pay more than this for a device if it could be related to reduced insurance premia; for example, taking €550 off after a few months would surely be cost-effective. Problems with this were also mentioned, such as being sure who was driving, ensuring that the information fed directly back to the insurers, knowing what was likely or unlikely to achieve the most desired feedback in terms of premium

reduction, etc. The focus groups saw this type of telematics as something for the future but not until all the logistics were sorted out, including driver identification so that other drivers could not help reduce the premium of one driver. If, as several focus groups said, insurance premia for young male drivers can exceed €3450 pa, and are unlikely to drop much even with the impending sex equality changes, and those for young female drivers are likely to rise because of this, then the cost of a device being €330 would not be prohibitive for this known risk group and its use might encourage better driving amongst at least some of them, especially with post-test training to help the learning.

A lesser usage was for a device to be included in fleet vehicles. However, this would need to be cost effective, in other words they would expect a return in cost saving in 12 months or so of installation. None of the fleet managers would be prepared to pay for something that did not bring about an equivalent cost saving, and it would seem that the unpopular trackers had already achieved some of this by discouraging domestic use of Council vehicles.

A third potential but unlikely usage would be for domestic users, but this would need to be matched with some incentive that would 'repay' the cost. Incentives suggested might include parking privileges, or special travel lanes etc., but these are unlikely since special lanes already operated for buses and parking for retail would be unlikely to provide any privilege. This was not seen to be a major option, especially as any resulting pollution reduction as a consequence of better driving is not costed anywhere. None of the focus groups seemed to think that many domestic drivers would pay extra for a device, so the solution must necessarily be to incorporate it into the design of vehicles in a similar way as the Toyota Prius, or the Nissan Leaf. So the device needs to be sold commercially to manufacturers rather than to individuals, apart from the insurance issue referred to above.

### **3.4 The need for incentives to drive better**

Nobody, apart from respondents from such organisations as the Energy Saving Trust seemed to be interested in improving driving to help the environment; this was accorded a low priority even though it is altruistic, or can improve health by reducing pollution. Thus, if there is no altruistic reason emerging, then clearly incentives will be necessary, and a lot of literature would point to reasons unconnected to the environment as being critical (e.g. Whitmarsh, 2009), and one of these could be money, specifically savings in fuel and costs of brakes and tyres. Thus the role of money, specifically savings, needs to be considered in terms of effect, and indeed how much constitutes a saving high enough to impel changing driving behaviour.

There seems to be general agreement in the literature that around up to €280 per annum could be saved in fuel consumption by driving as carefully as possible, but in most [not all] cases this was not considered sufficient to outweigh the need to drive faster to get to a destination more quickly; this could be described as a situation where time was more important than cost [i.e. time-poor]. Although the fleet driver focus groups alluded to this as being relevant to their own domestic driving, in relation to work-related driving their choice of saving time or fuel was governed by a number of things, including weather [e.g. "if cold, get to next job as quickly as possible"], urgency of jobs, whether ahead of, on, or behind schedule, whether travelling in the rush hour. To make matters worse, other factors also emerged as being causative in not saving fuel, i.e. the perceived lack of trust shown by management by the way the trackers were used, plus what was clearly seen as poor or illogical job allocations by the computer. However, within the poor allocation of jobs, some drivers would tackle the issue themselves by re-arranging job order to minimise the travelling and fuel used, and not enter the jobs into the computer as done until the time they were supposed to have been done rather than when they were actually done.

From the above, one can see that the fleet drivers care little about saving €280 per annum each from fuel-saving for Council vehicles, although some were minded to do so in any case, such as when the scheduling was perceived to be silly, showing some sign of caring and acting responsibly even when they thought that the management system was wrong. But if time was a priority, then going faster rather than saving fuel was done in domestic driving as well by our respondents, although to a small extent this related to whether they were living near to their economic margin and needed to save money.

The potential saving from changing driving behaviours could be around €250 per year; or €5.50 per week, or 10-20% in fuel alone (e.g. Barkenbus, 2009; Barth and Boriboonsomsin, 2009); all these ways of showing the saving were mentioned. In addition there are savings on brakes and tyres, although interestingly, no drivers considered these longer-term savings, but even those respondents who had particular interests in greener driving said these savings were difficult to cost and that most people would find it difficult to make this calculation. To this we can add that very few people consider their expenditure over a whole 12 months, and even having savings spelt out to them [per year, per week, as a percentage?] would be difficult to absorb or relate to when driving everyday or filling up the tank every week. In addition, we found that, whilst for some drivers €5.50 per week was important, for others it was not when there were time pressures. Coupled with a distinct lack of caring for the environment, this does not bode well for selling the idea of helping the environment and reducing CO2 emissions can mean saving €5.50 per week. In fact, the savings have sometimes been found to be less, such as the 6% saving in fuel for urban driving but only 1% for highways found by Boriboonsomsin et al (2010), which can only increase the problems with too strong a focus on cost-saving. It is likely that the cost-focus will not convince as many drivers as the green respondents think.

So monetary incentives, emphasised by the non-fleet-driving focus groups, are probably less effective than they might be supposing. That takes us onto what other incentives might there be, and several focus groups considered these. Included in the considerations were: preferential parking, preferential use of special or multi-occupancy traffic lanes for cyclists or those with similar 'green driving' devices. However, of all those discussing it, the costs of administering or policing these was the prominent issue, and if there was no net financial gain, then these would not be policed. In addition, it was considered that getting commercial and economic benefits to the centre were important, and thus insisting for example on preferential parking for green drivers would not work with supermarkets etc. So for the Councils, cost had to be outweighed financially by benefit and this was not evident in costings that did not usually include environmental factors such as air quality.

The focus groups that included local authority managers thought that whilst elected Council Members were often interested in the 'green agenda', this was less important than savings, costs etc. to those having to implement the policies for real. Costs were really heavily emphasised as crucial to whether any programme could go ahead or not.

An issue was raised by one focus group about who used vehicles and for what purpose. The group considered this as critical and referred to different requirements for tourists, shoppers and workers presenting different issues in relation to a green agenda, not all of which supported walking or cycling or even buses, as shown in Table 4. In particular, the role of worker-commuters was seen to be most wasteful of parking provision, with vehicles driven in traffic congestion and parked all day to service often only one person, the driver.

**Table 4.** Different reasons for different transport modes

	Tourists	Shoppers	Workers
Transport mode?	Park and ride	Car preferred	Car
Parking needed	All day non-rush hour	Short time	All day
Issues and needs	Direct to centre Frequent service	Carrying bags - car is preferred	Clogging parking and traffic
Feedback device could include	Access to park and ride	Parking near shops	

So from this it can be proposed that the use of these devices in cars should also include in-built navigation to park-and-ride, or to bus termini, and also to convenient places to park in order to access the services.

## 4 Discussion and conclusions

The environment is not something that figures strongly in the concerns of domestic drivers, fleet drivers or the policy-implementers that are covered in this research. For almost everybody, there appear to be higher priorities, including cost, time saved or spent, convenience. This finding is sadly one that is quite common, that environment is not at the top of individuals' agendas, and there are well-documented reasons why this might be so, including issues of cognition, affect, feeling of personal inability to help, perceived lack of control, risk perception, etc. (e.g. Pooley and O'Connor, 2000). Indeed many people, as found here, agree that the environment is important yet their actions seem to be rather inconsistent with this (Lorenzoni et al, 2007; Johnston and Scicchitano, 2000). This inconsistency between concern for the environment and actual behaviour must surely generate dissonance, and in order to reduce this and justify their behaviour, it is possible that many people consider they are already contributing [for example by recycling], and as their contributions are framed as gains, so they will see the problem as less important (e.g. Spence and Pidgeon, 2010). It was evident here that fleet drivers have some priorities other than saving fuel, and these include getting to a job quickly, but it is likely that these attitudes are typical, for example, if a journey-to-work time can be halved using a car.

It is also difficult to see how the well-intended ideas of getting people out of their cars and into trains, on bicycles or walking will work, given the weather in the UK and the prices of public transport. If convenience, comfort and safety are important, these are not easily provided by these options. In addition, cars are often an important part of our self-identity and the importance of this cannot be underestimated (Fielding et al, 2008; Whitmarsh and O'Neill, 2010). It would seem that driving a car is more about affect and less about cognition if we are to understand why drivers place these values above cost and environmental issues (E.g. Slovic et al., 2004). Therefore it is critical that attempts are made to reduce the pollution and CO2 and energy use associated with cars.

These findings would seem to suggest a number of points in relation to a driver performance monitoring and feedback device. Perhaps the overriding one is that most people [other than the already very 'green'] would not be interested in purchasing such a device unless there was some direct benefit. The only direct benefit that would seem to be important from our investigation would be financial, such that the information was fed back to some central source and used to incentivise the driver, such as for younger drivers in order to reduce their insurance premia.

For fleet management, these devices would need to generate sufficient income to cover their cost fairly quickly, in probably less than 12 months. Our findings show clearly that introducing any device that can track a vehicle in a fleet needs to be done with care and needs to be have a sensible management system to go with it. For example, having drivers waiting around leads to engine idling, which especially in winter raises the expenditure on fuel, as

does having jobs geographically close to one another but well separated in time. So adding in devices needs to be part of a management system that can benefit from the devices being used.

The greener members of the focus groups could see positive driver responses where the feedback was immediate and stimulating, and the literature would bear this out for domestic vehicles as it can act as a target or challenge to the driver. The Toyota Prius, Lexus CT200h, Vauxhall Ampera and Nissan Leaf are examples of such devices already installed in cars, and there are others. The problem would then be to encourage drivers to feel it important to respond to that challenge. If time taken to get to a destination is reduced by higher speeds, then the need to minimise time would override the challenge to drive to, for example, 'grow the tree' [as in the Nissan Leaf]. Most ordinary people can comprehend that a 350 km drive done at 120kmph would take less than if it were done at 90kmph, and it is difficult to explain to them how the journey can actually be no slower if driven at the slower speed.

The findings here do not convince that saving €5.50 per week [or less] is anywhere near a sufficient motivator for many people when they place convenience and time as much higher priorities and care little for the environment. The motivation must be directed towards convenience, time and comfort, which may be difficult for a feedback device to provide. An alternative would be to provide incentives for greener vehicles, such as the congestion charges in London, or priority or cheaper parking. Other alternatives would be to legislate or provide subsidies such that greener vehicles were cheaper to buy, or levy higher taxation on buying less green vehicles. Simply pricing drivers out by increased fuel costs has a long long way to go when prices of alternatives such as trains are so high.

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# The Role of the Wine-Production Industry in South Moravia

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**Annotation:** The role of the wine-production industry is given not only to historical tradition. The first mentions of the vine were from the period two thousand years ago. The wine-production industry is significant to their position within the South Moravian region, which is characterized by an appreciable economic potential. Wine-production can be described as very attractive, favorably developing industry with significant potential for growth and expansion main from view increasing consumption and production, introduction of new technical innovations and introduction of innovative changes in production. The total area is agricultural land, almost 60 %. The vineyards are spread over 4 % of the whole area, that is approximately 17 400 hectares of the land. In the South Moravian region is found about 90 % area of vineyards, which are registered in the Czech Republic (CZ). The South Moravian Region is supporting significantly small and medium business and while also local winemaker, which will be providing the necessary jobs. An important indicator of regional importance of this sector is less than 19 thousand registered vine-growers in the country. The wine-production industry is participated in the job creation as well as to promote the development of downstream industries such as glass, steel, machinery and equipment, transportation, hotels and restaurants and more. Specialized human resources are mostly college graduates from the Mendel University and students from many secondary vocational schools. The wine sector can help to reduce seasonal unemployment, because this sector needs to use other human recourses to the other necessary activities. In last years was created many different concepts of winegrowing and wine production in the Czech Republic, from which can we the positive development of wineries and vineyards in South Moravia see after the detailed analysis.

**Key words:** Human Resource Management, job, the South Moravian region, unemployment, wine-production industry

**JEL classification:** Q 13

## 1 Introduction

South Moravian Region is situated in the south-eastern part of the Czech Republic near the border with Austria and Slovakia. The centre of the region is second largest city in the Czech Republic – Brno (Jihomoravská kraj 2007). Strength of the region is position, which is the crossroads of trans-European road and rail routes. The region has considerable economic potential. The development of recent years is characterized by a growing number of enterprises. The quality of education is reflected in the educational structure of the population.

South Moravian Region is characterized by its agricultural focus. Agricultural land accounts for 60% of the acreage of the entire region, of which is 83% of arable land (ČSÚ c). North County area is distinguished mainly by forestry and timber production. There is the important tradition of the cultivation of fruits and vegetables and wine. South Moravian Region covers approximately 96% of vineyards registered in the country.

The tradition of winemaking and viticulture in Southern Moravia is one of the oldest in Europe. There is grown the vine for more than two thousand years. Moravia is known by many small wine cellars, since Roman times.

The current winery uses the latest technological methods, focusing mainly on the production of quality wines and quality wines with special attributes. Production is in the colourful varieties, emphasis is placed mainly on the quality and overall production levels.

Natural and climatic conditions give the wines to national uniqueness, originality and exceptional taste. The taste is characteristically spicy. It gives them a potential advantage in the global market.

The biggest changes in recent years occurred before the entry into the European Union (EU) in 2004, when many new vineyards planted mainly due to government subsidies. EU accession has led to a tightening of conditions and legislative regulation, many growers had to adapt.

This paper is a comparison of selected indicators of the viticulture and viniculture in the Czech Republic and determines the role of wineries and vineyards in South Moravia. The paper is mainly focused on description and analysis of viticulture and winemaking. The paper also mainly devoted to the significance of human resource perspective, which is one of the biggest problems of this sector. At the same time this article is the underlying output for further scientific work of authors in this sector.

## 2 Materials and Methods

To achieve the objective was used dates from the situational and outlook reports, which were issued by the Ministry of Agriculture, than the concepts of development of viticulture and winemaking in the Czech Republic of newspapers and magazines and literature. These data are characterized by significant obsolescence and sometimes are the data only theory. This data was made to update with the latest materials and information available on the Internet.

Furthermore was used the statistical methods to provide objective results. Most approaches to forecasting are based on applying various statistical methods. Between statistical methods for forecasting belong time series analysis, correlation analysis and mathematical modelling (Koontz, Wehrich 1993). It is important to note that statistical methods based on known past values, which are indeed the foundation for future development, but is not guaranteed that the future will unfold in the same manner as before. Parameters of the trend line  $b_0, b_1$  come out from the system

of equations: 
$$\begin{aligned} \sum y_t - nb_0 - b_1 \sum t &= 0 \\ \sum y_t t - b_0 \sum t - b_1 \sum t^2 &= 0 \end{aligned}$$
 . Statistical models are created by selecting

variables and choice functions. The value of variables is the regression analysis. The model can be one-dimensional model or multidimensional model and additive or multiplicative. The additive model can be straight line, parabola, polynomial or logarithmic hyperbola. Multiplicative models are exponential and power. The logarithmic model has the prescription of the equation:  $y = b_0 + b_1 \log x$  .

The evaluation of attractiveness in the wine sector is influenced by many factors. For purpose of this paper it is used a division according to Sedláčková (2000), which is oriented to *the sector dimension, sector structure, influence of the movement changes-form forces, a probability of entry or exit of a big company, capital requirements, demand stability, technological level and innovations, costs conditions, intensity of competitive fight and the legislative, legal and other regulations.*

The paper of Elizabeth C. *Thach Wine Business Management Practices that Promote Productivity and Profitability* (Thach, Halhoul, Robertson 2005) is concerned with figuring out how human resources are managed in California and eight other U.S.A. wine regions. Human resources are a major cost of any enterprise, it is necessary to analyze and express the area of financial and Cost of any changes. But they are not only costs but also investment. Human capital can be beneficial for the company. The proper approach to human capital brings benefits and prosperity of the enterprise. It is therefore necessary to find a correlation between in-kind resources such as technology, land, capital and human resources and their

influence on the results of operations. This is to verify that human resources can carry the added value that can be considered as assets, the asset (Festing, Royer 2008).

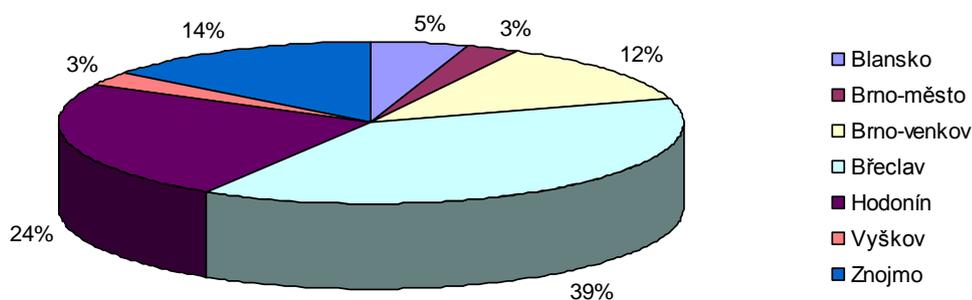
### 3 Results

#### 3.1 South Moravian region

South Moravian region according by the Czech Statistical Office has a total area of 7195 square kilometres and approximately 1.14 million inhabitants with a population density of about 157 inhabitants per km<sup>2</sup>. This region consists of seven districts, 673 municipalities and 49 cities. South Moravian region is one of the regions with significant economic potential. The gross domestic product of the region represents one tenth of gross domestic product of the Czech Republic. The capital city of the region of Brno is the dominant industry in particular its focus in the region can not forget the manufacturing, trade and repair of consumer goods and so-called commercial services.

The traditional industry especially southern area of the region is agriculture, while almost 60% of the total area is agricultural land, of which 83% is arable land. The highest percentage of arable land (arable land for farming) districts have Vyškov and Znojmo.

In terms of productive sectors, agriculture focuses on growing cereals, oilseed rape and sugar beet. Above average levels of climatic conditions has a long tradition of specialized agricultural production, linked to specific regional features. It is especially wine, fruit and vegetable growing. The region is located more than 90% of the vineyards of the Czech Republic. Viticulture is developed in the district of Breclav, which is 46% of all vineyards in the Czech Republic and 39% of all farms first, see *Fig. 1.* (ČSÚ b)



**Fig.1.** The ratio of agricultural businesses in South County

Source: (ČSÚ c)

#### 3.2 Human resources

The South region has currently about 1.14 million inhabitants. South Moravian region, like the vast majority of Czech Republic faces with natural population decline, which is primarily caused by declining birth rates. Even a slight increase in recent years didn't reverse the trend of demographic decline. In recent years are the population increasing slightly, especially thanks international migration. (Jihomoravský kraj 2007)

Age and education characteristics of the population are quite significant changes. The number of pre-productive population (0-15 years) plummeting in recent years. Productive

population (15-64 years) and post-productive (65) increased slightly. Educational structure of population aged 15 years continues to improve. (ČSÚ d)

In the region South Moravian the graduations of vocational education in secondary schools present around 45% of educational opportunities. In future will be the stake in the fields of vocational training with graduation around the value of 40%. In the region are presenting pupils of secondary education with a certificate 24% of all secondary school pupils. In the secondary schools count demographic forecast with the loss of pupils (Machovcová 2007).

The total number of employed in different regions indicates the importance of region, see *Table 1*. This is the number of jobs created, which are necessary for the operation of the entire national economy.

The region is on fourth place from the overall number of employees. On the same site are also employed in agriculture yarrow, see *Table 1*. There are employed about 10.5% of total employed in agriculture, which are almost 18 thousand workers. This number is not compared to total employment essential. However it is important to evaluate this indicator as an important. Agriculture is a source of livelihood, conservation values, cultural practices and traditional ways of life. This is essential to promote and try to keep, because so we will not need to rely on imports of all foods and materials.

**Table 1.** The table of number employed in agriculture

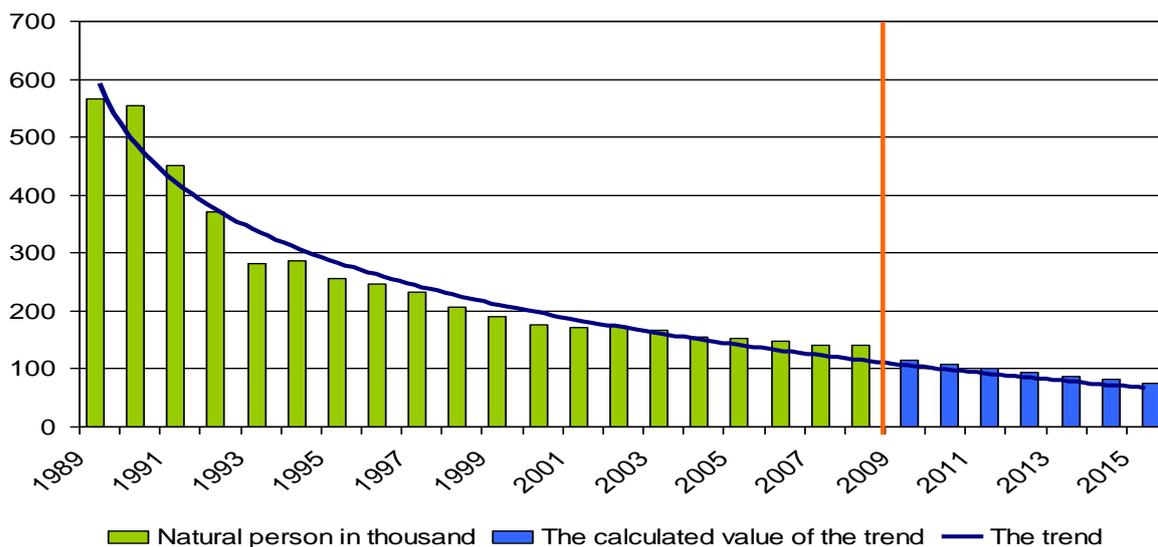
Order	Region	The total number of whole employed in CZ (in thousands)	The percentage employed only in winemaking and viticulture	Absolute employed only in winemaking and viticulture
1.	Vysočina	247,8	14,14 %	23 333,07
2.	Středočeský	599,4	11,92 %	19 668,12
3.	Jihočeský	314,7	11,15 %	18 400,46
4.	Jihomoravský	537,0	10,50 %	17 320,79
5.	Plzeňský	280,0	8,10 %	13 368,77
6.	Moravskoslezský	568,6	7,32 %	12 075,24
7.	Olomoucký	296,0	7,20 %	11 882,39
8.	Pardubický	245,1	6,86 %	11 313,43
9.	Ústecký	372,0	6,38 %	10 521,59
10.	Královéhradecký	265,1	6,26 %	10 321,17
11.	Zlínský	283,4	4,59 %	7 572,53
12.	Liberecký	199,7	3,13 %	5 160,04
13.	Karlovarský	148,0	1,81 %	2 986,05
14.	Hlavní město Praha	645,6	0,64 %	1 050,32
<b>Total employed</b>		<b>5002,5</b>	<b>100,00 %</b>	<b>164 973,97</b>

Source: ČSÚ c, own work

The trend of the employed in agriculture has currently a declining tendency. Values were smoothed trend curve. In 1989 were the values working people in agriculture about 600,000.

Today is the value around 20,000 human resources in the sector. The trend will not be in other years better. At present, prevailing trends in the subconscious CZ population, that agriculture is unprofitable and unattractive industry and the people go in search of better economic activities.

The trend curve, which has the shape  $y = -159,26 \ln x + 590,78$ , was calculated by analyzing the time series correlation 0.9581. This value can be described as statistically significant, see Fig. 2. This model is logarithmic functional form. It is one-dimensional model of an additive logarithmic.



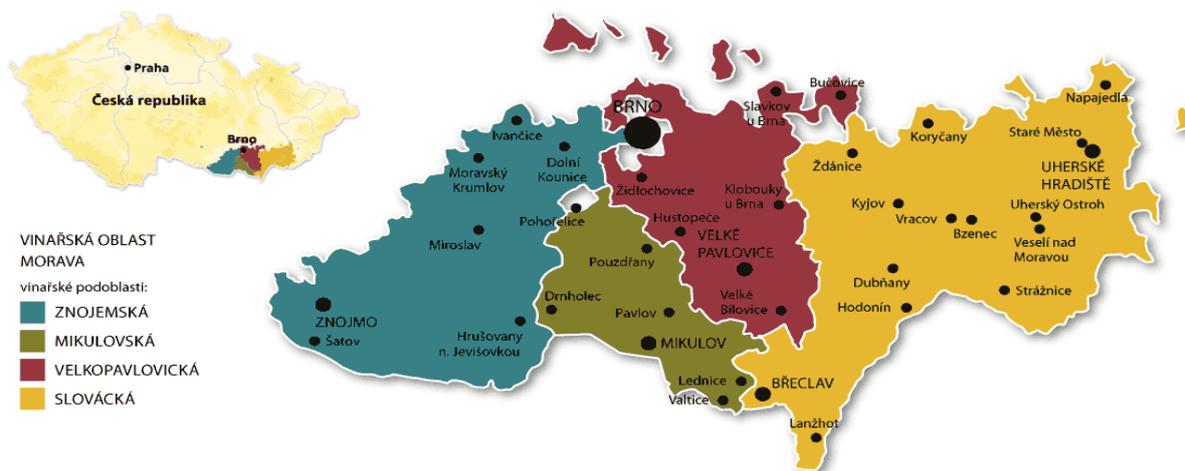
**Fig. 2.** The number employed in agriculture

Source: ČSÚ a, own work

### 3.3 The wine sector

After the accession to the EU have been wine regions again legally separated, see Fig. 3. The wine region Bohemia is divided into two sub-areas - Litoměřickou and Mělnickou. These territories aren't continuously planted. They are located on consist various convenient locations and they are on sheltered southern slopes of the lower altitude. South Moravian Region is divided into four sub-areas at Znojemská, Mikulovská, Velkopavlovická and Slovácká. These sub-regions are interconnected Moravian wine trails that promote the development of tourism since 1997.

In CZ can be considered South Moravian Region as the center of viticulture. There are over 96% of all vineyards (Duda 2005). In the region has the wine sector a long tradition supported by the local folklore. There are also regularly held various events to celebrate the folk harvest wines, the so-called vintage wine feasts or festivals. In addition, there operates the largest domestic producers of Moravia wine wineries, Moravské vinařské závody, Bzenec, s. r. o., Templářské sklepy Čejkovice, Vinařské družstvo Vinium, a. s., Velké Pavlovice, Vinselekt Michlovský a. s., Znovín Znojmo, a. s., Vinné sklepy Valtice, a. s., České vinařské závody, a. s. and The group of Bohemia Sekt, a. s. and other (Bublíková et al. 2010).



**Fig. 3.** The distribution of wine regions in the CZ

*Source: Svaz vinařů České republiky & Národní vinařské centrum*

### 3.3.1 The Industry structure

The structure of the size of vineyards is divided by the amount of hectares planted with vines by the (Bublíková et al. 2010), valid for 31.12.2009. It can be observed, that 42% of the total number of growers, which is 18 983, manages the vineyard to the size of 0.1 hectares and it is generally only 4% of the total area. The main share of 46% of growers with vineyards is over 5 hectares.

In the Czech Republic worked about 500 business subject in the wine sector, valid for 6<sup>th</sup> February 2011 (Albertina). These are the entities which were the subject of action under the Trade Register of making wine from grapes. Distribution of enterprises in the CZ is very heterogeneous. Regional structure of wineries by region based primarily on the distribution of wine regions and subregions (see Fig 3), where the largest concentration of wine subjects, valid for 6<sup>th</sup> February 2011 (Albertina). In the wine region of Moravia are 85.87% of subjects.

### 3.3.2 Human resources in the wine sector

In the South Moravian region are high schools, which are focused on the winemaking and viticulture: winery Secondary School and gardening Vocational School Valtice, horticulture Secondary School and Vocational School Rajhrad and Secondary Agricultural School and Vocational School Znojmo and Secondary Agricultural School and Vocational School Bzenec. For universities, it is the Mendel University in Brno. The garden of the university faculty can study degree program Horticultural engineering field of viticulture and viniculture (Mendelu.cz). From the number of schools with special focus on wine can be suggest, that the importance of the sector is not negligible. It is traditional representation of jobs in this region. It is almost impossible to determine the exact number of people employed in this sector due to the fact that they often are family businesses that employ their family members a "without compensation".

## 4 Conclusions

Winery in the South Moravia appeared before more than two thousand years ago. This sector is clearly inherent representation. Historical tradition, influence on culture, on the characteristics and uniqueness of local people is unforgettable roles to be developed. Assistant Wine trails project, which is built since 1997, is a strong argument for the development and promotion of this sector. Establishing cooperation with other countries, particularly Austria is

certainly a promising step forward in the development and promotion of the region. At the same time able to draw not only from EU subsidies, but many other schemes can give basic blocks for growth and development of viticulture in Southern Moravia. Based on the analysis, we can say that it is an emerging market in the growth stage of the life cycle. Positively contributing factor in the CZ is constantly growing consumption of wine. The number of consumers is higher and increasing production of growers is very positive. Overall, the sector can be described as very attractive. It is necessary to continuously ensure its development especially in terms of constant promotion, technical and technological innovations and efforts to produce top quality wines with a focus on the wine menu specialties. Without these assumptions, the industry could lose the benefit of some kind of revival and rediscovery. (Hejmalová, Šperková 2011)

The role of wine in South Moravia is clearly substantial and significant. Due to the local orientation of the individual indicators can be not compared with national statistics, because they obtained ratios reached minimum values and completely negligible effects. The county can assess the industry as an inseparable part of economic activity and GDP. The wine sector is involved in creating not only jobs but also to maintain the traditional regional patterns.

It also strongly supports the work of other downstream industries such as glass, steel, machinery and equipment, transportation, hotels and restaurants and many more. Professional human resources are mostly college graduates from Mendel University, and students from many professional schools. Wine sector can help to reduce seasonal unemployment because of the need to use additional human resources to other necessary work. In recent years, resulted in different development concept wine sector, from which a detailed analysis shows the positive development of wineries and vineyards in South Moravia.

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# Work-Motivation Theories: A Semiotic Analysis

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**Annotation:** The paper deals with a semiotic analysis of work motivation theories developed in the second half of the twentieth century. These theories stem from different theoretical backgrounds, varying in ideas as well as in their impact to work motivation reality. For a student approaching this field it might seem to provide an overwhelming situation in an area of study filled with contradictory theories. The method used in this study is similar to one historians use when analyzing development in a human society. Based on the historical analysis, an analysis of ideas and clusters of meanings follows. Such clusters of meanings might be understood as sources of ideologies, whereby ideology is meant a worldview. For this reason we prefer to speak about a semiotic analysis here. Authors assume that personal experience might determine individual motivation factors. It is quite clear, that on the biological level the processes of motivation should be the same in all humans. However, stimuli or conditions under which the processes of motivation are commenced might be caused by the personal experience of the individuals concerned. Authors believe that the above mentioned analysis of clusters of meaning could help us to better systemize the wide range of work motivation theories and make it more clear for all students of the field.

**Key words:** Work motivation, work motivation theories, semiotic analysis, clusters of meaning

**JEL classification:** D200

## 1 Introduction

The development of the work motivation theories in the second half of the twentieth century is a phenomenon which deserves a study in its own right. There appears to be a succession of meanings and ideas, which sometimes support and sometimes oppose one another. This might be a regular part of a development of a scientific field of study. The number of theories developed, tested, and generally dismissed was rather large, though. If the amount of theories concerning one thing is too big, it might be assumed, there is a lack of understanding of the phenomena studied. Another possible explanation of the number of work motivation theories of the time period mentioned might stem from the need to study and explain diverse aspects of the work motivation. If it would be so, however, one would expect some cooperation or complementarities between different theories. This does not seem to have happened. Every one of the succession of work motivation theories tried to explain the field as a whole and as such was tested, and supported but in due time was substituted by the next one. This problem was addressed by other authors before (Locke and Latham, 2004). Here we propose a perspective which might help in achieving the aims they suggested.

In this paper we advocate the idea that the field of work motivation is really very complex and that the students of it approached the field from different perspectives. These perspectives were derived from or connected to ideas and ideals concerning many diverse things that work stands for in human lives. Because of it, the perspectives on human motivation mirrored in the work motivation theories are connected to clusters of ideas. These clusters could be called ideologies, like man as a machine, or protestant ethic. Consequently, the theories expounding such clusters of ideas used specific sets of meanings. The question is, of course, if an analysis of meanings and ideas employed in the work motivation field could help us to further our understanding of the field, which the present authors believe it could.

## 2 Materials and Methods

The method employed in this study is akin to the one a historian uses when she/he tries to analyze development in a human society. Accordingly, the main part of the analysis will stem from following just these developments in the field of the aforementioned period. Based on the historical analysis an analysis of ideas and clusters of meanings will follow. Such clusters of meanings might be understood as sources of ideologies (e.g. of work and/or work behavior), where ideology stands for a worldview. However, the term ideology has many other connotations which might clash with the aims of this paper. For this reason we prefer to speak about semiotic analysis here. (Another possibility would be to call the clusters of meanings metaphors, but analysis of metaphors will be more complicated.)

Semiotics is commonly understood as a study of signification and communication. To justify the use of term semiotics and calling the method employed in this paper a semiotic analysis it would be necessary to make a proviso. This proviso is that the term semiotics is used here in a rather broad sense, implying that this analysis will deal with meanings assigned to human behaviors, feelings and thoughts and the ways they are used in interpretations of the same behaviors, feelings and thoughts. The interpretations, of course, are to be understood as the work motivation theories. (For the definition of semiotics presented here and semiotics in a broad sense, see e.g. Eco, 1976, p. 27.)

## 3 The subject matter

A possible way in which historical and semiotic analyses might become intertwined might easily ensue from an attempt to analyze a narrative on things past. The narrative in question is well known, so it might be recounted in an abbreviated form. It all started several decades earlier as in the 1940s, namely with the commencement of Taylor's scientific management. Taylor's efforts were probably the first attempt to study work behavior and jobs. For Taylor, a job was something mechanical, which could be developed to a higher standard by an engineer in a similar way as machines are bettered by experts. This perspective on work was upheld commonly through the first part of the twentieth century. In 1948, Bartlett compared modifications of work procedures to modifications of a machine in his paper (Bartlett, 1948). At that time, the results of Hawthorn studies became known and this brought about a change of the paradigm. The new ideas on work and work behavior got the full expression as late as in 1960 in McGregor's *The Human Side of Enterprise* (1960).

McGregor's theory Y was widely accepted as a formulation of a humanistic conception of work. For many professionals in the field it stood for a new and morally superior view to the one represented by its opposite, the theory X. This wide acceptance and acclaim of the theory Y is significant, especially as careful reading of McGregor's works shows his own views were different. With the theory Y humanism developed in a very important stream of thought concerning work motivation. Shortly afterwards Maslow's theory had arrived, followed by variations on the same theme like Alderfer's theory (Alderfer, 1972). These conceptions were overly humanistic and humanist thinking stays with us to this day as an important asset of the psychological empowerment. If we understand the meaning of empowerment correctly, it says: give the worker freedom and she/he will be happy and will produce.

McClelland's theory (1961) dealt with needs like Maslow's, but in a different way. The achievement was for McClelland a self-standing quality which was good for the society (if, perhaps, not always for the individual). The achievement is about striving to accomplish something specific. In goal-setting theory there seems to be a similar idea – according to

Locke (1981) the most important ingredient of motivation induced by a goal was a commitment to it. In this theory again, the effort, the striving is an important value by itself and on its own. In both the theories, striving (to achieve or to meet a goal) is understood as a general good. This understanding of what work means in the life of a human being is akin to protestant ethic as described by Max Weber (1976) about a century ago.

For several decades Vroom's expectancy theory was rather influential. Vroom (1964) understood motivation as a power to act, which resulted from simultaneous influence of three components called expectancy, instrumentality and valence. Vroom's theory is not machine-like. The assumed operations of the three components resemble rather a physiological process. In the eighteenth century a French philosopher de la Mettrie published two essays entitled L'Homme Machine and L'Homme Plante. If we would accept L'Homme Machine as a predecessor of the man-as-a-machine conception, then we could take L'Homme Plante as a model for the Vroom's conception or, perhaps, call Vroom's conception man-as-a-living-organism.

Another approach to motivation originated with Adams' equity theory (Adams, 1965), from which developed a number of theories dealing with perceived justice at the work-place together with the theories of organizational citizenship. These theories understand the processes of work motivation as a result of social perception and interaction of the worker and her/his co-workers. In this case the conceptual model could be called man-as-a-social-being, or in case of organizational citizenship theories, work as a social institution.

Psychological empowerment theory was briefly mentioned above in connection with humanistic ideals. Empowerment theory is based on them and the same holds for Herzberg's theory as well as for Hackman and Oldham conception. In empowerment the freeing of an employee is typically achieved by job enrichment procedures which were proposed originally by Herzberg. Hackman and Oldham's (1980) conception presupposes that a job will motivate the worker, if it takes on specific qualities. These qualities are those which sustain human worth, dignity and meaningfulness of the activities on the job. It might be argued, though, that in the theories discussed in this paragraph elements of protestant ethic could be identified as well. All of them find occupation and work as something good in itself, under the condition that the job or the work supports human interests or values.

The discussion of the work motivation theories indicates five clusters of meanings (or ideologies). To analyze these clusters a bit further, we could employ definitions of the core concepts of the clusters as found in dictionaries and encyclopedias. That way, the clusters (or ideologies) could be described, as follows:

*Man-as-a-machine:* a whole composed of parts; uninfluenced by mind or emotions; automatic; governed by, or in accordance with the principles of mechanics; related to the quantitative relations of force and matter;

*Man-as-an-organism:* a whole composed of parts, internally organized and coordinated; having the characteristics of an organism;

*Man-as-a-social-being:* involving allies or confederates; relating to human society, the interaction of the individual and the group, or the welfare of human beings as members of society; tending to form cooperative and interdependent relationships with others;

*Protestant ethic:* the value is attached to hard work, thrift, and efficiency in one's worldly calling;

*Humanistic*: centered on human interests or values; the belief that humans, as individuals, are unique beings and should be recognized and treated as such; a concern with the fullest growth of the individual in the areas of love, fulfillment, self-worth, and autonomy.

The five clusters of meanings (or ideologies) associated with work and activities on a job could be construed in at least two ways. Obviously, we might understand the five clusters as standing for five distinct areas of interest concerning the study of human labor. In such a case it would make sense to ask if the five clusters cover all the important things in the field of work motivation. Or, perhaps, if some clusters are represented in more or less detail as others. In both the cases asking the questions will help to develop the theory of work motivation and further its utility.

Another way to see things is the ideological one. If we would call the clusters of meanings as ideologies, this would lead to questions of a different kind. First of all the term "ideology" is emotionally laden with both positive and negative aspects ("ideology" Encyclopædia Britannica.). On one side it might be understood as just a Weltanschauung or a point of view and on the other as an opinion which is pushed through to serve someone's interest. In both the cases, again, we could ask why somebody has chosen this and not some other opinion and if this kind of taking sides have served some purpose, or not. Of course, asking these questions might make sense only if there is no unequivocal winner, a theory widely accepted as the only true one. It goes without saying that for many work and organizational psychologists the theory of psychological empowerment would be a good candidate for this position.

Psychological empowerment developed in the recent years in a rather sophisticated conception supported by an amount of research data. Even so, the same has held for practically all the work motivation theories mentioned above some time ago. These theories were widely accepted and supported by numbers of empirical studies in their own time. In the next part of the paper we will discuss both the reasons why the same fate might lay ahead for the empowerment in future developments of the work motivation theories and try to answer the abovementioned questions.

#### **4 Discussion and conclusions**

Humanism is a nice idea and a very Western one that seems to be a powerful and recurrent theme in the work motivation theories. Part of the problem with humanist ideals stems from their Western origin. Because of it, they are culturally determined and therefore do not have to represent the preferred values of non-Western countries. Hofstede's discussion of theory Y (2005, p. 203) in Indonesia is rather telling. However, a wide cultural divide is not necessary. Our country is located in Middle Europe and it is one of the post-communist countries. In the last decade we have conducted two surveys on work motivation (Kolman, 2001, Michálek et al. 2006) and some results suggest that respondents, who are older, less educated and living on the country margins, understand performance on the job in a different way than younger, more educated respondents living in the central part of the country. The two kinds of respondents mentioned differ mainly in their experience on the job. The younger ones believe that to produce on a job will bring rewards to them. The others do not believe it is so. This finding let us conclude that in order to grasp in full what are the processes and the content of the work motivation, we have to take into account what job and working signify to the people whose work motivation we try to research on.

The use of the word "signify" in this place turns us back to semiotics. A job and working activities might mean very different things to people of diverse cultural origins, of diverse social standing and those who hold different beliefs on what work and/or being on a job

stands for in their lives. If the scope of the work motivation theory is enlarged accordingly, it would become clear that this field truly is very complex. It might be extremely difficult or, perhaps, insurmountable to build one unified theory which would cover it in all its intricacy. At the same time, there might arrive new themes, new points of view which would differ from those we have introduced above. For some people, a job might primarily be a social role. For other people it might be a way to develop as a human being. There is also a third group which continually finds it to be a toil which cannot be avoided. These different kinds of viewpoints may lead to different conceptions of work motivation.

One of the recommendations Locke and Latham (2004) proposed was to “integrate extant theories by using existing meta-analyses to build a megatheory of work motivation.” Semiotic analysis might help act as a conceptual tool.

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# The Comparison of the Causes of Employees' Turnover and Knowledge Continuity Ensuring in Small and Large Organisations

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**Annotation:** The consequences of employee turnover are one of the crucial problems that affect organisations' efficiency. An awareness of causes and consequences of turnover is necessary in order to ensure a competitive advantage in today's knowledge economy. On the basis of an analysis, the article deduces the main factors causing employee turnover that in turn lead to the loss of knowledge. Using the outcomes of primary surveys, the article deals with the impact of employees' leaving on their organisations. The article describes the differences in effects between small and large organisations in terms of turnover and the subsequent interruption of knowledge transfer. The article also presents an analysis of inadequate behaviour within organisations and highlights problematic organisational practices that most frequently lead to an employee's decision to leave the job, thus causing an outflow of knowledge. The objective is to compare statistically provable causes of employees' leaving organisations and to ensure knowledge continuity in small and large organisations. A partial objective is to check the dependence between selected qualitative variables in the area of knowledge continuity ensuring related to employee turnover, and to confirm or reject its relevance at the selected level of significance. The verifiability of factors characterising the reasons for employees' decisions to leave, or rather of the determined hypotheses testing how organisations are threatened by the loss of knowledge, has been statistically tested to validate the outcomes and their further utilization. For modern-knowledge organisations, it is essential to know the causes and consequences of turnover in order to maintain their competitiveness. One of the conclusions of the article is that factors determining employee turnover also have a positive impact at the individual level (internal motivation, previous experience in knowledge sharing and trust) that subsequently support knowledge continuity ensuring. It is also possible to say that factors determining employee turnover have a positive impact at the organisational level (organisational climate, stimulation /remuneration system/, communication process, willingness to invest into employee education) consequently leading to knowledge continuity ensuring.

**Key words:** Turnover, employees, knowledge continuity, small and large organisations, survey

**JEL classification:** J53, J63

## 1 Introduction

Employee turnover is considered to be one of the persisting problems in organisations (Armstrong, 2007; Reiß, 2008). In particular if it involves quality employees who have worked for the organisation for many years, high performers and experienced and loyal individuals (Branham, 2009, Katcher and Snyder, 2010; Somaya and Williamson, 2008). The turnover means that another organisation may gain a new knowledge employee who can become its competitive advantage (Branham, 2000). The loss of knowledge thus is a threat for the former organisation, which increases the significance of knowledge continuity.

Organisation managements have to consider how to cope with the potential leaving of their employees for competitors or their retirement (Beazley et al., 2002; Eucker, 2007). It is one of the essential factors influencing knowledge continuity and it is necessary to eliminate its consequences by means of knowledge management and knowledge continuity management.

## 2 Data and Methodology

The aim of the article is to compare causes of employee turnover in small and large organisations by statistical tests and analyses. A partial objective is to test dependencies between selected qualitative variables in relation to knowledge continuity ensuring in the process of employee turnover and to confirm their validity or reject them at the selected significance level.

Based on literature review determinants of reasons of employee turnover were deducted and main factors constructed. In two successive surveys 29 determinants<sup>1</sup> were used to describe 7 main factors causing employee turnover. Those factors are remuneration, certainty, relationships, recognition, communication, culture and expectations. The factors were confirmed by the method of induction based on the results of the surveys. For reasons of provable clear understanding, the factors were structured as general, analogically to the survey carried out by Gosling, Rentfrow and Swann (2003), John, Naumann and Soto (2008) and Benet-Martinez and John (1998). The conclusiveness of the outcomes was supported by aggregation; by adding individual tested items the superordinate item and the whole were supported<sup>2</sup>. The conclusiveness of factors and their determinants was tested by means of a correlation analysis at the significance level of 0.01. The outcomes indicate a direct and strong dependence between employee dissatisfaction with the identified factors and the decision to leave their work position. The factors were therefore used for further analyses.

Both surveys were filled by 100 respondents who left their jobs past 12 months. Employees were surveyed to find hidden reasons to leave the organisation. The method used for data collection in the first survey was CAWI (computer-assisted web interviewing). The second, control questionnaire was based on the CATI method (computer-assisted telephone interviewing). The selection of a representative sample of employee population across sectors was carried out by a random selection of telephone numbers, which incorporates the advantages of multilevel random selection (Disman, 2008). The sample was selected solely for the purposes of the survey and included employees or managers in the age category from 20 to 55. Following an introduction, respondents were included in the survey provided they had satisfied the predefined conditions. Their answers were categorised according to identification questions that formed the first part of the questionnaire. In the first survey, the measurement was based on closed questions with one or several possible answer(s) that had been selected based on the study of literature, documents and other related surveys carried out by the following authors: Branham (2009), Hackman (1980), Meyer and Allen (2004) and Katcher and Snyder (2009). In the second survey a semantic differential was applied that permitted the identification of nuances in respondents' attitudes through the questionnaire. Respondents' reactions to target statements and their attitudes to the given matter were restricted by offering a set of several statements (Hayes, 1998). The extremes of the seven-point scale<sup>3</sup> represented bipolar concepts of the evaluation dimension.

The respondents were surveyed firstly in August and September 2010, secondly in November 2010. The overall return of the first questionnaire was 22%. Return of the second questionnaire is not possible to find out regarding special type of survey (CATI). 61% of respondents of the first survey were female. The second survey did not include question focus on sex of the respondent, because  $\chi^2$  test indicated that there is no dependence between sex and reasons to leave the organisation. As well as  $\chi^2$  test did not indicate any dependence between sexes of respondent, also sector does not affect causes of employee turnover.

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<sup>1</sup> Statements used by the respondents to characterize the main reasons to leave.

<sup>2</sup> Individual items of the construct sustaining final factors were tested separately and their reliability was added up in the whole.

<sup>3</sup> Using a scale of 1 to 7, respondents expressed their inclination towards one of the preset extreme statements or, provided it was not possible to favour either of the sides, selected a median, neutral value.

The analysis was carried out using the Microsoft Excel 2007 and SAS programmes. The conclusiveness of the outputs and relationships obtained were supported by the tools of descriptive statistics and factor analysis.

The data for the evaluation of relationships between potential threats of organisations from the loss of knowledge and identification variables has been gathered through a quantitative survey, i.e. a questionnaire survey, in which 167 higher and middle management managers from various organisations took part; the branch in which the organisations operate has not been taken into account in 2010. The questionnaire contained 19 questions (15 closed and 4 semi-open) on the knowledge sharing and knowledge transfer and 8 identification questions. The questionnaire was distributed to 814 respondents. The overall questionnaire return was 20.52%, i.e. 167 respondents took part. 55.1% holds a senior management position, 68.9% have university education, 45.5% are in the age group 46-62 years, 70.1% are employees of Czech organisations, 51.5% work in tertiary sector and 38.9% work in the primary sector. 76.6% of respondents were male.

The data have been processed by means of absolute and relative frequencies using the Lime Survey application and the Excel 2007 programme. Testing is done by Pearson Chi-Square test in association table and contingency table. The power of dependence is determined by the correlation coefficient and Cramer's coefficient.

## **2.1 Theoretical Background of the Work**

Jenkins, (2009) and Ramlall (2004) describe the causes of turnover as disharmony with internal motivation. If a need at a higher level of the pyramid of needs is not satisfied, an individual aims at satisfying a need at a lower hierarchical level. The most common case is that an employee's unfulfilled expectation in the area of self-development translates into the development of relationship needs. Should these be unsatisfactory as well, an employee leaves his/her job (unless conditions can be changed).

For employers it is very important to monitor the volume of employees who leave the organisation and how this factor influences the organisation. That, of course, is dependent on the size of the organisation, its location and special teams of employees, etc. that can help to formulate a general strategy of sources (Hutchinson and Purcell, 2003).

According to Stam (2009), organisations are facing a crisis of knowledge management which is to ensure that employees will not leave the organisation before transferring their experience. This means that organisations are facing a "knowledge preservation crisis" as organisations' knowledge is threatened. In this respect knowledge continuity management becomes a key means of reducing the risk of loss of critical knowledge.

## **3 Results and Discussion**

### **3.1 Causes of Employee Turnover**

If personal reasons, such as moving, starting a family, illness, retirement or restarting studies are not taken into account, the causes of turnover can be summarized into the following seven factors:

1. Employees leave their work position due to low pay (remuneration, benefits, imbalance between performance and reward).
2. A secure future is an important factor having impact on the decision to leave a work position (trust in the company's vision, following business ethics, trust in leaders/management, new projects and innovation, speed of employee turnover, a vision of the future).

3. Good relationships at the workplace support employees' decision to stay with their organisation although there are good reasons for leaving (co-operation, treatment, fairness, tolerance, helpfulness, the style of assigning and performing tasks).
4. Roles and positions (recognition) in the organisation have a major impact on work satisfaction (prestige, opportunities, development, recognition).
5. Communication within the organisation and its level also determines work satisfaction (type, feedback, sincerity, ethics, awareness, concealing of information, respecting opinions).
6. Organisational culture (strong) is a critical factor for an employee's decision to stay in the work position (workload, flexible working hours, access to sources, type of culture, focus on quality).
7. The expectation factor determines the length of stay in the work position (imbalance between work and personal life, unclear assignments, expectations, without the support of innovations proposed by employees).

Statistical analysis revealed adequate quality of correlation indicators for all factors, which were compiled by the induction method. Correlation analysis indicated that on a significance level of 0.01 there is a relationship between all elements of the construct (table 1). The differences in employees' reasons for leaving small and large organisations (see Table 1) have been tested based on Student's t-distribution. A statistically important difference at the significance level of  $\alpha=0.01$  has been proven.

**Tab. 1.** Comparison of the factors which affect staff turnover (source: author's survey)

Factor	% turnover			R <sup>2</sup>	Student's T-test
	SUM	Small organisations	Large organisations		
Remuneration	21	23	19	0.942	$t=4,5714^{**}$ $t_{\alpha}=3,499$ $t > t_{\alpha}$ $\alpha=0,01$
Future certainty	17	18	16	0.976	
Relationships	16	16	26	0.847	
Recognition	14	14	10	0.914	
Communication	14	10	16	0.778	
Corporate culture	11	12	6	0.982	
Expectations	7	7	7	0.914	
$\Sigma$	100	100	100	-	

### 3.2 Comparison of the Causes of Employee Turnover in Small and Large Organisations

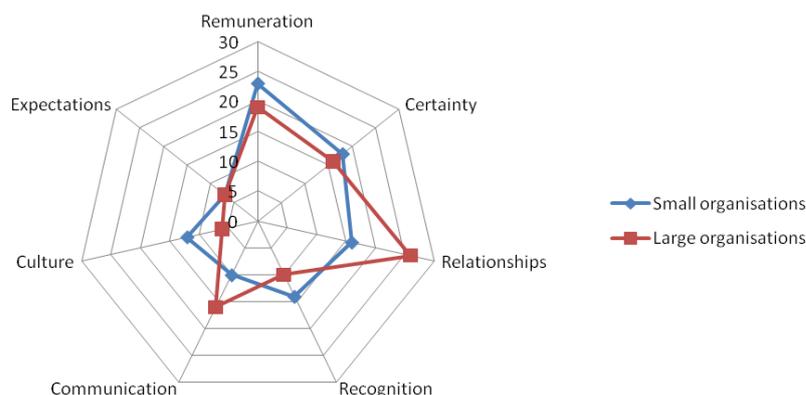
In small organisations (up to 20 employees) the most frequent reasons for an employee's leaving are insufficient or unsuitable remuneration. 23% of respondents said they were not satisfied with the amount of salary paid to them or the compensation-performance ratio or they were not satisfied with the benefits and perks provided by a small organisation. Small organisations tend to retain their employees by meeting their expectations (only 7 % of respondents disagree) and providing an agreeable organisational culture (suitable for 90%). Small organisations tailor positions to suit their employees, however, they are limited by their budget and therefore cannot pay high remuneration. Another reason of employee dissatisfaction is insecurity as far as the future of the organisation and their job is concerned (18% of respondents) and unsatisfactory relationships (16% of respondents), in particular managers' behaviour, such as trust in employees' independence, unfair treatment. In the majority of cases, employees feel that the management does not want to inform them about what is going on because the situation is unfavourable for the organisation and thus also for the employees (if the information is concealed they count on a worse scenario), which reduces

the feeling of certainty and recognition (they feel that the management does not consider them to be equal partners and trustworthy collaborators and therefore does not think it fit to provide them with such internal information). Such employees feel undervalued and leave their job that was previously chosen with the hope that it would meet their expectations.

On the contrary, in large organisations (over 250 employees) the main reason for leaving the job definitely does not lie in remuneration. Much more frequently employees of large giants show dissatisfaction with the relationships at their workplace (26%) which they find impersonal. They also think that the management does not show a disposed approach and degrades them to the wheels of a large machine. This is confirmed by another important reason of dissatisfaction, i.e. poor communication in the organisation, such as insufficient feedback, failure to communicate important organisation information, lack of ethics or integrity and inability to fully appreciate new ideas and proposals (16% of respondents). Employees of large organisations feel that their work is not duly appreciated and this threatens the security of future work. 16% of respondents do not have trust in the management of the organisation; do not consider some of its practices ethical or feel that the organisation is not interested in common employees and their development. Large organisations do not support independence and recognise the uniqueness of their employees who therefore feel dreary and do not want to accept the idea that they are not being taken care of and that there is no effort being made as far as their development, self-fulfilment and prestige are concerned.

Employees join both types of organisations with equal expectations. We can say that current employees have realistic expectations as regards their jobs and responsibilities associated therewith. The state and style of organisational culture is perceived very differently in both types of organisations. While in small organisations more attention is paid to this factor (12% of respondents left the job for reasons of unsuitable culture), in large organisations this factor turned out to be the least risky of all. The style of culture in large organisations can thus be considered more employee-friendly and appealing in Czech Republic. Remuneration is the most important factor of dissatisfaction and the most frequent reason for leaving in small organisations. In large organisations this factor does not stand out from the average. The cause can be excessive workload and imbalance between remuneration and performance in small organisations compared to automatically higher salaries paid by large organisations that are, in capital terms, stronger than other organisations and may offer their employees adequate remuneration for strictly defined responsibilities. Small organisations usually do not have precisely defined tasks for individual employees and often apply the rule that each of the employees must be able to carry out all tasks in order to be able to substitute others. Employees may see this as extra workload. In compliance with the above said, more people employed by small organisations suffer from poor recognition. They have no possibility of promotion or personal development. The total number of employees leaving for reasons of lack of recognition does not dominate over the average of other factors. Employees in large organisations do not have problems with recognition. The contrary applies to communication. Employees of small organisations rate the style of communication much higher than their colleagues in large organisations.

The following graph shows the comparison of factors based on the type of organisation.



**Graph 1.** Difference in reasons to leave the organisation in small and large organisations  
(source: author's survey)

### 3.3 The Knowledge Continuity Ensuring in Small and Large Organisations

The survey tested a relation between a threat arising from the leaving of an employee and size of the organisation. Based on the  $\chi^2$  test, the null hypothesis has been rejected and the degree of dependence is 0,334 (see table 2).

**Tab. 2.** The results of the quality characteristics test (source: author's survey)

Null hypothesis H0	Test depending	Rejection of H0	Power dependence test	Dependence
A threat arising from the leaving of an employee with critical knowledge for the organisation is not dependent on the size of the organisation.	0,005	YES	0,334	weak

Based on statistical tests it is possible to say that the experience with knowledge continuity ensuring is determined by the size of the organisation. A total of 50.3 % of respondents involved in the survey said that they had never come across the concept of knowledge continuity ensuring. We can therefore say that the issue of knowledge continuity ensuring has not been discussed in organisations in the CR yet. The highest number of respondents that have at least once experienced knowledge continuity ensuring work for organisations with more than 250 employees (71.7 %).

In both small and large organisations, unsatisfactory relations at the workplace are one of the most frequently stated causes of dissatisfaction and an impulse leading to a decision to leave the organisation. In the case of large organisations, this factor strongly dominates over other factors. More than a quarter of employees of large organisations leave their job due to the relationships at the workplace. Compared to all other stated factors, the difference between small and large organisations in this area is the largest, nevertheless there is a strong dissatisfaction seen in both types of organisations in this aspect. Despite the above said, small organisations show a 10% lower dissatisfaction. What dominates is the feeling of unsatisfactory remuneration and lack of security.

The outcomes show that the highest percentage of respondents who think that an organisation would be endangered by an employee's leaving are people from organisations with more than 250 employees and then the organisations with a maximum of 20 employees. The threat of utilization of the knowledge by competitors is perceived in particular by individuals from organisations with no more than 20 employees.

Respondents in small organisations have unanimously agreed that the most important factor that determines knowledge continuity ensuring is the organisational climate (relationships, expectations, recognition). A friendly atmosphere among colleagues and superiors in an organisation will encourage knowledge continuity ensuring. The second most important factor in small organisations is motivation. If an employee is motivated, it strengthens an employee's will to share knowledge with colleagues. In small organisations, the need for internal motivation to transfer knowledge is stronger than remuneration, which is confirmed by the outcomes of the quantitative survey, i.e. employees in small organisations are motivated most and in large organisations they are stimulated most. Other factors that have the same effect include organisational culture and trust. It is possible to say that organisational culture in small organisations is based primarily on loyalty to the organisation. According to the respondents, the least important factor both in small and large organisations is their organisational structure.

In large organisations the organisational climate has the biggest influence on knowledge continuity ensuring as well. It is followed by motivation and stimulation. Organisational culture is a more important factor in large organisations than in smaller ones. In large organisations it is advisable to establish a firm organisational culture to be respected by all employees. If knowledge continuity ensuring is anchored in the organisational culture, it will increase employees' willingness to share knowledge and trust in colleagues and superiors.

## 4 Conclusions

There are seven factors that have been proven to determine employee turnover (remuneration, certainty, relationships, recognition, communication, culture and expectations). A correlation analysis indicates a strong dependence between dissatisfaction of employees with the stated factors and tendencies to leave the working position.

The findings of the survey confirm the tendency of employees to stay with the organisation provided there are favourable conditions, they find the corporate culture suitable and there are no conflicts (95%). It is therefore necessary to apply long-term and non-tangible rewards and type of personnel work. Only 5% of employees focus on more suitable external offers.

The factors determining turnover are interwoven with personal and informal aspects. The most frequent reason for leaving is remuneration (21%) and insufficient future security (17%). Both these factors are part of a construct falling into the category of employee individualism. These were followed by factors linked to the relationships at the workplace (16%) that also indicate the emphasis on an informal and personal level. Then there is dissatisfaction with one's role and position in work (14%), which confirms the above concept. The style and state of communication in the organisation follows (13%), only then there is the type of culture prevailing at the workplace (11%).

It is possible to state that positive relationships and their experiencing create favourable preconditions for the strengthening of motivation of employees to do good work and perform better. Personal satisfaction is one of the main conditions for work satisfaction. These employees show better performance despite worse organisational conditions.

Based upon the results of the survey it is possible to conclude that in relation to ensuring knowledge continuity there is a positive impact of the factors at the individual level (internal motivation, previous experience with knowledge sharing and trust). It is also possible to say that in relation to ensuring knowledge continuity there is a positive impact of the factors at the organisational level (climate in the organisation, stimulation (remuneration system), communication process, willingness to invest in employee education). These factors also influence employee turnover in organisations.

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# Surface Design Response for Food Packaging Processes

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**Annotation:** Many process response optimization strategies exist. The objective is to find the optimum response and its associated factor levels as quickly as possible at minimum expense. A strategy is to find a relative broad-based initial experiment that includes the variables we think are driving the response. Next, we run the experiment and fit a response surface from the results. We then use the response surface model to guide us in developing our second experiment, thus moving in closer to the optimal response. This systematic practice tends to work very well with using quantitative factors during its dealing. The usual alternative is more or less haphazard trial-and-error search over our feasible region or study grip. The sequence of experiments may include second-order response surface if a first-order response surface is judge to be inadequate. Nevertheless, the objective remains to close in on our best operating setting as quickly and economically as possible. The theoretical objective of the paper is to demonstrate design that is useful in response surface work: a central composite design. Packaging in food products is a critical process. Robust, airtight seals are required to preserve product freshness and shelf life. The sealing process in packaging is critical. One of the leverage points in this process is seal strength. When wrapping materials are joined together, two important leverages are sealing temperature and sealing time. The practical (or experimental) purpose of the paper is to determine optimal seal process requirements in order to provide maximum tensile strength in the seal.

**Key words:** packaging, process, tensile strength, central composite design, Anova

**JEL classification:** C67 - Input–Output Models

## 1 Introduction

Design of Experiments (DOE) was developed in the early 1930s by group of researches leading by Ronal Fisher at the Rothamsted Agricultural Field Research Station in London, England (Antony, 2010). Their initial experiments were concerned with determining the effect of various fertilizes on different plots of land. The final condition of the crop was not only depend on fertilizer but also on a number of other factors (such as underling soil condition, moisture content of soil etc.) of each of the plots. Fisher's research group used DOE which could differentiate the effect of fertilizer and the effect of other factors. Since then this experiment the DOE methodology has been accepted and applied in biological, agricultural and food-manufacturing fields. The present potential applications of DOE is - according to (Grant et al, 2009; Lewis, 2007) in many manufacturing processes include:

- Improved process outputs and stability
- Improved profits and return on investment
- Proved process capability
- Reduced or minimalist of process variability and hence better product performance consistency
- Reduced manufacturing costs
- Increased understanding of relationship between key process input and output
- Heightened morale of engineers with success in chronic problem solving

## 2 Materials and Methods

Consider a welding process (in its general meaning – welding steel, welding plastic material, welding foil, etc.) where the primary concern of interest to engineers is the strength of the weld and variation in the weld strength values. Through scientific experimentation we can determine which factors mostly affect the mean weld strength and variation of main input welding machine parameters (e.g. weld, speed, welding time, weld position, welding pressure, voltage, etc).

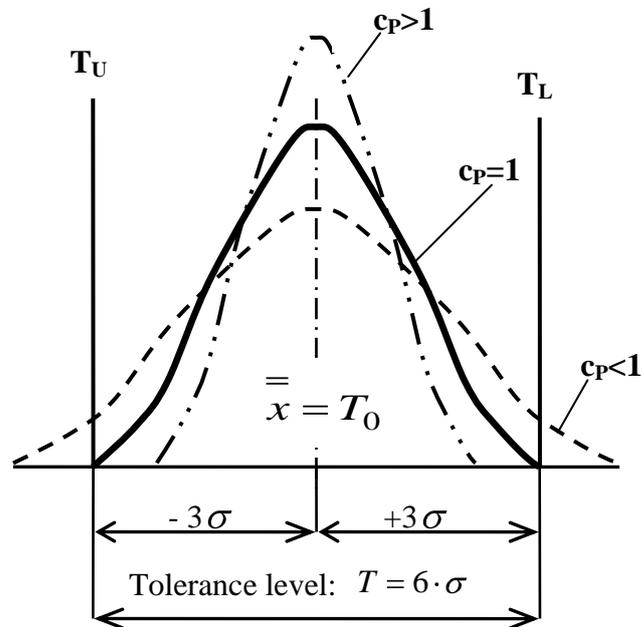


Fig. 1. Graphic illustration of the size of the coefficient of capacity of production quality

For example, the most common characteristics reflecting the ability of the manufacturing process to achieve the specified accuracy (stability) shall include capacity factor of production quality (Process Capability - CP).

CP Factor character determines the stability of the quality of the production process, assuming that the process is centered in the middle of the of tolerance (on the center of the tolerance field T0) (Roberts et al, 1993). Then we can determine the rate of eligibility as a proportion of total tolerance T (is the difference of the upper tolerance limit of TU and the lower tolerance limit TL) and percentage of products located within the zone defined tolerance limit. If the process is centered in the middle of the tolerance field T0, then the tolerance zone "corresponds to" times the "standard deviation:

$$c_P = \frac{USL - LSL}{6 \cdot \sigma} = \frac{T_U - T_L}{6 \cdot \sigma} = \frac{T}{6 \cdot \sigma} \approx \frac{T}{6 \cdot s} \quad (1)$$

In agricultural areas (mainly food processing) can distinguish three types of areas where it is possible to apply the methodology of designing experiments. It is possible to use the Design and Analysis of Experiment methodology to optimise the design of harvesting and sorting equipment and packaging media to reduce the likelihood of food mechanical damage (Lewis, 2007). The second way of using DOE methodology is presented in a study, which has used DOE - (more exactly experimental measurements and mathematical predictions) for the rational design of anti-microbial coatings and could be used in industrial applications (Guillard, 2009). The third option of DOE utilization is based on optimization process of food packaging.

Here are two typical tasks: first task focuses protective function of packaging - eg, (Mestdagh, 2005), the second task is based on optimizing the weld package (Carneiro, 2007).

The  $2^f$  design can be used to develop first-order response surface (Myers, 2009). Using a  $2^f$  design as the base, it can expand the plan to include a center point setting, which we arbitrarily call “zero” point or “origin”, for convenience. The centre point, by definition (Montgomery, 2009; Grant et.al, 2009) our best guess at an optimal process setting before the experiment. All other settings can be considered as step-out points to be investigated. Hence, it could be defined the step-out as the planned expansion distance from the centre point, in each direction relative to each factor.

We take one at each step-out point and taken  $n \leq 2$  observations at the origin. Using this design we can assess nonlinearity but generally cannot develop a full second- order regression model. For  $2^f$  design with centre point with no replication on the corners, we develop the pure error out of the centre point observations:

$$SS_{per} = SS_{err} - \sum_{i=1}^n (Y_i - \bar{Y})^2 \quad (2)$$

$$df_{per} = df_{err} = n - 1 \quad (3)$$

$$MS_{per} = MS_{err} = \frac{SS_{err}}{df_{err}} \quad (4)$$

- Where:
- $Y_i$  = i-th centre point response
  - $\bar{Y}$  = mean of n centre point responses
  - $n$  = number of observations at the design centre point
  - $SS_{per}$  = pure error sum of square
  - $SS_{err}$  = experimental error sum of squares
  - $MS_{per}$  = pure error mean square
  - $MS_{err}$  = experimental error mean square

### 3 Results

Packaging in food production is critical process. Robust, airtight seals are required to preserve product “freshness” and shelf life. The sealing sub-process in packaging is critical. One of the leverage points in this process is seal strength. When wrapping materials are joined together, two important leverage variables are sealing pressure a sealing temperature.

**Experimental purpose** is to determine “optimal” process requirements in order to provide maximum tensile strength in the seal. Temperature (TP) and pressure (clamping force) (TS) are indentified as two design variables. **Design strategy** is to develop  $2^2$  with a centre CRD experiment and fit a linear response surface. From this results determine optimal temperature a pressure requirements from the results. Physical experimentation is based on sample coupons, which are cut from wrapping materials and sealed at the TP and TS combinations, along one edge. Then the loose edges are clamped in a tensile puller and pulled until fracture. The fracture force is recorded in MPa.

**Table 1.** Overview of the  $2^f$  with a centre CRD

Source	SS	MS	F	P value
<b>Total corrected</b>	419.37			P<0.01
<b>TP</b>	344.00	344.00	344.00	0.01< P<0.025
<b>TS</b>	64.00	64.00	64.00	0.01< P<0.025
<b>TP times TS</b>	4	4	4	P>0.10
<b>Curvature</b>	2.25	2.25	2.25	P>0.10
<b>Experimental error</b>	2.00	1.00		

Table 1 provides an overview of the  $2^f$  with a centre CRD. The factor levels explored, the response data obtained and the models fit are summarized in this table. Here we can see no significant curvature present P value  $\geq 0.10$ . We can see a significant temperature effect, P value  $< 0.0$ , and significant pressure effect ( $0.01 < P \text{ value} < 0.05$ ). The computer aided solution in code units, according to the response surface coefficients, both positive, it appears that our optimal operating area is up and to the right of our first experimental factor level boundaries. Therefore, for our follow-on experiment we will expand our coverage in the north-east.

## 4 Conclusions

For the successful application of an industrial designed experiment, we generally require the following skills. *Planning skills* which is based on understanding the significance of the experimentation for a particular problem, time, budget required for the experiment, how many people should be involved with experimentation. *Statistical skills* that involve the statistical analysis of data obtained from the experiment, assignment of factors and interactions to various columns of the design matrix (or experimental layout), interpretation of result from the experiment for making sound and valid decisions for improvement, etc. Engineering skills based on determination of number of levels of each factor, range at which factor can be varied, determination of what to measure within the experiment, determination of capability of measurement system in place, determination of what factors can be controlled and what cannot be controlled for the experiment. *Teamwork skills* which involve understanding the objectives of experiment and having a shared understanding of the experimental goals to be achieved, better communication among people with different skills and learning from one another. That means we should use brainstorming of factors for experiment by team members.

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# Risk Predictability with Financial Ratios in Case of Agricultural Enterprises

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**Annotation:** The international financial and economic crisis has brought more attention to risk management. In the last years and nowadays almost every business has been experienced the crisis effect and the resulting after-effects in their own skin. The economic crisis has also highlighted that the companies can not continue to operate the same way as before the crisis, the future is required a very serious change. Risk is a fundamental component of agricultural production. The agricultural enterprises have greater exposure to risk than other industry of the economy, and therefore it is especially important to have to pay more attention to risk prediction and management. There are simpler and more complicated risk assessment methods, starting with the financial ratios, through several statistical methods, as far as the different simulation models. In our paper we deal with several financial ratios, and their effects on the business risk. The degrees of operating and financial leverage play an important role in measuring the business risk because they are some components of the risk. The measure of total firm's risk is the combined leverage ratio. The clarity in regard to operating and financial leverage is important because these concepts are important to assess the business risk. We present what factors influence the value of the financial and operating leverage. The paper analyses what have the indebtedness an effect on the shareholders' return. Based on the analysis we try to answer how affect the capital structure on the shareholder return and risk. The study is to provide support to the farmers to take in advance account of risk in the course of their decision-makings and to avoid the bankruptcy.

**Key words:** financial ratios, risk analysis, leverage, capital structure, indebtedness, agricultural enterprises

**JEL classification:** G31, G32, G33, Q12, Q14

## 1 Introduction

As we move into the 21st century and concern about our environment grows, there is an obvious move towards more sustainable farming. Sustainable farming is concerned with anything that affects the sustainability of a farm. (Mason, 2003) Today's economy and business world is constantly changing, it is unpredictable, volatile and seems to become more complex every day. As the world's population increases the demand for agricultural product increases too. Poorly maintained agricultural enterprises produce less quantitatively and qualitatively. Profitability decreases what means that surplus money is no longer available for improvements. If the farming is not profitable, it may not be sustainable. Perhaps the most important decision of a farmer to decide what and how to grow. (Mason, 2003) Ensuring the sustainability the agricultural enterprises face a variety of risk of which we are dealing with essentially the operating and financial risks. To operate a sustainable farming system the farmers need to analyse their activities. To avoid disruption and possible economic problems to have to be explore the risk factors that affect the farm management.

In case of agricultural systems, the financial capital is more of an accounting concept, it serves as a facilitating role rather than as a source of productivity of itself. It represents accumulated claims on goods and services, built up through financial systems. (Pretty, 2008)

The Dictionary of Agriculture (2006) defines the risk as a combination of the likelihood of injury, damage or loss being caused by a potentially dangerous substance, technology or activity, or by a failure to do something, and the seriousness of the possible consequences. Risk is an important aspect of farming companies. The uncertainties of weather, yields, prices, government policies, global markets, and other factors can cause wide variability in farm income. Risk management involves choosing among alternatives that reduce the financial effects of such uncertainties. The companies need to develop the mindset and tools to explore the many dimensions of risk associated with each activity and opportunity so that they can balance these against the more obvious signs of reward. In order to measure risk, the analyst first seeks to identify the key factors that seem likely to cause volatility in the returns. The number of risk factors that are considered in a risk analysis varies considerably. Understanding the various types of risk is important because the several types demands a different set of risk management skills. Classification is an important part of the effort to make an otherwise ill-defined risk measurable, manageable, and transferable. Once we've put boundaries around our risks by naming and classifying them, we can also try to attach meaningful numbers to them. (Crouhy et al., 2006)

Risk assessment provides a mechanism for identifying which risks represent opportunities and which represent probable dangers. This means that the risk assessment gives organizations a clear view of variables to which they may be exposed, whether internal or external, retrospective or forward-looking. Risk assessment is the process of gathering data and synthesizing information to develop an understanding of the risk of a particular enterprise.

This paper contains the partial results of the project "Performance indicators of agricultural enterprises in Hajdu-Bihar county" started in September 2010. As a first step, we investigate the agricultural enterprises whose main activity is crop production and revenues are excess of 50 million forints. During the investigation we want to choose those indicators which provide an opportunity to develop a simple model what allows for the agricultural enterprises to define their own performance. We present the liquidity ratios and their corrections in our paper, because we found that the traditional liquidity ratios often do not give a proper picture of the enterprises' financial situation. In frame of the research we use various statistical methods to explore the relationships between the different ratios. To explore the relationships we use traditional "frequentist" and Bayesian statistical methods. In this study we are only dealing with some financial ratios due the paper's page limitation.

## **2 Materials and Methods**

The data for analysis are essentially from the financial reports of the county's agricultural enterprises: from the balance sheets, the income statements and the notes. There are 71 agricultural enterprises dealing with crop production in the Hajdú-Bihar county, what we could be included in the investigation. There are five companies from which more detailed data are available. Using the available corporate data we calculated several financial ratios. The leverage ratios were calculated for each county firm with which we can only be drawn conclusions for the county enterprises.

In our paper, we deal only two risk factors what are the operating and financial leverage. This two leverage ratio, as a risk measure, affect both sides of the balance sheet. The operating leverage is primarily based on the assets, while the financial leverage is based on the liabilities and equities.

## 2.1 Corporate leverage

To measure the corporate risk we can use several financial ratios what are based on balance sheet and income statement of a corporation. If we would like to measure the risk in a more appropriate level we should use the leverage ratios. There are three types of leverage ratios: financial leverage, operating leverage and combined leverage.

Business leverage deals with the magnification of profits. Leverage results from the use of fixed-cost assets or funds to magnify returns to the firm's owners. Generally, increases in leverage result in increased return and risk, whereas decreases in leverage result in decreased return and risk. The amount of leverage in the firm's capital structure can significantly affect its value by affecting return and risk. (Gitman, 2007)

The nature of fixed and variable cost is well known in the business terminology. Fixed costs come in two varieties: operating and financial. The top half of the income statement is the operating half where fixed operating costs are identified directly, and which begins with sales and ends with operating income. The bottom half of the income statement is the financial half. It begins with operating income and ends earnings after taxes (net income), and it details how operating earnings are distributed. The fixed financing cost is interest, which must be paid regardless of the level of earnings, and it arises when a company elects to finance with debt.

Measures of leverage vary substantially for several reasons. For example, the small firms are mostly more levered than larger ones, and so leverage ratios are higher than in case of other companies. If leverage is so high that the company is unable to face its debt obligations, creditors can threaten to liquidate the firm, and thereby acquire control over the firm's access to the capital market. (Tirole, 2006)

## 2.2 Financial leverage

The final goal of corporations is the value creation, consequently the companies should increase the shareholder's income or return on equity ratio. The return on equity ratio depends on ROA and equity multiplier. If a company has debt in its financial funds the return on equity will grow to a greater extent than the return on assets. To use debt in a firm's capital structure is called financial leverage. The more debt a firm has (as a percentage of assets), the greater is its degree of financial leverage. (Ross et al., 2007) Financial leverage increases the potential reward to owners, but it also increases the potential for financial distress and business failure. Considering the Du Pont identity, it appears that the ROE could be leveraged up by increasing the amount of debt in the firm.

Using debt in the firm's capital always increases the risk of the firm, basically the bankruptcy risk, which is proportional to the level of indebtedness. However, it also should bear in mind that the indebtedness reduce the firm's disposable income. Therefore, the company's net income decreases in proportion of the indebtedness which reduces the ROA value, ie we can achieve a more less multiplication with the leverage. The question arises when the debt increases the return on equity, and when does not. The previous question is answered by the following expression:

$$r_E = r_A + (r_A - r_D) * \frac{D}{E} \quad (1)$$

where

$r_E$  – return on equity

$r_A$  – return on total assets

$r_D$  – cost of debt capital

$D/E$  – debt/equity ratio

The formula (1) shows that the return on equity will be increased if return on assets is greater than the cost of debt capital ( $r_A > r_D$ ), and the growth rate depends on the indebtedness. The

financial leverage increases the potential reward to shareholders, but it also increases the potential possibilities for financial distress and business failure. (Ross *et al.*, 2007)

The **degree of financial leverage** (DFL) is the numerical measure of the firm's financial leverage

$$\text{DFL} = \frac{\text{Change in net income}}{\text{Change in operating income}} \quad (2)$$

The DFL ratio is an elasticity coefficient which shows the percentage change in net income resulting from one percentage change in operating income. The effect of DFL can be positive or negative. If the economical circumstances are favorable the leverage effect will be positive and otherwise negative in the same extent. The interest cost determines the degree of financial leverage.

We have been found that in case of a firm with no financial leverage, EPS changes at the same rate as net income. By contrast, a firm financed partly with debt will find its earnings per share changing by more than the change to net income.

### 2.3 Operating leverage

Operating leverage is caused by the fixed costs of operations and is the magnification in the operating (top) half of the income statement, that is, how the operating income responds to a change in sales. When a company's sales change, its net income changes as well, but the value of the change depends on the firm's operating leverage. A firm with operating leverage means that its EBIT change by more than the change in sales.

$$\text{DOL} = \frac{\text{Percentage change in operating income}}{\text{Percentage change in sales}} \quad (3)$$

The DOL ratio is an elasticity coefficient which shows the percentage change in operating income resulting from one percentage change in sales. The degree of operating leverage can be associated with the proportion of fixed costs in the total company cost. If a high percentage of costs are fixed, hence do not decline when demand falls, then the firm is exposed to a relatively high degree of business risk. Business risk depends on the extent to which a firm builds fixed costs into its operations, if fixed costs are high, even a small decline in sales can lead to a large decline in ROE. (Birgham-Houston, 2009)

### 2.4 Combined leverage

Combined leverage occurs whenever a firm employs both operating leverage and financial leverage in an effort to increase the returns of owners. It represents the magnification of sales increases (or decreases) and into relatively larger earnings increases (or decreases) resulting from the firm's use of both types of leverage. The degree of combined leverage (DCL) is the product of the two independent leverage measures

$$\text{DCL} = \frac{\text{Percentage change in net income}}{\text{Percentage change in sales}} = \text{DOL} * \text{DFL} \quad (4)$$

The total risk exposure the firm can be managed by combining operating and financial leverage in different degrees. Knowledge of the various leverage measures aids the financial officer in determining the proper level of overall risk that should be accepted. If a high degree of business risk is inherent to the specific line of commercial activity, then a low statement regarding financial risk would minimize additional earnings fluctuations from sales changes. Conversely, the firm incurs a low level of fixed operating costs might choose to use a high degree of financial leverage in the hope of increasing earnings and the rate of return on equity. (Keown *et al.*, 2006)

### 3 Results

Related to our research project we disclose the relationships which can help to use the leverage ratios to measure the entrepreneurial risk. To raise the question, what is the value, which means an excessive risk? To answer the question we use the interest coverage ratio what measures how well a company has its interest obligations covered:

$$\text{Interest coverage ratio} = \frac{\text{EBIT}}{\text{Interest}} \quad (5)$$

The expected value of this ratio is 5. We can calculate the degree of financial leverage based on the following expression

$$\text{DFL} = \frac{\text{EBIT}}{\text{EBIT} - \text{Interest}} \quad (6)$$

**Table 1.** The relationship between degree of financial leverage and interest coverage ratio

DFL	Interest coverage ratio
1,20	6
1,25	5
1,33	4
1,50	3
2,00	2

Source: own calculation

Table 1 shows how changes the interest coverage ratio depending on changing of the financial leverage ratio. We have been found that the value of DFL is acceptable if its value does not exceed the value 1.5 what means a value 3 in case of interest coverage ratio. However the good value of DFL is less than or equal to 1.33 because the interest coverage ratio is greater than or equal to 4.

Since financial leverage multiplies the underlying business risk, it stands to reason that firms that have high business risk should be reluctant to take on financial leverage. It also stands to reason that firms which operate in relatively stable businesses should be much more willing to take on financial leverage. (Damodaran, 2006)

Since the degree of operating leverage depends on the extent of fixed costs, and therefore is closely related to the break-even quantity or sales. The relationship between break-even quantity or sales and the degree of operating leverage can be expressed with the equations what we can see in Table 2.

**Table 2.** The relationship between the degree of operating leverage and the break-even quantity and sales

Break-even quantity (a)	Break-even sales (b)
$\text{DOL} = \frac{Q}{Q - Q^*}$	$\text{DOL} = \frac{S}{S - S^*}$
Q – sales quantity Q* – break-even quantity	S – sales S* – break-even sales

Source: own work

The break-even analysis is widely accepted by the business community because it is based on straightforward assumptions, and companies have found that the information gained from the break-even model is beneficial in decision-making situations. (Keown et al., 2006) To implement a break-even model, we must separate the production costs of a company into two exclusive categories: fixed costs and variable costs. The operating leverage calculation also

uses this cost separation. If we examine the following two expressions, we can see that the break-even quantity ( $Q^*$ ) and sales ( $S^*$ ) depends on the fixed cost.

$$Q^* = \frac{FC}{p - vc} \quad (7)$$

$$S^* = \frac{FC}{1 - \frac{VC}{S}} \quad (8)$$

where

**FC** – fixed cost

**vc** – variable cost per unit

**S** – sales

**p** – unit price

**VC** – total variable cost

Table 3 shows clearly that if we want to reduce the risk the sale quantity should be over the break-even quantity. We have been found that to achieve at least 2 of the operating leverage value should be double the amount of the break-even sales.

**Table 3.** The effect of the sales and break-even quantities' proportion on the DOL's values

$Q / Q^*$ $Q^* = 100 \%$	DOL
110%	11,00
120%	6,00
130%	4,33
140%	3,50
150%	3,00
160%	2,67
170%	2,43
180%	2,25
190%	2,11
200%	2,00
210%	1,91
220%	1,83
230%	1,77
240%	1,71
250%	1,67

Source: own calculation

To use the Table 4 we can see how the DCL ratio depends on sales quantity and the interest coverage ratio. For example, a company has an interest coverage ratio with value 4 and a 150 % sales quantity to break-even quantity ratio what results a DCL ratio with value 4.5. If the company can increase its sales quantity by 10 % then its net income will increase or decrease with 45 % what depends on current economic situation.

The risk is that we do not know exactly what will be the future economic situation. If the economic situation is favorable we gain 45 % if it is unfavorable we lose the same amount. If a company works close to break-even point its risk can be higher, for example the firm can only achieve 110 % in sales quantity compare to break-even point and it has an interest coverage ratio with value 4, its DCL ratio will be 14.33. The 14.33 value of DCL provides a very high profit growth in case of 10 % sales growing (143.3 %) in good economic situation otherwise it can cause a same amount of loss in a bad economic situation.

## 4 Conclusion

Operating leverage is the responsiveness of the firm's operating income to changes in sales revenues. It arises from the firm's use of fixed operating costs. All types of leverage are two-edged swords. When sales decrease by some percentage, the negative impact upon operating income will be even larger.

A firm employs financial leverage when it finances a portion of its assets with debt. When financial leverage is used, changes in operating income translate into larger changes in earnings. The concept of the degree of financial leverage dwells on the sensitivity of earnings to changes in operating income. The operating income can rise or fall. If it falls, and financial leverage is used, the firm's shareholders endure negative changes in earnings that are larger than the relative decline in operating income. Again, leverage is a two-edged sword.

**Table 4.** The relationship between degree of combined leverage and interest coverage ratio and sale quantities

$Q / Q^*$ $Q^* = 100 \%$	Interest coverage ratio	DOL	DFL	DCL
125%	5	5,00	1,25	6,25
150%	5	3,00	1,50	4,50
175%	5	2,33	1,75	4,08
200%	5	2,00	2,00	4,00
125%	4	5,00	1,25	6,25
150%	4	3,00	1,50	4,50
175%	4	2,33	1,75	4,08
200%	4	2,00	2,00	4,00
125%	3	5,00	1,25	6,25
150%	3	3,00	1,50	4,50
175%	3	2,33	1,75	4,08
200%	3	2,00	2,00	4,00
125%	2	5,00	1,25	6,25
150%	2	3,00	1,50	4,50
175%	2	2,33	1,75	4,08
200%	2	2,00	2,00	4,00

Source: own calculation

Firms use operating and financial leverage in various degrees. The joint use of operating and financial leverage can be measured by computing the degree of combined leverage. This measure allows the financial manager to ascertain the effect on total leverage caused by adding financial leverage on top of operating leverage. Effects can be dramatic, because the degree of combined leverage is the product of the degrees of operating and financial leverage.

The ratios and the relationships between them presented in this paper provide an opportunity for the decision makers to evaluate the impacts of these ratios in case of their companies. Better understanding of the relationships allows the well founded decision-making.

We have been found that a large part of the company problems occurs the increasing in operating leverage and the decline of the financial leverage is the consequence of the previous problem. To understand these ratios in case of agricultural enterprises is more important like other enterprises, because they are more exposed to the risk.

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# Solving of Economic Crisis in Business Management

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**Annotation:** The paper presents the results of research MSM 6215648904 (Brno, 2011) focused on crisis management, which is based on the process of change management by the author-formulated methodology of the creation, implementation and changes of business strategies and requirements for their improvement due to the incidence of a turbulent management environment and other essential factors. The main factors of crisis and methods of their analysis are formulated. Thereinafter, strategies of solving crisis situations are formulated. The company Bioveta, Inc. is analysed in detail. The research has proved that companies with modern management need a well-made and working system of crisis management due to their complexity and risks.

**Key words:** crisis management, algorithm, company life cycle, crisis matrix.

**JEL classification:** M11 – Production Management

## 1 Introduction

As stated by Drucker (2001), no century in the history of mankind has seen as many radical changes as the 20th century. In the publication entitled "Management at the Time of Big Changes", the quoted author publishes the practical experience of companies and particular approaches on how the respective situations can be approached and used in a practical manner. The integration processes characterizing the current state and prospects of changes in Europe and world-wide significantly affect the behaviour of all economies, i. e. including the economy of the Czech Republic as a part of the EU. Other important factors include globalization of the market environment, which penetrates almost all spheres of society.

Hron (2001) states that the basic constant in managing the development of business entities is change, good mastery of which is the basic criterion for evaluating the managerial work of all company managers.

In addition, the economic situation characterized by the development of a crisis that has been occurring gradually in advanced economies world-wide since last year fully confirms the mentioned opinion.

Švejnar stated at the International Economic Forum (Prague 2008) that the first driving force of the mentioned crisis was the United States of America, particularly by relaxing the monetary policy in 2000, then there was a boom in the real estate market, complicated financial instruments, panics and some other problems, bankruptcies of banks and insurance companies, the price of crude oil and food, etc.

The behaviour of business entities also has a significant effect on the development of new information technologies. Gates (1999) states that the digital flow of information enables transforming all kinds and forms of information into a unified digital form and subsequently storing it in any computer, processing and resending it further. This fact is very important in all areas of management as all control processes are decision-making processes, subsequently influencing the processes and control processes while all the mentioned processes are in fact realized through information processes. The company information system should satisfy all the company functions while ensuring them with the necessary amount, structure and quality

of information. These individual functions fulfil the complex of the company operation while the function is understood as a specific activity.

Hron (2006) writes, that knowledge management has become much more a matter of information technologies, and although the discussion on knowledge usually started at the level of strategic management in an enterprise it very quickly moved on towards the area of designing applications, architecture of the knowledge databases, searching for tools, etc. Tichá and Hron (2006) note that the opportunity for learning is greater in a firm with higher knowledge basis than in a firm less well equipped. Hron (2004) deals with the diagnosis of business health. He mentions, that every business grows, develops and dies within its life-cycle, dependent on its relations with the external and internal environment. Rössing (2005) deal with the ways how to manage and control ongoing processes in the Enterprise.

Also Tomšík (2004) and Tomšík, Minařík and Somerlíková (2008) are concerned with diagnostics of business health and finds, that the resulting diagnosis determined by diagnostic methods has to help to reach the goals, which – based on the activities of the business – lead to generation of an appropriate reaction to the identified status of the diagnosed business.

The quality of managerial decision-making depends on a number of factors that undergo dynamic changes and the task of good managers is to affect the changes successfully in the direction of properly set objectives. Inadequate reaction to any of the important factors of the external or internal business environment may lead to the occurrence of a partial or more comprehensive crisis situation. Chiu and Kwan (2010) deal with the role of culture in creativity and explain the role of culture at each stage of knowledge creation.

## **2 Materials and Methods**

The objective of the present scientific contribution is to publish the results of the author's research, MSM 6215648904 (Brno, 2011), in which the subject of the analysis is the area of decision-making of the company management in selected companies during their life cycle while stating circumstances which can lead to crisis situations in the company management. One of the tasks of the performed analyses is the timely reaction of the company management, which makes it possible for it to reduce the impacts of possible crises significantly, or to prevent a coming crisis. The published results have a methodological character and they state the formulation of an algorithm of monitoring the causes of a crisis with possibilities of their solution by the company management. The analysis is carried out according to the approach formulated by Svoboda (2002 and 2006) and Svoboda, Bittner, and Svoboda (2006): the application of which relates to almost all phases of the company life cycle in which crises may occur. The contribution states the causes of the occurrence of crisis situations in analyzed business entities, in the area of economic, financial and accounting activities with possibilities for their solution using the principles of crisis management with application of the principles of knowledge management.

Methods of strategic decision-making, controlled dialogue, methods of management environment analysis, economic and financial analyses and in particular, methods of crisis management application were used with the focus on the markets in the Czech Republic and the EU and on international markets. The analyzed companies represent medium-sized business entities with a more extensive scope of business and equipped with modern technical means of control that are necessary for carrying out individual kinds of financial and economic analyses, specifically in connection with analyses of management and marketing. Bioveta, a.s. in Ivanovice na Hané is analyzed in detail. Bioveta, Inc. Ivanovice to Hana is very active in research, development and using of new methods of treatment and application of new medical and veterinary products. It is also active in making projects which are supported by EU-funds. With EU support was also built a new Bioveta Training Centre for new research program. Bioveta got in 2011 AA credit ratings (excellent), i.e. stable

company with very good return of investments and low credit risk. Within the quality evaluation of products is Bioveta included among most stable 100 Czech firms – its products are exported to more than 70 countries around the world - it guarantees to the company high commercial and financial stability and good image.

During the research analyses were carried out, specifically PEST analyses, the EFE analysis (External Factor Evaluation Matrix), IFE (Internal Factor Evaluation Matrix) and BCG and SPACE analyses, the results of which form the basis for crisis management. The analysis of the Boston Consulting Group and the related SPACE analysis, which evaluate the position of the respective company on individual markets were realized from 1998 to 2009. In this contribution, the results from 1998 to the end of 2009 are specified.

### **3 Results and Discussion**

Due to the limited scope of this contribution we will present the results of the BCG analysis, the SPACE analysis and the analysis according to Miles - Snow and their context will be provided.

BCG monitors the market according to two basic parameters, specifically with regards to the market growth and market share of the analyzed company. These two dimensions make it possible to formulate a relations matrix with four quadrants. The results of the BCG for the given time period are given in Table No. 1.

The SPACE analysis evaluates the company's position on the market with regards to the field environment when it correlates the basic factors of changes in the field and on the other hand, the prerequisites and changes in the decision-making factors on the company level. These data are stated in Table No. 2. Thus the mutual relationships of selected decision-making factors of the strategic position on the market are shown. From the performed BCG analysis, the general positive trend in the product portfolio is apparent in individual quadrants even though relatively high annual fluctuations are obvious, to which the company management must react by its measures and it must coordinate them.

It is obvious from the changes in the percentage representation of products in individual quadrants that it is rather beneficial for the analyzed company, as most products belong to quadrants I to III. It is also obvious from the results of the analysis that the company is applying the strategy of innovation of its products well, shown in quadrant II at the beginning of its implementation into practice. The data in this quadrant were growing in time until 2005 when a decline to 29.7% was noticed. In the following period, the share was also increased to 34,2 %, specifically in 2009. Those crucial for the volume of sales and satisfaction of clients are the products in quadrant I. These are products that are suitably located on the emerging market. It is apparent that the company applies the strategy of diversification well, which can be noticed in the growth of representation on the market - growth in quadrants I to III. Quadrant IV informs the company management about representation of the products that are not successful on the market and therefore are not economically beneficial for the company. Significant and positive reduction of products in the quadrant was the result of good use of the application of stock management with the system of managers' motivation depending on the volume of required stock of ready-made products. Fluctuation occurred only in 2005 and 2006 due to the growth of competition particularly on the EU markets.

**Table 1.** Representation of products according to the BCG analysis (in %)

Year	Quadrant			
	I	II	III	IV
1998	38.1	24.0	25.7	12.2
1999	43.4	27.5	27.0	2.1
2000	34.5	31.0	30.0	4.5
2001	32.1	34.2	26.0	7.7
2002	27.2	34.5	22.1	16.2
2003	45.1	34.0	18.2	2.7
2004	38.7	35.1	17.9	8.3
2005	32.1	29.7	26.8	11.4
2006	34.1	30.1	24.5	11.3
2007	42.1	29.9	24.6	3.4
2008	39.2	31.1	23.3	6.4
2009	40,1	34,2	20,6	5,1

*Source: Svoboda (2011)*

The SPACE analysis supplements the previous conclusions and its summary results show that the field of sale of veterinary biological preparations and pharmaceuticals is relatively stable, but with high dynamics of change in the sale of individual products. The results in the monitored timeline are obvious from Table 2.

**Table 2.** Results of the SPACE analysis (points)

Year	Characteristics of the field		Characteristics of the company	
	Degree of attractiveness	Stability	Financial strength	Competitive advantage
	(1)	(2)	(3)	(4)
1998	3.2	3.5	4.7	4.9
1999	3.7	3.6	4.9	5.1
2000	4.2	4.0	5.2	5.0
2001	3.9	4.0	5.2	4.9
2002	4.3	3.9	5.7	5.3
2003	4.4	4.0	6.0	5.4
2004	4.2	3.9	5.4	5.5
2005	4.4	3.7	5.2	5.2
2006	4.4	3.8	5.3	5.7
2007	4.2	3.9	5.5	5.6
2008	4.5	3.9	5.6	5.6
2009	4,8	4,0	5,6	5,7

*Source: Svoboda (2011)*

As shown in Table 2, the financial strength of the company grew significantly in the monitored period, evaluated by the point scale, from 4.7 points to 5.6 points. Its highest value was reached in 2003, specifically 6.0. It was reduced in 2004 mainly due to the effect of preliminary problems in the entrance to new markets. The competitive advantage of the company was also improved as its initial value was 4.9 points and the value in 2009 was 5.7 points. With regards to business in the field of the production of pharmaceuticals and organic preparations it can be evaluated as stable, with initial values of 3.5 points and current values of 4.0 points. In addition, the level of attractiveness has been a good opportunity for the company the entire time. The initial value was 3.2 points and the current value is 4.8 points. The selected values characterize the selected markets and they are average values.

We will further state selected data of the market evaluation according to Miles - Snow, together with the experience of the management of the analyzed company on individual markets.

If we notice the characteristics of individual markets with regards to the Bioveta offer, we can state that the company always has a wide portfolio of products on domestic and foreign markets. In addition, behaviour on individual markets is adapted to the particular conditions. The protective approach (1) may be applied by the company on the Czech market only, specifically for products that it receives as a public order. In 2009 it is much more difficult to receive these orders. The prospecting approach (2) is, used particularly for entrance to foreign markets. This approach is usually combined with the analyzing approach (3). On Czech and foreign markets, the reacting approach is also used, in particular for products with high competitiveness or for products that are pushed aside by, more up-to-date and more effective preparations.

The experience of the company's TOP management shows very different characteristics, particularly on foreign markets. Veterinary pharmaceuticals and organic preparations in the current EU are characterized by compliance with all the rules with high administrative demands, particularly in the registration of individual products on these markets. The main representative of the markets for Bioveta is the German markets. These markets can also be characterized by good payment ethics and compliance with business rules.

The Asian markets can be briefly characterized by an easier entrance to the market compared to the EU, a wide portfolio of products and high competition, which is demonstrated by pressure on low prices. The other important sign is the high risk in the payment ethics of the companies. The requirements for the quality of products are standard, i.e. the quality is lower compared to the EU. The markets in South America and other countries on the continent have the specific and high competitive strength of American and Mexican companies. Some conclusions correspond with the findings of Simonton and Ting (2010) and Morris and Leung (2010).

Strong specifics can be noticed on the markets of Belarus and Russia. In particular, there are few clearly defined business rules, non-standard measures are used, business is mostly realized through agents.

Due to the effects of the world economic crisis it has been necessary for Bioveta to reduce its business contacts on the markets of the Ukraine and all the Baltic states significantly due to their poor solvency.

The current situation of the analyzed company on individual foreign markets with the exception of the mentioned states can be evaluated as good, as the financial strength of the company is growing significantly and the company is gradually managing to penetrate new markets. It is obvious from the performed analyses that this is due to two groups of factors. The first group includes top-quality products and flexible price strategies on individual

markets and the stabilization of prices or their slight decline. The second group of factors includes application of the fundamentality strategy in costs, which creates the basis for setting adequate prices for individual products compared to the competition. The price relations for individual products are monitored by the analysis of a complex value index, which makes it possible to reflect changes in sales for the products sold, due to changes in the amount of products and price effects. The company creates good prerequisites for achieving profit in all company products.

One very important factor in the whole analyzed range is good orientation of the company toward the requirements of clients and market segmentation. Since 1990 there has been a significant decline in the number of livestock in the Czech Republic and a related reduction of the demand of agricultural companies for veterinary products, thus there was also a decline in the sales of Bioveta. In connection with the current development of the purchase prices of animal products we can expect that there will be a further reduction in the number of milk cows and pigs. This will reduce the need for veterinary preparations and their sale by Bioveta. The mentioned problem was gradually handled in the past by two groups of measures, specifically by extending the assortment of products and moving to "Hobby Programmes" for pets, i. e. for dogs and cats, for the domestic and foreign markets. The second measure monitored the significant expansion of all requested products of Bioveta on foreign markets. Both measures mentioned will have to be perfected and continued.

We can say that company management during a crisis can be regarded as a state when a company does not fulfil some of the long-term objectives, i. e. there is a partial crisis, or there are more long-term objectives that are not met; then it is a deeper or general crisis. Therefore, a crisis can have a partial or a comprehensive character.

The procedure that makes it possible to predict a crisis or to deal with it can be divided into three stages, specifically the analysis of the degree of risk (1), formulation of a crisis strategy with specification of the degree of risk, or the elimination (2) or realization of a crisis strategy, i. e. the reduction or removal of the cause of the crisis (3). The analysis of the degree of danger builds on the process of strategic decision-making, specifically on the methods of the management environment analysis. Based on the methods, individual factors are formulated with the probability of their occurrence, from the internal and external management environments. We will create a crisis matrix by classifying the factors above with the probability of their occurrence and their classification from highest to lowest and with parallel definition of the impacts that the crisis causes. By analyzing the crisis matrix we will define the crisis strategy, i. e. we will specify the measures and the process of elimination or removal of the crisis. It is obvious from the facts above that there can be four basic combinations of the probability of occurrence of a crisis with a definition of their impacts: high probability of occurrence of danger with above-average to significant economic impacts (I), high probability of the occurrence of risk with below-average to minor impacts (II), medium to minor probability of the occurrence of risk with significant economic impacts (III), medium to minor probability of the occurrence of risk with minor economic impacts (IV). The mentioned alternatives are obvious from Figure 1.

Drafting a crisis matrix is a guideline for the possible solution of a crisis. Situations I and III require the elimination of possible sources of the crisis, either by not including the respective activity, elimination of the activity by termination, or by formulating an alternative solution. Situation II requires either the elimination of the respective activity or looking for an alternative solution to the respective problem and situation IV enables solving a crisis with an alternative or using common measures. After determining the crisis strategy, a plan can be set in the case of the occurrence of a crisis, the realization of which can eliminate or solve the crisis. The data from the crisis matrix serve for detailed drafting of a risk map, including all the areas of the company activity. The results of the paper are applied in practice by the analyzed business entities.

	I	Significant	Low
Danger →	P 1 Significant 2 3 · ·	I	II
Weaknesses →	· · · · · Low m	III	IV

**Fig. 1.** Crisis Matrix (*P* - probability of occurrence, *I*- impacts incurred )

The ascertained results correspond to the works of some authors. These include in particular Hron (2006), Gozora (2001), Šimo (2000), Švejnar (2008), Šulěř (1995), Tomšík (2004), Whitelay (1994) and Zuzák (2008). The quoted authors put significant emphasis on managerial work, developing business activities and effective application of the marketing activity in company management.

## 4 Conclusion

As is obvious from the performed analysis, if a company wants to be successful in growing competition, it must strive to obtain valuable information about the management environment and the other facts it will get from performing managerial, marketing, economic and financial analyses. We can state that a well-run economy puts new and important demands on strategic decision-making of a company's management with the application of the methods of crisis management. This regards preference of the following requirements:

- Application of the system of a governmental recommendation to eliminate the effects of the financial and economic crisis in practice,
- Adequate reaction of the company management to the changing environment, in particular the external environment with the necessary degree of creativity and respecting the clients' requirements,
- Application of modern methods of decision-making with a well-operating company information system using modern information technologies with good awareness in the area of strategic decision-making and with the application of suitable systems of the motivation of the managers and all the company employees,
- In the case of problems in fulfilling the fundamental company objectives, timely application of the recommended and applied methods of crisis management.

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# Liquidity Management of Agricultural Enterprises

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**Annotation:** Importance of dealing with the risk and the liquidity has been extended since the economic and financial crisis was started in 2008. We believe that the liquidity management and counterparty risk are in generally the two biggest problems of the corporate finance at present. We also know that the agricultural enterprises have greater exposure to risk than other industry of the economy. This risk exposure has serious consequences for income generation and loan repayment capacity of these enterprises. We deal with several aspects of liquidity measurement and working capital management of agricultural enterprises in our paper. An effective liquidity and working capital management can provide a strategic advantage especially in difficult economic times. We found during our researches of corporate financing that the traditional liquidity ratios do not give an accurate picture of the enterprise liquidity position, and therefore it is necessary to adjust them. The problems in the calculation of the traditional liquidity ratios are caused thereby they do not take into account the turnover ratio of the current assets and the current liabilities. An other important financial indicator closely related to liquidity is the cash conversion cycle what should also adjust in order to measure more accurately. The adjusted ratios using for the business analysis provide a more accurate picture of the current company's financial position for the stakeholders, while the traditional ratios under- or overvalue it. Using the new ratios will support the firms' risk assessment a lot better. The ratios above mentioned were using for analysis of agricultural enterprises.

**Key words:** working capital, financial ratios, liquidity management, cash conversion cycle, agricultural enterprises, risk assessment

**JEL classification:** G31, G32, Q14

## 1 Introduction

The consequence of the economic crisis, the access of the external financing resources was narrowed significantly and lenders had become more cautious. The aspect is why the ratios presented in the study, the firms should be addressed much more thoroughly than ever before to have a much better understanding their situation, to recognize the sources of internal funding opportunities, and to use more efficiently the available internal resources.

Firms are viewed as ongoing entities, whose project completion may require renewed injections of liquidity. There are three dimensions of corporate financing: (1) liquidity management, (b) risk management, and (c) capital structure. (*Holmström-Tirole, 2000*) The firms from around the world use credits and cash to provide their corporate liquidity. However it should be noted that cash provides unconditional liquidity available at any time, whereas credits provide conditional liquidity because they are depends on the borrower's decision. (*Lins et al., 2010*)

Financial distress is recognized as a driving force behind many corporate decisions. However, there is little understanding of the roles and relations between corporate illiquidity and insolvency - the two sources of financial distress. (*Gryglewicz, 2011*) In this paper, we deal only with liquidity.

Liquidity is a complex concept defined by multiple factors, which are used by different ways. *Crockett (2009)* wrote in his study: „Liquidity is easier to recognize than to define.” Basically, the terms of liquidity means how easy we can generate cash from assets. Liquidity is not depending on simply on objective, exogenous factors, but it is crucially influenced by

endogenous ones, especially the reactions in contrast to uncertainty and asset value changes. However, analysts need to know the relationships which are among the ratios to provide accurate information for the leaders of the firm. In each case the information communication must be such as to enhance the company's knowledge of firms' leaders and to contribute to the increasing of organizational knowledge. (*Palepu et al., 2004*)

As we move into the 21st century and concern about our environment grows, there is an obvious move towards more sustainable farming. Sustainable farming is concerned with anything that affects the sustainability of a farm. (*Mason, 2003*) Sustainable agriculture can be seen in many different lights. Some managers see sustainable agriculture as a shrewd business decision, to ensure the longevity of the business enterprise. Liquidity needs to be maintained within the enterprise. Profitability decreases what means that surplus money is no longer available for improvements. If the farming is not profitable, it may not be sustainable. Perhaps the most important decision of a farmer to decide what and how to grow. (*Mason, 2003*) Sustainability in agricultural systems addresses many wider ecological, economic and social and political dimensions. In case of agricultural systems, the financial capital is more of an accounting concept, it serves as a facilitating role rather than as a source of productivity of itself. (*Pretty, 2008*)

This paper contains the partial results of the project "Performance indicators of agricultural enterprises in Hajdu-Bihar county" started in September 2010. As a first step, we investigate the agricultural enterprises whose main activity is crop production and revenues are excess of 50 million forints. During the investigation we want to choose those indicators which provide an opportunity to develop a simple model what allows for the agricultural enterprises to define their own performance. We present the liquidity ratios and their corrections in our paper, because we found that the traditional liquidity ratios often do not give a proper picture of the enterprises' financial situation. In frame of the research we use various statistical methods to explore the relationships between the different ratios. To explore the relationships we use traditional "frequentist" and Bayesian statistical methods. In this study we are only dealing with some financial ratios due the paper's page limitation.

## **2 Materials and Methods**

The data for analysis are essentially from the financial reports of the county's agricultural enterprises: from the balance sheets, the income statements and the notes. There are 71 agricultural enterprises dealing with crop production in the county Hajdú-Bihar, what we could be included in the investigation. There are five companies from which more detailed data are available. Using the available corporate data we calculated several financial ratios. The liquidity indicators and their corrections were calculated for each county firm with which we can only be drawn conclusions for the county enterprises. In case of operating and financial cycle we could only calculate the traditional ratios because the corrections need data what are not in companies' the financial reports. We could only calculate these latter ratios in case of five enterprises from what we have more detailed data.

### **2.1 Correction of liquidity ratios**

Many companies still underestimate the importance of working capital management. To ensure the appropriate level of internal resources the company's activity is continuous financing closely related to the working capital management. The other reason is why the working capital management coming into view - which is linked to the previous one - that longer and longer payment periods have emerged in the corporate sales, in point of fact there is a significant increase in commercial lending period, the companies must be able to finance this period. The working capital is essential for companies to determine their short-term financial positions. (*Preve et al., 2010*). A significant change in working capital provides

important information to the company's various stakeholders, and this is especially true for the net working capital. The working capital analysis is one way the company's creditability evaluation, and helps also to better understand the company's normal business cycle.

The term working capital refers to a firm's short-term assets, ie current assets. Managing the firm's working capital is a day-to-day activity that ensures that the firm has sufficient resources to continue its operations. (Ross et al., 2007) Net working capital is equal current assets less current liabilities. Thus, net working capital compares the amount of current assets to the current liabilities. (Keown et al., 2005) The goal of working capital management is to ensure that a firm is able to continue its operations and that it has sufficient ability to satisfy both maturing short-term debt and upcoming operational expenses. Implementing an effective working capital management system is an excellent way for many companies to improve their earnings. The two main aspects of working capital management are ratio analysis and management of individual components of working capital.

## 2.2 Modification of liquidity ratios

Liquidity analysis is the process of measuring a company's ability to meet its maturing obligations. Liquidity measurements are designed to provide information about the paying ability and financial flexibility of the firms. In finance, this term is used in respect to several assets that can be converted into cash at fair market price without loss. (Chofaras, 2002)

The traditional liquidity ratios do not sufficiently take into account that how long the assets or liabilities are hold in firm's operations. However, the length of holding or turnover period has a significant impact on how quickly the company can meet the payment obligations, or changes the value of liquidity ratios. To solve this problem will be adjusted certain components of the current assets and current liabilities, and we determine the liquidity ratios using these adjusted values. The balance sheet items used to the liquidity calculation are adjusted to take account, in the case of current assets and current liabilities how much time spend the given assets in the company's operating cycle, what is ignored by traditional liquidity ratios. (Gangadhar, 2003) In case of each adjusted assets and liabilities we have to calculate the correction factors:

$$\text{correction factor} = 1 - \frac{1}{\text{turnover ratio of assets or liabilities}} \quad (1)$$

The appropriate balance sheet item must be multiplied by the calculated factors, and so we get the adjusted liquidity values. The inventories and receivables will be only adjusted amongst the current assets. The bill (trade acceptance) obligations and the long-term debt part reclassified for the current year should not be adjusted amongst the short-term liabilities. After completing the corrections, the adjusted liquidity ratios are calculated using the adjusted values of current assets and current liabilities:

$$\text{adjusted current ratio} = \frac{\text{adjusted current assets}}{\text{adjusted current liabilities}} \quad (2)$$

The company can increase the value of its liquidity ratio to achieve a growth in receivables and inventories, and to reduce the turnover ratio of its current liabilities, ie to improve an efficiency of its asset and resource management. The value of adjusted current ratio can be higher or lower than the traditional current ratio. However, if the company effectively manages its current assets and current liabilities, then the adjusted current ratio value will be higher than the traditional current ratio. (Gangadhar, 2003) Using the adjusted current assets and current liabilities we can calculate the other liquidity ratios such as quick ratio and cash ratio. However, it should also be noted that these ratios are statics and they do not measure the company's cash flow generating capability.

## 2.3 Modification of cash conversion cycle

The liquidity ratios are very closely related to the cash conversion cycle, since its main components are the inventory turnover period, the receivable turnover period and the payable turnover period.

It is the weakness of the traditional cash conversion cycle not to be adequately express the conversion period days in the net working capital requirement given in cash. In addition, it does not adequately distinguish between cash and credit sales, which can cause problems, ie. if two companies have the same receivable period, but they have different proportions of credit sales. The traditional cash conversion cycle model does not deal the profitability impact on the liquidity. Because the profit is a surplus resource what covers the liabilities therefore the profitability takes actually as a support factor of corporate liquidity. To determine the net working capital given in cash to be build in the „gross return on sales” and the "credit sales/total sales" ratios in the cash conversion cycle model. The net working capital what was determined in this way is necessary to the firm's operation.

The determination of the modified ratios

$$\text{modified inventory turnover period} = \text{inventory turnover period} * (1 - \text{gross return on sales}) \quad (3)$$

$$\text{modified receivable turnover period} = \text{receivable turnover period} * \text{proportion of credit sales} \quad (4)$$

As the gross return on sales is increasing, so is decreasing the operating working capital requirement. The cash flow difference between the beginning and end of the cash conversion cycle is the direct link to the profitability. This means that the more profitable business creates more cash flow from its operations.

## 3 Results

### 3.1 Modified liquidity ratios

We present the current ratios before and after the modification on the Figure 1. which shows how changed the ratio values. We can see that the distribution of the values changed significantly. The values are concentrated in a narrow interval.

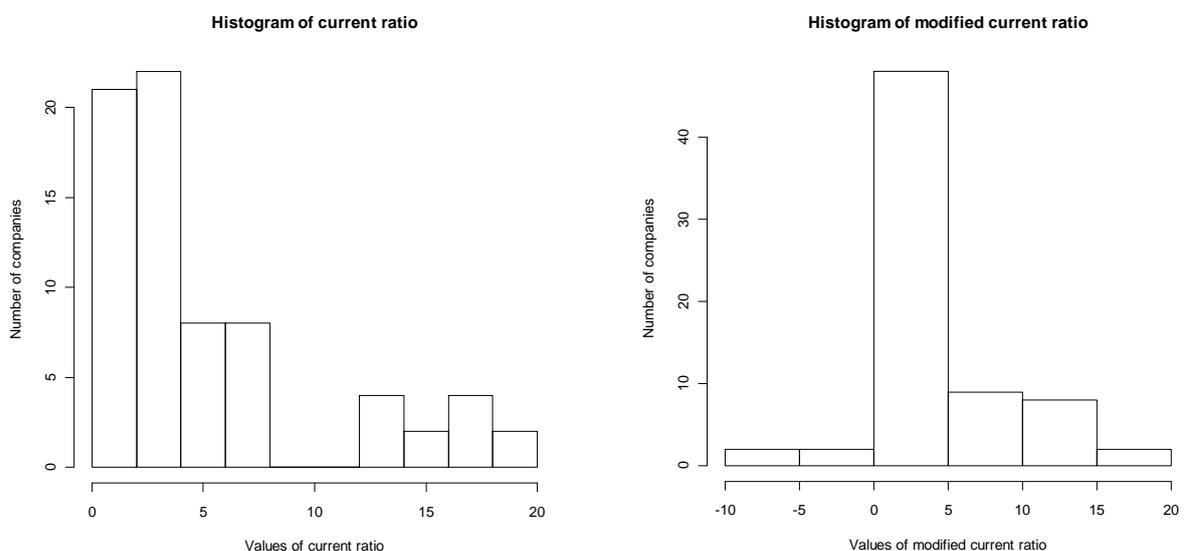
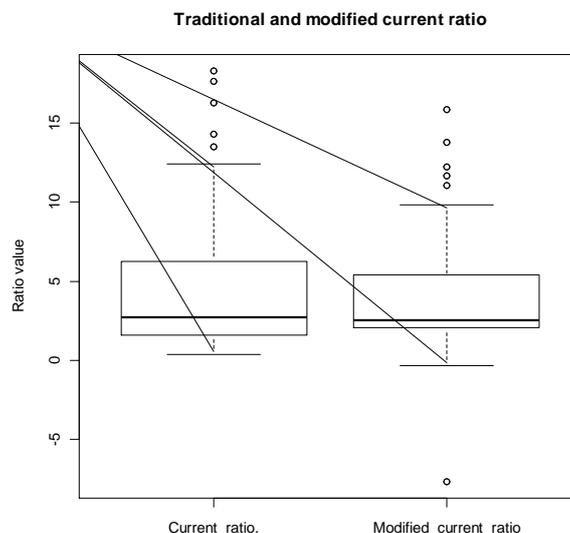


Fig. 1. Histograms of traditional and modified current ratios (2009)

The boxplot diagram on Figure 2. shows the followings:

- decreasing in maximum value and upper quartile,
- very little change in median , lower quartile and minimum value
- smaller interquartile range.



**Fig. 2.** Bloxplot diagram of current ratios (2009)

The boxplot diagram of Figure 2. indicates the concentration of ratio values. The changes in the liquidity indicators depend on the management efficiency of the current assets.

The calculations were performed in case of 71 companies, but we present only two extreme examples in details. The most of the analysed cases the direction of changes is very different, there are years with an increasing values and there are years with decreasing ones.

We present the changes of an agricultural enterprise's liquidity ratios in Table 1. The Table 1 shows that the values of liquidity ratios have improved in case of this agricultural company every year. There is a significant improvement in the level of cash ratio which is similar for all companies with relatively high levels of cash and/or short-term securities, because they are not adjusted.

**Table 1.** Changing of liquidity ratios in case of Agricultural Company “AGRO-FÖLDES”

Title	2007	2008	2009
Inventory turnover ratio	2,34	2,36	2,91
Adjusting factor	0,5732	0,5763	0,6564
Receivables turnover ratio	6,95	8,39	3,97
Adjusting factor	0,8561	0,8809	0,7479
Turnover ratio of current liabilities	2,93	1,87	2,17
Adjusting factor	0,6584	0,4665	0,5393
<b>Current assets</b>	<b>1 101 777</b>	<b>1 328 662</b>	<b>1 150 028</b>
<i>Adjusted current assets</i>	<i>749 084</i>	<i>963 321</i>	<i>843 551</i>
<b>Current liabilities</b>	<b>593 861</b>	<b>1 005 973</b>	<b>777 497</b>
<i>Adjusted current liabilities</i>	<i>391 020</i>	<i>469 308</i>	<i>419 267</i>
Current ratio	1,8553	1,3208	1,4791
Adjusted current ratio	1,9157	2,0526	2,0120
Quick ratio	0,6058	0,5265	0,7333
Adjusted quick ratio	0,8279	1,0715	1,1042
Cash ratio	0,1844	0,3032	0,1863
Adjusted cash ratio	1,1821	1,4283	1,0764

We present the changes of the second agricultural enterprise's liquidity ratios in Table 2. The Table 2 shows that the liquidity ratios have improved except the first year. The level of cash

ratio has not improved to such an extent in the second case, as in the first. However, we can conclude from the results of Table 2 that the value of quick ratio was significantly improved after the correction. The overall conclusion is that the adjustment has an effect on liquidity ratios, and they were mostly improved.

**Table 2.** Changing of liquidity ratios in case of Agricultural Company „Agrárgazdaság“

Title	2006	2007	2008	2009
Inventory turnover ratio	1,67	1,45	1,33	1,51
Adjusting factor	0,3997	0,3092	0,2477	0,3391
Receivables turnover ratio	4,45	2,45	2,89	3,26
Adjusting factor	0,7752	0,5921	0,6545	0,6937
Turnover ratio of current liabilities	2,21	1,43	1,56	1,62
Adjusting factor	0,5471	0,2987	0,3599	0,3828
<b>Current assets</b>	<b>1 321 971</b>	<b>1 563 585</b>	<b>1 741 665</b>	<b>1 874 798</b>
<i>Adjusted current assets</i>	701 791	663 823	689 002	854 874
<b>Current liabilities</b>	<b>683 516</b>	<b>980 482</b>	<b>983 183</b>	<b>1 186 433</b>
<i>Adjusted current liabilities</i>	<i>373 973</i>	<i>292 867</i>	<i>353 850</i>	<i>454 182</i>
Current ratio	1,9341	1,5947	1,7715	1,5802
Adjusted current ratio	1,8766	2,2666	1,9472	1,8822
Quick ratio	0,6085	0,6097	0,5961	0,5094
Adjusted quick ratio	0,9082	1,2469	1,1383	0,9336
Cash ratio	0,1121	0,0281	0,0564	0,0132
Adjusted cash ratio	0,2049	0,0939	0,1568	0,0344

### 3.2 Modified cash conversion cycle

We can see in Table 3 that both operating and cash cycle are decreased, for example there was a more than 20% decreasing in 2008. A high scale of change has already altered the position of the company's judgement. The cash conversion cycle was negative in 2008, which means that the firm's payable turnover period is greater than its operating cycle, ie the firm has its suppliers and creditors to finance himself. Whereas the company's short-term loans make up 40 % of current liabilities, therefore the firm was financed by its suppliers.

**Table 3.** Modified cash conversion cycle of Agricultural Company “AGRO-FÖLDES”

Title	2007	2008	2009
Inventory turnover period	156	155	125
Receivable turnover period	53	43	92
<b>Operating cycle</b>	<b>209</b>	<b>198</b>	<b>217</b>
Payable turnover period	125	195	168
<b>Cash cycle</b>	<b>84</b>	<b>3</b>	<b>49</b>
Gross return on sales	2,63%	8,63%	2,53%
Modified inventory turnover period	152	141	122
Credit sales ratio	85%	78%	83%
Modified receivable turnover period	45	34	76
<b>Modified operating cycle</b>	<b>196</b>	<b>175</b>	<b>199</b>
<b>Modified cash cycle</b>	<b>71</b>	<b>-20</b>	<b>31</b>

**Table 4.** Modified cash conversion cycle of Agricultural Company „Agrárgazdaság“

Title	2007	2008	2009	2009
Inventory turnover period	219	252	275	241
Receivable turnover period	82	149	126	112
<b>Operating cycle</b>	<b>301</b>	<b>401</b>	<b>401</b>	<b>353</b>
Payable turnover period	165	256	234	225
<b>Cash cycle</b>	<b>136</b>	<b>145</b>	<b>167</b>	<b>128</b>
Gross return on sales	-15,29%	-33,72%	-28,22%	-22,32%
Modified inventory turnover period	253	337	352	295
Credit sales ratio	80%	83%	85%	81%
Modified receivable turnover period	66	124	107	91
<b>Modified operating cycle</b>	<b>318</b>	<b>461</b>	<b>459</b>	<b>386</b>
<b>Modified cash cycle</b>	<b>153</b>	<b>205</b>	<b>226</b>	<b>160</b>

## 4 Conclusions

Working capital management almost always determines the ability of a firm to earn profit. Efficiency with which a firm handles working capital ensures prosperity while neglect would spell danger for the survival of the firm. The managerial decision-making is needed to accurate ratios what describe the current situation of the firm, and they are also suitable for forecasting.

The traditional liquidity ratios, if we do not take into account the turnover periods, under- or overestimate the actual payment capability of the company. Incorrect liquidity values may lead to inappropriate management decisions. A similar situation exists in relation to the cash conversion cycle as well. The cash conversion cycle is the net time interval between the expenditure of cash in paying the liabilities and the receipt of cash from collection of receivables. It is often a more accurate measure of overall liquidity than current ratio. The modified cash conversion cycle also shows that more resources will be used for enterprises non-operational purposes as if we make the calculation with the traditional cash conversion cycle. It is also shown that the increase in "credit sales proportion ratio" results an additional increase in net working capital demand, which is clearly follows from the fact that the ratio represents an increasing debt and sales levels. With the application of the presented ratios we get more opportunity to explore and analyze the financial situation.

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# Formation of Regional Associations of Wine Producers in the Czech Republic

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**Annotation:** This paper describes the main reasons for the formation of new regional associations of wineries, whose aim is to capture the concept of regional typicalness trend in the wine region of Moravia in the southeast part of the Czech Republic. This research aim is to create a plan for new development of such associations on the basis of results of localization factors. There coefficient of localization is used for identification of cluster. New method is to use a concentration factor, which is concentration of vineyards in the associations. Results are compared with already operating on associations for the appellation in Austria DAC. They were traced changes in consumer preferences in the Czech wine market. Consumers are placing more emphasis on the selection of wine on its descent from a particular area, growing community and the individual grower. The dynamic development of the wine category, major changes in market and consumer demand are the main causes for the formation of associations of small and medium-sized wineries. This paper specifically introduces new associations for appellation system VOC. This alliance is described in the context of the establishment, operation, development and expansion, respectively the possibility of involvement of additional organizations suppliers and research institutions. Based on the experience of newly emerging VOC system of appellations was setting up a plan of formation association with the proposed methodological approach. Open cooperation between associations VOC appellation and other entities involving suppliers, customers, research institutions and universities has the possibility of creating an institutionalized wine cluster. Some practical experience of the new members of wine clubs mentioned in this paper may find applications in other wine regions.

**Key words:** association, cluster, DAC, demand development, VOC, wine origin

**JEL classification:** L66

## 1 Introduction

Viticulture and wine industry in the Czech Republic has undergone over the last twenty years extensive reform and has experienced a significant shift from the quantitative orientation of production towards high quality. Cooperation winemakers and wineries, significantly contributed to positive changes and the overall transformation. In recent years, there is a whole new kind of regional associations, based on the guarantee of origin of a particular wine in a region.

The research project is to propose a plan for the formation of regional associations with system for appellations - *Vina Originální Certifikace (VOC)* with the methodical process of formation. Research work was also conducted to determine whether the newly founded association and cooperation associated companies may create a potential for the establishment of the cluster. The paper will present the most important forms of cooperation in wine-growers and winemakers in the world, which can serve as a source of inspiration for the growing cluster initiatives in the Czech Republic. Operation of regional associations, which are based on certification and appellation system, will be described in more detail based on a research in Austria in the system for appellations – *Districtus Austriae Controllatus (DAC)*.

The formation of a regional association of wine producers is a strategic business decisions, leading to a strengthening effect on the negotiating dynamics in the industry.

Analysis of the industry is made in structure by vineyards, grape production, wine production and consumption. The tool to achieve the goals of this work is needed in research on the causes of the new regional association of wine producers in the Czech Republic and cooperation processes.

The aim of the conclusions of this research project is the expression of specific practical recommendations that are useful for wine producers and a proposal for a methodological procedure for formation an association of undertakings.

Research studies dealing with the theory of agglomeration of economic activity appear as early as the authors of the Marshall (1890) to Porter (1990, 1998) and subsequently by others.

The dynamic development of the wine industry in the so-called *New Wine World* has brought many scientific studies on wine clusters. Porter (1990) was the first in his work using the concept of cluster in the context of wine production, namely on the basis of research work related to wine producers in California, specifically in the Napa and Sonoma Valley. There was started a regional research activities to study winemaking. Before wine from California in the eighties of the last century broke on the export to all over the world, wine production has undergone great development in quality and quantity. This development has attracted some new producers to enter into this industry and also caused the development of other related industries such as wine tourism. California wine cluster is Porter (1998) given as an excellent example to explain the notion of cluster.

Australian wine is now at the forefront of a changing global wine market with a tradition dedicated to intensive research and innovation. The success of the organization and development of the Australian viticulture and winemaking, as the literary sources suggest, is currently associated with that cluster. Ditter (2005) even uses the entire walkthrough of the rapid development of Australian winery concept of meta-cluster or super-cluster. Australia is too large, so there can be only one cluster of wine, but wine as a whole has successfully cooperated with a common strategy for the sole purpose of export-quality wines. Aylward and Glynn (2006) describe the differences in the two types of Australian wine clusters. South Australian cluster, which can be described as innovative and organizational type cluster in Victoria and New South Wales

Ditter (2005) indicates that the impact of globalization in the wine category in the nineties of 20<sup>th</sup> century meant a major crisis for the traditional model of production and labeling wines based on the guarantee of origin *Appellation d'origine contrôlée (AOC)*. These wines have a high added value in a typical product in limited quantities through a combination of a defined area of origin, the so-called terroir and yield, which is due to restrictive requirements and regulations. On the other hand, French wine growers face competition from *the New World Wine*, the model simply by marking the most preferred varieties, and only the zone or country of origin. Their model of production and trade is based on a combination of industrialized mass production and intensive marketing of relatively standardized products that are very identifiable. Bergouignan (2010) indicates that wine cluster initiatives in France revived in 2009, but already the main focus of cooperation towards the cluster's potential research and development, based on the experience and inspiration taken from the countries of *the New Wine World*.

In recent years, there have been many researchers who focused on wine production and wine consumption in the Czech Republic, e.g. Tomšík, et al. (2006); Janda, Mikolášek, Netuka (2010). There are also publishing researchers, who engaged in the initiatives of local/regional farmers which joint together to market, e.g. Lošťák, Kučerová and Zagata (2006).

## 2 Materials and Methods

To determine the work is based on data from the cultivation of grapes and wine production together in the Czech Republic. In defining the categories of wine on the labor market comes from the fact that the group is composed of wines, both from domestic production, as well as wines imported from the European Union and third countries. The main objective of this work is needed to gather available information on the details of viticulture and the wine market and on this basis to analyze the sector. Analysis of the sources can be divided for two types of data: published data and data gathered through interviews with operators and industry observers. The paper describes the basic features of the season within the last ten years. Trend analysis is made by determining the function of time using the method of least squares. Researched time points are usually equidistant. Before collecting the data was compiled from the practice schedule (based on the model by Porter, 1990) possible and available resources.

For the analysis of the newly established regional wine-producers associations was used the structured interview, in which the required information is obtained in a direct interaction with the respondent. Interviews were done directly with the respondent. Selection of respondents focused on the initiators and founding members of the regional association of wine producers in the Czech Republic, an association of wine with the original certification Znojmo (VOC Znojmo). In Austria, a survey was conducted using a structured interview with the founding members of the wine-producers association producing brand *Districtus Austriae Controllatus* (DAC Weinviertel and DAC Burgenland). The research agenda was to find out what the original motives for establishing the association, was trying to describe the principles and management of cooperation in this association. The research results should provide conclusions on whether the association is open for further development. Directly were calculated concentration factors for the emergence of the cluster, which should answer the question whether there is scope for a cluster or clusters.

Based on the calculation and comparison of the concentration coefficients of vineyards in the DAC associations in Austria and VOC associations in the Czech Republic can make possible recommendations for the selection of a region with a number of vineyards and producers to create a cluster.

In order to identify the cluster can use the following macro-analytical tool (recommended by Porter, 1998):

$$\textit{Localization quotient (LQ)} = \frac{x/X}{y/Y}$$

LQ - location quotient of employment in the region

x - the number of employees working in the sector in the region

X - total number of employees in the region

y - the number of employees working in the sector in the state

Y - total number of employees in the state

Potential for regional cluster is where there are groups of related industries with LQ greater than 1.

To achieve the goals of this research is designed *Concentration quotient*, which is indicating the proportion of vineyards in the region and the total area of vineyards. This concentration factor is calculated for the association of VOC in the Czech Republic and also for the associations with DAC appellation system in Austria.

$$\text{Concentration quotient (CQ)} = \frac{a/A}{b/B}$$

CQ - concentration quotient area of vineyards in the region / in a certain area for the establishment of an association of wine producers or cluster (ha)

a - the number of vineyards in the region certified by the association rules (ha)

A - total number of vineyards across the region (ha)

b - the number of vineyards of all associations (ha)

B - the total area of vineyards in the country (ha)

### 3 Results and Discussion

Wine Producers Association in the Znojmo wine region introduced the first appellation system - VOC Znojmo Wine Original Certification. The approval system for granting the VOC Znojmo has been completed and certification of wines according to the specified conditions is possible from 2009. For this newly formed association of growers a competitive advantage that appeals to enter the first brand. The appellation system applies only to wines from three of the most typical varieties in region: Sauvignon Blanc, Riesling and Grüner Veltliner, or cuvée, regions that show typical uniform flavor profile. The origin of grapes must be selected and only from certified vineyards. The area of certified vineyards and size of the proposed new association VOC are listed in Table 1. The research dealt with preparing for a new association in region called Modré Hory in the area Velké Pavlovice – upcoming Association of VOC Modré Hory. To achieve the optimal concentration factors for the production of wine and gain a competitive advantage is proposed to establish a cluster, based on the principle of integrated three regions of the VOC (Velké Pavlovice, Mikulov, Znojmo) with the brand Southern Moravia (Table 1).

The primary motive for establishing a new regional association was effective cooperation in communication highlighting the uniqueness of the primary origin of wine. The main objective of the association is to create a system for maintaining originality of their products is guaranteed by maintaining quality standards according to the association and the certification of origin of the wine, which is guaranteed quality from "Soil to the glass." To determine the above-mentioned goals were decisive motive grow and strengthen the competitiveness of participating companies.

**Table 1.** Vineyards in VOC potential

Wine Region	Potential VOC (ha)	Vineyards in region (ha)	share VOC potential (%)
VOC Znojmo	392	552	71
VOC Modré Hory	129	1 138	11
Southern Moravia (3VOC)	3 241	12 376	26

*Source: Ministry of Agriculture of the Czech Republic, 2010*

In each of the possible areas of cooperation is carried out most of the common form of communication and promotion of joint participation in trade fairs and organizing joint sales presentations. The association has a registered logo and implemented joint purchasing of labels for the VOC. Each Member of organization buys and pays for the number of labels according to the number of bottles of wine only is certified, the price of one bottle is set on

the amount of two Czech crowns. Selected resources that are the difference between the purchase and that price, are used to further common branding VOC Znojmo, such as joint purchasing of printed promotional publications, joint operations online [www.vocznojmo.cz](http://www.vocznojmo.cz) presentation and publication of a common catalog of wines and service members. In a further development of cooperation is the possibility of extending the joint purchase of materials for bottles, cork stoppers, caps, packaging material, technical preparation and possibly other production inputs. Participating businesses also are looking into the possibility of joint logistics management, marketing research and design e-shop. In research and development members have so far adopted specific targets. The first form of cooperation with educational institutions lies in the organization of presentations and organizing sensory certification exam, which is a partner of the association of Secondary School in Znojmo. In other areas of possible cooperation in research and development there is possibility to cooperate partners like universities or research institutions. There is great interest in the future to actively participate in this cooperation and research institutions to address specific projects.

In cooperation with the member communications companies have a common database of contacts to reach customers and professionals in the industry. Used for communication within the association as a common web portal and regular meetings of all members.

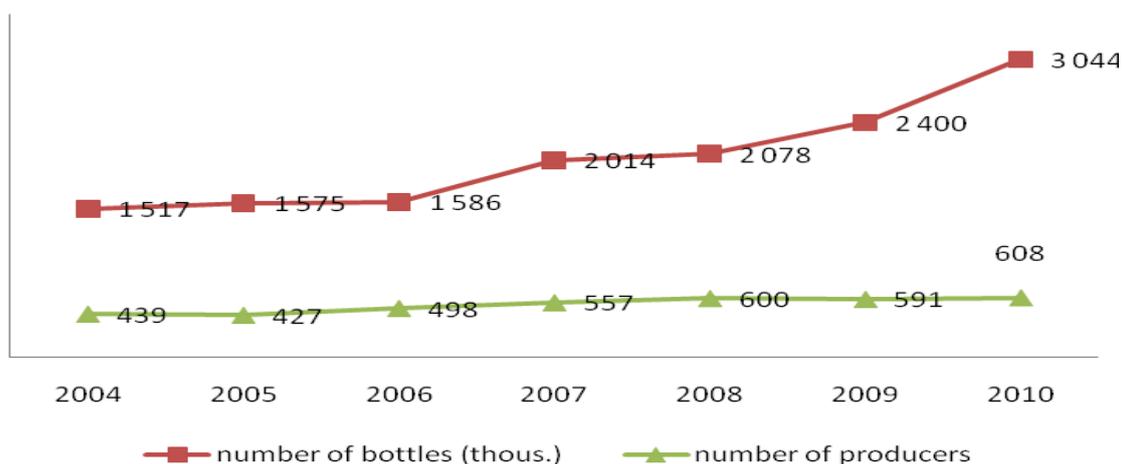
**Table 2.** Vineyards DAC

Wine Region	Potential DAC (ha)	Vineyards in region (ha)	share DAC potential (%)
Weinviertel	7 377	13 389	55
Mittelburgenland	1 164	2 121	55
Südburgenland	177	499	35
Kremstal	1 502	2 246	66
Kamptal	2 301	3 803	60
Traisental	463	790	59
Neusiedlersee-Hügelland	2 575	3 756	69

*Source: Federal Ministry of Agriculture, Austria, 2010*

The research was further analyzed by the regional association of the DAC appellation system. Austria is a typical varietal wine oriented country to recognize the origin of the future will be much more important than variety, because the wine with guaranteed origin cannot be so easily confused in the market. The area of certified vineyards of associations DAC is listed in Table 2.

Cooperation on the certification label wines *Districtus Austriae Controlatus* (DAC) takes the form interprofessional association, which includes regionally syndicated wine-growers, wine-producers and regional chambers of commerce. Management Association is the responsibility of regional and national committees of DAC. Members of the Regional Committees and National Wine Committee are nominated by the Agrarian Chamber of Commerce and Development in rate fifty to fifty, and appointed minister of agriculture for 5 years. Each committee shall elect a president and vote with two third majority. The Regional Committee may decide, but is not the obligation, it will be fixed price for wine sold certified according to the rules of the association. The fees for a certified wine used for marketing support the brand specific association of the DAC. The results of collaboration winemakers to build a common brand Weinviertel DAC can be monitored since 2004, when certified by approximately 1 517 000 bottles from 439 producers, in 2010 was certified 3 044 000 bottles from 608 producers. (see Figure 1).



**Fig. 1.** Certified bottles and producers, *source: Weinkomitee Weinviertel, 2011*

When comparing these results, quotients were observed in approximately similar values for both the DAC associations in Austria (see Table 3 for research in three DAC's), as well as associations of VOC in the Czech Republic (see Table 4). Based on the experience of newly emerging VOC system of appellations was setting up a plan of formation association with the proposed methodological approach.

**Table 3.** Localization (LQ) and Concentration Quotients (CQ) DAC

Wine Region	LQ	CQ
DAC Weinviertel	1,61	3,62
DAC Mittelburgenland	1,61	4,91
DAC Südburgenland	1,04	2,46

*Source: own work*

**Table 4.** Localization (LQ) and Concentration Quotients (CQ) VOC

Wine Region	LQ	CQ
VOC Znojmo	1,02	3,27
VOC Modré Hory	1,30	0,52
Southern Moravia (3 VOC)	2,26	2,81

*Source: own work*

Localization quotient association DAC Weinviertel and DAC Mittelburgenland was calculated to a value well above the minimum value of 1.0 and for the association DAC Südburgenland localization quotient is also above this level (see Table 3). Association VOC Znojmo and the upcoming VOC Association Modré Hory reaches value of localization quotients above the minimum value 1.0. The value of concentration quotient is less than 1.0, but it must be stressed here that it is an area of vineyards in the plan for registration and the actual area may be higher. The proposed Association Southern Moravia has a value of localization factor and also concentration factor much greater than the minimum value of 1.0 (see Table 4). There is concentration of vineyards in terms of concentration quotient similar values as the Associations DAC.

## 4 Conclusion

Based on the results it can be concluded that the interprofessional Association DAC Weinviertel and Association VOC Znojmo meets the conditions for a cluster. Localization quotient was calculated on the value well above the minimum value. A new association of wine producers of VOC in the Czech Republic also has a concentration quotient larger than a minimum value, and thus fulfills the opportunity for the foundation of the cluster.

The application of the results of localization and concentration quotients was a plan for the establishment of various associations of VOC. Specifically the proposed association is upcoming VOC Modré Hory, which established the 30 wine producers of wine in 5 villages around the center Velké Pavlovice. It was selected as a unique selling position of certified production of red and rosé wines. The plan to create a wine cluster was proposed to establish cooperation between the newly emerging associations of VOC at three sub-region of Southern Moravia, in order to achieve competitive advantage

Research conducted in the fully functioning associations of wine producers DAC Weinviertel showed positive results of cooperation, which can be expressed, the annual increase in sales of bottles of wine with a certified value-added and higher price than uncertified products. The cooperation of this association is also already the joint education and research collaboration with universities and joint marketing.

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# **Rural Development**



# E-Learning in Rural Areas

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**Annotation:** Globalisation, the accelerating development of new information and communication technologies (ICTs) and the increasing dynamics of markets place new demands on knowledge transfer. Of particular significance in education is the use of e-learning, learning based on new ICTs. Due to its independence of time and location, e-learning is viewed as an opportunity to overcome spatial disparities between countries, but also between urban and rural areas within every country through the improvement of Knowledge Management. “e-ruralnet - network promoting e-learning for rural development” is a project co-financed by the European Commission and deals with e-learning as a perspective for rural areas in the context of the “Programme for Lifelong Learning”. Particularly the needs of the rural workforce are the main focus of interest. One emphasis of the project is the analysis of the e-learning market, in terms of both supply and demand. This report presents the first results of the supply side of the e-learning market on basis of a nationwide survey of e-learning providers in Germany. The survey focussed on identifying available learning products, especially in terms of innovations and creativity. The research findings demonstrate different structures in the use of e-learning in urban and rural areas. Based on this data it is the objective to derive recommendations for actions for relevant interest groups.

**Key words:** e-learning, human resource development, sustainable rural development

**JEL classification:** I29, Q01

## 1 Introduction

Lifelong learning and the promotion of qualifications and competences are decisive framework conditions for the economic development and sustained competitive strength of enterprises (Hay, 2003). By the technological and economic structural change new demands are made on the imparting of knowledge (Jimoyiannis and Gravani, 2011). In the context of Knowledge Management the use of information and communications technologies (ICTs) play a central role to promote sustainable development (Mohamed, Murray and Mohamed, 2010). In order to meet the demand for further training and education of various occupational groups and sections of population mainly in the rural area, there must be ensured an efficient educational offer. In this connection special importance is attached to e-learning, a new type of learning in the educational sector based on new ICTs (Ala-Mutka, 2010). Due to the individualization of the learning process and the independence of time and place of learning e-learning offers the opportunity to bridge the digital divide and to surmount spatial disparities between countries, but also between urban and rural regions within every country (Johnson et al., 2007; Coneus und Schleife, 2010; Schleife, 2010). “e-ruralnet - network promoting e-learning for rural development“, a project co-financed by the European Commission (in 10 other EU-countries with project coordination in Greece) is dealing within the scope of the “Programme for Lifelong Learning” with e-learning as a perspective for rural areas and at the same time mainly putting into the centre of interest the needs of SMEs as well as micro-enterprises, self-employed persons, but also the needs of job seekers. Previous investigations of the e-learning market have shown that the little use of ICT-based learning in rural areas has to be attributed to an insufficient infrastructure and little personal motivation of people capable of gainful employment (Laschewski, 2008). In the following first selected results of the investigation of the e-learning market are presented within the scope of a quantitative survey, which give an insight into the e-learning offer in Germany currently available in the area of further training and education and have relevance to the rural area.

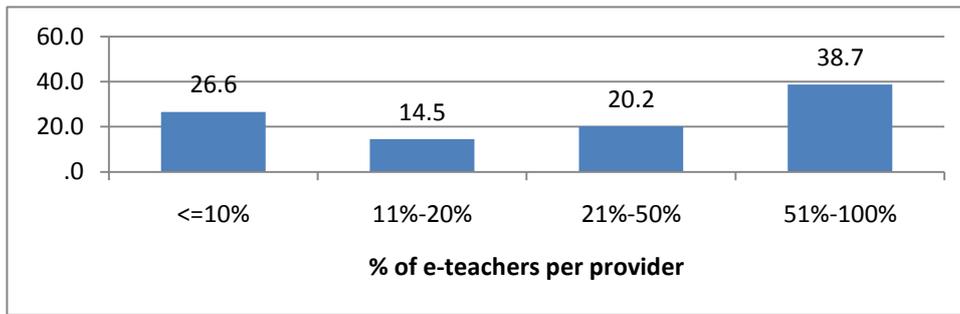
## 2 Materials and Methods

Within the period from February until August 2010 a survey of e-learning providers was made throughout Germany in order to investigate the use of e-learning in the area of further training and education. For this purpose the focus was directed to non-formal and informal learning conceptions. On the basis of qualitative investigations and a quantitative questioning the aim of this survey was to ascertain the offer on the e-learning market with the emphasis being on recording innovations and creativity. Within the scope of this quantitative research method an online-based questionnaire for the target group concerned was provided through an internet platform. According to Batinic (2001) the advantages of this kind of questioning are the time and cost advantages as well as a fast availability and a time flexibility of the respondent (Jansen, Corley and Jansen, 2007). Within very short time intervals in 2012 providers of further training and education, which had been chosen by random sample selection throughout Germany, could be contacted without a high financial expenditure. Through this the handling and processing expenditure could be reduced and a high data quality could be produced, because the data are available in electronic form. However, the advantages may be eclipsed by existing problems, which may reduce the validity of the results. In the course of the online-based survey little readiness to cooperate was shown by those questioned, which led to a little rate of returns and high rate of breaking off respectively. After sorting out questionnaires answered incompletely, 194 e-learning providers constitute the data basis of this study. The questionnaire included questions about the profile of the organization and the product portfolio offered in the area of e-learning as well as questions concerning innovations, but also about personal views and opinions of those questioned. The data available was first examined by means of a descriptive statistical analysis using the statistics software IBM SPSS Statistics 19.

## 3 Results and Discussion

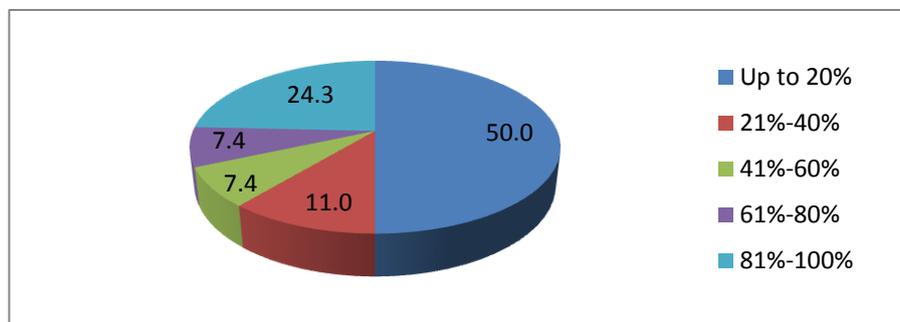
With a share of 85% private organizations are represented in this survey. Of them commercial enterprises have the biggest share at about 82%, followed by non-profit making organizations with about 14% and foundations with about 1%. On the other hand, public organizations can be found with about 15%. From the number of teachers employed one can infer the enterprise size of the responding further training and education providers. According to this micro-enterprises (about 40%) and small enterprises (about 28%) are dominating. The remaining shares are to be attributed to medium-sized enterprises and large-scale enterprises. In this connection, however, there is no information available about the annual turnover or the annual balance sheet amount. About 69% of the e-learning providers employ less than 10 teachers who are actually involved in e-learning. The remaining 31% are to be attributed to further training and education organizations which employ more than 10 e-teachers.

The specialization of the further training and education provider in e-learning can be expressed by the proportion of the teachers involved in e-learning to the total number of all teachers employed. About 41% of the enterprises have not specialized in e-learning and have a share up to 20% of e-teachers, but offer e-learning in addition to the “conventional“ imparting of knowledge. For about 39% of the enterprises questioned the share of e-teachers is bigger than 50%, so that one can here speak of a specialization of the enterprise in e-learning (Fig.1).



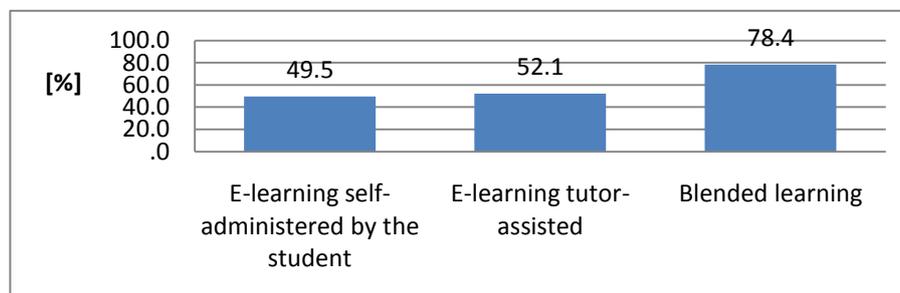
**Fig. 1.** Proportion of e-teachers involved in e-learning (N=124)

The share of e-learning courses in the current total offer of organizations providing e-learning is in 50% of the cases less than or equal to 20%. Therefore it can be presumed that e-learning currently for the enterprises as a whole rather plays a secondary role. On the other hand, in about 32% of the organizations questioned one can refer to the great importance of e-learning for the organization, because these ones make up more than 60% of the total output (Fig.2).



**Fig. 2.** E-learning courses as a % of total training output (N=136)

Only about 15% of the e-learning providers specially aim at rural areas and have a service and product portfolio focused accordingly. The major part of the respondents (85%) stated that they do not offer any special e-learning offers or courses for the rural area. According to this, these further training and education providers do not differentiate between rural and urban regions and offer their e-learning courses to various occupational and population groups irrespective of their home and place of work. As a rule, the e-learning providers use different modes of e-learning delivery. Blended learning was stated by the participating enterprises and organizations most frequently (78.4%), followed by e-learning tutor-assisted (52.1%) and e-learning self-administered by the student (49.5%) (Fig.3).



**Fig. 3.** Mode of e-learning delivery (N=194)

However, when comparing between actors, which aim at the rural area and those which have an undifferentiated e-learning offer, then e-learning self-administered by the student can be found with 66.7% significantly more frequently as a teaching method in the rural area than at a provider with an undifferentiated e-learning offer (46.3%) ( $p=0,041$ ).

E-learning-providers expect for a successful completion of the e-learning courses of their e-students self-discipline and willingness to learn as the most important factors (Fig.4).

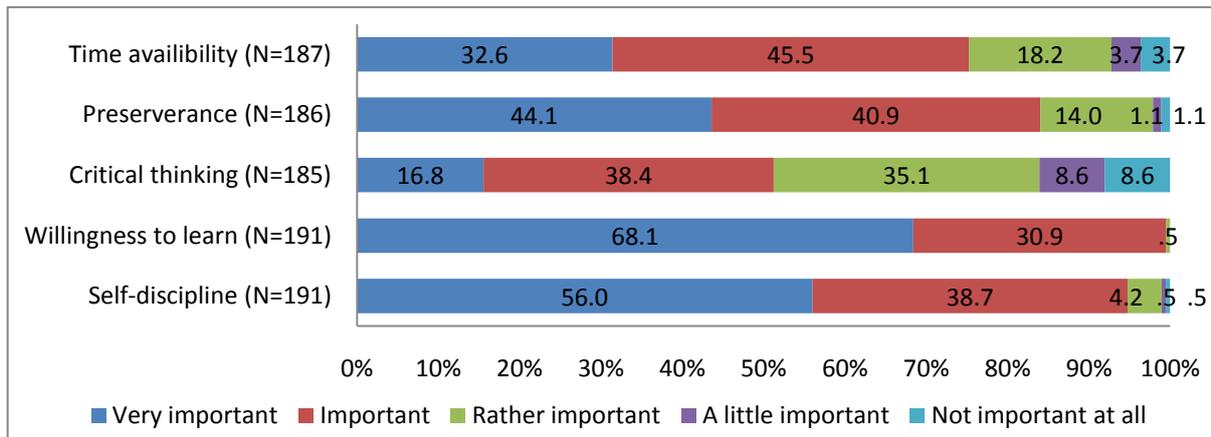


Fig. 4. Provider expectations from e-students

E-learning is particularly aimed at employees in enterprises and self-employed persons. According to this, about 79.5% of the e-learning providers questioned give the target group of employees in enterprises a high to very high priority, followed by the target group of the self-employed persons with 60.5%. When looking at the type and size of the organization, then 67.1% of the e-learning providers mainly give medium-sized enterprises a high to very high priority, followed by large-scale enterprises with 59.8%. Large-scale enterprises, SMEs, but also public organizations are altogether of a relatively great importance as a target group for e-learning providers. On the other hand, unemployed people, students and other individuals only play a secondary role (Fig.5).

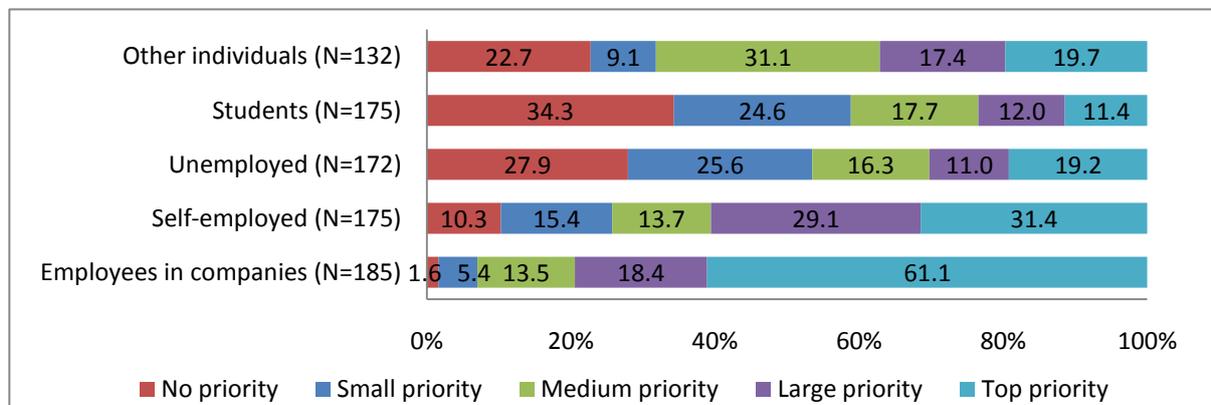
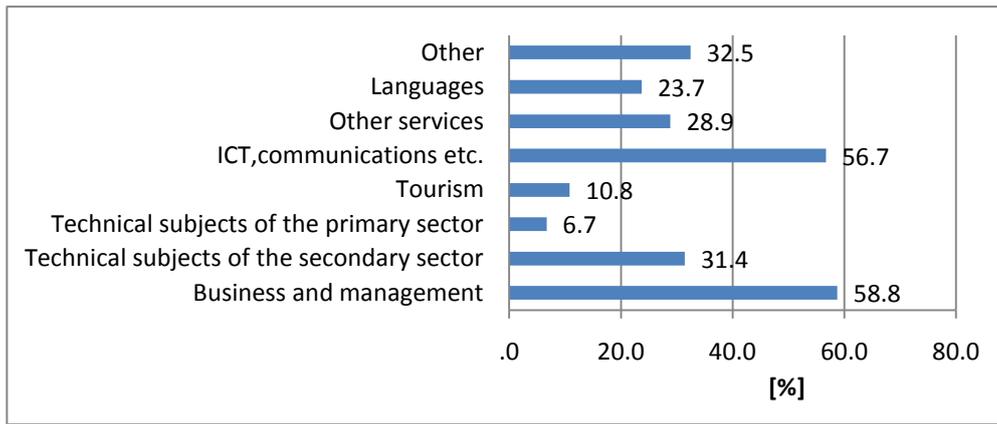


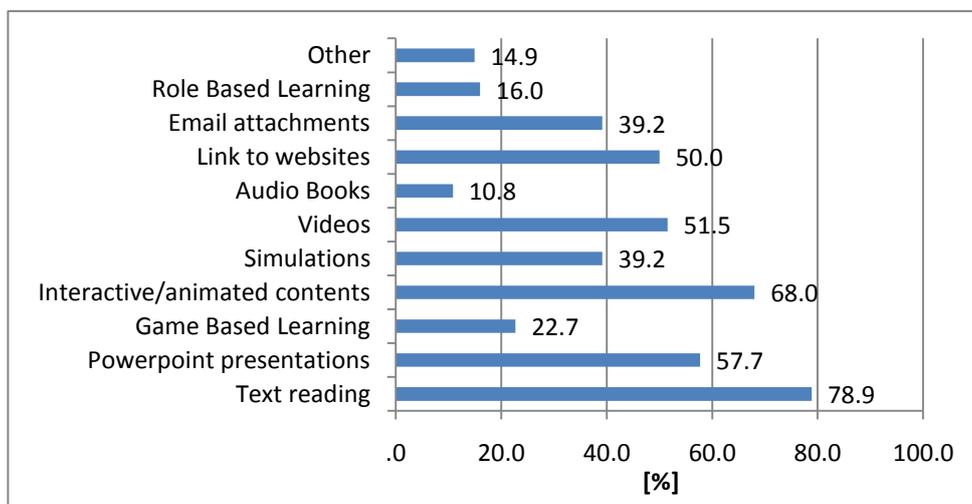
Fig. 5. Targeting groups: Individuals

With 58.8% mainly business management subjects and with 56.7% ICT, communication technologies, etc. are the dominating contents of the e-learning courses. Other course contents like languages, other services and technical subjects of the secondary sector are rather ranking in a middle position with 23.7%, 28.9% and 31.4%. With only 10.8% and 6.7% of the answers contents from the area of tourism and technical subjects in connection with the primary sector are mentioned (Fig.6). When comparing again between providers, which are aiming at the rural area and such ones with an undifferentiated offer, then it is becoming clear, that providers, which are specially aiming at the rural area, significantly more frequently offer e-learning contents from the area of tourism or technical subjects of the primary sector. (Tourism: 20% compared to 9%; Technical subjects of the primary sector: 23.3% compared to 3.7% with  $p \leq 0,05$ ).



**Fig. 6.** Subjects included in e-learning courses (N=194)

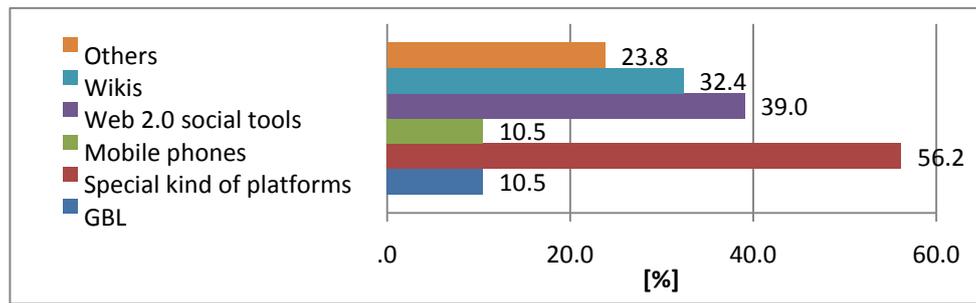
Within the range of educational methods the reading of texts is still quite common (78.9%). Besides, Power Point Presentations (57.7%), links to websites (50%) and e-mail attachments (39.2%) constitute further “conventional“ options which are still used quite commonly. But on the other hand, a change in use of educational methods is becoming apparent, which are just made possible or promoted by the use of new technologies and their possibilities. Working with interactive contents/animations, which are suitable for imparting complex learning contents and processes, is stated by 68% of the respondents. Likewise, the use of videos (51.5%), simulations (39.2%), Game Based Learning (22.7%) as well as Role Based Learning (16%) are further applied options of the distributors (Fig.7).



**Fig. 7.** Type of pedagogical methods (N=194)

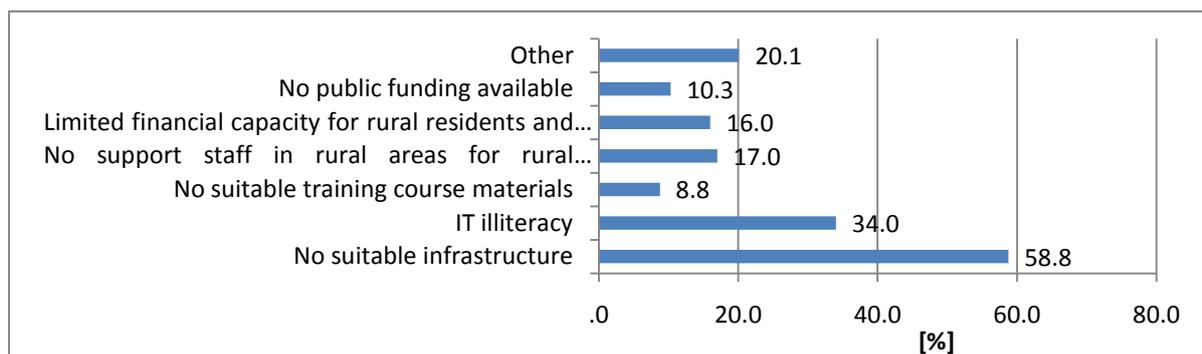
With regard to the use of different educational methods when distinguishing organizations with a special gearing to rural areas and such ones with an undifferentiated offer, it has been noticed that particularly Game Based Learning (GBL) and interactive contents/ animations are significantly used more frequently in the rural area (GBL: 36.7% compared to 20.1% and interactive contents: 83.3% compared to 36.7% with  $p \leq 0,05$ ). But here also exists a significant connection with the preference of the teaching method “self-administered by the student”. With this teaching method particularly GBL, interactive contents, but also simulations or videos are significantly used more frequently than for example with Blended Learning. The majority of the respondents (69%) is of the opinion that they offer innovative e-learning. E-learning providers, which are specially aiming at the rural area, significantly more frequently state that they offer innovative courses than providers with an

undifferentiated e-learning offer ( $p=0,022$ ). In this survey, particularly the use of special platforms as well as the use of Web 2.0 social tools is regarded as innovative (Fig.8).



**Fig. 8.** New e-learning technologies/tools (N=105)

From the view of the e-learning providers and irrespective of the gearing of their areal activities primarily an insufficient technical infrastructure (58.8%) and poor computer knowledge of the students or insufficient skills of handling and using (new) technologies (34%) are stated as main problems for access to e-learning in the rural area. Other problems like the lack of support staff in rural areas for rural entrepreneurs and employees, limited financial capacity for rural residents and entrepreneurs, as well as no available public funding and no suitable training course materials play a secondary role (Fig.9).



**Fig. 9.** Main problems associated with e-learning especially in rural areas (N=194)

## 4 Conclusion

The results of the survey of e-learning providers give an overview of the use of new information and communication technologies in the field of further education. Irrespective of the place and branch of industry – the workforce, especially employees in enterprises and self-employed persons are very important target groups for e-learning providers. Besides further training and education providers, which supplement their traditional learning and teaching methods with e-learning, there exist further training and education providers, which have specialized in e-learning. Providers, which provide e-learning offers especially for the rural area, prefer a mode of e-learning delivery supporting studies of the student by himself/herself. Correspondingly, supporting educational methods, such as GBL or animations are preferred. The existence of an adequate technical infrastructure is a prerequisite for the use of e-learning. But an insufficient technical infrastructure is still stated as the main problem for or hindrance to the use of e-learning in the rural area. E-learning providers described as a further problem the IT-illiteracy of the participants and their abilities in working with these (latest) technologies. Looking at these first results following conclusion can be drawn: A policy, should make improvements of the technical infrastructure in order to increase the accessibility and the usability of e-learning, which can be considered as a mean for sustainable development especially in rural areas. The accessibility to the (latest) technologies can help to

prevent the digital divide. In this place it should be pointed to the broadband initiative of the Federal Ministry of Economics and Technology taking place throughout Germany, the aim of which is to fill existing supply gaps especially in the rural area. With regard to the quality of (further) education, it is necessary to ensure that the (further) learning opportunities are equal for all people irrespective of where they are from or their place and level of education. Therefore it is necessary to improve the availability and simplicity in the handling and operation for the users in order to increase the accessibility, motivation and acceptance. From the viewpoint of the respondents especially persons with a high potential of self-discipline and willingness to learn can benefit from e-learning. A more detailed analysis of the e-learning market in which the demand side is taken into account is still pending. In this particular, the needs, difficulties and problems of the learners should be identified so that will be included for a final evaluation of the outstanding results of the overall study.

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# Rural Cultural Landscape as a Space for Appreciation of Cultural Heritage

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**Annotation:** Important questions in the area of improving our society's cultural level and maintaining and using of cultural potential and heritage are closely related to an economic perspective on culture and to support from potential resources. One of the key roles of national culture policy is to enable more effective usage of our cultural heritage. It does not include merely the maintenance of our cultural values, which have formed in Czech society over thousands of years, but also involves the continuing processes of European and global economic integration and the use of cultural resources to accelerate economic development in the Czech Republic. The co-authors will analyse the usage of selected financial resources of cultural, regional and European agricultural policies, which are useful for the repurposing of cultural heritage. Selected resources are compared using a combination of quantitative and qualitative approaches. They will seek routes to "good solutions" for motivating local society to appreciate and animate its cultural heritage as a part of the cultural landscape. The article deals with the cooperation between public and private sectors implemented in the Czech Republic through the PPP (Public Private Partnership) as well. The first experience resulting from this process is examined. Primary attention is focused on cultural heritage and its appreciation in local development and on the economic and social benefits of rural cultural heritage for local communities.

**Key words:** cultural landscape, cultural heritage, repurposing, cultural policy, regional policy, appreciation of cultural heritage.

**JEL classification:** R58

## 1 Introduction

In the broadest sense, according to Johnson, cultural industries amount to 5 % or more of the GDP in most countries – that is significant economic contribution. Moreover, the huge financial value of tourism, the biggest industry in the world nowadays, and culture heritage in cultural landscape becomes an important source for development. (Johnson in Kesner, 2000). The World Bank supports projects which preserve local culture and give local people an economic and social stake in their cultural landscape. In many cases, we are merely facilitators - there are the residents themselves, who are organizing these projects. (Kesner, 2000). Another dimension of the economic importance of appreciation of cultural heritage in a rural landscape can be presented. The productivity of work in the "creative" sectors with a cultural component is extremely high and represents a force causing a rise in productivity throughout the economy as a whole – in short, cultural enterprise is one of the primary resources of innovation for other economic sectors (Johnson in Kesner, 2000). Examples from the U.S., England and Germany show that on the knowledge and understanding of the relationship between culture and economy are built practical activities in the cultural sector, government, regional administrations, cities and individual institutions and international organizations. The pressure on cutting public expenses and on maximum efficiency of expenditure of state funds logically instigated an interest in applying economic criteria and methodology to the sphere of creation and distribution of cultural values, contributing to an intense development of cultural-economic studies (Kesner, 2000). Cultural economy is a matter of interest in many articles published in *Sociologia Ruralis* (e.g. Banks, 2000).

Examples of systematic rational approaches to enhancing cultural capital and a determined management of cultural assets can be observed in the practice of non-profit and entrepreneurial sectors. As an example of animation projects (Pek, 2009), we can name the programmes of the following organizations: the National Trust and Landmark Trust, and Vivat Trust, which rent monuments to the public for holidays. It is popular to use smaller monuments for cookery courses, fishing and hunting in UK. In Italy, these projects are shared by a group of investors. They contribute not only to expenses, but also share the use of repaired monuments. In Spain, there is a chain of hotels and accommodation in the historical monuments. (Pek, 2009). The experts expression (summarized in documents on regional development) is that the cultural landscape in the Czech Republic is full of available cultural heritage, as well as a developed cultural and artistic tradition. These factors predetermine culture to play a significant economic role and to be one of the catalysts of economic and social development. If we focus on rural areas, we have to take in account not only activities in the frame of cultural and regional politics, but in agriculture politics as well. Co-financing of projects and co-operation between public and private sector will become more frequent. Not many authors are engaged in these issues in the Czech Republic: Patocka and Hermanova (Patocka, Hermanova, 2008) can be named. Appreciation of cultural heritage in the countryside concern authors who publish in Agriculture Economics (Hajek 2003 and 2004, Hudeckova and Sevcikova, 2007). Attention is devoted to the solutions of this problem in broader context, particularly within the approaches of Leader (Maurel, 2008, Lostak and Hudeckova, 2008). The article deals with the issues of cultural heritage and its appreciation in rural development or enhancement thanks to it. The article is an analysis of financial means spent to enhance of cultural heritage in rural development of the Czech Republic. It refers to the amount of funds in which some programmes are not fully exploited despite the fact that they provide wide possibilities.

## **2 Materials and Methods**

The authors are analysing the usage of selected sources devoted to the appreciation of cultural heritage. They are interested particularly in rural areas or the rural cultural countryside. Their approach is close to the cultural economy. The analysis combines qualitative and quantitative approaches. From the quantitative point of view, secondary data from the public yearbooks of relevant programmes devoted to the above stated objectives are used. The qualitative point of view completes the analyses by giving examples (listed on seminar meeting in Bohemian Switzerland o. p. s.) of the first Czech experiences from co-operation between the public and private sectors (so-called PPP projects) in the area of appreciation of cultural heritage in the countryside. The paper presents various examples of appropriate co-operation. While analysing the financial means devoted to the restoration of rural cultural heritage and its animation, it is essential to choose only the programmes or their priority axes, and priorities which are aimed at this objective. The following programmes or grants, which were classified in conformity with Pek (Pek, 2009), have been selected:

- direct support from state budget (thereinafter SB) for restoration of cultural monuments in the Czech Republic (thereinafter the CR) (emergency programme for rescue of architectural heritage, programme for maintenance of village conservation area, areas and landscape conservation area, and programme for restoration of chattel cultural monuments are selected);
- support from regular programmes of the Ministry of Culture (thereinafter MC) and other ministries (Rural development programme financed from EAFRD is selected);
- support from regional programmes (Regional operational programmes supported from ERDF are analysed here);

- support from integrated programmes (particularly Integrated Operational Programme supported by ERDF is focused on here);
- support from community programmes of the EU (we focus on the Central Culture programme) and programme of European Territorial Cooperation (supported from ERDF);
- support from so-called Norwegian funds;
- support from so-called Switzerland funds, in particular from the Foundation Partnership.

Original intention to analyse support from thematic funds, priority axis (5.3) Infrastructure for Business and (6.3) Restoration of Landscape Structure was abandoned due to lack of public information focused on the observed themes. For the purpose of comparison, the analysis of selected programmes supporting cultural heritage and landscapes is summarized in table with an overview of financial means drawn in 2009.

### 3 Results

#### 3.1 Direct support from the State budget for restoration of cultural monuments in the Czech republic

The share of spending on the restoration of chosen types of monuments from the entire state budget between 1999 and 2009 has declined. The share of expenses for the restoration of monuments from the entire budget of the Ministry of Culture has decreased as well. In both cases, it represents decrease of over 50 %. The share of selected programmes on SB's expenses was only 0.68 per thousand in 2009, which is less than in 1999. The share of selected programmes on expenses of MC (chapter 334) was 9.3 % in 2009. There was a three per cent increase in the area of new programmes – these programmes represented almost 50 % of the expenses of the selected programmes. The trend of decreasing grants in the frame of MC or SB has not been broken despite the creation of new programmes.

**Table 1.** Share of expenditure of MC's programmes on reconstruction of monuments on the total budget of MC

Year	SB expenditure in million of CZK	MC, total expenditure in millions of CZK	Selected programmes of MC in thousand of CZK	Share of expenditure of MC on the state budget in %	Share of expenditure on selected MC's programmes on MC's budget in %	Share of expenditure on selected MC's programmes on SB in %
1999	605127	5244	706000	0.87	13.46	0.12
2009	1152101	8411	537371	0.73	6.39	0.05

*Source: Pek, 2009.*

In the framework of the Preservation of Architectural Heritage, the repair of, for example, Loreta in Rumburk was implemented in the total amount of 21.5 million CZK during the period of 1996-2010. This is a correct example of the joint-action of the public and private sectors, as the parish of Rumburk co-operates in the restoration of this cultural heritage with several donators (MC, Via foundation, Schäfer and Sykora, charitable fund Philip Morris CR, town of Rumburk, etc.)

### 3.2 Support from regular programmes of Ministry of Culture and other ministries (Rural Development Programme)

In this group of grants, attention is focused on the Rural Development Programme (thereinafter RDP), specifically to the measure in the scope of Rural Cultural Heritage protection and development (axis III, measure 2.2) and to axis Leader (IV). Subsidies are devoted to villages with up to 500 inhabitants. Within the framework of measure III 2.2 there were 167 projects registered in 2009, which is a comparable number with previous years, however, the requirement of financial subsidies in the amount of 465 million CZK has exceeded demand from 2008 by a third, and doubly exceed the average annual allocation. In the same year, applications submitted in autumn of 2008 were approved. 109 grant applications were approved to be supported in the financial amount of 229 million CZK. Total financial means devoted to the RDP for the period of 2007-2009 were 3.670 million EUR. From this amount, 17.6 % of the funds were aimed at axis III – measure to improve the quality of life in rural areas and to encourage diversification of economic activities, and 5.5 % went to axis IV – Leader.

**Table 2.** Financial allocation of RDP in the CR for 2007-2009 according to the 2009 Annual Report

Axis	Total public resources (thousands of EUR)	Share of EAFRD financing	EAFRD (thousands of EUR)
Axis III - 2.2	280 284	75 %	210 213
Axis IV - Leader	201 995	80 %	161 596
Total axis	3 670 068	78 %	2 857 506

*Source: own calculation*

Financial means from Leader are used by the so-called Local Action Group (LAG), which is based on the co-operation of the public and private sectors. On the cultural heritage in the rural area are aimed two Fiches: 2 – Renovation and Development of Villages and Fiche 3 – Rural Cultural Heritage Protection and Development. For example LAG Hlubocko – Lisovsko o.p.s. was granted 4,538 thousand CZK for these objectives. A specific example of a fully financed project from Fich 3 is the rescue and restoring of the Guardian Angel's Chapel in Lhotice, where 178,028 CZK was granted. A subsidy in the amount of 570,636 CZK had been requested for restoring the Virgin Mary the St. Vojtech chapel in 2008. However, only 84 % of the financial means was paid one year later. In the scope of Fiche 3, subsidies were granted to the municipality Hury for restoring the chapel at the town square in 2009.

### 3.3 Support from regional programmes (Regional Operational Programmes)

EU Regional Operational Programmes (ROP) are divided according to the NUTS II level. On the objective Convergence is aimed 4.6 billion EUR during the 2007-2013 period. Priority Tourism Development is included in the restoration of cultural heritage in the frame of rural development. Between 2007 and 2009, the majority of financial means was allocated to Northwest Bohemia, smaller part to Southeast region in CR.

**Table 3.** Priority axes according to each ROP - tourism and rural development for 2007-2009 (in EUR)

Year	Northwest	Northeast	Central Bohemia	Southwest	Southeast	Silesia	Central Moravia
2007	167.79	1.05	0.00	0.00	2.68	68.15	0.00
2008	142.62	52.22	206.86	123.93	6.69	113.37	132.35
2009	142.62	169.91	13.77	123.93	12.59	24.04	8.60

*Source: Annual reports of period 2007-2009 from Regional Operational Programme of Cohesion.*

An example is the Parish Museum in Kondrac, which has been built on the former rectory upon request of the municipality Kondrac in co-operation with civil association Monuments for Life. The implementation cost 14 million CZK, of which 92.5 % was refunded from ROP Central Bohemia. Another example is the implementation of museum and information centre in the framework of ROP Southeast – sustainable tourism development in the municipality Vedrovice. The subsidy covered 85 % of eligible costs. Contribution from national public resources amounted to 7.5 %, the same as the contribution from the municipality of Vedrovice.

### **3.4 Support from integrated programmes (Integrated Operational Programme)**

In the scope of axis 5 National Support of Territorial Development, the share of grant for appreciation of the potential of cultural heritage is 13.4 % per cent. This is not an insignificant amount. 940.8 million CZK was granted in 2009. The measure of support is very high. However, only outstanding projects on national or supra-national level can apply for grants. It is not easy to find an example in the rural landscape. It is possible to present Velehrad as an example, where the project Centre of Cultural Dialog between Western and Eastern Europe had been implemented in 2009.

### **3.5 Support from community programmes of the European Union (Central Culture Programme and European Territorial Cooperation Programme)**

The EU Central Europe programme supports co-operation between Central European countries (Austria, Germany, the CR, Hungary, Italy, Poland, Slovak Republic, Slovenia). The main aim is to increase the competitiveness and attractiveness of cities and regions. The project is financed from the European Fund for Regional Development (EFRD) and is ongoing during the 2007-2013 period. 231 million EUR have been invested to the support of supra-national projects of cooperation in the area of public and private organizations in the framework of this programme. It is divided into small and big projects. In this group of subsidies, the indispensable part is presented by projects which are focused on increasing competitiveness and attractiveness of marginalized rural areas by appreciation of local natural and cultural potential in the framework of sustainable rural development based on partnership of the public and private sectors (municipalities, development agencies, universities, local companies etc.) A good example of an implemented project is pilgrimage way in Mimon formed in the scope of the project Tourism Development in Borderland, tourist appreciation of Zlotoryje and Mimon in 2010. It was supported by ERDF in the framework of Operational Programme of cross-border co-operation between CR-Poland. Partners of this project are towns Zlotoryja (Poland) and Mimon (CR), Roman Catholic Church and Mimon parish.

### **3.6 Support from Norwegian funds**

The main priority in the scope of European Economic Area is the protection of cultural heritage. In the framework of Norwegian funds, 2.8 billion CZK had been prepared for the CR until 2009. Financial means could have been used for projects focused on preserving cultural heritage. Another example from Velehrad is presented. This time it is the reconstruction and renovation of the transept and presbytery of Velehrad's basilica financed by Norwegian funds in the amount of 542 thousand EUR. Renovation of cultural heritage in Vysocina region and the preservation, restoration and public access of the immovable cultural heritage of Zlin region were supported by grant in the amount of 600 thousand EUR.

### **3.7 Switzerland funds (Foundation Partnership)**

Switzerland funds represent irrevocable aid for the CR in the scope of 100 million Swiss francs (almost 88 million EUR) in 2010-2014. They are focused mainly on the North and

Central Moravian region. Rural areas are significantly included because grants accent the maintenance of landscape, “green ways”, revitalization and animation of the countryside. For example, the Partnership Foundation supports a modern approach to the protection of nature based on co-operation between owners, municipalities, state administration and NGOs. Many projects had been supported in 2008, specifically the maintenance and revitalization of small monuments in rural areas for 27 thousand CZK (the promoter was the elementary school in Tanvald), and the restoration of historical lime avenue in Zasmuky for 165 thousand CZK.

Selected programmes of MC	Support from regular programmes of MC and other ministries (RDP)		Support from regional programmes EU - ROP	Support from integrated programmes EU - IOP			
	Axis III 2.2 Rural cultural heritage protection and development	Axis IV - Leader	Tourism development and restoration of cultural heritage	5.1 National support of territorial development	Programme Central Culture and European territorial cooperation	Norwegian funds	Switzerland funds
SB	EAFRD	EAFRD	ERDF	ERDF			
5373.710	2326.357	5029.676	12336.960	940.8	10.357	31.414	2.085

**Fig. 1.** Comparison of selected grant programmes in 2009 (in millions of EUR). *Source: own calculation*

## 4 Conclusions

The key role of a national cultural policy is to enable more effective usage of cultural heritage. The scope of the policy does not include only the maintenance of cultural values, which has been formed in Czech society over the centuries, but also the usage of cultural sources for acceleration of economic development in the CR. Due to the fact that the analysed programmes are registered and recorded differently, special attention was devoted to each of them. For the purpose of comparison, it was only possible to use the year 2009, while equal annual spending for the entire term of use was assumed in the case of RDP and Norwegian funds. We presume that the negative trend of the decline of grants to the programmes supporting cultural heritage from SB can be balanced by other sources, mainly by those from the EU (ERDF, EAFRD, or ESF). In the framework of IOP, particularly in axis 5.1 National Support of Usage of a Cultural Heritage Potential, financial means were left unused. However, conditions of these subsidies for eligible recipients do not enable rural development actors to acquire these grants. It seems that the CR does not fully use specific grants which are suitable for rural landscape, its countryside and cultural heritage - such as Switzerland funds. On the other hand, it seems that there is relatively good usage of grants in the frame of ROP and from Norwegian funds. Reasons which are listed as barriers are the following: self pre-financing of implemented projects, complicated administration of projects. We present as an example the experience with co-operation on a supra-national level. Realizing the value of the countryside and of the cultural heritage for effective maintenance and development of the rural area is required. Suitable animation elements are based on the co-operation of various actors. We present PPP examples for each analysed programme. Co-operation of PPP in the area of rural landscape is not significantly spread out in the CR, however, we have managed to find suitable examples which bring contribution to each involved part. We presume that the financial value of the PPP projects will increase in the future.

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# Education as One of the Activities of Local Action Groups

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**Annotation:** The paper deals with the activities of one of the important actors in rural development in the Czech Republic - local action groups. Local action groups implement the LEADER approach, which is based on the endogenous principle, partnership of private and public sector, innovativeness, establishment of local social networks, implementation of integrated strategies and cooperation projects. The paper focuses primarily on the educational activities of local action groups, as education is one of the principles which is applied within the LEADER approach in the Czech Republic (every member state of European Union can involve its own defined principles among the general principles of the approach), and because the inhabitants of some regions are able to create and spread innovation thanks to the process of education, and they can therefore utilize the development potential of a particular region. The objective of the paper is to find out which types of educational activities (educational activities that promote regional and local identity of inhabitants, educational activities focused on managing of project documentation for development, and eventually others) are supported through the LEADER approach. In order to fulfill this objective, the secondary analysis of information which is available on the web pages of all local action groups which act in the Czech Republic is used. This is supported by information from a field survey which concerns educational activities for rural inhabitants, and which is still in progress. The paper is part of broader project - Education for rural areas as a part of regional development priorities.

**Key words:** education, local action groups, rural development, LEADER approach.

**JEL classification:** R58

## 1 Introduction

Local action groups are considered one of the most important actors who are able to promote rural development thanks to the approach they implement. This approach is called the LEADER approach, and it is characterized by the endogenous principle, partnership of the private and public sectors, establishment of local social networks and emphasis on innovativeness, integrated strategies and cooperation projects (The Council of the European Union, 2005).

The LEADER approach was officially launched in 2004 as the LEADER initiative in the Czech Republic. But according to Maurel (2008), there were some other LEADER-type activities in the Czech Republic before it was officially started. In the contemporary period, it is applied as axis IV of Program of Rural Development. Hudečková and Balzerová (2010) indicated this approach as a unique approach in new European rural development programs, whose basic feature is its target orientation on establishing regular territorial administration. Sucksmith (2010) stated that the LEADER approach was created in order to solve rural problems in an innovative way that best complies with a particular area, and which can be implemented in any other rural area. With the exception of the principles mentioned above, there exist others principles which were stated by the National Network of LAGs of the Czech Republic, and which were added into the list of 10 principles of LEADER in the Czech Republic (Ministry of Agriculture of the Czech Republic, 2009). Orientation on educational activities is amongst these principles. According to Schumacher (2000), the development begins with well-educated, well organized and well-disciplined people and without these people, all the resources remain purely latent and go to waste. Therefore, education is an

important process for rural development, because thanks to it, inhabitants can create and spread innovations and utilize the resources and the potential of a particular region. To do this, they need to also know the potential of a given region, they need to be aware of local resources, local history, natural and cultural monuments, traditions and other unique facts which can give advantages to the region and can be used for its development. Another important concept for the development of a particular region is the concept of local and regional identity. Local identity and regional identity represent one part of human identity and can be defined as a relation between a human and the place where he or she lives (Zich, 2003). The strength of local and regional identity influences the willingness of inhabitants to get to know and utilize the potential of their region. Inhabitants with strong relationships to the place where they live want to improve the quality of life of their region, so they participate in the educational process in order to be able to create and spread innovation on the basis of the region's potential. According to the concept of learning regions, the innovations connected with knowledge are a prerequisite for the competitiveness of some regions. And it is the larger amount of so-called tacit knowledge which is the main source of the competitiveness (Maskell and Malmberg, 1999). Tacit knowledge is knowledge (in comparison to codified knowledge), which is not standardized and can be obtained only by own direct experience and participation in a given activity (Hudson, 1999). More projects focused on obtaining tacit knowledge for inhabitants and more competitiveness in the particular region can be deduced from the aforementioned.

The objective of the paper is to find the answer to the following question: Which types of educational activities (educational activities that promote regional and local identity of inhabitants, educational activities focused on managing of project documentation for development, and eventually others) are supported through the LEADER approach? The fulfillment of this objective proceeds through a secondary analysis of information available on the web pages of all local actions groups in the Czech Republic, thus the paper does not deal with all educational activities done by LAGs, but only with those which are accessed via the web pages of LAGs. Another source for the purpose of this paper was information from the field survey which is a part of the research project called "Education for rural areas as a part of regional development priorities", solved in 2010 and 2011.

## **2 Materials and Methods**

The main part of this paper concerns the types of educational activities which were implemented by local action groups in the Czech Republic, and which the public had access to via web pages. To fulfill the objective mentioned above, author used a secondary analysis of the web pages of local action groups acting in the Czech Republic. Thus, the author utilized materials which were originally created for other purpose (Velký sociologický slovník, 1996) - to inform the public about the activities of local action groups within the principle of transparency. Thanks to the usage of the secondary analysis technique, the author gained better structured materials which can be used for the technique of content analysis within further research.

However, there are considerable differences between the content of the web pages of local action groups – some local action groups do not even operate any web pages, some of them do not provide information about their activities or projects, and others provide only partial information (local action groups do not provide the same types of information - in some cases it is only the name of the project, in other cases the name of the project, acquired subsidy or name of applicant; for some of their projects, some LAGs provide deeper information, such as specification of the project and total costs). Therefore, the paper also discusses the question of the transparency of projects and the activities and public

expenditures connected to them. The majority of analyzed materials contain the name of the project, the name of applicant and amount of acquired subsidy.

In April 2011, the author analyzed the web pages of 160 local action groups (web page about the LEADER approach) located in the Czech Republic (regardless of whether they are active or not). The number of LAGs differs in various sources – e. g. material from the Ministry of Agriculture of the Czech Republic (2009) mentions 155 local action groups. The difference is probably caused by the fact that some LAGs ceased their activity, but they are still in the database.

The analysis was conducted in two stages. In the first stage, the information about projects and activities of LAGs was searched on their web pages. When the information was found, firstly the names of the projects and activities were analyzed. If the name contained a word or phrase connected to education, the project was put into the analysis. Nevertheless, the projects and activities whose names were not clearly connected with education but were focused on education based from the description of the project or activity were also included into the analysis. Orientation on educational actions had to be evident from the name or the description of the project or activity. Therefore, it is possible that some projects/activities from whose names or description it was not possible to determine whether they are educational projects/activities were not included into the analysis, although they in fact could be focused on education. This was the case of approximately 50 projects and activities. The last criterion for involving the project or activity into the analysis was the orientation of the project or activity. For the purpose of this paper, we choose only projects and activities (they are not part of any broader project) in which primary attention was focused on providing education to inhabitants. This means educational projects and activities which enable inhabitants to utilize and extend their experience and knowledge and resources existing in the region in order to spread innovation and contribute to the development of particular area. These are projects focused on arranging educational and training programs, seminar meetings, educational classes, improving the educational process, the foundation of museums of diverse topics, educational centers and educational paths. The projects and activities focused only on creating and improving the amenities for educational activities (e. g. construction or reconstruction of school buildings and other projects providing technical infrastructure for educational activities) were not included into the analysis, as the existence of an educational infrastructure itself does not guarantee either educational actions, or educated inhabitants (educational infrastructure can enable educational activities and projects and help the process of education, but it does not educate inhabitants). The names and the description of projects and activities also enable educational projects and educational activities to be classified into a particular type. This classification was part of the second stage of the analysis. The obtained information was classified by all NUTS III regions of the Czech Republic with the exception of Prague, as Prague does not fulfill the conditions of the LEADER approach.

### **3 Results and Discussion**

The author focuses the secondary analysis of web pages of Czech LAGs on two spheres – firstly, on the transparency of projects, activities and public expenditures (do LAGs provide information about their projects and activities?) and second, on the types of educational projects and activities implemented by local action groups.

Table 1 deals with the transparency of information and the number of LAGs that implemented at least 1 educational activity or project, or no educational activity or project (according to information provided on their web pages). More than 20% of LAGs in the Czech Republic do not provide information about the projects they implemented or do not operate any web pages. This means that the public does not know what the financial means from public resources are used for. However, information regarding the use of public

resources is essential for securing the legitimacy and responsibility of public administration and achievement of participatory democracy (Commission of the European Communities, 2001). When considering the transparency of projects, activities and public expenditures according to the NUTS III regions, the highest number of LAGs that do not provide any information about projects and activities or do not operate web pages is in Vysočina (18% of the total number of LAGs without web pages or information about their projects) and in Středočeský kraj (15%). If we look at the share of these LAGs in the total number of LAGs in a particular NUTS III region, we can conclude that almost 37% of LAGs located in Vysočina and Ústecký kraj, and 36% of LAGs from Pardubický kraj do not inform the public about their activities and projects (regardless of whether they operate any web pages, or if they operate web page but these pages do not contain this information), so this does not justify the receiving of public resources. When comparing this result with the list of active and inactive LAGs in the Czech Republic (Tima Liberec and SEAL Praha, 2010), it is necessary to point out that two local action groups from Vysočina, one LAG from Středočeský kraj and one from Ústecký kraj are considered as inactive LAGs (but they are still registered in the database).

**Table 1.** Number of LAGs with or without educational projects or activities

NUTS III region	LAGs with information on web pages about			Total
	at least 1 educ. project or activity	no educ. project or activity	no information, no web pages	
Zlínský kraj	10	4	2	16
Olomoucký kraj	13	2	3	18
Ústecký kraj	4	1	3	8
Liberecký kraj	5	1	3	9
Jihočeský kraj	13	1	2	16
Jihomoravský kraj	10	0	2	12
Plzeňský kraj	6	2	1	9
Vysočina	8	2	6	16
Středočeský kraj	12	1	5	18
Královéhradecký kraj	11	2	0	13
Karlovarský kraj	4	0	1	5
Pardubický kraj	6	1	4	11
Moravskoslezský kraj	7	1	1	9
Total	109	18	33	160

The first two columns show the number of LAGs which implemented (or did not implement) educational activities or projects in the period of time from their establishment, or the day they started to utilize the LEADER approach (generally, the LEADER approach was started in the Czech Republic in 2004) until April 2011. In total, 68% of LAGs implemented at least one educational activity or one educational project according to information accessed via web pages. This result confirms the opinion which was expressed during an interview conducted within the resolved project mentioned above. This project was firstly focused only on Schools of Rural Renewal (special organizations for the education of rural inhabitants). A

representative of one School of Rural Renewal in the Czech Republic stated during an interview (others representatives of Schools of Rural Renewal agreed with him afterwards) that local action groups have been undertaking the original role of Schools of Rural Renewal in the sphere of the educational process. Therefore, the educational activities of local action groups have become a part of the survey within the resolved project, and the results of the secondary analysis confirmed their importance.

Looking at the absolute numbers according to NUTS III regions, the highest number of LAGs that implement educational actions are in Olomoucký kraj, Jihočeský kraj and Středočeský kraj. There is again a difference when comparing these results in the percentage share of the number of LAGs within one category with the total number of LAGs in particular NUTS III - region. The biggest share of LAGs with at least one educational project or activity is accomplished in Královéhradecký kraj (85% of total number of LAGs in this NUTS III region), Jihomoravský kraj (83%) and Jihočeský kraj (81%). Adversely, the smallest share was noted in Vysočina and Ústecký kraj (both 50%).

Table 2 is focused on educational projects and activities which are mentioned or described on the web pages of LAGs, and it shows the distribution of different types of educational projects and activities implemented by local action groups within the Czech Republic and particular NUTS III - region. In total, according to information from web pages of local action groups, 385 educational projects and activities were implemented by LAGs in the Czech Republic in 2004 – 2011. More than 47% of them (183 activities) were educational activities focused on providing information about obtaining financial means from PRD and managing of project documentation. The second part (53%), contains projects (202 educational projects), which were financed not only from the European Agriculture Fund for Rural Development (EAFRD), but also from other resources, and which are focused on various spheres of educational actions. We can conclude that there is approximately the same share of actions focusing on project management or ways of obtaining financial means and actions where attention is devoted to strengthening the local identity of inhabitants and improving their ability to create and spread innovations. The question is whether the share of the second group should be larger and more significant.

According to information obtained from web pages, the greatest number of educational projects was implemented in Jihočeský kraj (15.8% of the total number of educational projects of LAGs in the Czech Republic), Jihomoravský kraj (13.3%) and Plzeňský kraj (12.8%). LAGs from Plzeňský kraj also arranged the greatest number of educational activities (11.5% of the total number of educational activities). The same result (11.5%) was accomplished by LAGs from Středočeský kraj. In Jihočeský kraj, 10.4% of educational activities were implemented, and LAGs from Zlínský kraj, Olomoucký kraj and Pardubický kraj each implemented 9.3% of educational activities. The lowest numbers of educational activities (1.6% of the total of educational activities) and projects (2% of total of educational projects) were accomplished in Karlovarský kraj. This can be influenced by the lowest number of local action groups acting in this NUTS III – region, as well as the lowest number of inhabitants living in Karlovarský kraj. Nevertheless, in Jihočeský kraj, Plzeňský kraj and Zlínský kraj there also live a lower number of inhabitants than, for example, in Jihomoravský kraj or Středočeský kraj. The second and the third lowest number of educational activities were implemented in Ústecký kraj (3.8% of the total of educational activities), and Liberecký kraj (5.5%). These two NUTS III regions also achieved the third lowest number of educational projects (4% of the total of educational projects). The second lowest number of educational projects was achieved by Pardubický kraj (3.5%). This is an interesting result, because Pardubický kraj achieved the third highest number of educational activities. It can be assumed that in Pardubický kraj, primary attention is devoted educational actions which are focused on project management and ways of acquiring financial means.

Concerning the types of educational projects implemented by local action groups in the Czech Republic, the most common group are projects focusing on arranging educational classes, courses and programs (29.2% of total of educational projects). Most frequently, they were language and IT classes and courses, followed by education of rural managers (how to write a project, how to obtain financial support from the European Union, etc.) and courses focused on strengthening local production and local entrepreneurs. At least two projects of this type were implemented in every NUTS III region in the Czech Republic (except Prague), and the highest number of these projects was implemented in Jihočeský kraj. This orientation is also the most common group of projects within a particular NUTS III region in 8 NUTS III regions (we do not take into account the group “Others”). In the case of 4 NUTS III regions, the most frequent orientation of projects were “Educational centers”, i.e. projects whose main goal was to establish these centers and provide them with the appropriate technical and educational equipment. The greatest number of projects of this type was implemented in Jihomoravský kraj and Královéhradecký kraj. Shares of other types of projects according to their content orientation in particular NUTS III region are not significant. We can point out the share of projects which are focused on the establishment and equipment of museums (these projects can strengthen the local identity of inhabitants) in Plzeňský kraj and Moravskoslezský kraj, and the share of projects improving educational process in Jihočeský kraj.

**Table 2.** Types of educational projects (Proj.) and activities (Activit.) of LAGs according to NUTS III regions in the Czech Republic

NUTS III region	Activit. PRD	Proj. Educ. center	Proj. Museu m	Proj. Educ. paths	Proj. Improv. of educ. proc.	Proj. Educ. classes, progr.	Proj. Ot- her	Proj. Total
Zlínský kraj	17	2	2	0	3	2	1	10
Olomoucký kraj	17	2	0	1	2	6	4	15
Ústecký kraj	7	1	3	0	0	3	1	8
Liberecký kraj	10	2	2	2	0	2	0	8
Jihočeský kraj	19	6	4	1	6	10	5	32
Jihomoravský kraj	14	9	5	0	0	5	8	27
Plzeňský kraj	21	2	6	3	3	8	4	26
Vysočina	10	4	2	0	0	6	0	12
Středočeský kraj	21	3	1	3	1	2	7	17
Královéhradecký kraj	16	9	5	0	1	7	0	22
Karlovarský kraj	3	0	0	0	0	2	2	4
Pardubický kraj	17	0	2	2	0	2	1	7
Moravskoslezský kraj	11	1	6	1	0	4	2	14
Total	183	41	38	13	16	59	35	202

*Note.* Activit. PRD = Activities within Program of the Rural Development of the Czech Republic – this group contains educational activities which are focused on managing project

documentation for development. Above all, they are educational courses and classes providing information on how to obtain financial means from PRD, how to write a successful project etc.

*Note.* Proj. Other – in this group are included projects which were aimed at other educational activities and educational projects that could not be categorized into any groups mentioned in the heading of the table - this is due to the lack of information on the web pages of given local action groups.

From the point of view of financial sources for educational projects (there was not enough information about financial sources for educational activities on the web pages of LAGs) implemented by local action groups, the most common financial source is the European Agriculture Fund for Rural Development (it is a fund from which are provided financial means for the implementation of the LEADER approach), followed by the European Social Fund. According to information available on the web pages, 74% of a total of 202 educational projects were supported from the European Agriculture Fund for Rural Development (through the Program of Rural Development). The European Social Fund (through the Operational Education Program for Competitiveness and Human Resources Development Operational Program and Joint Regional Operational Program – the last two were valid in the 2004 – 2006 programming period) was used in 15 cases (it represents 7%). Other programs and financial instruments were also used - Grant Program of Liberecký kraj, Financial Mechanism of European Economic Area/Norway, funds of NUTS III regions of the Czech Republic, State Environmental Fund of the Czech Republic or the operational programs of cross-border cooperation. These results demonstrate that local action groups are also able to acquire financial means from other sources than EAFRD, which is important especially for those local action groups who were not successful in obtaining support within the LEADER approach. These unsuccessful LAGs do not have any way to “survive” other than to try to acquire financial means from various sources. In the case of almost 10% of projects, information was not presented about financial sources on the web pages of LAGs.

If we compare both tables, we can see that the NUTS III regions with the highest number of LAGs implementing at least one educational project or activity according to information on their web pages are those which achieved the highest number of educational activities and projects. It is obvious that more actors in a particular NUTS III region means more educational activities and projects.

## **4 Conclusion**

According to the information obtained from the web pages of local action groups acting in the Czech Republic, local action groups implemented 385 educational activities and projects. More than 47% of them were educational activities focusing on information which is necessary for the successful acquisition of financial means from the European Agriculture Fund for Rural Development. In the second part, almost 53% were created by different types of educational projects (different sources). From this distribution arose the question of whether the second group should be represented by a bigger share, as this group is focused on educational projects supporting tacit knowledge, which is considered by Maskell and Malmberg (1999) as more important for the region in order to be competitive with other regions. The most common type of educational projects were language courses and classes, courses of IT, project management and classes focusing on local production and local entrepreneurs. The group of educational projects for the establishment and activities of Educational Centers was the second most frequent group.

Looking at the results according to the NUTS III regions, Jihočeský kraj and Plzeňský kraj appear to be the best in providing educational activities and educational projects. Despite the

small number of inhabitants living in these NUTS III regions, the number of local action groups providing educational activities and projects is high. Adversely, NUTS III regions which are not as active in educational projects and activities are Ústecký kraj and Moravskoslezský kraj (both provided low number of educational activities and projects for the high number of inhabitants living in them). We can conclude from the above mentioned results that rather than the northern NUTS III regions of the Czech Republic, it is in the southern NUTS III regions where a higher number of educational actions are implemented (Olomoucký kraj is the only exception).

From the information obtained on the web pages of LAGs, it is apparent that not only the European Agriculture Fund for Rural Development, but also other funds, financial instruments and programs - primarily the European Social Fund - were used for the implementation of educational activities and projects of local action groups.

The survey also showed the problem of transparency of information provided by local action groups. Some of the local action groups still do not operate any web page or do not provide information about their actions on their web pages. In addition, the depth and character of the information provided on the web pages differs. Problems of transparency were also confirmed by other researches, e. g. Lošťák and Hudečková (2010), Balzerová (2009). The problem of transparency influenced the results, which are provided in this paper.

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# Climate Change, Mitigation of Consequences and Development of Sustainable Management of Agriculture in Bulgaria

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**Annotation:** The agriculture will be seriously affected in terms of less precipitations and higher temperature. The hydro-meteorological conditions of Bulgaria have been worsening. The long-term meteorological data analysis of different regions (1971-2000) shows a clear tendency of warming and drying. The rough estimation has been taken from the Intergovernmental Panel for Climate Change 2007.

The main goal of the research is to help the farming in adaptation with the climate change and to mitigate its impact for long term period 2020-2050-2070. It needs cost-benefit analysis of public investment in order to consider using an ecosystem-based approach for climate change adaptation and mitigation. The development of sustainable agriculture is not possible without applying an agro-climatic zoning.

The objectives of the research are, as follows:

- Analysis in order to recover the growth, development and the productivity of the agricultural crops by simulation models of production conditions and in correspondence with the expected climate change;
- Bringing up-to-date the existing agro-climatic zoning of Bulgaria for the main cereals, fruits, vegetables, vineyards and forage herbs; to examine the interrelations among biological, economic and agro-climatic indicators in order to determine regions for irrigation and more suitable crops for it in low-favoured agricultural regions mitigating the climate change for 2020-2050-2070;
- Finding hydrothermal indices and its applicability using an ecosystem-based approach; initiate the process of restructuring of agricultural production depending on the real and potential resources in order to mitigate the climate change.

The final results of the research are recommendations for public administration to organize agro-climatic zoning and to achieve better investment of national and EU funds in agriculture development.

**Key words:** Climate, Drought, Agricultural Policy, Natural Resource, Spatially, Regional Data

**JEL classification:** Q18, Q54, R1

## 1 Introduction

The agriculture is the main source of the society food supply and no other new technology for replacement exists. In the same time, the process of agricultural output passes in the open air and it depends in great extend on all changes arising there, i.e. the climate change plays significant role for the sector conditions and its productivity (Polly, Ingram, Liverman 2009, IATP 2009). The tendency towards more increasing warming and drying up makes experts to ponder over how to improve technologies, how to manage selections and how to cope with diseases and pests (Hlavinka et al. 2009, Mestre-Sanchís, Feijóo-Bello 2009, Motha 2007). It could happen only due to the detailed investigation of the cause and effect relationship of changes and consequences (Apipattanavis et al. 2010, Olesen, Bindi 2002).

The research goal is to outline the expected climate change in Bulgaria for the period of 2020-2050-2070 and the most probable impact on agriculture in order to mitigate its consequences and to establish real preconditions for sustainable agriculture development of the country output regions (Spiridonov, Déqué, Somot 2005, Supit et al. 2010).

The firsthand objectives are, as follows:

- Creating a methodology for assessment and analysis of the future climate change on agricultural resources of the country;
- Bringing up-to-day the agro-climate zoning according to the biological resources of the output of: cereals, fruits and vegetables, vineyards, forage crops;
- The spatial outlining of the areas of growing the above plants depending on water shortage at natural and irrigated conditions with recommendations of irrigation norm size;
- To determine indexes of the complex specification of hydrothermal conditions for each area;
- Outlining perspectives how to use the low quality water from wastewater treatment plants, drillings, wells, etc. for irrigated agriculture (Salinger, Stigter 2000, Sivakumar, Motha 2007).

With the project implementation measures will be suggested for applicable regulation of the agricultural output by regions for the periods 2020-2050-2070.

The main tasks in order to achieve the project firsthand objectives are, as follows:

- The borderlines of the expected change of Bulgarian agro-climatic conditions should be determine according to the various climatic scenarios and the likely climatic norms of environment examined parameters for the above period of time;
- Performing simulation with the model of growing, development and productivity of the agricultural crops WOFOST<sup>1</sup> of the expected output results of the main cereals up to 2020-2050-2070 (Supit, Hooijer, van Diepen 1994);
- Determining the irrigated agricultural areas, the irrigated norms and agricultural crops depending on the terms of changes' intensity.
- Bringing up-to-date the agro-climatic zoning of Bulgaria. Formulating recommendations for modernisation of the followings: agro-climatic zoning as a part of the activity of public administration and the Ministry of Agriculture and Food; investment policy in order to absorb the national and European funds of agriculture; direct the insurance companies policy at agriculture.

## 2 Materials and Methods

In order to perform the necessary research some model simulations were followed with present climate data and other simulations also were done relative to the climate of 2020-2050

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<sup>1</sup> - WOFOST is a tool for the quantitative analysis of the growth and production of annual field crops. As with all tools, you should know what you could do with it and what not. This chapter provides some insight in this matter.

Like all mathematical models of agricultural production, WOFOST is a simplification of reality. In practice, crop yield is a result of the interaction of ecological, technological and socio-economic factors. In WOFOST, only ecological factors

With WOFOST can calculate potential production and two levels of limited production: water-limited and nutrient-limited production. Production-reducing factors are not taken into account.

and of 2070. It was accepted that the second part of the 20 century, the data 1961-2000 are the most similar to the present climate characteristics. Those data fully reflect the intense changes and the dynamics of meteorological elements and phenomena during the last ten years of the 20 century. For this purpose data base was created containing the daily measured temperature data (minimum, maximum and average), the air humidity deficit, the air relative humidity, the wind speed, the precipitations and the rainy days number; furthermore, on the basis of the climatic norms for the period 1961-1990 the data of minimum, maximum and average temperature and the precipitation amount for the period up to 2020/2050 and 2070.

The main steps towards the assessment of the climate change impact are, as follows:

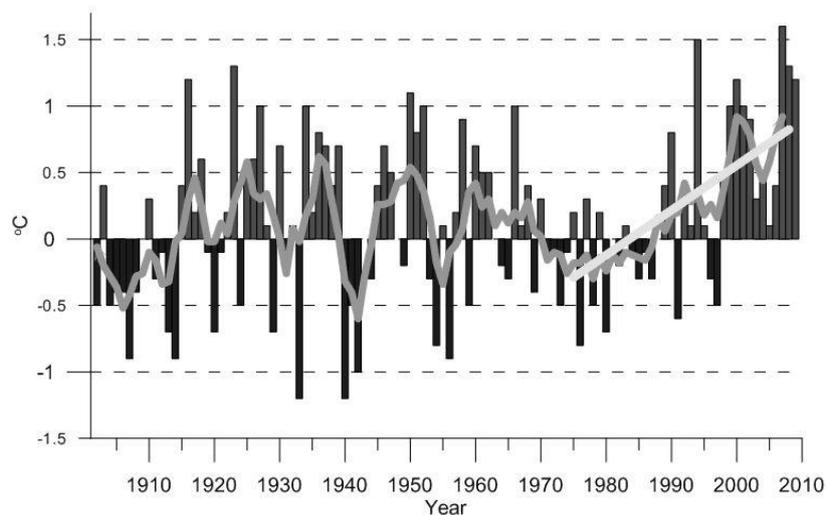
- Emission scenarios on the result of the population preliminary scenarios, the society socio-economic and technological development;
- Scenarios of the green house gases concentrations - carbon dioxide, methane, sulphate, etc. which are used at climatic scenarios for the calculation of climatic projections;
- Climatic scenarios of the expected global climate change (Global Climate Models) – in regard to temperature, precipitation, sea level, etc.;
- Models for regional climate change (Regional Climate Models) – models reflecting the regional specificity - mountains, islands, extreme phenomena, etc.;
- Models of the climate change impact – on the water resources, agriculture, food supply, etc.

The main characteristics of Bulgaria which are included in the research are, as follows:

- The warming tendency has been observed since the late seventies;
- The winters of the second half of 20 century were milder;
- Since 1989 18 of the latest 21 years the average annual air temperature has been with positive anomaly;
- The average annual temperature in 2009 for Bulgaria was with 1.2°C higher than the climatic norm. This was the consequent 12<sup>th</sup> year with temperature higher than the usual for the country (Fig. 1.);
- The frequency of the meteorological and climatic extremes have increased in recent years;
- There are significant increases of the average days with twenty-four-hour amounts above 100mm at the extreme precipitations, with about 30% for the period 1991-2007 comparing to 1961-1990.

Phenological phenomena are the natural indicator of climate change. The phenological observation data show that the forestall development periods are 7-15 days depending on climatic regions and unambiguously bear record of climate warming in recent 30 years compared to previous assessment periods.

There are other very precise indicators of climate fluctuations and changes and for the meteorological weather anomalies too. This is the speed and rate of the phenological development of annuals and perennials – agricultural plants, wild herbs and bushes, perennials and trees. All of them react simply and clearly to the climate change – temperature and humidity and they provide faultless information about the type and direction of changes.



**Fig. 1.** Air temperature anomalies in Bulgaria from 1901 to 2009 compared to 1961-1990.

It is impossible to use the climate simulation results directly. The cause is in the error accumulated during the integration of the 30 year climatic period. The model simulates its own dynamics which has nothing to do with the forecast. The final result is an average value (norm) for the given element aligned to the model area. The hypothesis is that the alignment of this error by space is identical for the various simulations. That is why the assessment of changes is usually done according to the 'referent' simulation for the past period for which the real norms are known. This referent period usually is 1961-1990 and its norms are compared to those of the climatic simulations for 2021-2050 and 2071-2100.

In order to have plausible picture of the way how the agro-eco-systems will react to the climate change up to the end of 2020 and to 2050 and 2070 some model simulations have been done where the meteorological data were up-dated with the results achieved by ARPEGE<sup>2</sup> and ALADIN<sup>3</sup> climatic models. From this point of view and taking into consideration the fact that the biggest part of the agricultural fields in Bulgaria are situated in the regions with unstable humidity or with limited heat resources or they suffer from the impact of extreme meteorological conditions as frost, drought, flood which determines the

<sup>2</sup> - Coupled atmosphere-ocean-sea ice model has been developed, named the Bergen Climate Model (BCM). It consists of the atmospheric model ARPEGE/IFS, together with a global version of the ocean model MICOM including a dynamic-thermodynamic sea ice model. The coupling between the two models uses the OASIS software package. The new model concept is described, and results from a 300-year control integration is evaluated against observational data. In BCM, both the atmosphere and the ocean components use grids which can be irregular and have non-matching coastlines. Much effort has been put into the development of optimal interpolation schemes between the models, in particular the non-trivial problem of flux conservation in the coastal areas. A flux adjustment technique has been applied to the heat and fresh-water fluxes. There is, however, a weak drift in global mean sea-surface temperature (SST) and sea-surface salinity (SSS) of respectively 0.1 °C and 0.02 psu per century. The model gives a realistic simulation of the radiation balance at the top-of-the-atmosphere, and the net surface fluxes of longwave, shortwave, and turbulent heat fluxes are within observed values. Both global and total zonal means of cloud cover and precipitation are fairly close to observations, and errors are mainly related to the strength and positioning of the Hadley cell. The mean sea-level pressure (SLP) is well simulated, and both the mean state and the interannual standard deviation show realistic features.

<sup>3</sup> - The basic concept of the model is described in *Horányi et al. (1996)*, its nonhydrostatic version in *Bubnová (1995)* and more recent physical parameterizations in *Gerard (2001)*. ALADIN is a popular model for the European meteorological services thanks to its combination of modest computational demands and high efficiency. Its origin could be tracked back to the early nineties when it was originally designed as a tool for pure downscaling (dynamical adaptation) of weather forecasts produced by the global model ARPEGE used at Météo-France. The first study investigating ALADIN performance during long-time integration based on a one-month experiment was conducted by *Janišková (1995)*.

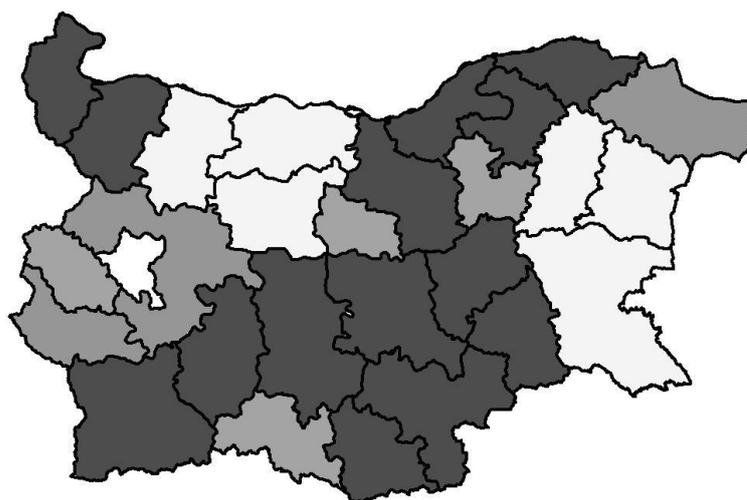
yield fluctuation of the main cereals and cereals-forage crops. Virtually, during the ten of the recent 20 years (1991-2010) significantly lower yields of the autumn cereals have been observed because of the abnormal extreme meteorological conditions. More of the half of the sown fields of Bulgaria is with winter cereals. The cereals yield determines the bread and cereal-forage balance of the country.

Two groups of key questions have been taken into consideration. The first group covers the quantitative description of environment factors impact on the agricultural crops, in particular the modelling of the extreme conditions (frost and drought) impact which are the main reason for yields fluctuation. The second group of questions refer to the parameters of dynamic models which take into consideration the geographical characteristics of environment and the resulted instability. WOFOST model has been used as a simulation tool to simulate the agro-climatic and agro-meteorological conditions together with various agro-technological solutions aiming the determination of its impact on yields. WOFOST simulates the growing and the development of agricultural crops at random location. It is an instrument for quantitative analysis of the growth and productivity of field annuals. Actually, it is very rear to have exactly one of the growth and productivity levels, that is why it is necessary the specific cases to make equal to one of them because it facilitates focusing on the impact of the environment limited conditions on productivity, as light, temperature, water and nourishing macro elements nitrogen, phosphorus and potassium. The other factors could be neglected because they do not influence the crops growth and development.

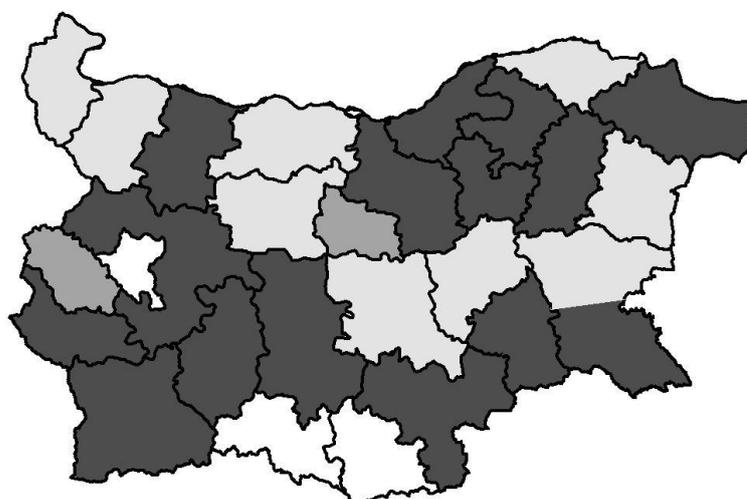
With WOFOST we could calculate the potential yield and yields of the two levels of limited productivity – at water shortage and the shortage of nourishing matters. The yield reducing factors have not been taken into consideration. According to the simulations of future climatic conditions with the help of ALADIN and ARPEGE climatic models we have had the temperature and precipitation data. Simulations were done with above data and WOFOST model on three levels – present, near future and far future about the productivity response to agro-eco-systems for the main cereal-forage crops. As present we understand the period of time 2000-2010, near future – 2030-2050 and far future – 2070-2100. The results of these simulations have been summarized by regions and presented as maps using four levels of clusters depending on crop types for which the model calculations were done.

### **3 Results**

In order to have a clear grasp of what really happens and what is going to happen we have done a model simulation of the two most significant cereals for the Bulgarian climatic conditions - winter wheat and grain maize. The calculations do not outline very good perspective of the wheat output which has a quite high potential productivity in the most regions of the country at the present, Fig. 2 and 3.



**Fig. 2.** Wheat productivity in Bulgaria grown at natural conditions at 2050 by regions ■ - up to 1,500 kg/ha; ■ - from 1,510 to 2,500 kg/ha; ■ - >2,500 kg/ha; ■ - insufficient assessment data for the region



**Fig. 3.** Wheat productivity in Bulgaria grown at natural conditions at 2070 by regions ■ - up to 1,500 kg/ha; ■ - from 1,510 to 2,500 kg/ha; ■ - >2,500 kg/ha; ■ - insufficient assessment data for the region

The followed simulations of the maize output show results which are different from those of the wheat. The maximum potential productivity reaches 6,000-6,500 kg/ha which is connected with the growth of various maize hybrids at conditions without water regime limitations or irrigation conditions. At these conditions the significant part of country territory is suitable for maize growing. The situation is not the same if the growing is followed under natural conditions, Fig. 4 and 5.

For the crop water balance formulation the humidity flow from the crop to the atmosphere is given by evapotranspiration. The standard evapotranspiration of various parts of the country is stable in time. The variation coefficient for the three studied periods is about 10%. The biggest variation has been observed in the Southern-West regions but this is a region with varied lay and micro-climatic conditions.

The 30-year tendency of standard evapotranspiration, as well as for the periods April-June and July-August is increasing and shows process of warming and drying up of the climate.

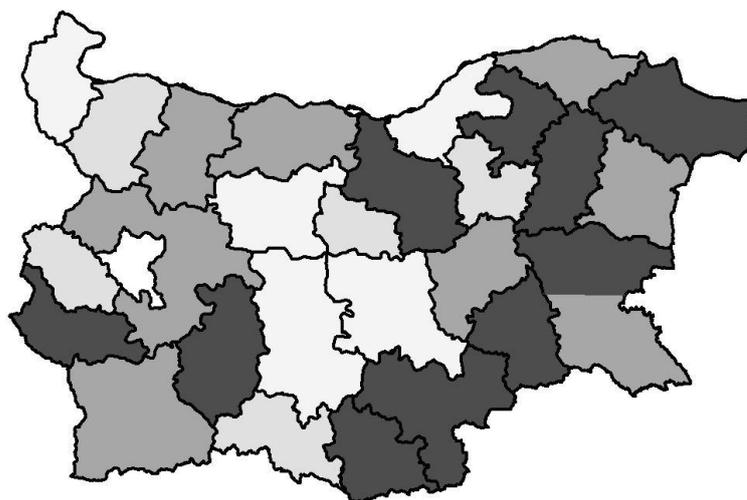


Fig. 4. Maze productivity in Bulgaria grown under natural conditions at 2050 by regions ■ - up to 3,000 kg/ha; ■ - from 3,010 to 4,500 kg/ha; ■ - >4,500 kg/ha; ■ - insufficient assessment data for the region

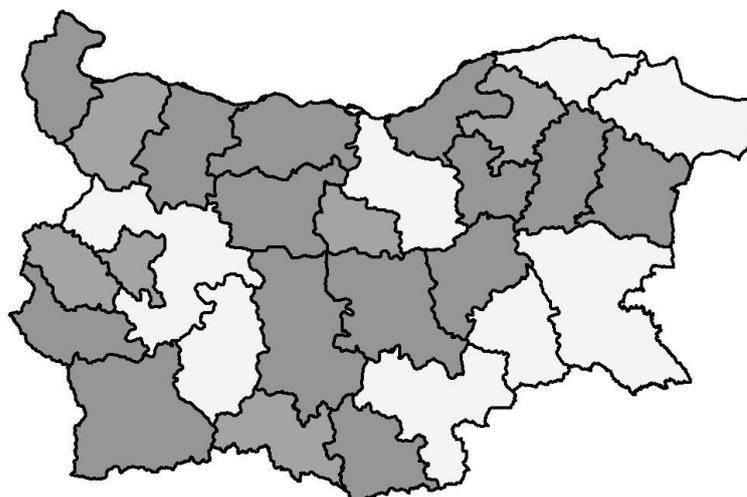


Fig. 5. Maze productivity in Bulgaria grown under natural conditions at 2070 by regions ■ - up to 3,000 kg/ha; ■ - from 3,010 to 4,500 kg/ha; ■ - >4,500 kg/ha; ■ - insufficient assessment data for the region

The total water consumption data also have been calculated, the necessary quantity irrigation water and the effective precipitations for wheat, maize and sunflower depending on the sowing time. Because of the climate change the optimum sowing time is shortened, time when positive output could be achieved at natural conditions of growth.

At 2050 the wheat which will be grown at natural conditions tends to decrease the yields and the growth will not be possible in Northern-East, Southern-East, Central-South and Southern-West Bulgaria. Around and after 2070 the water shortage will be all over and the wheat should be cultivated under irrigation conditions.

The simulations with maize show a permanent increase of water quantity necessary for irrigation, the quantity of effective precipitations tends to decrease regardless the time sowing. This suppose the periods of drying up followed by torrential rain falls. The reduction of the total effective precipitations during the maize vegetation period up to 2050 will be 15-25% to the climatic data for the period of 1971-2000, and to 2070 the reduction will be 35-55% compared to the same period. Here too, there is seen the shortening of the optimum sowing period and it is 5 – 20 May.

We could say that the cultivation conditions of sunflower will be a little bit better. From 2000 to 2020 the effective precipitation will decrease and the water quantity indispensable for irrigation will increase. At 2050 the water quantity necessary for irrigation will decrease and later on up to 2070 there will be water quantity increase in order to compensate the shortage and for the sunflower normal growth.

## 4 Conclusions

Bulgaria is situated in the zone of insufficient humidity. The irrigation is an obligatory activity in order to get high and sustainable yields. The country hydrothermal conditions are characterized as humid to very humid for the period April-June and dry to very dry for the period July-August. The most adverse hydrothermal conditions determining evapotranspiration are in Southern-Central region and in the Southern parts of the Southern-West regions. The most favourable are the conditions of the Northern-East region.

The thirty-year tendency of standard evapotranspiration shows warming and drought of the country climate in the future.

The cultivation conditions of autumn and spring cereals at natural conditions worsen permanently and at the second half of the present century the sustainable management of agriculture will be unthinkable without artificial irrigation. This requires more pressing improvement of the irrigation technologies, their implementation into the precise, computer based systems which has to monitor continuously the environment and to use only the indispensable water quantity.

## Acknowledgements

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# A Depiction of Regional Development in Local Press (Sušicko Case Study)

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**Annotation:** The paper is focused on one of the often-mentioned tendencies in current regionalism, which is related to the position and mission of the regional press. The subject matter is framed by the phenomenon of mass communication in globalized society. The present “disembeddedness” of the social human world is also reflected in the emphasis on local communication, although it is implemented through the means of mass communication. The main question of this study is whether local newspapers perform the role of an intermediary in providing information about activities related to local development. This issue also indirectly affects the question of the actorship of local media in regional development. Within the empirical study, a quantitative approach to media content was used. Overall, 535 articles were analysed and official press news covering information on (a) towns and their activities enhancing the quality of life of local inhabitants; (b) projects that were implemented in terms of public interest; (c) projects of investors focused on education with the links to the sphere of public services; (d) projects of a permanent nature related to the construction of public facilities. In addition to this, semi-standardized interviews with mayors of the relevant towns, who represented publishers of local newspapers, were used. The object of the study was the newspapers issued in local areas of the selected rural regions – Sušicko (Sušické noviny, Kašperskohorský zpravodaj, Horažďovický obzor). The results of the analysis provide information about the extent and main topics of articles with the above-mentioned issues presented in the newspapers during 2008-2010. Simultaneously, it evaluates the suitability (potentials and limits) of using content analysis for media messages affecting the given topic in local newspapers (which are typically distributed in less than 3,000 copies) that are published by small towns and centres of rural micro-regions.

**Key words:** media, newspapers, quantitative content analysis

**JEL classification:** R58

## 1 Introduction

The paper is concerned with the question of how the local press in a rural area shows its development (as it monitors the development and what developing activities it is focused on). The choice of themes justifies two important phenomena in the examination of rural society. Firstly, regionalists and rural sociologists, including Czech authors (Wokoun 2007, Blažek 1998) identically point to the fact that current regionalism shows the rise of the local media, from printed to a computer network. Secondly, local media having the potential to be a major player in local governance in the process of locating and rural renaissance (Kayser 1990, Peters 2003) in the period of post-traditional and post-modern rurality in the context of global society is discussed (Gransberg, Kovách, Tovey 2011).

We chose press as a medium of information about regional development for several reasons that were reported by many authors (e. g. Blažek 1998, Jeřábek 1997, McNair 2004):

- a newspaper can be read at a time when it suits the reader, and in a place where it suits the reader
- newspapers can act also as a means of "relaxation"

- monitoring of newspapers does not require any special technical devices for receiving and processing of information, and it is easy to obtain them and they are not expensive,
- newspapers have a high value simply because they are so common
- in the conditions of our country, the media monitoring of provincial locations is more established through local newspapers (often with a long tradition) than through regional radio and television stations
- newspapers are generally (according to communication research) considered a more serious source of information (compared with other mass media)

The reason for this is also the detailed knowledge of the investigated area and the practice of one of the co-authors as local newspaper editor.

Harold Lasswell (Lasswell, 1948) imputes to the mass media three basic functions - control of an environment through the current news, transfer of social heritage between generations and creating synergy amongst the elements of the community. Regional press, compared with nationwide print, should play a major role in strengthening a sense of belonging to the dispersed recipients both to each other, and to the territory in which they live. We even believe that this mission can be considered a challenge to regional mass media to intensify the rational and emotional grounding in the area. This means the fulfilment of a socially integrative function through the mass media, which is mentioned by many authors and cited by Jirak and Köpplová (Jiráč, Köpplová, 2003).

We conclude that regional media fulfils this role in countries where the mentioned trend of regional movement has been observable since the turn of the 1960s and 1970s as a reaction to globalization processes, and where the de-concentrated, territorially administrative structure is already well developed - whether with a greater or lesser success, as the process of globalization of the media and transnational press barons are their rivals. In the Czech Republic, the socially integrative mission of the regional mass media is just beginning to be fulfilled. The basics of the fulfilment of socially integrative functions of the regional press are laid down as the phenomenon called "social imago" by T. Burrows is perceived (Velký sociologický slovník, 1996). This is reflected in "local public opinion".

During the 20th century, critical works describing the effect, influences and impacts of mass media in relation to the audience were written. We will point out some of the critical comments. They are related to print media, but are not limited to them.

The first one is devoted to the nature of the audience from the aspect of its passivity or activity. Passivity of the audience was mainly dealt with by the Frankfurt School, which strongly connected with passivity the phenomenon of manipulation and loss of local public space (Habermas, 2000). Another concept, the so-called cultivation theory, was developed by the group around Georg Grabner (Jiráč, Köpplová, 2003). It mentions that prejudice and stereotypical behaviour are supported through mass media. On the other side, the various conceptions of active audience were worked up and were adumbrated in the opinions of classics Paul Lazarsfeld and Bernard Berelson. Because we emphasise the social integrative function of the regional press, it draws us to the so-called reception theory (Mocná, 1996), which represents the "interpretative community" actively involved in media communications because it has its own repertoire of reactions. However, this does not mean that through this activity the audience can achieve victory over mass media in reciprocal communication.

Along with John B. Thompson (Thompson, in Giddens, 1999), we maintain an opinion that is optimistic in terms of the power of the local press to create the public sphere. Our position contains the idea that people in localities are not only passive recipients, and that local mass media create an access way to knowledge that can be used for many social

activities that take place in locations and make them more than a location, as they in fact lead to the community.

The second comment is aimed at the reporting value of the media message. This value is created by the producers of media message represented by media owners and editors of media messages. In direct application to local development, we can only conclude that its media image is influenced by creators of reporting values - it is the social product of these creators. They respect the audience in accordance with the premise of which reports in local development are worth publishing. Thereby, locals (the audience) are more pointed toward some events, relations and processes relating to local development and less to others, and some are not notified at all. The media image of local development is only partially overlapped with its image in the eyes of the actors themselves, who are numerous, and they are connected with the regional mass media with a different intensity of strong or weak ties. Hypothetically, we can conclude that in our case, this type of distorted image of regional development is limited in the local press because it is limited only to news with the effect classified as "didactic propaganda" (Thompson, 1977) with the aim only to report, not persuade.

The third important comment is addressed again to the eventual distortion of the mass media image of local development, which has its origin in so-called "infotainment." It is connected with the trend to approach the contents of communication to the taste of the "average reader" (viewer, listener), in which the requirement of entertainment dominates over the informative depth, accuracy and quality. In this hypothetical case, we assume that the contents information that we monitor which relates to events at the place where its residents form the audience are relatively more controllable and communicable in more ways that just through the mass media, and they will therefore be less distorted by infotainment.

## **2 Materials and Methods**

From the above theoretical basis of the empirical investigation and interpretation of the results arise two important facts:

1) The content orientation of analysing material on the structure of the image of local development as it serves the local press as a player in the creation of interpretative community. The mission of this is primarily the maintaining and strengthening of local identity through communication, providing serious information and qualitative knowledge about the locality and community. Thus, civic participation of local residents can be facilitated.

2) Sector (spatial) orientation of the analysing material is limited to public space (sector) and to the corresponding point of view - public administration. Private space means the space of market exchange that we consider an important regulator of social development. Its funded media image would require a content analysis of the structure of the local economy (including agriculture) to be performed, and to apply in particular their economic point of view. The authors did not address this aim because their professional specialization corresponds to the sociological point of view on local development and its anchoring in the public and community space.

The research question was asked in order to find out whether (how much) and how (according to content) printed media (local newspaper) in the selected region (Sušicko) produces information about regional development. The production of such information is a specific report on local development and formation of an "interpretative community".

The object of the research is Sušicko, a rural micro-region near the south eastern border of the Pilsen region - three small cities that publish newspapers in this micro-region. In Sušice (11,500 inhabitants), the Sušické noviny newspaper is published, Horažďovice (5,650

inhabitants) publishes the newsletter Horažďovický obzor (horizon) and in Kašperské Hory (1,600 inhabitants) we can read Kašperskohorský zpravodaj newsletter. In all three cases, the local newspapers are published regularly (in Sušice 24 ×, in Horažďovice 12 ×, in Kašperské Hory 6× per year) in the range of 12 to 20 pages. These newspapers are either directly or indirectly issued by the town administration. They have steady structuring content and occasionally a special attachment. A content analysis was processed from all editions from 2008 – 2010. It was an analysis of the articles that pertained to the regional development implemented in the public space (not in the market exchange space) about the municipalities and activities (of the municipalities and development initiatives) with regard to improving the quality of the life of local residents, about projects and programmes implemented in terms of public interest, about the projects of investors that have the nature of activities aimed at supporting the regional public services, and about perspective projects which are appropriated to the construction of facilities serving the public.

The contents of these articles were categorized according to the main discussed themes:

- a) public policy + administration (includes state and local government administration in terms of foreknowledge of citizens about publicly accessible services, more effective work of offices, public administration, elections, and of the actions of political parties, groups and movements of civil society)
- b) management + maintenance of the town (information about the economy with budget, the investment plan, implemented investments, the maintenance of the town, reconstruction and revitalization of public areas and spaces, residential houses owned by the city, public buildings, sports facilities etc.)
- c) health + social care (information about investment and non-investment activities and programmes with impact on providers and users of such services)
- d) education (information about school and after-school activities above the scope of the educational programmes, education of adults, including specialized courses, regional and international co-operation of schools and programmes and activities - courses, seminars, workshops - for the general public etc.)
- e) culture + sights (information about projects and programmes of investment and non-investment nature impacting the general public in the development of tourism, increasing the attractiveness of the micro-region through the access, reconstruction and revitalization of cultural sights and traditional and newly created events of supra-regional importance)
- f) sports + tourism + tourist trading (information about investment and non-investment projects leading to the development of sports facilities, tourism opportunities and attractiveness for tourism, important sporting and tourist events of supra-regional importance)
- g) housing (information about projects and investment activities for increasing the quality of the buildings owned by the town, including sanitary facilities, localities for housing, investment plans, preparation and construction of clean housing zones)
- h) transport (information about transport infrastructure, its administration, reconstruction and maintenance and projects and actions in public transport)
- i) the environment (information about projects, programmes and actions to protect the environment, its support and permanent validity, including educational activities about waste economy)
- j) free time (information about projects of perennial recreational activities for the general public to improve the quality of life for both local residents and tourists)

k) other (information about the origins and effects of specific development initiatives, public collections, etc.).

We have selected the following as identification variables of coding units (editorial reports and official press releases): the time and local destination, the existence of the connected pictorial material, author / initiator / investor, origin of the report.

The extent of the articles (coding units) was measured partly by the variable of the occurrence (in % of area occupied in one page of the print), and partly by the variable of the proportion of the pages occupied by the relevant article (in % of total pages of the print). The values of these indicators give quick direct information about the amount of attention given to the projects, programmes and activities included into regional development implemented in the public space in the local newspapers.

535 articles were entered into the above mentioned content analysis (345 from Sušické noviny, 104 from Horažďovický obzor and 86 from Kašperskohorský zpravodaj), published in total of 121 editions of these local publications including special attachments. This means that on average, 4.4 articles concerning regional development fall on one edition. What is extraordinary is the publishing of articles with this theme in the Kašperskohorský zpravodaj (5.3) newsletter and Sušické noviny (5.0) newspaper, while in the Horažďovický obzor newsletter, their number in one print does not reach a value of 3, and more often than in Sušické noviny and Kašperskohorský zpravodaj, the articles about regional development are not accompanied by pictorial material.

Material for the quantitative content analysis, which consists of 535 units of coding, and time of monitoring, which includes three years (2008, 2009, 2010) is considered to be representative of the regional development implemented in the public space from the view of the local press in Sušicko.

### **3 Results and Discussion**

With regard to the content analysis, whose results we present here, we were asked to research the satisfaction of readers of one of the surveyed newspapers - Sušické noviny. Research monitoring included 119 respondents from regular readers, who on average "attach" to themselves three additional readers from their homes. In this survey, it was ascertained that the readers would welcome the expansion of current information concerning regional development. On the contrary, they wish to narrow the space applied to advertising and reports from readers (Staňková, 2009).

The quantitative content analysis of Sušické noviny, Horažďovický obzor and Kašperskohorský zpravodaj analysed the reports of which the absolute majority had an origin of an editorial article - a small part (less than 5%) were official press releases. For articles about regional development, there is a clear the slightly increasing trend of occurrence in 2008-2010 (2008 = 100%, 2009/2008 = 108%, 2010/2009 = 111%). Pictorial material is connected to these articles regularly, and after exclusion extreme values, it is related to 50-84% of the reports in every newspapers and monitored year. As the main actor of publishing activities, projects and programmes, Sušice and Kašperské Hory show similar results, where the town appears in two thirds to 90% of the analysed results. In 2008 and 2009 in Horažďovice, the proportion between the mentioned actors (town or other entities) is well-balanced, and in 2010, the town began to predominate in actorship (at the rate of 2/3: 1/3). This result is clearly different, and according to our knowledge of the locality, it cannot be interpreted with greater or less involvement of the towns in regional development. The interpretation could only be permitted through a triangulation of the used research techniques, in this case the questioning, and preferably also long-times direct monitoring in all three towns.

The content analysis of the reports regarding regional development in all three regional newspapers in 2008-2010 proceeded in three steps: 1 - the order of the articles was established in every periodical and in every year (in accordance with the main theme), standing with 1 – 3 place, 2 - the rates of these articles to all of the articles included in the analysis were added up (according to the main theme), 3 - in the end, the added rates of these articles (according to the main theme) were recast with a coefficient of 3 in the first order, in the second order with a coefficient 2 and in the third order with coefficient of 1 = final order.

In this way, the score of the media image of information on regional development under the thematic specialization in the micro-region Sušicko by three local newspapers in the past three years was achieved.

**Table 1.** The image of regional development implemented in the public space in Sušicko according to local press (2008-2010) - basic results.

Score		Main theme	Commentary - occurrence of the theme in order 1-3 - proportion of the theme in order 1-3 - local determination
Number of the points	Order		
462	1.	management +maintenance	- 4×1 order - 23% - 61% - smaller locality, greater occurrence
269,5	2.	culture+sights	- 2×1 order, 5×3 order - 13.5% - 39% - occurrence through the localities
238,5	3.	sports+tourism +tourist trading	- 1×1 order, 2×2 order, 3×3 order - 6.5% - 22% - small occurrence in the smallest locality
227	4.	education	- 2×1 order, 1×2 order - 25% - 35% - occurrence in the largest locality
188,5	5.	environment	- 1×1 order, 3×2 order, 2×3 order - 6.5% - 22% - small occurrence in the largest locality
98	6.	public policy + administration	- 3×2. order - 13% - 20% - greater occurrence in the smallest locality
33	7.	leisure time	- 1×2 order, 1×3 order - 11% - occurrence only in the smallest locality
20,5	8.	health+social care	- 1×3 order - 20.5% - occurrence only in the largest locality

*Note.* Legend: occurrence of the theme in the 1-3 order = how many times the articles about the main theme in the 1-3 order occupied the total number of analysed articles of regional development in the three monitored titles and three monitored years; proportion of the theme in the 1-3 order = the same in percentage formulation; local determination = shows about articles about main theme, which occupied the 1-3 order of the total number of analysed articles from lower/higher occurrence according to monitored locality.

The results show:

- significant superiority of the topic of public funds in the emphasis on this issue in smaller localities issuing local press
- relatively great attention to issues of culture + health, sport + tourism + tourist trading (the last named area is emphasised only in the largest monitored locality)
- relatively little attention to environmental issues (mainly in the largest monitored locality)
- clearly little attention to issues of public policy + administration (again mainly in the largest monitored locality)
- marginal attention to issues of leisure time (mainly in the largest monitored locality) and issues of health + social care (the opposite is true for the smaller monitored locality).

The other category of the themes belonging to the problems of regional development did not occupy a significant place in any of the nine groups of local and temporal coding units in publication (i.e. less than 6.5% of the articles in the periodical and the year). These are the topics of housing, transport and others.

## 4 Conclusion

Although the conference is called “Agricultural perspectives”, for 10 years, it has dealt with the wider problems of development of rural localities, including the aspects of public administration. This report also falls into this area. We conclude that we must permanently increase the publishing of information about regional development in the local press (we have monitored the horizon of the past three years), which can be regarded as a positive finding.

An interesting finding is that the topics of regional development that are preferred by the mayors and the results obtained of quantitative content analysis are different. They themselves put greater emphasis on the sphere of public policy + administration, which appears only as the sixth of eleven monitored themes in our results about the media image of regional development in the local press. This can indicate the fairly weak effort of municipal councils to influence the contents of local periodicals, which are issued by the towns. There is, however, a less favourable interpretation: unwillingness or lack of interest in publishing some sensitive topics from this sphere due to fear of a negative feedback from readers. Or the reason can be also the form in which this theme is imparted, as the value of reports created by the editors conform more to the readers. It is not presumed that information from public policy + administration would be more requested – they miss the entertainment features, it is not easy to reveal the direct benefit for the readers - the fear of awakening the distrust which now affects the Czech political scene in general can play a role, etc.

The assumption of "for readers" themed news value confirms our findings about the most frequent themes in the media image of regional development in the Sušicko region. This image is significantly created by information on the management + maintenance of the town, on culture + sights and on sports + tourism + travel industry. These spheres can be considered as those in which there is a presumption that people can appreciate them, including the benefits for themselves.

Significantly asserted themes show the different ranges published in the local press from the view of the monitored micro-regional centre. In the largest centre, great attention is given to education, health + social services, namely (in comparison with the smaller and the smallest centre of the micro-regions) at the expense of the aforementioned economy + maintenance of the town and the environment. The higher frequency of articles about

education, health + social services can be connected with the so-called town service function of this micro-regional centre. In the matter of the management + maintenance sphere, it is much more discussed in both smaller centres, and it can relate to the phenomenon of non-anonymous and more immediate relations between citizens and representatives in the smallest towns. Greater media attention is given to the questions of public policy + administration in the smallest of the monitored micro-regional centres.

A curious finding is that the huge predominance of information involved in regional development is that whose initiator (initiator of projects, programmes and activities of regional development) is the town itself. It does not seem likely that other regional actors belonging to the local civil society participate so little in regional development, as it is shown by the media image. Whilst at the beginning of this report we consider the socially integrative function of the local press, we believe that it should represent more consistently all civil society institutions and their actors in its information about regional development. Only then can we speak about strengthening communal life through the local press.

In conclusion, we remind that the findings mentioned in the results and conclusion relate to a case study of the Sušicko provincial micro-region, and these findings do not claim to generalize for other similarly structured micro-regions in the Czech Republic. For a better interpretation of the results obtained by the quantitative content analysis of media messages, it would be necessary to monitor the perception and assessment of regional development by local citizens using other research techniques.

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# Knowledge Dynamics Within the Rural Areas of the Czech Republic

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**Annotation:** Current society is often called a knowledge society, and knowledge is one of the most important development sources. Knowledge is often classified as explicit and tacit because there is a significant difference between these basic types. Both explicit and tacit knowledge is important for regional development, but tacit knowledge seems to be more important particularly for rural areas due to the specific conditions of rural areas, and usually a lack of explicit (codified) knowledge. The importance of tacit knowledge is also consistent with an endogenous approach to rural development. These are the main reasons for choosing the topic of this paper, which is focused on knowledge creation and knowledge dynamics within particular rural areas of the Czech Republic. The paper is focused on specialized institutions for education within the rural areas which are called “Schools for Rural Renewal”. The main aim of the paper is to examine the role of these institutions within the process of knowledge creation within the rural areas. The specific aim is also to compare the functioning of different types of Schools for Rural Renewal (which differs mainly by their founders) and to research different approaches to education within the rural areas. From the methodological point of view, mainly secondary analyses and semi-standardized interviews with representatives of Schools for Rural Renewal are used. Attention is also paid to the typology of implemented projects and activities of Schools for Rural Renewal which differs between the regions of the Czech Republic. As a result of the research, we identify success and failures factors of functioning Schools for Rural Renewal in the field of knowledge creation and knowledge dynamics within the rural areas.

**Key words:** Development, education, knowledge, rural areas, rural renewal.

**JEL classification:** R10

## 1 Introduction

Current society is often called a knowledge society and this results in a logical common effect which can be described as a focus of society on human resources from the perspectives of knowledge, skills and qualifications. From these facts, the concept of knowledge emerges as the most strategic resource, with learning as the most important process (Lundvall, 1995). Qualifications (qualifications of people living in a particular delimited area which consists not only of the educational structure, but also of the ability to be self-educated using more or less formalised methods and to use the knowledge and skills gained to increase the quality of life within the area) are therefore regarded as one of the main factors of development potential, not only from the individual aspect, but also from the regional and societal points of view.

Despite the fact that the learning process is not a complete guarantee of economic success, it still remains a universal cure for the problems of socio-spatial inequalities. Innovations and learning are important features in understanding why some firms or regions are economically successful and some are not (Hudson, 1999b). Firms use quasi-rent, which results from the possibility of using the knowledge potential and skills of a locality or region (not only of the individuals living in the locality, but also the synergic effect of sharing knowledge). Firms are localised on the basis of the capacity of localities or regions, which is formed in particular by the infrastructure, natural resources, institutional endowment and knowledge available within the locality (Maskell and Malmberg, 1999a). These

considerations correspond to the theory of learning organisation, which considers knowledge as a crucial source for entrepreneurship (Tichá, 2005) and which is the first theoretical concept used as a background for this paper. From these perspectives, knowledge becomes one of the most important locational and developmental factors. From this point of view, it is necessary to rethink approaches to local and regional development. As claimed by Hudson (2007), it is useful to establish local interregional alliances to cooperate mainly in view of knowledge transfer and knowledge dynamics. Considering the theory of learning regions (the second theoretical concept used within the paper), knowledge is often classified as codified and tacit because there is a significant difference between these basic types. Codified knowledge can be standardised and transferred by instructions, manuals, education, and it can be sold as goods. Tacit knowledge (e.g. know-how, skills and competences) may be acquired only directly by one's own experience and participation in a particular activity (Hudson, 1999a). Knowledge is difficult to grasp. Knowledge assets provide valuable services, and they have potential economic value. Compared to physical assets, it is possible to share knowledge without the loss of it by its owner. Knowledge sharing does not decrease the usefulness of knowledge, but it decreases its value - shared knowledge loses its scarcity. In this context, it is possible to debate about the codification of tacit knowledge, because codified knowledge itself represents an instrument for the production of new knowledge (Maskell and Malmberg, 1999b).

This concept of knowledge is typical of the individual, organisational and regional levels, but current conceptualisation is shifting away from these levels to the whole of society by use of the term "learning economy", which is the third basic theoretical concept used within the paper. Nielsen and Lundvall (2006) define the "learning economy" as one in which the ability to attain new competencies is crucial to the performance of individuals, firms, regions and countries. Recent decades have been characterised by an acceleration of both knowledge creation and knowledge destruction. Information and communication technology has made a lot of information more easily accessible to a lot of people, but it has also made many skills and competencies obsolete. These facts result in the new typology of knowledge, using a combination of two criteria – individual or collective entity and explicit (codified) or tacit knowledge. On this basis, Lam and Lundvall (2006) create the typology of four different forms of knowledge – embrained + encoded (explicit or codified), embodied + embedded (tacit). On the basis of these concepts and classification of knowledge, Schools for Rural Renewal and general knowledge dynamics within the rural areas of the Czech Republic are also researched.

## **2 Materials and Methods**

The paper is focused on knowledge creation and knowledge dynamics within the particular rural areas of the Czech Republic and particularly on specialised institutions for education within the rural areas which are called "Schools for Rural Renewal", and their role within the knowledge creation and knowledge dynamics within the rural areas in the Czech Republic. Attention is also paid to the activity or inactivity of particular Schools for Rural Renewal in the process of education for rural areas.

The main aim of the paper is to examine the role of these institutions within the process of knowledge creation within the rural areas. The specific aim is also to compare functioning of different types of the Schools of Rural Renewal (which differs mainly by their founders), and to research different approaches to education within the rural areas.

From the methodological point of view, mainly a secondary analysis of the database of the Schools for Rural Renewal, their web pages and particular implemented projects is used. In addition, semi-standardised interviews with representatives of the Schools for Rural Renewal are used. Attention is also paid to types of implemented projects and activities of

Schools for Rural Renewal differentiating between the regions of the Czech Republic. As a result of the research, we identify success and failures factors of the functioning of the Schools for Rural Renewal in the field of knowledge creation and knowledge dynamics within the rural areas of the Czech Republic.

### 3 Results and Discussion

Considering the knowledge dynamics and knowledge creation within the rural areas of the Czech Republic, it is possible to identify the three main groups of its organisational framework. The first of the groups is formed by organisations which ensure the implementation of The Strategy of the Regional Development of the Czech Republic for 2007 – 2013 in the field of education for rural areas. This group consists mainly of ministries according to their specialisation (particularly The Ministry for Regional Development, The Ministry of Education, Youth and Sports, The Ministry of Labour and Social Affairs, The Ministry of Industry and Trade, The Ministry of the Environment and The Ministry of Agriculture), as well as Regions at the NUTS 3 level. The second group is formed by organisations which ensure the implementation of the Operational Program Education for Competitiveness. This group consists mainly of The Ministry of Education, Youth and Sports at the central level and schools, educational institutions, research institutions, regions and municipalities at the local and regional level. The third group is formed by specialised organisations dealing with the problems of education in rural areas. This group consists mainly of the Schools for Rural Renewal and also Local Action Groups. The paper pays specific attention to the third group of organisations, and mainly the Schools for Rural Renewal are in the centre of its interest.

There exist 38 Schools for Rural Renewal (SfRR) in the Czech Republic, which cover all Regions at the NUTS 3 level, including the predominantly urban region (Prague) according OECD methodology. But the different Regions are covered by SfRR with different intensity (see Table 1). The highest coverage exists within the Středočeský Region (5 SfRR) and also within Jihomoravský and Královéhradecký Region (4 SfRR within each Region). This fact corresponds also to degree of rurality of these Regions (except of Vysočina Region). On the contrary, the least coverage exists within the Karlovarský and Olomoucký Region (1 SfRR within each Region). Table 1 also consists of the evaluation of the activity or inactivity of SfRR according to their presentation on web pages and semi-standardised interviews with their representatives. This type of evaluation is based mainly on information openness of a particular SfRR which could be slightly different, but we assume that efficiency of knowledge creation, knowledge dynamics and educational process within the rural areas is based on information openness towards potential clients. Considering the evaluation of activity and inactivity of SfRR, 26 of them could be classified as active, and 12 of them could be classified as inactive. Thus, one third of SfRR are inactive and two thirds of SfRR are active in the field of educational activities for rural areas regardless the types of activity.

Considering the other specific features of SfRR, attention is also devoted to time of formation, their founders, financial sources for the projects and typology of implemented educational projects. The time of formation of SfRR can be circumscribed by the years 1997, when were established the first SfRR, and 2007, when the latest SfRR was established. These ten years can be labelled as the “golden age” of SfRR due to funding by national sources. As results from our research, the role of SfRR is substituted these days by Local Action Groups which function as a specific entity, or are very closely linked to SfRR. Very important features of SfRR are their founders and their legal statuses, which significantly influence their activity or inactivity, as well as their functioning within educational process. The first group includes SfRR with their own legal personality (e.g. limited company), which usually experience a rather difficult existence because of the strict rules, necessity of market

orientation and profit generation. To the second group belong SfRR which do not have their own legal personality but which are linked to the municipality. These SfRR could easily accomplish their mission in education and knowledge creation within rural areas because they do not encounter the same problems as the first group of SfRR. But the problem of the second group is their often strict linkage to the active mayor of the municipality and their dependence on the political cycle of the mayor, which leads to less stability in their functioning.

**Table 1.** Activity and inactivity of Schools for Rural Renewal

<b>Region</b>	<b>No. of Schools for Rural Renewal</b>	<b>Active</b>	<b>Inactive</b>
Středočeský	5	4	1
Jihomoravský	4	2	2
Královéhradecký	4	3	1
Jihočeský	3	3	0
Liberecký	3	2	1
Prague	3	1	2
Ústecký	3	2	1
Zlínský	3	3	0
Moravskoslezský	2	1	1
Pardubický	2	0	2
Plzeňský	2	2	0
Vysočina	2	2	0
Karlovarský	1	1	0
Olomoucký	1	0	1
<b>Total</b>	<b>38</b>	<b>26</b>	<b>12</b>

Special attention is also paid implemented educational projects and their funding by sources at a national or supranational level. The broad spectrum of the project is implemented by SfRR, but the most common are projects pertaining to unemployment, environment, strategic rural development and educational projects focused on problems of subsidies from structural funds. Excursions to successful rural municipalities are also arranged. Considering the target groups of projects, mayors of the rural municipalities and members of municipal councils prevail. Less represented are rural local people in relation to the main orientation of the implemented projects. This could be seen as a main problem of the functioning of SfRR. Implemented projects are focused primarily on technical or professional education and codified knowledge creation, and less attention is devoted to local knowledge, strengthening of the local identity of the rural population and creation and support of tacit knowledge (both embodied and embedded). In this context, the activities of SfRR are not consistent with the assumptions of the concepts of localised learning, learning regions or learning economy (represented by, for example, Lam, Lundvall, Maskell, Malmberg or Nielsen – see above), which emphasize the role of tacit and local knowledge in rural development.

Compared to the typology of projects, funding of the projects is consistent with the three level support of regional policy (supranational, national and regional). The implemented projects are supported by the European Social Fund and the European Agricultural Fund for Rural Development at supranational level, the Ministry for Regional Development and the State Environmental Fund of the Czech Republic at national level and support is provided also by particular Regions through grant schemes of the Regions. This mixture of financial sources seems to be appropriate to the activities of SfRR and their role in education for rural areas.

Some topics of discussion result from the analysis of SfRR presented above. The first of them is decreasing the role of SfRR in education for rural areas on the one hand, and increasing the role of Local Action Groups on the other hand. This asks the question whether SfRR are important in education for rural areas, or if they could be replaced by Local Action Groups? From our research, it results that SfRR have an indispensable place in education for rural areas because they are the only specialised institutions in terms of education for rural areas. Local Action Groups prepare educational projects, but they also have many different objectives, and education for rural areas is only one of them. The decreasing role of SfRR results mainly from ill-conceived support by central authorities, which shift away the support from SfRR (which were supported mainly between the years 1997 – 2007) to Local Action Groups. But the question whether is the last change in supporting rules, and how Local Action Groups will be supported after 2013. This ill-conceived approach leads to uncertainty for all rural educational actors. The second topic of discussion is the issue of different approaches of particular SfRR to education within rural areas. There exist two different approaches to education in rural areas which are used by each of SfRR. The first is approach based on technical education and codified knowledge dynamics and the second is based on encouraging local identity and tacit knowledge creation (see above). The question is which combination of these approaches is suitable for efficient rural development. The first approach usually brings immediate impact on rural development, but issue is the sustainability of this approach. The second approach usually brings long-term impacts on rural development primarily encouraging local identity within rural border areas which suffer from displacement during their historical development and face to problem of less inveteracy of local people. This could be also seen as a potential topic for future research – mainly considering the educational process within rural border areas.

## **4 Conclusion**

At the basis of results presented above, it is possible to formulate some main conclusions regarding the research presented within this paper, and to also identify the factors of the successes and failures of the functioning of SfRR. The first of them is the existence of 38 SfRR in the Czech Republic that cover all Regions at the NUTS 3 level, including the predominantly urban region (Prague) according the OECD methodology – however, the different Regions are covered by SfRR with different intensity. The second main output is decreasing role of SfRR in education for rural areas and increasing role of Local Action Groups in this field. The third output is the rather difficult existence of SfRR with their own legal personality compared to SfRR which are strongly linked to rural municipalities. The fourth main output is the typology of implemented projects, which are focused mainly on technical or processional education and codified knowledge creation, and less attention is devoted to local knowledge, strengthening of local identity of the rural population and creation and support of tacit knowledge.

Considering the factors of the successes and failures of the functioning of SfRR, it is possible to define three main success and three main failure factors using the examples of “good practice”. The following factors which lead to successful activity of SfRR were

identified: 1. strong linkage between SfRR and rural municipality, 2. cooperation between SfRR and Local Action Groups, 3. focus on projects supporting local identity of rural population and tacit knowledge creation (this could be seen as success factor from the rural development perspective, but interest in these types of projects by target groups is rather low, so from the SfRR point of view, mainly projects focused on technical and professional education seem to be successful). The following failure factors were identified: 1. missing cooperation with particular rural municipality, 2. focus only on projects supporting technical and processing education, which is unsustainable over the long-term, 3. missing, less or passive cooperation with Local Action Groups, which become more important in the field of education for rural areas than SfRR. This is also a possible topic for ensuing research in the field of education for rural areas.

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# The Globalization in Relation to Development of Ecological Farming in Poland

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**Annotation:** In micro-economic dimension the globalization of agriculture will depend on the opening up of agriculture across national borders, with all its consequences. This would be equal to the release of the market across national boundaries in agricultural activities. The paper aims to investigate the mechanisms affecting the status and positions of European agriculture, as well as trace the instruments that determine the size of the development of sustainable agriculture, including ecological farming. The author tried to answer the question of whether globalization will destroy the European and Polish farming, or help it's grow. It was done by trading the reach literature and conducted a series of statistical analysis and economic comparisons.

**Key words:** ecological farming, development, globalization, economical situation

**JEL classification:** Q

## 1 Introduction

With growth of globalization processes the role of farming in economy is changing: the production structure and participation of products in global market decreases.

Comparison of costs of agricultural production in both developing and developed countries tends also to develop these activities beyond Europe and North America. Is it then advisable to promote the idea of development of organic farming in Poland? - This question is a research topic in the present study. The subject can interesting because of fact that ecological farming is associated with back to nature, the traditional methods of production, the high rate of involvement of human work, less efficiency and productivity per hectare. From the standpoint of profitability, at the current intensity of globalization, the development of ecological agricultural production in Poland is under question mark. This follows even from the fact that this activity makes sense only because of the high level of subsidies from the European Union. Currently, the EU has serious financial and economic difficulties and it can be assumed that agricultural subsidies will be reduced.

The purpose of this paper is to present arguments that are for and against development of ecological farming in Poland. This is shown in aspect of existing globalization processes.

For this reason, a review of the literature on economic evaluation of business activity and ecological farms in Poland and using statistical methods and economic analysis attempts to answer the question posed earlier.

## 2 Globalization and farming

The globalization is related to opening of farming over the country borders, open competition, it influences the growth of economical efficiency, usage of modern technologies in production and – what is unavoidable- growth of genetic engineering and usage of its effects in farming. In Poland this problem is well – known and described by Bożyk & Misala and Szymanski (Bożyk, Misala, 2003; Szymański, 2001).

The definition of globalization processes in Polish literature is presented by many authors (like Chołaj 2003, Kleer 2006, Flejtarski and Wahl, 2003, Kołodko 2001 and 2008, Gierszewska, Wawrzyniak 2001 and others.)

Primarily there are opening markets of goods, capital, information and services and to a large extent, the latest technology. However, labor markets remain under strong control of the country, and the flows of people together with the labor and human capital are controlled.

Physical, economical, political facilities of goods flow, removal of barriers to international economic exchange and investment flows and capital, accelerate the transfer of technical progress and the creation of integrated world markets and innovation diffusion.

The essence of globalization is spontaneous but selective liberalization of markets on a global scale, the development of integration ties and the strengthening of interdependence. About globalization, some authors say that it is incomplete, because to a large extent agriculture is ignored. It could be mentioned here the views of Kolodko (Kolodko, 2008), or Sobiecki (Sobiecki, 2007, 2009), who believe that the free movement of goods does not apply to agricultural products. Rebuttal to them Adamowicz, who believes that agriculture is involved in the processes of globalization, but as much as possible from its role in the economy. Limited participation in the globalization of agriculture is due to the specific characteristics of agriculture and from the scale on which the department participates in the process of economic integration and international linkages (Adamowicz, 2008).

Globalization accompanied by competition intensifies the process of socio-economic diversity within the farm showing different ability to compete in the market, as well as between regions and production areas (Adamowicz, 2008). Internal functioning of market mechanisms and pressure of international competition causes that much of the farm takes on typical strategies for commercial enterprises, whose purpose is to maximize profit (Sobiecki, 2007). **Commercialization of agriculture in the inner scale is therefore strengthening the internal polarization, which results in the formation of commercial sector next to the multifunctional agriculture (including ecological farms) and social welfare.** International commercialization of agriculture can lead to changes in zoning of agricultural land and changes in distribution of production between continents and countries.

**The development of agriculture and the potential to increase agricultural production determines - in the era of globalization - domestic demand and export opportunities.** In addition, the direction of agricultural development and attitudes is determined by consumer preferences (both domestic and foreign one).

These two, mentioned above, conditions allow to have thesis, that good solution for European countries (in face of incoming changes based on globalization) will be looking for new functions for farming, that will allow to distinguish it from farming of other regions of the world. Next to traditional functions, like production and service, there is more often visible in EU the spatial and environmental function. Van der Ploeg (2008) pointed out the problem. This idea bases on assumption, that economical system is only part of the ecosystem. This brings the view that in economical activity of human (especially farming) there is need to create and propagate the new value system, that will include not only income and usage, but first of all common good that will fulfill all ecological requirements (Lutz, 1999). Based on this in farming politic in EU there is stress on strong relation of effectiveness of management in farms with elements of high quality of methods that produce rural products. These guarantee the healthiness and quality of rural products (Agriculture et biodiversite. Valoriser les synergies, 2009). These actions, in face of opening European economy to external competition, will positively influence competitiveness of EU farms. For this reason there is more popular (both in Poland and Europe) idea of socially equal farming (Konceptcja

badań nad rolnictwem społecznie zrównoważonym, 2005, van Huylenbroeck and Durand, 2003). Under this definition there are concepts of integrated and ecological farming.

The characteristic elements of these actions are:

- Natural resources should be used in way to not destroy its self regeneration.
- The growth of food production can be only done by growth of resources of production
- Shows small susceptibility on changes
- Equal farming system expects full symbiosis of production and ecological purposes
- Managing of the natural resources allows fulfilling the decreasing needs, with keeping high quality of natural environment and protecting its resources.

Since 1989 European farming stepped into balanced growth, in which economical, social and environmental (ecological) problems are equally important and equally treated. The problem is well-described by Wilson (2007).

The problem with feeding human population in world are diametrical different in different regions. Nellesmann (Nellesmann et al., 2009) analyzes the state of world food, explains the world food crisis, demand, need and supply. From one side we have many countries where there is a shortage of food in the quantities necessary to meet the physiological needs for food, and food insecurity in terms of effective access to food. On the other hand markets for agricultural products in developed countries are well-saturated, that is in surplus supply. In these countries, there is deliberately limited supply, and the focus is on structural issues of supply, wide range of assortment and quality and ensuring food safety. Where there are excess supplies of agricultural products in relation to market needs, farms develop and strengthen non-productive functions, such centers are consolidating the culture of the region, maintain the traditions, the functions of social, cultural, service, environmental and others (Hennis, 2005). Additional features are a priority for agricultural development strategies for rural areas of the European Union.

The processes of globalization of production and trade in food products allow flow of products from places of surplus to areas of shortage, accelerate the diffusion of innovations in the field of products and manufacturing processes, and standardize the cultural and social patterns related to food, its production, circulation and consumption. Taking into account the additional arguments, for example, that food in modern times is relatively cheaper than ever then it can be said that consumers are becoming stronger in the marketplace and are becoming more demanding of the quality of purchased products. As far as raising the standard of living, the average consumer seems increasingly smaller proportion of their income on food. At the same time, it becomes more and more demanding regarding the quality, safety and nutritional characteristics of food products. Thus acquires a special rank to ensure food safety and quality of the increasingly diverse forms of food products. Food security and sustainability are arguably the most important issues facing the agri-food sector at the beginning of a new millennium. In an era of globalization, where nation states appear to have a diminishing role in governing these matters, the existing and emerging power relations underpinning agri-food regulation demand renewed scholarly attention (Higgins, Lawrence, 2005). The increasing diversity of needs and tastes of consumers, who pay more attention to the relationship between diet and health, results in the whole complex of measures to ensure food safety and quality, and indirectly on the food market regulatory systems and corporate strategies of agri-food trade and distribution. Deep processing of food most commonly used in manufacturing doesn't always improve the flavor and nutritional characteristics of food products. Therefore,

an increasing number of consumers interested in organic food, Mediterranean food, produced in specific regions of the world, tidal, without compromising ethics and animal welfare (Francis, 2009).

Growth in demand for knowledge of how food production - already observed in the European Union - will have its consequences not only for processing plants, but also farms and raw material sourcing processes. In the future – during filling up the market food products - consumers will look for smaller quantities of food, but with increasingly higher-quality parameters, nutritional and safety for human health and the environment. Globalization can therefore be the basis for the development of three types of households:

1. Commercial – focused on quantity production and getting the highest possible income,
2. sustainable farms (including ecological) - which will result in production in accordance with the requirements of environmental, health and cultural, which seeks to balance relations: *agriculture - environment - food - health*;
3. social farms – focused on such management that will guarantee self-functioning. These farms will slowly disappear.

The second kind of farming has specialty good conditions to develop in developed countries, because agriculture in these countries, apart from production functions, meets the increasingly important environmental and public functions. Its sustaining is done by interventionist agricultural policy and supporting rural development (van Huylenbroeck and Durand, 2003).

Development of sustainable farms in Europe, including ecological farms, is supported by the European Union institutions and their politics and approved programs such as the Common Agricultural Policy and other more specific programs. This problem is well-described by Kondratowicz-Pozorska (2009). However, if Europe and other regions would be treated without protective umbrella of law then there is a view that the globalization of agriculture could be beneficial to less developed countries with cheap labor and countries having favorable natural conditions for agricultural production. Full liberalization and opening up agricultural markets to unfettered competition would lead to a profound marginalization, and even the decay of agriculture in rich countries, industrialized and urbanized.

Nobel prize winner - Stiglitz (2006) states that the present form of globalization is a sweet raisins for 20% of the inhabitants of the earth and bitter almonds for 80% .. He also suggests that globalization will become a problem for small and medium-sized farms in developed countries, but the changes won't benefit the poor farmers in developing countries. Therefore he thinks that only the commercial farms have the chance to survive and flourish. This point of view could be acceptable, though the highly industrialized countries did not cared about food security and if environmental needs were not honored. Moreover, no country in the world does not want to lose their independence, at least in terms of food and, therefore, will conduct its agricultural policy as to ensure minimum food security for their people and to extend the efficiency of the environment, to serve the next generations. This tendency to “self-supply” of agricultural products and to maintain a satisfactory level of farm income is the reason why the major players in deciding on the situation in agriculture have become governments and national ministries of agriculture and trans-national bodies to support agriculture. For now, they successfully defend indigenous agriculture from changes resulting from the full globalization.

You can venture to say that European farms will be able to resist the negative influences of globalization, through agricultural production with specific properties that will stand out among other products such as food safety for health and taste, with additional values obtained

from the services provided by farmers for the production farm. Besides, these holdings can be defended against global competition through the use of technology and knowledge, which the other participants do not have. These considerations are tangible with the note that agricultural goods are not luxury goods, for which demand increases without limit as far as revenue growth of society. Therefore - with the assumption that globalization creates conditions for the growth of wealth of societies - creation an unlimited number of food products with standard parameters - does not make sense. Firstly, because after meeting the basic nutritional needs of society it doesn't want any longer buy an additional batch of this product. On the contrary it will treat such products as lower-order goods, thus demand for them will diminish. Secondly, people are looking for a change, and so the public will look for other new and better taste experiences and more. Along with the satisfaction of hunger, man reflects the conditions under which food is formed, whether it has health benefits, which also may obtain a consumer purchasing these goods. Therefore it is important and necessary to stress additional advantages of rural products, the one produced In Europe In ecological farms under stricte controls. Their value is validated with special signs and production certificates (Halberg et al., 2006). Therefore, organic farms could become centers of food production that finds favor with buyers after meeting the basic nutritional needs of man.

### **3 Data and methods**

The purpose of this paper is to present arguments that are for and against development of ecological farming in Poland. This is shown in aspect of existing globalization processes.

For this reason, a review of the literature on economic evaluation of business activity and organic farms in Poland and using statistical methods and economic analysis attempts to answer the question posed earlier. There should be a special attention on analysis of desirable direction of development of rural areas. The attention should be also put on try of historical changes in European farming. Additionally there is analysis of different mechanisms that strengthen the functionality of rural and ecological farms in EU.

There is description of:

- Evolution of support programs for farmers as well as programs for people living in European rural countries.
- Farming systems directed to production and economy
- Trend in quantity of money support in WPR as well as programs focused on agri-environment in years 2004-2009

In paper there are used different internet sources. Usage of this database is explained by fact that there are the most actual information and data focused on fast trend of changes in European ecological farming.

## **4 Results and discussion**

### **4.1 Protection of ecological farming in European Union against influence of globalization**

The European Union, since the early sixties, by introducing the common agricultural policy has protected and assisted the development of its agriculture. This policy has made a significant contribution to the development of agriculture and rural areas of the Member States, has also become one of the most important ways of strengthening the overall European integration (Table 1). With its results benefit not only farmers, but also the entire society.

**Table 1.** Desirable directions of rural development

<b>Lp.</b>	<b>Name of action</b>
1.	Increasing the competitiveness of the agri-food sector
2.	Food security of the country
3.	Actions against climate changes and adaptation of farming to result of these changes
4.	Usage of rural production area to produce energy from renewable sources
5.	The protection, preservation and use of natural resources and landscapes in rural areas.
6.	Conservation, preservation and utilization of cultural resources and heritage in rural areas
7.	Development and improvement of local infrastructure
8.	Development of entrepreneurship and investment attractiveness of rural areas
9.	Investing in human capital and social development and equal educational opportunities for rural residents and small towns
10.	Improving the quality and accessibility of public services in rural areas
11.	Improving the standard and availability of the tools of the information society for rural dwellers
12.	Extend the impact of the largest centers of economic development for rural areas by increasing their availability to the rural population (an increase in mobility of the circular)
13.	Improving the availability of work, including flexible work arrangements for residents of rural areas and increase mobility
14.	Preventing and reducing social exclusion

*Source: Kierunki Rozwoju Obszarów Wiejskich. Założenia do Strategii Zrównoważonego Rozwoju Wsi i Rolnictwa, p.64.*

However, looking at the history of changes in agriculture of the Union shows that it must introduce reforms in the current model of agricultural policy. Already under pressure from the WTO negotiations and other international organizations in the document Agenda 2000, the European Union considered the main objective of the common agricultural policy, improve internal and external competitiveness of European agriculture. This means that the EU will not be able, in so far as it has done so far, to protect its agriculture from competition from cheap agricultural products produced in the countries of North and South America, Australia, New Zealand and others. It also means the inevitability of further, gradual decline in real prices in agriculture and the difficulty in maintaining a satisfactory level of farm income, despite the strengthening and expansion of forms of direct subsidization of agriculture and production subsidies. The use of direct payments is to blame for the defense of a higher level of agricultural prices within the community.

Currently, there also come new aspects, which become the basis for reevaluation in the ongoing trend for some time limiting agricultural intervention in the European Union and are aimed at strengthening the direction of liberalization. This new situation is due to globally shown food shortages and the increasing trend of food prices.

To defend the European model of agriculture from the changes arising from globalization, the Union shall apply the instruments of the CAP and agri-environmental measures. Agri-environmental program includes eight agro-environmental projects, popularly known as agri-environment package. Their task is to reduce the negative impact of agriculture on the environment and maximize its positive impacts on biodiversity and rural landscape. The scope of the package includes 45 variants, which have the agri-environment payments. Agri-environmental measures are related to the management of agriculture-oriented environmental protection, preservation of habitats of high natural values and the preservation of plant genetic resources and livestock. Each package has a set of several closely explicit requirements that go beyond and do not overlap with other instruments of the Common Agricultural Policy.

For polish farmers it was foreseen that the package can be used either by conventional and organic farmers. Table 2 shows the current amount of aid in the production of agro-environmental.

**Table 2.**The amount of agri-environmental payments to polish farmers [in zł/ha]

No.	Agri-environment packages	Ver.	Agri-environment variants	Mount of agri-environment payment
1.	<b>Balanced farming</b>	1.1.	Balanced management system	360 zł/ha
2.	<b>Ecological farming</b>	2.1.	Agricultural crops (with a certificate of conformity)	790 zł/ha
		2.2.	Agricultural crops (without a certificate of conformity)	840 zł/ha
		2.3.	Permanent grassland (with a certificate of conformity)	260 zł/ha
		2.4.	Permanent grassland (without a certificate of conformity)	330 zł/ha
		2.5.	Vegetable crops (with a certificate of conformity)	1300 zł/ha
		2.6.	Vegetable crops (without a certificate of conformity)	1550 zł/ha
		2.7.	Medicinal plants (with a certificate of conformity)	1050 zł/ha
		2.8.	Medicinal plants (without a certificate of conformity)	1150 zł/ha
		2.9.	Horticultural crops as defined in Regulation Ministry of Agriculture (with a certificate of conformity)	1540 zł/ha
		2.10.	Horticultural crops as defined in Regulation Ministry of Agriculture (without a certificate of conformity)	1800 zł/ha
		2.11.	Orchard Crops (with a certificate of conformity)	650 zł/ha
		2.12.	Orchard Crops (without a certificate of conformity)	800 zł/ha
3.	<b>Extensive permanent pasture</b>	3.1.	Extensive management of meadows and pastures	500 zł/ha
4.	<b>Protection of threatened birds species and natural habitat outside of the regions of Natura 2000</b>	4.1.	The protection of breeding habitats of birds	1 200 zł/ha
		4.2.	Moss fields	1 200 zł/ha
		4.3.	Large sedge rushes	800zł/ha
		4.4.	Molinia meadows and alluvial	1 200 zł/ha
		4.5.	Thermophilous grasslands	1 200 zł/ha
		4.6.	Semi-natural wet meadows	800 zł/ha
		4.7.	Semi-natural fresk meadows	800 zł/ha
		4.8.	Species-rich twin grasslands	800 zł/ha
		4.9.	Salty grew	1 190 zł/ha
		4.10.	Natural grassland	550 zł/ha
5.	<b>Protection of threatened birds species and natural habitat in the regions of Natura 2000</b>	5.1.	The protection of breeding habitats of birds	1 370 zł/ha
		5.2.	Moss fields	1 390 zł/ha
		5.3.	Large sedge rushes	910 zł/ha
		5.4.	Molinia meadows and alluvial	1 390 zł/ha
		5.5.	Thermophilous grasslands	1 380 zł/ha

		5.6.	Semi-natural wet meadows	840 zł/ha
		5.7.	Semi-natural fresh meadows	840 zł/ha
		5.8.	Species-rich twin grasslands	870 zł/ha
		5.9.	Salty grew	1 190 zł/ha
		5.10.	Natural grassland	550 zł/ha
6.	<b>Protection of threatened resources of genetic plants in agriculture</b>	6.1.	Commodity production of local varieties of crops	570 zł/ha
		6.2.	Seed production of local varieties of commodity crops	800 zł/ha
		6.3.	Seed production commissioned by the gene bank	4700 zł/ha
		6.4.	Traditional orchards	2100 zł/ha
7.	<b>Protection of threatened resources of genetic animals in agriculture</b>	7.1.	Protection of local breeds of cattle	1140 zł/szt.
		7.2.	Protection of local breeds of horses	1500 zł/szt.
		7.3.	Protection of local breeds of sheep	320 zł/szt.
		7.4.	Protection of local breeds of pigs	570 zł/szt.
8.	<b>Protection of soils and water</b>	8.1.	Under sown intercrops	330 zł/ha
		8.2.	Rape intercrop	420 zł/ha
		8.3.	Stubble intercrop	400 zł/ha
9	<b>Buffer zones</b>	9.1.	Maintenance of 2-meter buffer zones	44 zł /100 mb
		9.2.	Maintenance of 5-meter buffer zone	110 zł/100 mb
		9.3.	Maintenance of 2-meter copper midfield	40 zł /100 m
		9.4.	Maintenance of 5-meter copper midfield	100 zł /100 m

Source: [http://www.doradcaprow.pl/prow/Info---nie-tylko-PROW/Program-rolnosrodowiskowy,234/\(XII.2010\)](http://www.doradcaprow.pl/prow/Info---nie-tylko-PROW/Program-rolnosrodowiskowy,234/(XII.2010))

In addition Polish producers of regional and organic food, who have the relevant certificates or confirmation of quality and accounting documents confirming the expenditure may turn to ARMA (The Agency for Restructuring and Modernisation of Agriculture) for funding:

- 3200 PLN a year for producers of so called Traditional Guaranteed Specialties and Protected Designations of Origin and Protected Geographical Indications;
- Over 2500 a year is price of grant for integrated production;
- Almost 1500 PLN a year In system „Quality and Tradition”;
- The smallest Mount is In case of ecological farming.

Independent of the support of agri-environmental programs, Polish farmers has been covered by the CAP. In 2007-2013, the rural development policy is implemented via the second pillar of the Common Agricultural Policy and horizontal objective No. 6 of the National Strategic Reference Framework, "*Balancing growth opportunities and supporting structural changes in rural areas*" under the policy (Kierunki Rozwoju Obszarów Wiejskich..., 2010).

Much of the instruments for rural development is the domain of the cohesion policy implemented based on the National Strategic Reference Framework 2007-2013 (NSRF) through operational programs (16 Regional Operational Programs and programs nationwide: Operational Program Infrastructure and Environment (POIS), Program Innovative Economy Operational (POIG), Operational Program Development of Eastern Polish (PORPW) and the Human Capital Operational Program (POKL). The implementation of the horizontal goal NSRO No. 6: "*Balancing growth opportunities and supporting structural changes in rural areas*" should mean in practice, significant support for rural development under all operational cohesion policy in Poland, especially in the use of non-agricultural development potential of rural areas and improve the public services, the availability of communication and

information society development in rural areas providing equal opportunities for development projects in rural areas.

All these treatments are primarily aimed at improving living standards in rural areas by raising incomes of the population living from agriculture. According to Eurostat data, EU farmers' incomes increased in 2010 by an average of 12.3 percent in comparison to the previous year. In Poland, the agricultural income increased by 18.4 percent. And, with respect to 2005, their value increased by 53.6 percentage points. To this the following factors contributed: the 9.9 percent increase of real income in agriculture with a decline of 2.2 percent. of work. The largest increase in revenues recorded in 2010 belongs to Denmark and Estonia, the largest decline (-8.2 percent) affected farmers in Romania and the UK. In 2010, the value of agricultural production in the EU-27 measured by prices increased on average by 4.3 percent. The increase was both on the value of crop production (6.3 percent) and animal production (+2.4 percent). The increase in crop production is mainly attributable to price increases (by 8.9 percent.) with a decrease in its magnitude (-2.4 percent). The prices were rising in almost all types of crops with the exception of olive oil (-0.4 per cent.). The largest increase was observed in plants of oil (27.1 percent), cereals (22.5 percent) and fresh vegetables (9 percent) The largest decline in production was observed in sugar beet (-6.8 per cent.), potatoes (-6.7 per cent.) and fruit (-4 percent).

Comparative analysis of various agricultural systems for economic production conducted in many Western European countries shows that on organic farms (Luczak, 2007):

- yields are lower than in the conventional system from 10% up to 50%, depending on the crop species and the intensity of the conventional system, before switching to organic production;
- the share of cereals and oilseed crops sown in the structure is smaller, and legumes, fodder, root crops and vegetables is much higher;
- input material - in cash for agricultural production (purchase of fertilizers, pesticides, feed) are much smaller;
- labor inputs are greater than 10-20%;
- there are real opportunities to obtain higher prices for crops and subsidies for agricultural production of environmentally friendly (participation in agri-environmental programs);
- incomes are comparable to those achieved in conventional farms;
- agricultural production is characterized by lower energy consumption, among others. because they do not apply fertilizer (especially nitrogen), whose production consumes very much energy.

Ecological farming in Poland is still small, but the dynamics of change is very high. It could attest to the ever increasing number of organic producers. As at 31 December 2010, activity in Poland resulted in 20 893 organic producers (about 18,4% more than last year), of which 20 623 are ecological farms. Studies on the economic efficiency of agriculture, unfortunately, are carried out sporadically and cover short periods and a small number of farms. According to research conducted at the end of FADN 2008, the production of organic farms amounted to 823.5 mln PLN, which accounted for 1.2% of the standard of agricultural production. It should be noted, however, that the farm was then 2mln199 standard, and only 8,685 green units. More information about this is Nachtman (2009).

The economic situation of the family next to the agricultural income also affects non-farm income such as pensions, earnings from employment. Both of these income sources, including personal income form. The non-farm income of organic farms does not play such a significant role in the structure of personal income. However, it is worthy noting that small ecological farms are often located on poor soils showed remarkable activity in the search for solutions that improve their economic situation. With the production of berries and vegetables, development of goat and poultry (laying hens and geese), these holdings reached a high value of production and agricultural income per 1 ha of farmland, often higher than households with better habitat conditions. In small farms, thanks to the precise organization of the production obtained from 50% to 100% higher rates related to the value of agricultural production and income from 1 ha, compared to medium and large farms. The organic farms accounted for 60% of the sale of crop production. An additional source of income is agro-tourism services provided by the organic farms.

In ecological farming, it is observed in the analyzed year steady increase in production in both countries in the EU and Poland. In the country, the 2010 organic farms supplying products to the market for organic products reached revenues by 40% higher than conventional farm incomes. On the economic situation of Polish ecological farms had a significant impact in 2010:

- subsidies for ecological production methods in the amount of 4 600 per household on average zł (280 zł / ha), which accounted for 9% of all revenues;
- higher selling prices by 20-40%, which were obtained mainly in the sale of plant products.
- increasing level of affluence of Polish and other EU citizens,
- increasing care about health of current and future generations
- decreasing trust to “industrial” food producers (for example affair with e-coli bacteria)
- increasing interest of EU citizens in Polish food,
- introduction in July 2010, common to all EU logo for organic products in the circuit are such indications as PGI (Protected Geographical Indications), TSG (Traditional Specialty guaranteed - TSG), there is also protected designation of origin (Protected Designation of Origin). Additionally, each organic product is certified to conform to the requirements of ISO 9001:2000.

## **4.2 Conclusions**

The new approach to food self-sufficiency in the European Union in the context of globalization of agriculture will determine the impact on the Common Agricultural Policy on Agriculture (Sobiecki R., 2009). The European Union is the largest exporter of agri-food in the world. World exports of food and agriculture the EU represent more than 10% of the total value of world exports. The export value of agri-food European Union is about 350 billion dollars of the total global export value of these articles for the whole world about 790 billion dollars, so it approx 44% of world exports. Thus, if the EU would reduce agricultural production in the first place it would limit exports outside the EU. With such a significant share in world exports it would significantly change the global demand and supply relationships of agri-food. As a result, there would be a price increase and thus reduce the availability of the food to the poorest peoples of the world. Thus, the effect would be different than presented in promotion of the effects of globalization.

The second problem is that the opening of the European economy without any restrictions changes the approach to the marginal conditions for agricultural production. Globalization makes that there will occur decrease the agricultural activity in Europe, the decline of agricultural income and thus reduce employment in agriculture. Europe cannot afford such a big rise in unemployment. The unemployment would be for people that have already bigger problems in finding the work than the one who live in cities. In addition, unemployment rates indicate that the current economy with all its management rules have already problems with the absorption of free labor.

Thirdly, Europe's response to future consequences of globalization is the development of additional functions in rural areas, so that they can develop and strengthen, even without further aid from the state and the European Union. Europeans already know that the earth has its own requirements and cannot be used indefinitely and without restrictions. They know the consequences of the intensification of technological processes in agriculture, which took place in second half of the XX century, and they also know that to this day there is no knowledge to revitalize the destroyed land. Therefore, it is promoted sustainable agriculture that will benefit current and future generations. A special case of sustainable agriculture is organic farming, that will develop the more intense the more there will be a conventional food in the world (and it will be caused by an increase in the number of commercial farms and the development of GMOs in other regions of the world), and less healthy food. In addition, the implementation of highly advanced technology and genetics make the agricultural productivity will increase and will be covered by the minimum nutritional needs of societies in the world. However the demand of population is wider. Satisfying the hunger with cheap modified food (that isn't verified for its impact on future) will not be end of human ability. Population is more open to everything that is happening around and in environment.

The development of organic farming in the EU is not only the result of subsidies for farmers, but also a growing social demand for organic products, the cultivation of traditions and customs, and philosophy is a way of life in harmony with nature.

Currently, the turnover in the market for organic food in the EU is estimated at over \$ 6 billion in the USA - U.S. \$ 4.2 billion and Japan \$ 1.2 billion. The share of turnover of organic food in the food industry in Europe is 1.5% (2.5% in Denmark), with the annual trend growth rate from 5 to 40%, the largest of course in the richest countries like the UK, Switzerland, Sweden and Denmark. In most European countries, organic products will become even more common, as increased accessibility to them for the average consumer. These products are sold through large-area grocery, stores that influence the reduction in prices and provide a greater rotation.

Is ecological farms in Europe and Poland are the 'raison d'être' in terms of opening the economy to the competition from outside? Commercial farms, that's role is described by Stiglitz will be created especially in those places where production costs are the lowest, and the legal principles as the most liberal. For sure the first will not be created in Europe. Therefore it appears that despite all the obstacles to sustainable agriculture and organic farming is a good way for the development of agricultural activities in the future. However, before fully opening of the economy it is important to strengthen capital and investment of the farm, so that their production won't be easy to reproduce in other conditions without the appropriate cultural climate, traditions and knowledge of people who are holding the lead. Jan Douwe van der Ploeg wrote that "(...)high quality production in agriculture is not a phenomenon that is just limited to the domains of production and transformation (...)", so it's conditioned also with something else. (van der Ploeg, 2002). It can be that rules of ecological

and equal farming are the answer to guarantee high level of European rural production in future.

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# Rural Governance in the Context of Climate Change Management

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**Annotation:** The subject of this paper is a result of an European Union Framework Program Seven comparative research project “Governance, Infrastructure, Lifestyle Dynamics and Energy Demand: European Post-Carbon Communities” (GILDED) and focuses on differences of rural and urban governance and households’ energy demand, energy use in the context of climate change management.

The primary goal of this paper is to identify social, economic, cultural and political changes which help rural ( and urban) households to reduce energy consumption. The empirical work ( tape interviews and surveys) was conducted in five European countries; each has rural and urban study areas (UK, Czech Republic, the Netherlands, Germany and Hungary).The comparative research has found three (hierarchical, autocratic and democratic) energy governance models which are present in diverse (urban and rural) terrains inside the EU. None of these models have an absolute benefit regarding an effective energy-saving policy, or dominant influence on household behavior. Combinations of strengths and weaknesses are present in each energy-governance model, and no single one should be appointed as an ideal. One conclusion of this study is that successful and effective energy governance can be linked to multi-actor or hierarchical, single-centred political structures and networks.

In European rural context local involvement and project class activity intermediate between governmental and local levels, enhance articulation of local needs, and facilitate a new coalition between stakeholders and non-governmental actors, that mutually adjusts all their interests, and promotes new governance approaches, may be the best practice toward reduction in household energy demand and management of climate change. The imperative introduction of new rural governance related to climate change management is seen as a main potential driver of European rural development.

**Key words:** climate change management, urban –rural energy consumption, rural governance

**JEL classification:** Q01, R0

## 1 Introduction

Scholars argue that in the power relations of rural areas, as well as other territorial development, there is a shift from government to new governance. New actors participate in managing those businesses what were under the control of state and local administration before. This paper studies actors, power relations and governance structures in special political arena, the climate change management. This paper focuses on rural (and urban) households’ behaviour, opinions and recognition of climate change, their evaluation about local, state and EU level administration. It is the rise of new actors, their networks and interest in local government related to climate change management and consequence of their involvement or exclusion of local power relation that is the subject of this paper. The new governance as a concept describes complex changes of local power structures. Through the concept of (energy) governance models I argue for a complex understanding of local power relations and involved actors’ interest and of their contribution to rural development.

In the first part I present case study areas, qualitative and quantitative surveys. In the second part of the paper I analyze urban/rural differences in understanding and recognizing

climate change. I then identify concept of governance and discuss local energy governance models that have been found on five European countries study areas. By focusing on the new governance structure created in local, rural places by EU and national development policy and general proliferation of projects I accentuate the need to radical reform of rural development policy.

## **2 Materials and Methods**

This paper is based on qualitative and quantitative interviews were made in five European countries (UK, The Netherlands, Germany, Hungary, Czech Republic). Potsdam and Potsdam-Mittelmark are the German case-study areas. Potsdam is a cultural centre in Brandenburg, with science institutes, universities and location for green industries. Potsdam-Mittelmark is a rural area, land is used for agriculture and forestry and farmers are key actors of local society. The Scottish study area incorporates rural Aberdeenshire and urban Aberdeen City. Assen, the capital of Drenthe province in north-east, and its rural neighbourhood were the locations of field work in the Netherland. The South – Bohemian county of České Budějovice, the urban České Budějovice and more rural Český Krumlov districts, are the case –study areas in Czech Republic. In Hungary the project areas are Debrecen city and Hajdú-Bihar County. In the Hajdúság region people have been used to living in market towns, the southern Bihar is more village region.

The two phases of qualitative interviews were conducted in each study areas. First we made 201 interviews with experts and representatives of households about their understanding and knowledge on climate change, energy consumption narratives and energy policy as well the urban and rural lifestyle related to the energy consumption, attitudes on energy saving and the origin of these attitudes. We collected information on three areas of potential behavioural change: direct energy use in people's homes, transport and food.

In the second phase document analysis and 75 interviews were conducted with local stakeholders (the administrative leader of the relevant territorial units, the environmental/energy specialists, the leader of the development department at each level and decision-makers of different policies by which energy consumption is influenced, entrepreneurs (managers of the local energy-provider, transport companies, environment protection agencies) and members of civil associations. The aim of interviews and document analysis was to collect information on urban and rural power relations and governance structure. For collecting quantitative information about role of lifestyles, perception of climate change, values and energy consumption we conducted a quantitative questionnaire in the urban and rural case-study areas in the project countries. Based on the pre-test in January 2010 a pilot-test was conducted. Majority of the questionnaires were distributed and collected via a door-to-door approach. By using the quantitative data we aimed to identify lifestyles in the energy demand context, and to study differences of individual, social and contextual factors between urban and rural areas in different EU countries which influence energy demand. We seek to answer research questions: how lifestyles relate to households' decisions regarding energy demand and use, and how environmental identity is embedded in such lifestyles,

The data were collected from February 2010 through May 2010 in the five countries. We used stratified random sampling method. In some cases matching was used to make sure balance between men and women and people from all ages. We split respondents into a control group and an intervention group. The intervention group received the intervention brochure about climate change and ways to reduce energy consumption. To measure the effect of the intervention we collected data among all participants again in 2011.

**Table 1.** Rural and urban respondents 2010

<i>Country</i>	<i>The area where respondents live in</i>			<i>Total</i>
	<i>city</i>	<i>small town</i>	<i>rural area</i>	
<i>Scotland</i>	140	69	125	334
%	41,9%	20,7%	37,4%	100,0%
<i>the Netherlands</i>	21	233	209	463
%	4,5%	50,3%	45,1%	100,0%
<i>Germany</i>	252	21	259	532
%	47,4%	3,9%	48,7%	100,0%
<i>Czech Republic</i>	206	67	217	490
%	42,0%	13,7%	44,3%	100,0%
<i>Hungary</i>	198	101	195	494
%	40,1%	20,4%	39,5%	100,0%
<i>Total</i>	817	491	1005	2313
	35,3%	21,2%	43,5%	100,0%

From the 2313 respondents 1005 answered that area where they live in has rural character. (table 1). In rural sociology literature is widely known that urban/rural structures are often embedded, combined and definition of rural is a complex question. The administrative categorisation of rural and urban in many cases doesn't correspond with outer and inner images on the place. This paper uses respondents' categorisation about rural, small town and city.

### 3 Results and Discussion

The results of this chapter is divided into three parts: comparison of urban and rural evaluation on climate change, urban and rural evaluation on institutions put an effort on decreasing energy consumption, and presentation of comparative study on local energy governance models.

First, by comparing urban and rural recognition and evaluation on climate change the analysis has found nuance differences between city, small towns and rural respondents. The first step comparison (crosstabs, compare means, cluster analysis) shows that the values (scores can vary from -1 up to 7) of protecting nature and preventing, unity with nature and preventing pollution, managing climate change is similar amongst the urban, small town and rural respondents, means are little higher in the case of rural respondents but this is not significant. We have not found characteristic differences about acceptance of actions to reduce climate change problems.

Second, answers to the question about the impact of organizations on respondent's energy consumption show that there are also similarities between urban, small, town and rural respondents. European Union politics and authorities have weakest impact on households' behaviours to climate management. The urban respondents generally report on lower impact of political institutions. The small town respondents marked highest scores. According to rural interviewees central government is the political institution which has most effective impacts on their energy consumption and local government is not so successful, urban and small town respondents rated analogously central and local government policy on energy consumption (Table 2).

**Table 2.** Organisations' impact on respondent's energy consumption, 2010 (scale is from 1 to 7)

<b>Respondents living area</b>		<b>EU politics and authorities</b>	<b>Central government (national)</b>	<b>Local government (town, county/region/district)</b>
<b>city</b>	Mean	3,06	3,36	3,35
	N	783	787	776
	Std. Deviation	1,691	1,773	1,716
<b>small town</b>	Mean	3,39	3,88	3,82
	N	478	480	472
	Std. Deviation	1,818	1,813	1,782
<b>rural area</b>	Mean	3,27	3,59	3,42
	N	951	953	940
	Std. Deviation	1,754	1,781	1,702
<b>total</b>	Mean	3,22	3,57	3,48
	N	2212	2220	2188
	Std. Deviation	1,75	1,794	1,733

Thirdly, the above outcomes of first step analysis on data from quantitative survey can give background information for better understanding of local energy governance models as they give short characterisation about attitudes and relation to policy institution and evaluation on climate change what need to be governed.

Scholars highlight that defining 'governance' is a complex task. As Stoker (1998,) argues governance is used in a variety of ways and it has variety of meanings. In the comparative paper of GILDED project (Csurgó et al 2010/1) we used Stoker's five theoretical propositions about a number of aspects of governance as a theoretical base

- governance refers to a set of institutions and actors who are drawn from and also beyond government;
- governance identifies the blurring of boundaries and responsibility for tackling social and economic issues;
- governance identifies the power dependence involved in the relationship between institutions involved in collective actions;
- governance is about autonomous self-governing networks of actors;
- governance recognizes the capacity to get things done, not relying on the power of government to use its authority or command. It sees government as being able to use "new tools and techniques to steer and guide" (Stoker, 1998 p.18).

We argued that aim of applying multi-lawyer concept of power and above definition of governance was to include in it the growing number of institutional and private actors and relational determinants which impact household behaviour to alternative energy use. Based on the literature we underline that governance is a continuously changing complexity of structures, institutions and actors, their networks, values and interests. The shift from government to governance labels ongoing changes and involvement of local stakeholders and actors in energy) governance is necessary according to majority of authors. (Viola, 2006; Kooiman, 1993, Murdoch, 2004, Derksen, 2008). The shift from government to governance

revaluates the civic sphere, the local stakeholders and actors. Hyden, Court and Mease suggest capturing various components of the political processes as civic society, political society, government, bureaucracy, economic society, and judiciary. (Hyden et al., 2004).

After reviewing discourse surrounding the emerging food practices, we focus on the actors and the role of their activity in governance mode and household energy demand and use. Building upon the growing literature we studied the role of the administrative leaders, intermediate actors, partnerships and networks (Jones & Little, 2000, Rhodes, 2000, Kovách & Kristóf, 2009, Greer 2005), the project class (Kovách & Kucerová 2006, 2009), civic organizations (Salamon 1987, Salamon- Sokolowski -List 2003, 1991), environmental organizations (Greenwood 2003.), enterprises, households and media:

Building upon these defined understanding of the concept, that governance should include all possible actors and stakeholders involved in planning, decision-making and management of local affairs, and on qualitative field-studies in the five GILDED countries we have developed the following typology of governance models (Csurgó at al 2010/1):

- Non-local hierarchical model;
- Dominating power positions – Local hierarchical model
- Formal democratic decision-making model
- Cooperative decision making: the local partnership model
- Independent authorities;
- Self-regulated cooperation.

In the non-local hierarchical model the leader of the organisation is not elected, but nominated by a central organisation (for example the central government), thus the leader is responsible for these institutions and follows their instructions. The organisation has rule-making power and executive power as well. Few actors are involved in decision-making. Decision-making is centralised, but activity of pressure and interest groups can be important and are not always transparent (Eckersly, 2004).

In the dominating power positions – local hierarchical model, the administrative leader is elected by locals or by a locally elected board. Power relations are hierarchical, the power of the leader can be very strong, thus management and leadership model can be autocratic The role and possibility of different stakeholders to influence decisions is unequal. (Eckersly, 1992, 2004; Peter, 2002)

In the formal democratic decision-making model democratic decision-making model the leader of the organization is elected by locals. The participation of different stakeholders has an established and well-organized forum, Not only the general assembly, but also other actors are involved in planning and decision-making. Democratic decision-making works at the institutional level and among institutions as well – the cooperation of local-governments, civic organizations, entrepreneurs in maintaining educational institutions, health care, social care programs (Beck, 1992; Backstrand, 2003)

In the cooperative decision making local governments cooperate with entrepreneurs and civic organizations for a longer period. A subsidiary approach and partnership are highly important in decision-making and decisions are result of agreements and negotiations. The leader has managing role, and the organization does not have rule-making power. The LEADER is typical example of the local partnership model (Geddes, 2008).

Self regulated cooperation works in non-governmental organization, which operates temporally, to provide services, sometimes public services (Sjöblom 2006). The decision-making is horizontal, but participants are autonomous and decide to cooperate freely. Power relations are horizontal; the leader also has a managing role in this model (Jacquet, 2002; Weale et al., 2003).

The independent institutions are, for example, national agencies controlling different policies, such as cultural, or energy policies. The independent institutions operate at the national or supra-national level, and have local or regional branches. These organizations have no right to establish new rules, decrees; the leader is nominated by central institutions, decision-making is bureaucratic, decrees and statements are typical instead of negotiations. (Wenman, 2003; Bache and Flinders, 2005) Investigating how power is distributed across the actors and their networks and how (new) actors involved in decision making and controlling local (energy) policy, analyzing their role in reshaping local (energy) governance a primary step for understanding local potentials for climate change management. Using the above theoretical frame the comparison of case studies has found three energy governance models (Csurgó et al 2010/1)

- The dominating power positions – local hierarchical model;
- The formal democratic decision-making model;
- The cooperative decision making: the local partnership model.

*The dominating power position - local hierarchy energy governance model* describes primarily the urban power relations. The Hungarian city, Debrecen and the Dutch, urbanized Assen region are governed by dominant political actors. From the case study settlements, which have a sort of rural character, the Hungarian small market – towns (between 10000 – 30000 inhabitants, strong agricultural traditions) belong to this model. The local oligarchy, the cooperation and inter-relationship between the local economic elite and political leaders, plays decisive role in the three small towns. The town councils and economically powerful actors struggle for local dominance and mayors play a balancing role in power networks. Power relations are hierarchical within the organization; the leader's powers are very strong, and thus, the management and leadership can be autocratic. The leader is very influential; consequently, negotiating and reconciliation are not typical, even though issuing directions and instructions are not the only method of decision-making. Decision-makings are top-down, hierarchical processes. Energy-use issues are dependent on financial rationality and accessing external (state, EU) sources which may give legitimacy. The multi-actor, interest group networks' political activity leads a less democratic and non-decentralized policy-making and control over political and economic processes. The representation of non-oligarchic civil associations is weak, but their activities are increasing in 'green' and energy issues. The civil associations' energy-policy actions are against oligarchic stakeholders.

*The formal democratic energy governance model* describes the urban/rural mixed Aberdeenshire and mostly rural Berettyóújfalu area. In Berettyóújfalu and its rural region the special feature of the local governance and especially in local energy governance is the active participation of entrepreneurs and civic organizations Csurgó et al 2010/2; due to this, efficient investments are being made, along with the use of innovative methods. Local entrepreneurs are elected members in the council and the main civic organization who are connected to the energy issue was established by the municipality. The local government is the owner of the firm which operates the geothermal power plant and local entrepreneur lobbies can influence decisions. Entrepreneurs, who have a strong link to local council, established Berettyóújfalu Entrepreneurs' Association, their pressure group and members help

each other to obtain work. The energy question is in the focus of local economic elite's interest. They aim to spread and utilize renewable energy sources, the geothermic energy. The representatives of civil organizations have already appeared on the city council, and they together with powerful entrepreneurs have had influence on local government operations. Their networks and co-operation are good, decision making is democratic in clear power structure. Due to this the region, despite non-urban character, is one of the most successful development fund applicants in the county.

The two mixed urban/rural areas, České Budějovice and Potsdam regions, *are the cases of cooperative decision making, local partnership energy governance model*. A variety of stakeholders, economic and civic actors are involved in the governance and influence planning, decision making and implementation. The involvement of non-governmental actors works through public negotiations, common projects, website forums, expert groups and NGOs public discussion and round table disputes). As the case studies show civic actors initiate discussions in many cases and they actively participate in negotiations. Non-governmental actors have strong network position and civic organisations are dominant actors of energy policy what legitimate strongly the climate change management policy. In the cooperative decision making model local inhabitants and their associations, the members of project class, interest groups can express their goals, they are in power position.

**Table 3.** Comparison of energy governance models

<i>Name of the model</i>	<i>Dominating power position-Local hierarchy</i>	<i>Formal-democratic</i>	<i>Cooperative decision making, local partnership</i>
<i>Case</i>	<i>Debrecen, Hungarian city, Assen, the Hajdú small towns in Hungary</i>	<i>Aberdeenshire, Berettyóújfalú - the Hungarian rural district</i>	<i>Potsdam, České Budejovice</i>
<i>Most influential stakeholder</i>	<i>Mayor</i>	<i>Mayor administration</i>	<i>Mayor - NGO administration; Entrepreneurs</i>
<i>Source of legitimacy</i>	<i>Elections, customs, reputation</i>	<i>Law, regulation</i>	<i>Embeddedness</i>
<i>Decision-making</i>	<i>Central decisions, control orders</i>	<i>Negotiations, Discussions</i>	<i>Participation, discussions, consensus seeking</i>
<i>General tools of decision-making</i>	<i>Voting, informal discussions; informal actions</i>	<i>Official consensus-building; discussion of equal partners</i>	<i>Participatory planning; negotiations; long discussions with all interested stakeholders</i>
<i>Used capital</i>	<i>Political, prestige economic</i>	<i>Political, cultural (professional); expert knowledge-based</i>	<i>Social, expert knowledge; local embeddedness</i>
<i>Connection to other stakeholders</i>	<i>Occasional, discrete and individual; sparse</i>	<i>Official, connections, multi-centred</i>	<i>Dense, multi-centred ; many connections among the actors</i>
<i>Network type</i>	<i>single-centred</i>	<i>central - circuits</i>	<i>Connected, non-centred</i>

*Source: Csurgó et al 2010/1 page 55*

A most significant element of comparison is that growing number of actors, their network and interests appeared in energy governance which may have an impact on household behaviour to alternative energy use. The literature (Stewart & Jones, 2003).shows that appropriate

governance enable actors to control and coordinate stakeholder decision-making, policies, structures and processes and that may facilitate the development of a set of shared values on climate change management.

The second issue concerns actors of climate change management is the shift from government to governance evidently reevaluates the civic sphere, the local stakeholders and actors. The emerging importance of partnerships in the mostly rural or mixed urban/rural formal–democratic and cooperative decision making, local partnership model energy governance models and networks as principal tools of coordination (Rhodes, 2000) has led to the growing significance of new stakeholders who mediate between actors, and of the role of intermediate actors which are becoming cardinal in professionalised and project-driven developmental work (Sjöblom et al. 2006; Kovách & Kristóf, 2009). In rural areas, and in the cases of mixed urban/rural governance models intermediate actors are powerful stakeholders as they mediate between households and different policy levels, and as they impact on household values and decisions over energy use. A specific group of intermediate actors is the project class, a new social formation in Europe (Kováč & Kucerova, 2006, 2009).

None of the three energy governance models (or other existing practices) has an absolute benefit regarding an effective energy-saving policy, or the influence on household behaviour and no single one can be appointed as an ideal.

Municipalities have limited powers to control households' energy consumption, as national governments determine the laws and regulations for the whole country; subsidies are defined by central governments in Hungary, the Netherlands and the Czech Republic.

Other successful examples (Gotts – Kovách 2010) suggest that a close cooperation with public local stakeholders (private and business as well) contribute to a holistic development of a low-carbon society both in urban and rural areas.

It can be argued that such variety of (local) governance is a frame of policy mechanism that fundamentally drives household behaviour, and generates the social conditions for energy saving. The change from (top-down) government to (new) governance is evident in all the project countries; a multitude of new actors, with diversified networks and interests, have appeared in urban as well rural energy governance.

Many tasks of energy governance (including education and training) are outsourced to short-term institutions and this lead to proliferation projects which changed power structures (Csurgó et al 2008).

## **4 Conclusion**

I have argued in this paper that rise of new actors in local energy governance lead to social and power situation is described in the literature as precondition and root cause of implementation of new governance. Successful and effective energy governance alike can be linked to multi-actor or hierarchical, single-centred political structures and networks. The in-channeling and institutionalization of diverse economic, social and political interests may ensure the flexible, efficient involvement and convincing of household members to reduce energy use. From this point of view, the emerging activity of civil associations and entrepreneurs in managing 'green issues' is a necessary condition for addressing climate change. From the other point of view it is obvious that the EU, and national and local governments, having power and legitimization, and having control over financial sources, seem to remain key stakeholders within energy governance.

The power relation and actors' interest approach may instruct rural scientists that we should go beyond mainstream analysis of rural sociology to identify and analyze forgotten subjects, the power positions and relations of the various actors, and the role of these in most rural issue.

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# Rural Transfers

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**Annotation:** Case and consequences of repayment of leaving member from co-operative was observed in this article. Due to loss of trust it causes unemployment, abandonment with later deterioration of rural infrastructure and costs of migration for building of second homes, brain drain and high rural subsidies for import of innovations. All these output effects are called “rural transfers” and were found in case study of legal framework of membership share repayment from co-operative farm D1. It was found that members leaving the co-operative are not entitled to receive any share from increase of own capital after 1993 till 2004 when they resigned. Repayment of value, which was brought into the co-operative is only 20% of own capital while 80% of own capital is blocked for unfinished process of transformation, restitution and other funds. This and other sources of obstacles enabled to derive general conclusion that, leaving members are treated under presumption of guilt while winners take all. Co-operative company is winner who may use funds as collateral. Each of found legal obstacles may cause lost of trust, which makes global governance from bottom up impossible. Therefore, if the legal framework doesn't change, the active people and governing representatives will be isolated. The effect of deterioration of rural areas will create kind of slavery in society by instead of democracy.

**Key words:** rural, area, transfer, member, migration, company, state.

**JEL classification:** HNZ

## 1 Introduction

Treatment of members is defined by corporate law but the legal framework of implementation of this law enables to apply ‘winner takes all’ principal to companies in rural areas, where ability of members to protect their rights in front of the court is low. Application of winner takes all by managers is seen everywhere, for example in global companies Enron or Lehman Brothers and its cases. Natural monopoly and impact of global companies was associated with collective culture where weaker members have no ownership rights. Adele (2008) negatively interpreted impact of state on individuals in Africa because he has not taken global and individual dimension of this problem into account. Process of computation is not connected with its sources and consequences in the statement „State capacity is used neither narrowly nor exclusively as human and physical resource capacity-building or capacity-enhancement, nor limited to econometric or statistical computations of gross domestic product or national income data, though it includes and requires both“. Sources and consequences were found in three arguments, which are especially valid in rural areas. Firstly, many citizens are forced to sell their rural real estates and leave, searching for employment. “The relatively high proportion of elderly persons is often a reflection of younger age groups finding it necessary to leave the region in their quest to find work” (Eurostat, 2011a).

Secondly, the reverse flow from town to rural areas can be derived finding “Turkish cities are growing considerably faster than cities inside the EU” (Eurostat, 2011b). If people are leaving rural areas, but no population decline is measured there, other people must move there from towns. The proof for this conclusion can be demonstrated by price increase of parcels for building houses.

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<sup>1</sup> D is abbreviation of the name of the observed co-operative farm, which was converted into Joint Stock Company

The research question is where are holes in legal framework enabling to legal winners to control property of losers? For example to convert co-operative of worth EUR 10 million to joint stock company and buy it later for EUR 0.2 million? Law on protection of rights of small shareholders neither one man one vote co-operative principal are not valid here, probably.

“Winner takes all“ principle is typical for collectivist behaviour, which is honestly announced in Chinese law, where collectives own the property in the village and if any migrant worker leaves the village, he or she is not entitled to take any share of rural property. Comparison of property rights Czech and Chinese inhabitants of rural areas seems to be against Hofstede’s finding (1991) that differences between cultures remain the same. But, effect of foreign investments gives no chance to compete to local co-operatives.

Further evidence can be mentioned. For example, repayment of leaving member in one month on occasion the co-operative converts to joint stock company was cancelled (§ 233 of commercial law).

This principal of natural monopoly was discussed sharing rules for the pension fund leading to conservative guarantees for the contributor: “the sharing rule is a way to create a continuum between two extreme pension funding methods that are Defined Benefit and Defined Contribution Pension Schemes, and the sharing rule allows partial risk transfer between the contributor and the pension fund manager” (Deelstra, Grasselli, Koehl, 2004).

Further, “pocket cost minimization at the organization stage is only of secondary importance in "choice-of-business-form" decisions, no competitive pressures arise that would engage national legislatures in far-reaching reform of corporate governance more generally” (Bratton, McCahery, Vermeulen, 2009). The examples above remind us that of natural monopoly are strong enough to enable comparison between Czech Republic and China. Tsuneki (2011) relates social impact of natural monopoly to following conditions: “If the fixed cost that pushes the entry-limiting price above marginal cost is large relative to the level of external harm of firms, the negligence regime is socially superior to the strict liability regime. In the opposite case, the strict liability rule may be socially superior”

Liability rule states in more detail that “interest and asset value can be substantial in different situation with three company specific inputs: the equity spot price, the equity volatility (which is transformed into asset volatility), and the debt/share should be calibrated to market quoted credit default swap spreads: the default barrier, and the volatility of the default barrier. The Merton model evolves asset value movements through a diffusion process and a fundamental purpose of the default barrier volatility is to provide a jump-like process which can capture short term default probabilities. ... However, this study was performed during bull market conditions and may not represent the current state of the market nor a specific industrial sector. Subsequently, it is important to calibrate the model with respect to your industrial sector and the tenor of credit default swap spreads you wish to obtain” (Hull, 2004). The problem of natural monopoly calls for governance from bottom up.

The above found relationships between global, natural monopoly and local; written, rewritten and applied law; computation and its sources; and social superiority over liability comprise overall legal framework, which is going to be researched. The objective of this article is to find relevance of factors affecting through legal framework entrepreneurial and innovation potential of people in rural areas. The event researched is the example of members willing to transfer their capital from co-operative in rural area to other uses. More precisely, the situation of repayment of membership share of leaving members when Co-operative farm is converted to Joint Stock Company was selected for experimental design. Many problems tackled in this article were not found in the literature. For example backing funds or leasing 80% of property without ownership rights.

## 2 Materials and Methods

To answer research questions whether individuals should be taxed not only by state but also by company where they have put their assets and life long work was researched by several methods. Firstly, historical analysis of investments and its deterioration in the observed case answer problem of consequences for individual, company and state. Secondly, the question whether legal framework favours any of involved parties (state, company or individual member) was approached by method of deduction. Thirdly, definition of backing funds, by which court experts why don't repay added value to membership share was analyzed by method of induction from interactions between paragraphs of different laws.

Methodology has collected data proving expectations from the lack of innovations to expropriation of funds and presentation of rights in favour of corporations ignoring good will of individual members.

Chances of small business partners or members to withdraw proportionate capital share from funds of agricultural co-operative in juridical process were monitored.

## 3 Results

Co-operative farms collected venture capital funds and equity to use economy of scale from the year 1949. The funding of economy from pockets of rural inhabitants was transformed Czechoslovakia after the issued law<sup>2</sup> between years 1992-1993. It was expected probably, that former members of co-operative farms will invest into new technologies as start-ups replacing economy of scale. New transformed farms have suffered till the year 2004 when EU CAP subsidies became available.

### 3.1 Historical mix of individual interest and economy of scale for profit or development

The observed case of leaving members when Co-operative farm is converted to Joint Stock Company was selected based on historical procedure. Following facts about equality of distribution of assets were found in the place of observation:

1. Feudal estate was sold in the first land reform around 1930. Its barns and storage around the yard have bought many part time farms. Newcomers to the village have rebuilt them into houses. High production infrastructure was deconstructed and used by small holdings. Why economy of scale was abandoned?
2. After collectivisation, which begun 1949, the former independent family or part time farms of the village were usually deteriorating except of its parts, which has been rebuilt into residential places. The infrastructure of former family farms was abandoned to regain economy of scale in farm for whole village. Majority of inhabitants of village moved to repair damages of World War II. This period of stability have given time to co-operative farms to overcome initial troubles and merge interests of individuals with economy of scale.
3. Four co-operative farms of village size were amalgamated into one farming company in 1975 year. Recently, the company is renting fields in diameter of 50 kilometres. Only one farm estate was rebuilt into meat product processing factory with some 70 employees. Both economy of scale and individual interest were abandoned being replaced by lobby farming, which brought subsidy for investment into almost 1 MW bio-gas power plant with continuously valuated guaranteed prices slightly above

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<sup>2</sup> Law 42/1992 about correction of property relations and repayment of property claims in co-operatives

competitive price of electricity. Agriculture moved to energy sector due to capital concentration.

4. The previously mentioned capital concentration moving money of agriculture to other sectors was the last, not the first one. Processing co-operative system was nationalized around year 1950 and then privatized in year 1993. Co-operative farms became shareholders of joint agricultural companies for 30000 pigs<sup>3</sup>, lots of poultry and calf production for area of about 30000 hectares after year 1970. These specialised farms with high capacity were mostly abandoned under pressure of imports now.

This historical analysis shows how economy of scale is dangerous strategy for survival. But, if individual interest is stimulated by national policy, then economy of scale can replace labour intensive sector of agriculture by sector of chemistry of energy, which are competitive with world market prices.

It was proven that if individuals may keep the property the continuous entrepreneurial innovation and resistance to crisis are possible. Historically from neolith age the entrepreneurial innovations of rural individuals and families were always without any subsidies creating perfect market. Co-operative on farm, processing, financing or marketing level were tools to keep individuals competitive with organised national market. Following analysis of legal framework for co-operative members will show that is not possible any more in Czech Republic.

### **3.2 Case study of legal framework for co-operative entrepreneurship**

Some 30 former farmers, later members and employees of agriculture co-operative farm have resigned from membership when co-operative was converted to joint stock company. Eight of them claimed their repayment membership share through court procedure. Remaining 22 members were convinced to accept the 4.98 times lower sum, which corresponds to their membership share in year of transformation of socialistic co-operative to capitalistic in year 1993. It is interesting to see that socialistic co-operative has declared an increase of membership share from assets brought in about five times without paying any yearly rent in 1993 year. Opposed to that the capitalistic co-operative has increased value of membership share 4.98 times but leaving members got nothing of it and after conversion to joint stock company lost the right to get repaid membership share at all.

Conversion of juridical form from co-operative D to joint stock company D was announced by invitation to member's meeting on 30 January 2004. D is territorial abbreviation of the company. Members were invited to present their objections, which were later ignored by the meeting chairman. External lawyer was appointed for this position and notary was recording the meeting procedure and materials. 30 members have cancelled their membership as was recommended to follow procedure of commercial law. Written membership cancellation application forms were delivered in due time. It is not clear whether mistake or intention of this conversion of corporate legal status caused that joint stock company was not registered because of delayed announcement of the date of the member's meeting in media. Commercial court objected that some parties concerned should be disadvantaged. Therefore, new member's meeting was called one and half year later, after which the commercial court had no objections and joint stock company D was registered. Commercial court had no problem that 30 members were expropriated. Some of them condemned the joint stock company D from offending their right to withdraw membership share. The first court procedure have occurred on 30 March 2011 concluding that based on expert statement no valuation of their membership share will be repaid even if own capital has grown five times from year 1997 to 2004 as the evidence is available. Undividable fund was

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<sup>3</sup> The **large breeders** (at least 400 pigs and 100 sows) manage more than two thirds of the other pigs in five countries (Czech Republic, Ireland, Greece, Cyprus and Portugal), where production is concentrated in a less organised production sector (Eurostat, 2011 c)

subtracted from the value of farm brought in the co-operative around the year 1950 under argument that court refused to register joint stock company after the first meeting.

This case just shows the last of repeated experience of rural entrepreneurs of that geographic area. Previous similar cases were described by one former farmer on question of American professor who visited the territory after 1990 Velvet Revolution with question ‘Who of you, people, will restart your farm?’ The answer has arrived after long silence from one former farmer and employee of agricultural co-operative farm. ‘I have begun my first farm in late 1920 after the First land reform, when large farm estate of this village was divided into several small farms with size below 50 hectares of land. Without paying the debt back, I had to sell and start new farm on other place because Germans established a military exercise place in this territory. I have reopened the farm after the WWII repaying recovery of ruins with my previous debts as heirs of my second farm have claimed it back after WWII. It was not easy and the farm became part of co-operative farm in the village in 1950, which amalgamated with co-operative farms of neighbour four villages in 1975. No one can ask me to restart the farm the fourth time in my life’. Smile of US professor signalled understanding and his comments have tackled property rights.

**Table 1.** Own capital growth (mil. CZK)

Year	1997	1998	1999	2000	2001	2002	2003	2004
Own capital	19.578	20.953	44.147	49.730	55.419	62.074	87.664	97.644

*Source: Balance sheets of the former co-operative D*

Own capital has grown 4.98 times only between years 1997-2004. Data from the year of the farm delivery around 1950 till 1997 are missing. But, the property share was recalculated for each member during the transformation of co-operatives in year 1993.

**Table 2.** Recalculation of 4.98 growth on equal membership share

Name	Property 1993	Property share 1997	Membership share 1997	Undividable fund 1997	Increased value 2004	Repayment share	Repayment share	Gift to company
HS <sup>4</sup>	984000	960 000	20000	4000	297630	1257630	956000	301630
HM	85805	61805	20000	4000	297630	359435	57806	301629
LZS	275205	275205	20000	4000	297630	572835	271205	301630
LZM	42809	42 809	20000	4000	297630	340439	38810	301629
JF	205041	205 041	20000	4000	297630	502671	201042	301629
PK	45005	45 005	20000	4000	297630	342635	41005	301630
HJ	382243	382 243	20000	4000	297630	679873	378243	301630
KK	238000	238 604	20000	4000	297630	536234	234605	301629
NJ	84586,29	88 585	20000	4000	297630	386215	84585	301630
NR	54947,76	58 947	20000	4000	297630	356577	54948	301629
VK	51590	48 834	20000	4000	297630	346464	44835	301629
Source:	Transformation record	Recalculation of property for newly established co-operative in 1997			*Own calculation		Expert's calculation	Own calculation

*\* Repayment share = (Own capital - undividable fund – property share) / number of members with equal number of membership years*

Recalculation should be made also on property share because all amount of property shares of members were inserted into own capital. Membership and property shares have increased five times during eight years form 1997 to 2004 but why all is gifted to company? What are main arguments?

There are two main arguments. Firstly, member's rights are shifted from commercial law to bylaws pointing on delayed registration of Joint Stock Company. Secondly, incompetence of former management is used as argument, which members have to pay for. The

<sup>4</sup> Abbreviations of names of formel members, who were involved in the case.

incompetence the expert explains by reference to bylaws, which are promising to inform members about yearly increase or decrease of their property share. But, members are not entitled to any valuation of their membership and property share as this re-calculation never happened. We may accept this if we find an argument assigning the member's money to company.

The commercial law allows to company to keep money in undividable fund or other fund, which is defined by bylaws as backing the company.

**Table 3.** Company's funds

<b>Bookkeeping number and name of funds composing own capital in 2004</b>	<b>CZK</b>
411-basic capital	31496490.46
413-other capital funds	8401512.39
422-undividable fund	3192254.17
427-fund for cultural and social needs	2155960.16
427200-fund of salaries	666007.13
427210-1-fund of appraisal differences	10315977.60
427300-reserve from transformation of co-operatives	349370.75
427379-reserve for property restitutions	21727146.40
427431-reserve for losses	7687594.94
427432-investment fund	2646256.43
Yearly profit or loss	9005908
<b>Total own capital</b>	<b>97644478,58</b>

*Source: Report of independent auditor from <http://www.justice.cz>*

Law has cancelled majority of funds except of undividable fund and fund of undistributed profit. Other funds are still keeping money without having backing status clearly defined in bylaws.

Bankrupted family farms have been replaced by state and co-operative farms in around year 1950. Majority of former rural estates were used as apartments when stables and sheds remained abandoned. Much larger cow stables, storage and more productive machinery was built. Productivity of co-operative and state farms has moved many rural citizens to towns. Income and status of both leaving and still working in agriculture improved. People whose fathers left property shares in agricultural companies are still land owners. But, their income is not high enough to operate the land independently. Especially, if country is becoming net importer and unemployment rate is increasing.

Data have shown that funds from unfinished political and juridical cases are depriving members from repayment of added value of own capital. The idea of prosperity, which is gained by economies of scale, is collapsing in case of joint stock companies for pork production. Innovation through co-operative entrepreneurship can find other competitive products and income for rural population. But, unfinished processes of legal framework block even repayment of membership share favouring recent managers of former co-operative. Let's clarify the main obstacles.

### **3.3 Impact of unclear definition of backing funds**

Backing fund is defined by commercial law § 235 as follows: "Co-operative is obliged to fill undividable fund from at least 10 of basic recorded capital to the day of its registration. This undividable fund is yearly increased by 10% of net profit until it reaches one half of basic capital. Bylaws can assess higher values of undividable fund or other backing funds."

Neither higher value nor other backing funds were described in studied bylaws. Therefore, the company may keep newly added value of members but is not ready to proof ownership of it. Without being owner the company have recorded reserves for restitution,

transformation, price differences, social and cultural needs and property shares of its members in own capital in consonance with law. Therefore, definition of backing funds in paragraph 233 of corporate law allows announcing any fund as backing one or not? We pass this 'winner takes all' principle favouring companies in definition of backing funds in law and bylaws is passed to legislators with note of its impact on company's performance and innovation potential of individual. Large agriculture companies in Czech and Slovak Agriculture would not generate any profit without CAP subsidies. Therefore, it is hardly to prove that Eastern farming companies perform better than farming individuals in western EU countries. The negative impact of winning companies on innovation causes lower gross agricultural production per hectare and total dependence on purchases of seeds and technology from western EU countries.

### **3.4 Double-entry principle proposal for corporate law**

It would be good if 'winner takes all' principle in criminal code excludes criminals from legal part of society. Individuals are deprived from membership repayment shares if corporate law applies the same principle. State has to invest into unemployment subsidies or into new labour opportunities development in this case. Therefore, we argue that the law can save costs of state if before approval of pulling money out of one pocket the other pocket proves the right to own it. The double-entry bookkeeping does it and legislators can just follow. Auditors do not recommend keeping any funds except of reserve, undividable and undivided profit in the company for owner's good. The corporate law with such double-entry feedback may just follow what auditors do. We have seen that auditor and expert skipped any remuneration of membership repayment share and just explained the law and bylaw as judges do. The unemployment subsidies, exclusion, and migration, reduce costs of rural policy and improve conditions for entrepreneurial innovations are consequences.

### **3.5 Impact of collectivism and individualism on performance and innovations**

It was observed that all what individual can do was neglected. Firstly, the members were invited to deliver their objections against conversion of co-operative to Joint Stock Company before the meeting on this topic was held on 30 January 2004. All objections delivered in time were neglected as not relevant by chairman of the meeting. Secondly, even if court didn't register the joint stock company, members were not informed and not invited to the second meeting, where the company was approved. Thirdly, it was denied that 30 leaving members who protested against conversion of co-operative to joint stock company ever protested. It was said that they left co-operative during its existence from their individual decision. Fourthly, Court rejected call for cancelling validity of the meeting, which would return membership rights to protesting members and sustain on appointing attorney. Fifthly, attorney neither judge felt competent to calculate membership repayment share. Therefore, they ordered court experts. Sixthly, court experts visited only the company and interpreted law with conclusion that leaving members are not entitled to 4.98 time increase of own capital. Seventhly, two of remaining 8 former members died. Therefore, court procedures were stopped. Eighthly, the new expert was appointed by former members. He denied all explanations of previous expert. But, he had no a round stamp. The round is highly valued by judges. Therefore, third expert was called. He intended to check all money transfers from 1949 when first co-operatives were established. The third expert rejected to interpret the law, just to measure facts, contrary to the first expert. The third expert said that he will step from contract if data will not be available. Ninthly, Union of court experts and estimators was requested why some experts are explaining law instead of attorneys and judges while others reject it. No answer arrived. Further five years are expected the court procedure will go on. It is not curious that this procedure is great school for all rural people preventing them from any activity, except of neuroticism. Individuals lost belief that they will not be robbed again. It

explains also why recent financial crisis is caused by lack of innovations. The membership share repayment should be the first step to recover trust in the society.

It is not enough to change the law as the legal framework favours winners. We may generalise that 'Winner takes all' rule, where 0% individualism and 100% collectivism is not rewording individuals for efforts while reaching their own short term entrepreneurial objectives. Socialistic co-operative have answered this question negatively after 40 years and capitalistic one after 14 years. Performance of family farms after the first land reform was generally not good. Some of them had to repay loans after Second World War. But, without this education at family farms the success of co-operative would not be possible. We may object that capitalistic co-operative was also successful. But its success was generated by large investments into imported technology compensating previous delay in technology, which was planned by socialistic state. Neither farmer in old capitalistic countries have all conditions perfectly arranged. They have no advantage of large scale farms, which were generated by socialism. This case of individual or member entrepreneurship during post war and socialistic normalisation periods explained causes of recent repeatedly returning crisis.

## 4 Conclusions

The rural infrastructure was rebuilt during the last century each 20 years. Individual, ideological, economical purposes were either premature or caused delays. This article observed how legal framework causes obstacles to individuals to offset consequences of premature policies or sales of technology to delayed countries. But, the fact that winners may buy co-operatives of worth EUR 10 million by converting it to joint stock company for EUR 0.2 million is so attractive for some individuals that they can modify legal framework as was shown. Apathy of majority individuals and domination of few managers with attorneys is the cause of recent crisis. The first step to remove obstacles should be to clean up consequences of unfinished processes like transformation fund, restitution fund and unclear definition of backing funds. The second step would be to erase changes of law to enable individuals to be repaid when leaving the company. The third step is to change law about procedures of court experts and assistants to forbid them to substitute judges.

Therefore, double entry bookkeeping was proposed as feedback to previous three steps to prevent legal framework from keeping unfinished processes for ever.

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# Analysis of Social Networks in Local Action Group

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**Annotation:** Local actors, living and working in the locality play a crucial role in development of rural areas. Thanks to their knowledge of local specificities and developmental potential, they are qualified to prepare quality strategies and propose necessary projects. Furthermore, they are able to use their already existing social ties, and contacts. These contacts can be on social as well as entrepreneurial or political level. How extended a network of such contacts is depends on the position of each local actor in each individual locality.

Built on the principles of the LEADER program, Local Action Group (LAG) represents by its composition and character of its nature a complex element of development of rural area. It is a group combining various types of local stakeholders - representatives of communities, businesses, special interest societies and associations, NGOs and other actors. If the community finds a powerful leader, willing to engage for the development of the municipality, he or she may apply their influence, either officially in the municipal administration or in the form of voluntary cooperation of several participants, such as LAG.

Given the above facts, the existence of an extensive network of social contacts and relationships and strong social capital can be assumed in LAGs. To obtain a sufficient volume of data and a coherent picture of the functioning of these networks and expressions of social capital in chosen rural locality in the Vysočina region, a field survey was carried out in the LAG Havlíčkův region. The aim was to map the structure and extent of networks of social contacts and relationships.

The carried out analysis showed that in the case of LAG Havlíčkův region close cooperation between the public sector (local and municipal authorities) and the business sector particularly agriculture and forestry is crucial for the development of the locality.

**Key words:** social capital, Local Action Group, social networks, actor, rural development.

**JEL classification:** R11

## 1 Introduction

Local Action Groups (LAG) started to be formed upon the implementation of the LEADER approach, which is one of the tools for rural development in the EU. Concept LEADER is based on principles of endogenous development; respect the principle of territoriality, the use of local resources and local contextualization through active public participation.

In the Czech Republic the LEADER program is currently implemented as a part of the Rural Development Programme (RDP) as its 4th axis. Within this program, a LAG is defined as a group of public bodies, members of private and voluntary sector at local level. It represents a geographically homogeneous area with the minimum of 10 thousand and maximum of 100 thousand inhabitants including villages and towns with population up to 25 thousand.(RDP CR) Its main task is the mobilization of people in the micro-region, building partnerships, uniting inhabitants and encouraging volunteer activities at all levels of the rural life. From rural development point of view, LAGs allow local communities to be actively involved in the care of the environment in the region and the development of planning in a broader context.

Local Action Group in its composition and character of its nature constitutes a complex element of development of the countryside. It is a group, which combines various types of

local actors - representatives of communities, businesses, interest societies and associations, NGOs and other entities. As stated by Shucksmith (2000), the LAG activities contribute to the creation and development of different forms of social capital, which are valuable for the society as a whole.

Social capital has appeared on the agenda of public policies as an important factor that facilitates "concrete actions of actors within the existing structures" (Coleman 1988), and thus overcomes the long-standing division between "the impact of structures" and "the impact of actors". Social capital is, unlike other forms of capital (financial, human ...), not attributable to individuals themselves, but is linked to relations between them. It is a concept which refers to "features of social organization such as trust, norms and networks that can improve the efficiency of the functioning of society, by simplifying the coordination of actions" (Putnam 1993). Practically speaking: the existence of social capital reduces transaction costs and increases efficiency of the system by facilitating the interactions between actors in the society. In the case of LAG operation as a tool for endogenous development of the locality level and quality of relationships within the group are important. (Ray 2000)

One of two basic components of social capital are social networks. Also Putnam considers the concept of collective networks an important component of social capital in civic engagement (i.e., membership in voluntary associations). This membership creates resources for solving problems and promoting the objectives in the society (Putnam 1993, Paxton 1999) and is linked to high levels of social capital.

Torp (2003) states that civil associations and unions help create positive attitude towards cooperation among members, between social groups and different segments of society and between associations and public institutions at central and local levels. These relationships enables the exchange of information and services between otherwise separate social groups and strengthens the ability of groups to organize themselves and cooperate in order to promote common goals. This form of capital brings together people across different social groups that are united by some common interest or effort to push for a common cause. These include various associations and interest groups, sports clubs, etc. This type of coexistence is considered positive from the point of view of social development and the development of civil society (Stachová 2008).

Given the above facts, the existence of an extensive network of social contacts and relationships and strong social capital can be assumed in local action groups. Our analysis will focus on only one component - social networks. Social networks are systems of reciprocal social relations among three or more people (Buščíková 1999).

The project „Social capital as a factor influencing regional disparities and regional development“ was started in 2007 and is carried out by the Department of Humanities at the Czech University of Life Sciences in Prague in collaboration of with other research teams from the Faculty of Science at the Charles University in Prague and from the Institute of Sociology of the Academy of Sciences of the CR. This research project is financed by the Ministry for regional development. Its objective is to analyze social capital, its existence and use in given areas (region, locality) of the Czech Republic, and its significance for different developmental activities. The impact of the factor of social capital is monitored on model area on three levels: region, town and rural area (microregion). Suitable model area was selected based on a comparative analysis of data on social and human capital, potential for economical development and other indicators from different regions. Finally, the region Vysočina was chosen, as the region with the highest rate of social capital. LAGs were identified as representatives of local development, such as institutionalized social capital. Among other activities, the project examined in detail one successful LAG, which was originally founded in order to support the activities of NGOs in the region.

The aim of this paper is to present part of the research, which analyzed networks of relationships of members in Local Action Group (LAG). The aim was to identify who is playing the role of a leader, who influences events within the group and who has the significant profit form cooperation between actors from various sectors.

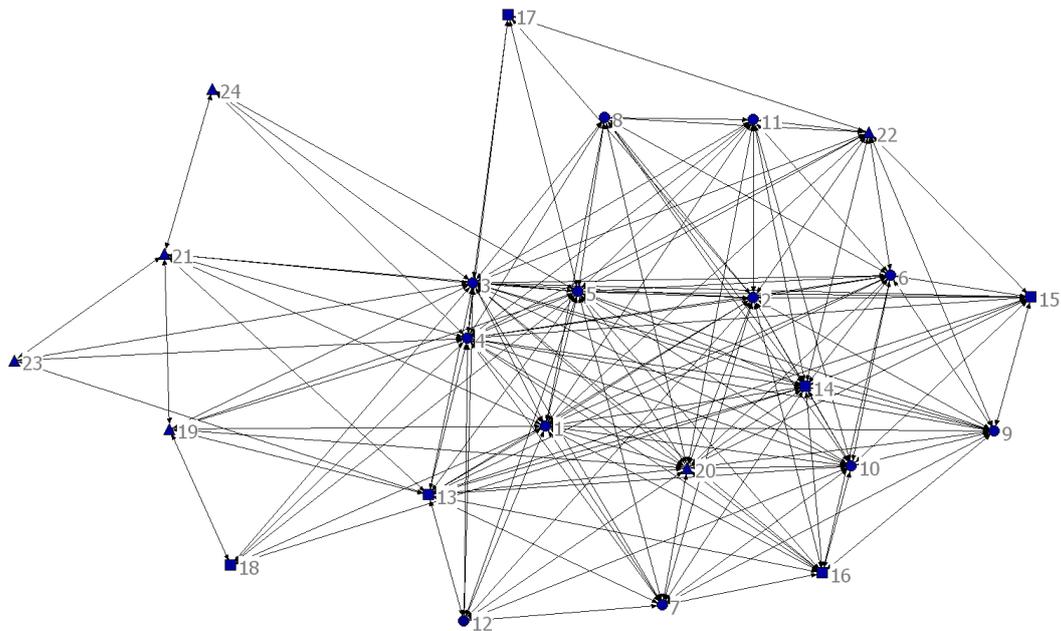
## **2 Materials and Methods**

The LAG Havlickuv kraj was selected for detailed investigation. This LAG consists of following members: 14 towns, villages and municipalities, 5 legal persons, 5 individuals , 7 clubs and interest groups, 1 parish congregation of the Evangelical Church).

The methodology for contact-network analysis mainly taken from the work Vajdová (2008), The analyses were carried out in the computer program UCINET (Hanneman, Riddle). LAG members were asked to complete a table of contacts. UCINET requires a symmetric matrix of contacts, i.e. contacts reciprocity for the analysis. This means that if a respondent confirmed a contact, we have assumed the existence of this contact also for the other side. The second simplification for the purpose of analysis represents the evaluation only of contacts in a closed system of LAG members.

Using UCINET program we have calculated the density of the whole network as well as the density of sectors, centrality of individual actors and the centralization of the network of contacts and structural equivalence of LAG members. These characteristics demonstrate the quality of relationships in the LAG system.

All 34 members of the LAG were asked through the manager of the LAG to complete the questionnaire. The question inquiring about the existence and frequency of contact was: "Please, look at the enclosed list of partners. With which is your organization regularly in contact concerning matters connected to the development of the region where your LAG works? Is contact done by telephone, e-mail or personal meetings? How often do you have contact with this organization?" 24 questionnaires were returned completed. These were then divided into three groups: the response of public representatives, business and non-profit sectors. The public sector was represented by representatives of 12 municipalities, business sector by 6 organizations (2 agricultural associations, 1 forest cooperation, 1 business organization doing packaging, wood processing and storage and 1 operating restaurants and accommodation), 6 non-profit and public organizations (3 sports organization, 1 cultural and 1 volunteer fire brigade) . 24x 24 matrix containing contact information from the completed questionnaires LAG members was created.



**Fig. 1.** Network of contacts LAG Havlíčkův kraj according to sectors (1-12 public, 13-18 business, 19-24 NGO)

### 3 Results and Discussion

The density of contacts networks is defined as the sum of the ties divided by the number of possible ties and it gives us insights into such phenomena as the speed at which information diffuses among the actors, and the extent of their social capital ( Hanneman, B., Riddle M. UCINET tutorial, p. 99) . The greater the density the more contacts in the network and therefore more organizations are in contact with each other. In the particular case of LAG Havlickuv kraj the density is 0.5652, i.e. about 57%. This is not high density. After 4 years of operation, the LAG should have built quality contacts. The possible reason why the indicator is quite low could be that the most important actors for development were not chosen or they did not fill out the questionnaire. However, when filling out the questionnaire, none of the respondents chose to complete the list of “other partners” with whom they have been in contact. The second reason why the density of a network of contacts is not too high may be that information is communicated through no informal networks, which could not be traced.

**Table 1.** Density of network of LAG Havlíčkův kraj according to sectors

Sector	Public	Business	Non-profit
Public	0,8636	0,6993	0,5404
Business	0,6993	0,4000	0,2197
Non-profit	0,5404	0,2197	0,1667

*Source: UCINET program*

As shown in Table 1, the main actors of developmental activities in LAG Havlickuv kraj are public sector institutions - local and municipal authorities (network density 0.86). Between the public and the business sector and public and non-profit sector is the density of networking also higher than within the sectors themselves. The lowest density of networks of contacts (0.1667) is within the non-profit sector, these organizations not exchange much information.

The concept of network centrality is linked with the concept of social power, because an individual has power only in relation to others; the power lies in the ability to control others. Position in the network indicates the degree of actor centrality, which is the ratio of existing contacts of one actor to all other possible contacts in the network. For purposes of comparison rate is normalized so that the simple step is related to the total number of possible relationships with other actors. To determine the position of individual LAG members the standardized level of degree of centrality of 24 institutions, whose representatives provided the necessary data, was quantified in the program UCINET.

**Table 2.** Centrality of network of LAG Havlíčkův kraj according to sectors

Institution code	Sector	Degree	Normalized degree %	Institution code	Sector	Degree	Normalized degree %
4	1	23	100	6	1	15	65
3	1	23	100	9	1	13	57
5	1	22	96	7	1	12	52
1	1	19	83	22	3	12	52
2	1	18	78	16	2	12	52
20	3	17	74	8	1	11	48
14	2	17	74	11	1	11	48
13	2	16	70	15	3	11	48
10	1	16	70	12	1	9	39
				21	3	8	35
				19	3	8	35
				18	2	6	26
				17	2	5	22
				23	3	4	17
				24	3	4	17

Group of actors who have a standardized degree centrality of at least 70%, i.e., they have the greatest influence in the network, are mostly from the public sector, i.e. representatives of municipalities. Two business entities also include in this group (agricultural and forestry cooperative association of municipalities) and a sports club, which brings together 400-500 members-athletes.

The centralization of the whole network is 47.43%. This figure is the ratio of the current structure of contact within the whole LAG to a hypothetical absolutely centralized (star-shaped) contact structure (in an absolutely centralized structure one central actor would have direct contact with other actors, who do not have direct contact with each other). This information helps to draw a picture of the structure of the entire network. In our case, centralization is relatively high, which does not promote the principle of partnership in local development strategy.

Structurally equivalent actors have common features in the sense that they could behave similarly, for example, to create a similar communication mechanisms. The program UCINET procedure Concor can divide actors into groups so that structurally equivalent actors are in the same group. Each group is characterized by a common communication strategy. In our case, the set of 24 LAG members was split after some simplification of the 4 groups. The first structurally equivalent block comprises 4 local administrative authorities, their density of contacts is 1, which means that they are each in contact with one another. In the second block are 13 institutions from all three sectors: 8 institutions from the public sector, 3 from the

business sector and 2 non-profit organizations. Contacts between block 1 and 2 are also very tight, as the density is 0.981. 3 business organizations and 4 non-profit organizations were allocated into the block 3.

In general, block 1 can be characterized as a block of public institutions, block 2 as a block of public institutions, agricultural and forestry businesses and nonprofit organizations closely linked to local government. Block 3 can be characterized as a block of small businesses and nonprofit organizations.

## 4 Conclusion

LAG Havlíčkův kraj was founded in 2006, during research it has therefore been operating already for 4 years and functional network of information and participation should have already been created. The manager of the LAG plays an important role in the actions of the organization. She was the one who gave the first motion for founding of the LAG. The original intention was to encourage non-profit organizations to cooperate in order to raise funds for individual work through the LEADER approach. Her initiative was successful when leaders of agricultural and forestry companies supported the idea. Although the initiators of LAG were the leaders of agricultural associations, municipal representatives also supported the idea of the birth and provided the administrative apparatus, which businesses and nonprofit organizations do not have available. Municipal and city authorities have the administrative apparatus, which has time and resources for keeping contacts within the LAG. Apart from that condition the work and initiative of "drivers or leaders" are necessary for the successful operation of the LAG. The investigation showed that agriculture is still an important rural sector. Representatives of agricultural and forestry companies, in collaboration with municipality representatives play an essential role there.

## Acknowledgements

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# Support of Agricultural Development from National Funds in Poland in 2003-2010<sup>1</sup>

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**Annotation:** Agricultural activity requires involvement on the part of the government and also financial support from public institutions because it is burdened with a high level of risk and is subject to the influences of many unfavourable phenomena (e.g. natural, social or economic phenomena). The support of those activities which contribute to the development of agriculture and rural areas in Poland from the national funds is offered by the Agency for Restructuring and Modernization of Agriculture (ARMA), which was established in the year 1994. The national programmes of the financial support of agriculture consist among others in subsidies offered by the Agency to the interest on bank credits (preferential investment and working-capital credits in the agriculture, agricultural and food processing and services for agriculture) and in the provision of guarantees and credit guaranties to farmers in agriculture and agricultural and food processing (including investments and loans concerning natural disasters) to finance a part of investment costs. The aim of the present study is an analysis and an assessment concerning the support of the development of agriculture from the national funds in Poland in the years of 2003-2010, which are considered on the grounds of the volume of preferential agricultural credits given with the subsidy of the Agency for Restructuring and Modernization of Agriculture to the interest and the number of securities and guaranties granted for the repayment of bank credits. Furthermore, the analysis covers the number of investment credits according to the types of credit lines. In the article, statistical data from the reports of the Agency for Restructuring and Modernization of Agriculture was used, and the time scope of the analysis included the years of 2003-2010.

**Key words:** agriculture, preferential credits, national funds, the Agency for Restructuring and Modernization of Agriculture

**JEL classification:** Q14

## 1 Introduction

Agriculture is an important sector of each market and it constitutes the basis of the existence for many agricultural enterprises; it provides the source of living to those who deal with agricultural production. Since agricultural activity is burdened with a high level of risk and is subject to the influences of many unfavourable phenomena, not only those natural but also social and economic ones, it requires an involvement on the part of the government and also financial support from public institutions. Financial support may take for example the form of lower interest rates (Brandes, Odening, 1992). Scientific literature shows that financial support for agriculture can be evaluated positively and may be criticized. Opponents shows that the administrative costs associated with servicing the loan are too high compared to the results achieved (Kochne 1976). Other part of academic estimates emphasizes the validity of this as the following positive changes and development of agriculture (Alberts, 1983). The main factors, affecting the necessity for financial support for agriculture and rural development are: the creation of new jobs, moving from employment in primary agricultural sector; the increase of entrepreneurship in rural areas; the improvement of quality of life; the development of infrastructure in rural areas (Ciburienne, 2009).

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<sup>1</sup> The project was funded by the National Science Centre.

The expenditures of the European Union for financial support of the development of agriculture constitute the highest position, ie. ca. 46 per cent, in the total budget of the European Union for the years of 2007-2013.

Currently in all the Member States, the systems of national support are in compliance with the Community Guidelines concerning the governmental support in agricultural and forestry sectors for the years of 2007-2013 (Official Journal of the European Union C 319 dated 27 Dec. 2006), which were accepted by the European Committee in December 2006, and with the Ordinance by the Committee (EC) no. 1857/2006 dated 15 Dec. 2006 concerning the application of Art. 87 and 88 of the Treaty with reference to the state support for small and medium sized enterprises that run business activities connected with the production of agricultural products, and with the Ordinance which replaces Ordinance (EC) no. 70/2001 (Official Journal of the European Union L 358 dated 16 Dec. 2006). These documents determine the scope of national support which may be used starting from 1 May 2007 to the benefit of the agricultural and food sectors in the EU Member States including Poland.

The support of those activities which serve the purpose of the development of agriculture and rural areas in Poland from national funds is offered by the Agency for Restructuring and Modernization of Agriculture, which was established in the year 1994<sup>2</sup>. The Agency for Restructuring and Modernization of Agriculture is a governmental institution and its activity is modeled on the practices applied by similar institutions which support the development of agriculture in the EU states.

The Agency deals among others with the implementation of instruments which are co-financed from the budget of the European Union. In practice, this means that the Agency operates financial transfers for the majority of actions within the framework Common Agricultural Policy (CAP) and Structural Funds, i.e. Sector Operational Programmes “Restructuring and modernization of the food sector and development of rural areas in the years 2004-2006” and “Fishery and fish processing for the years 2004-2006”<sup>3</sup>. Subsidies create real incentives for individual agricultural production chain actors to improve production efficiency, cooperation, or to change the nature of the activities (Boche, George, 2006).

The Agency for Restructuring and Modernization of Agriculture also offers national support (within the framework of the national budget) which consists in subsidies to the interest on various preferential loans and offering other forms of support. The Agency for Restructuring and Modernization of Agriculture constitutes the most important entity in the system of preferential credits for agriculture in Poland and it can provide financial support in the following forms (the Ordinance as of 26 April 2007..., the Ordinance as of 22 January 2009):

- Subsidies to the interest on bank loans (investment and working-capital credits in agriculture, agricultural and food processing and services for agriculture), which are given to finance a part of investment costs (those credits constitute the basic form of support offered by the Agency from national funds).
- Partial repayment of the capital of bank loans destined for financing a part of investment costs.

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<sup>2</sup> It was established on the grounds of the Act as of 29 Dec. 1993 concerning setting up of the Agency for Restructuring and Modernization of Agriculture whereas currently it acts on the basis the Act as of 9 May 2008 concerning the Agency for Restructuring and Modernization of Agriculture, Journal of Laws from the year 2008 No. 98 Item 634.

<sup>3</sup> In the years 2007-2013, ARMA is implementing aid instruments financed from new European funds: The European Agricultural Fund for Rural Development (EAFRD) which finances all measures concerning the rural development, The European Agricultural Guarantee Fund (EAGF) and European Fisheries Fund (EFF).

- Guarantees or securities for the repayment of bank credits in agriculture and agricultural and food processing (including those related investments and natural disasters) to finance a part of investment costs.

The purpose of the present study is an analysis and assessment concerning the support of the development of agriculture from the national funds in Poland in the years 2003-2010, which is considered on the grounds of the volume of preferential agricultural loans granted with the subsidies from the Agency for Restructuring and Modernization of Agriculture to the interest and the number of securities and guaranties given for the repayment of bank loans. Furthermore, the analysis covers the number of investment credits according to the types of credit lines.

## 2 Materials and Methods

The research is of an analytical nature, the statistical data processed by the Central Statistical Office and the data from the reports of the Agency for Restructuring and Modernization of Agriculture constitutes the source of empirical materials. In the article, the research material was subject to a numerical and descriptive analysis. The results were presented using a descriptive and comparative method. The time scale of the analysis included the years 2003-2010.

## 3 Results and Discussion

Agricultural loans constitute an essential external returnable source of financing of agricultural activities in Poland because on the one hand they help to fully use the reserves possessed by a farm, and on the other hand they enable restructuring and modernization of agricultural farms (Siudek 2001). Among the main reasons concerning the use of bank loans by farmers, the following can be mentioned (Kata 2009):

- a low ability of farms to accumulate their equity both for the needs of simple reproduction and extended reproduction to carry out production investments,
- a high production risk and fluctuations of the market economic situation which result in a great instability of agricultural incomes,
- divergences between the date connected with incurring expenses in relation to production and the date connected with obtaining incomes and monetary revenues (a delay in the payment of liabilities towards farmers on the part of the customers of agricultural products),
- an increased demand for materials and services from the purchase.

The national programmes concerning the financial support of agriculture consist in the subsidies from the Agency for Restructuring and Modernization of Agriculture to the interest on credits given from the funds of those banks which cooperate with the Agency. On the grounds of contracts concluded with the banks and based on the limits granted, the Agency for Restructuring and Modernization of Agriculture distributes funds to banks, which constitute subsidies to the interest. The interest which is owed to the bank is paid by<sup>4</sup>: the borrower: to the amount of one half of the interest however not more than 20% of the loan on the annual basis, and by the Agency for Restructuring and Modernization of Agriculture: the remaining part. Preferential loan is an instrument of intervention, which is support the development of agriculture activities (Jochimsen, Leiner 1978).

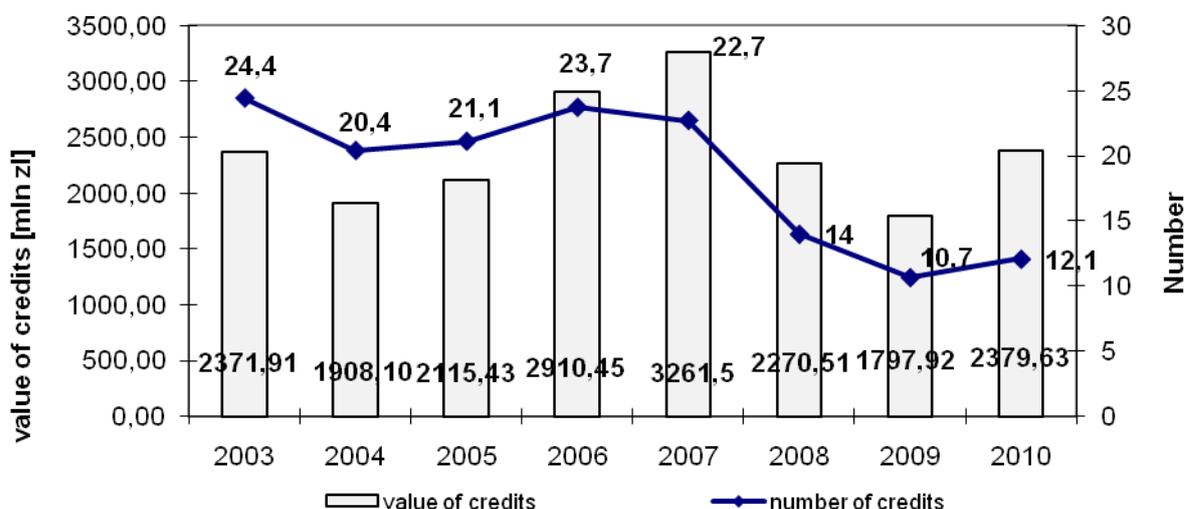
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<sup>4</sup> Decree issued by the Council of Ministers as of 4 Apr. 1995 concerning detailed activities of the Agency for Restructuring and Modernization of Agriculture and ways to implement these; Journal of Laws No. 47, Item 244 from the year 1995

Above all, preferential loans through the Agency reach farmers through cooperative banks; this has an influence on changes in the quantities of the credit debt of agriculture in Poland. The following are the priority goals in the scope of granting and use of preferential loans<sup>5</sup>:

- an increase of the offer of commodities and services and its better adaptation,
- an improvement related to the requirements concerning the well-being of animals,
- an improvement of the effectiveness of production which consists in particular in a reduction of manufacturing costs,
- maintenance or improvement of conditions concerning requirements related to environmental protection,
- an improvement of the quality and promotion of agricultural products,
- an improvement of the agrarian structure,
- an improvement of working conditions and a better use of labour reserves,
- a creation of a raw material base for the crops of energy plants.

Due to this fact that the operating cost of loans with the subsidies of the Agency for Restructuring and Modernization of Agriculture to the interest is much lower in comparison with the operation of commercial loans, preferential investment credits are a popular source of financing of investments realized in agriculture and they possess an essential role connected with the provision of loans to agriculture in Poland. Their number and value is presented in Fig. 1.



**Figure 1.** The number and value of investment credits with interest subsidized by ARMA from 2003 to 2010 in thousands and million Polish zloty

*Source: Author's own calculation based on ARMA*

From the beginning of the activity of the Agency to the day of 31 Dec. 2003, banks granted a total of 292,909 investment loans with the subsidy from the Agency to the interest to a total amount of 16,824,122 thousand zloty. With the overall growth tendency of the volume of preferential credits, the year 2004 which saw a decrease of the value of preferential loans is an exception. This decrease was the result of the policy of the Agency for Restructuring and

<sup>5</sup> Instruments of financial support for the years 2007-2013, the Agency for Restructuring and Modernization of Agriculture, Warsaw 2007, p. 6

Modernization of Agriculture in the scope of the subsidies applied to the interest on these credits. In the year 2004, subsidizing of working-capital credits for agriculture was eliminated by the Agency (except for working-capital credits related to natural disasters).

Those entities which are intending to invest into farming production or processing of farming products can apply for credits within the framework of the following credit lines (ARMA):

- a credit for the realization of investments on farms, special divisions of farming production and farm produce processing: nIP symbol,
- a credit for the purchase of arable lands: nKZ symbol,
- a credit for the creation or furnishing of a farm by persons under 40 years of age: nMR symbol,
- a credit for the realization of investments in agriculture and farm produce processing by groups of farm producers formed pursuant to the Act as of 15 September 2000 concerning groups of farm producers and their associations, and concerning amendments to other acts (Journal of Laws No. 88, Item 983 as amended): nGP symbol,
- a credit for the purchase of farming immovables intended for the creation or expansion of a family farm pursuant to the Act as of 11 April 2003 concerning the formation of the agrarian system (Journal of Laws No. 64, Item 592): nGR symbol,
- a credit for the realization of investments in connection with new technologies of agricultural production which ensure a high quality of the product: nNT symbol,
- a credit for the realization of investments within the framework of “The Trade program of the development of the shared use of farming machines and devices”: nBR10 symbol.
- credits for the realization of investments within the framework of “Programme of the support of restructuring and modernization of meat industry, storage freezing and egg processing in Poland”: nBR14 symbol.
- credits for the realization of investments within the framework of “Trade programme of dairy industry”: nBR15 symbol.

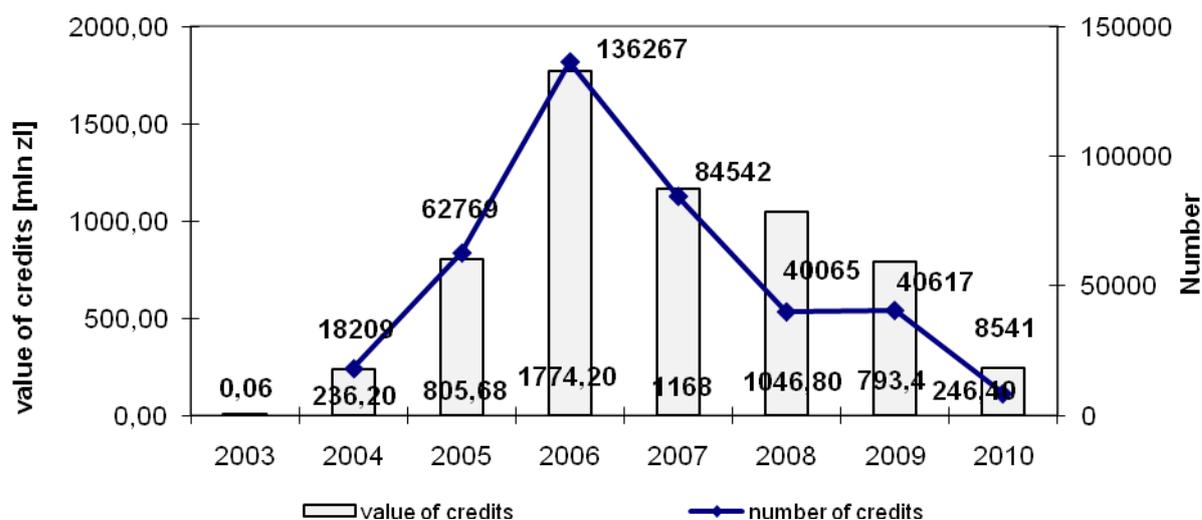
The number of preferential loans provided by ARMA for the period 2003-2010 by the credit line is presented in Table 1.

From among preferential investment credits, farmers can use two of their forms: preferential credits for investments in agriculture and food processing, and disaster credits with subsidies from the Agency for Restructuring and Modernisation of Agriculture. The purpose of disaster credits (operating or investment credits) is to provide aid connected with resuming production on a farm and repair of damages due to natural disasters, such as the following among others: drought, hail, rain, early spring frosts, floods, hurricanes, lightnings, landslides, avalanches, excessive precipitation or destruction by frost. The number and value of disaster credits with interest subsidized by ARMA in the period 2003-2010 is presented in Fig. 2.

**Table 1** Number of preferential investment credits granted by ARMA from 2003 to 2010 by type of credit line

Credit line	2003		2004		2005		2006		2007		2008		2009		2010	
	number	share	number	share	number	share	number	number	share	share	number	share	number	share	number	share
nIP	5206	21%	4814	24%	4598	22%	5173	22%	4248	19%	1174	8%	947	9%	1226	10%
nKZ	6152	25%	6077	30%	6267	30%	6377	27%	5227	23%	4719	34%	5542	52%	5792	48%
nMR	11500	47%	7659	37%	8365	40%	9933	42%	10616	47%	6223	44%	3074	29%	3761	31%
nGP	7	0%	10	0%	7	0%	5	0%	5	0%	3	0%	3	0%	8	0%
nGR	-	0%	398	2%	469	2%	501	2%	455	2%	357	3%	417	4%	542	4%
nNT	-	0%	336	2%	635	3%	1149	5%	1861	8%	1372	10%	607	6%	696	6%
nBR10	1392	6%	74	0%	56	0%	63	0%	24	0%	10	0%	3	0%	3	0%
nBR14	-	0%	144	1%	48	0%	53	0%	24	0%	15	0%	8	0%	16	0%
nBR15	-	0%	807	4%	619	3%	432	2%	244	1%	164	1%	61	1%	113	1%
Other	187	1%	128	1%	22	0%	9	0%	2	0%	0	0%	0	0%	29	0%
Total investment credit	24444	100%	20447	100%	21086	100%	23695	100%	22706	100%	14037	100%	10662	100%	12186	100%

Source: Author's own calculation based on ARMA



**Figure 2** The number and value of disaster credits with interest subsidized by ARMA from 2003 to 2010 in thousands and million Polish zloty

Source: Author's own calculation based on ARMA

In the years 2003-2009, farmers took out 382,469 loans concerning natural disasters in the total amount of 5,824.33m. zloty. In the structure of credits concerning natural disasters, working-capital credits concerning disasters have a dominating position (in the examined period, as many as 381,945 credits were granted with subsidy of the Agency while 524 investment credits concerning disasters were granted). In 2010 compared to previous years there has been a decline in the number and the value of disaster loans. This decrease amounted to 2009 - 32076 and 547 mln zloty.

National programmes for the financial support for agriculture also consist in giving securities and credit guaranties to farmers<sup>6</sup>. Securities and guaranties make it easier to economic entities to take out credits for financing of investments in agriculture, agricultural and food processing and services for agriculture. By issuing securities and guaranties, the Agency for Restructuring and Modernization of Agriculture enables those legal entities and natural persons that are creditworthy but do not have guarantees of credits required by banks, to take out a credit. When examining applications for securities and guarantees the Agency assesses the following: the effectiveness of an undertaking, the possibility to repay the credit and credit rating of the petitioner. From the beginning of the activity to the day 31 Dec. 2003, the Agency issued 149 guaranties to the value of 38,531 thousand zloty and 14 guarantees in the amount of 3,658 thousand zloty through 25 banks. The number and value of securities and guarantees for the repayment of investment loans which were issued by the Agency for Restructuring and Modernization of Agriculture in the years of 2003-2010 is presented in Table no. 2.

**Table 2.** Securities and guarantees for the repayment of investment loans issued by the Agency for Restructuring and Modernization of Agriculture in the years 2003-2010

		2003		2004		2005		2006		2007		2008		2009		2010	
		number	value														
Securities and guarantees for the repayment of investment credits	Proposals submitted	6	3345	7	3456	0	0	3	1772	0	0	2	670	6	2564	1	1000
	securities	6	3345	7	3456	0	0	3	1772	0	0	1	287	5	1947	1	1000
	guarantees	0	0	0	0	0	0	0	0	0	0	1	383	1	618	0	0
	Total issued	6	3745	1	500	1	541	2	1122	0	0	1	287	3	841	2	1482
	securities	6	3745	1	500	1	541	2	1122	0	0	1	287	3	841	2	1482
	guarantees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Source: ARMA

The Agency may also issue securities and guarantees for the repayment of loans related to natural disasters. The procedures connected with the possibility to apply securities and guarantees in connection with this type of loans were implemented in Poland in the year 2004<sup>7</sup>. In spite of the limits for issuing guaranties for the repayment of credits related to natural disasters granted to cooperating banks, the banks did not petition for the security of these loans in the first year. In the years 2005 and 2006, the Agency issued 2 guaranties each year to the total amount of 226 thousand zloty, and in the year 2009 it granted one guaranty for the repayment of a loan related to a natural disaster in the amount of 65 thousand zloty.

<sup>6</sup> A guarantee is a legal security of A debt which consists in the guarantor's commitment to repay the guaranteed amount in the case when the debtor, upon whose instructions the guarantees was issued, fails to repay the amount due. The guaranty as a security for the repayment of monetary receivables is a civil law contract through which the guarantor undertakes towards the creditor (i.e. the bank) to perform this obligation should the borrower fail to perform this commitment.

<sup>7</sup> On the grounds of Decree No. 17 issued by the President of the Agency for Restructuring and Modernization of Agriculture on 6 Apr. 2004 concerning introduction of *Regulation on issuing securities and guarantees connected to loans related to natural disasters*.

## 4 Conclusions

The purpose of the present article is an assessment concerning the support of the development of agriculture from national funds in Poland in the years 2003-2010 on the grounds of the volume of preferential agricultural loans granted with subsidies from the Agency for Restructuring and Modernization of Agriculture to the interest and the number of the securities and guarantees issued for the repayment of bank loans. The following conclusions have been formulated on the basis of the analysis conducted:

- The national programmes for the financial support of agriculture consist among others in subsidies to the interest on bank loans and in issuing loan repayment securities and guarantees to farmers.
- The system of preferential credits in Poland constitutes an important instrument of the government's influence on agriculture, and the Agency for Restructuring and Modernization of Agriculture constitutes the most important entity in the system of preferential loans for agriculture in Poland.
- Preferential credits constitute a popular source of financing investments realized in agriculture because the costs of their operation are lower owing to the subsidy from the Agency for Restructuring and Modernization of Agriculture than in the case of the operation of commercial credits.
- In the period analyzed, there was a decrease of the number and value of investment credits which were granted with the subsidy from the Agency for Restructuring and Modernization of Agriculture to the interest.
- The largest growth of the volume of preferential credits occurred in the year 2006, and in comparison to the year 2005, it was 795.02 m. zloty. It was the result of awarding of high subsidies to the interest on preferential credits to young farmers by the Agency for Restructuring and Modernization of Agriculture and for the purchase of land and setting up of an agricultural farm.
- Among the preferential investment loans granted by the Agency for Restructuring and Modernization of Agriculture, those credit lines enjoyed the greatest interest that were granted for the creation or organization of agricultural farms by those under forty years of age for the purchase of agricultural lands (arable lands) and for the realization of investments in agricultural farms, special branches of agricultural production and in the processing of agricultural products as well as for the purchase of shares. The abovementioned types of credits constitute over 90% of the whole debt of farmers.
- In the years of 2003-2010, the Agency issued a total of 16 securities and guarantees to the total amount 8,518 thousand zloty including 16 securities and no guarantee. A part of applications were rejected on the account of formal omissions and shortcomings related to documentation.
- From the moment of the implementation of the procedures to enable the application of securities and guarantees for the repayment of loans related to natural disasters, i.e. from the year 2005, the Agency has granted 5 securities to the amount of 291 thousand zloty.

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# The Role of Institutional Arrangements in Rural Development

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**Annotation:** In this presentation, the concept of multifunctionality of agriculture is elaborated as a way to conceptualise the integration of non-market services in farming. Because in farming commodity and non-commodity outputs are jointly produced this requires careful analysis of whether the bundle of outputs is socially optimal. In case of non-optimal provision of public goods, it means that governance structures or institutions have to be developed for correcting the composition of the output bundle. In the article we argue that hybrid governance structures, which are defined as structures in which actors with autonomous property rights transfer part of their rights to other stakeholders or to the public sector, may play an important role. Based on the theory of hybrid governance structures for private goods, the concept of hybrid organisations in public good markets is conceptualised and illustrated for the provision of non-market or public goods or services such as landscape services.

**Key words:** multifunctionality, rural development, institutional economics, transaction costs

**JEL classification:** Q01, Q18, Q28

## 1 Introduction

Agricultural policy in the EU is more and more shifting towards programs and payments for services to society, both in the first and second pillar. In its communication of 18.11.2010 on 'The CAP towards 2020: Meeting the food, natural resources and territorial challenges of the future' (COM2010- 672), the EU Commission names viable food production, further greening of EU agriculture and provision of public goods, contribution to mitigation of climate change and balanced territorial development as the main challenges and objectives for the post-2013 CAP. In its communication the Commission sees among others in the new CAP scope for better targeting of subsidies, greening of direct payments, more support to small farmers and areas with specific natural conditions and better delivery mechanisms in the second pillar schemes (European Commission, 2010). Although at this moment the concrete proposals of the Commission are not yet known, it is sure that any reform will go in the direction of less payments for commodity production and more payments for delivery of public goods and management of the countryside with probably increased requirements to first pillar payments and more strict delivery mechanisms for second pillar measures. Support to agriculture and rural areas/sectors will in future increasingly be motivated by their contribution to the whole (urban) population.

This will increase the attention towards institutional arrangements for the delivery of public goods and rural development outcomes. In this paper we try, based on the theory of new institutional economics and in particular transaction cost theory, to set forward some important issues when looking at delivery mechanisms and contractual arrangements for public goods delivery and other outcomes of a multifunctional agriculture.

The paper is structured as follows: first we assess the present rural development policies and lessons we can learn from this. Next we develop a theoretical framework for institutional arrangements for the delivery of public goods and multifunctional outputs of farming and

finally we derive some conclusions and recommendations for the future implementation of such mechanisms.

## 2 Evaluation of the present rural development policies

The introduction of the second pillar of the CAP coincided with a renewed view on agriculture, approaching it as part of a wider rural economy. The productivism paradigm was being replaced by a post-productivism paradigm, in which agriculture was considered to be inherently multifunctional: next to producing food and fiber, agriculture takes care of nature and the environment and plays a key role in increasing the welfare of rural and urban populations. In the second pillar of the CAP emphasis was placed on contributions of individual farmers towards management of natural resources, provision of recreational possibilities in the rural areas and so on. These contributions can be labeled with colors with the white color indicating contributions to food safety and security, green indicating contributions of farmers to landscape maintenance, nature management and environment (including carbon sequestration), yellow indicating contributions to recreation, regional identity and health care, blue indicating contributions to water quality and flood regulation and finally red indicating the contributions to energy provision (Van Huylenbroeck, *et al.*, 2007).

With the end of the second programming period (2007-2013) slowly approaching, and efforts starting to design the new one, an increasing amount of studies appear that evaluate the effects of the present European rural development policies. Overall it seems that the subsidies given, have only a modest impact on the economic performance of rural areas (Diakosavvas, 2006). The effect of the second axis 'agri-environmental payments' is also under debate: although it may be too soon to see the overall effects, many studies are critical about the schemes' ability to create the intended environmental goods and services (i.a. Berger, *et al.*, 2006; Kleijn, *et al.*, 2006; Kleijn, *et al.*, 2004; Kleijn and Sutherland, 2003; Matzdorf, *et al.*, 2008; Ohl, *et al.*, 2008). The overall critique is that the policy instruments in the second axis are too rough and not able to fine-tune policy support to the diversity of interactions between agriculture and the environment (Petersen, 2010). Axis 3 and LEADER, aiming at the wider rural population, did seem to be powerful tools to create change in rural areas. However, critique on the 3<sup>rd</sup> and 4<sup>th</sup> axis is increasing, as the implemented changes would be too fragmented and projects are often set up because money is available and not because of a real need within the rural community (Oedl-Wieser, *et al.*, 2010).

Also own evaluation of the current Flemish rural development program (Van Herck, *et al.*, 2010) leads to similar conclusions:

- Economic impact:
  - Very small or negligible impact on employment and stabilisation of the rural population;
  - Limited positive impact on income in agriculture, but a positive incentive to diversification of incomes (through agri-environmental measures or, other forms of diversification);
  - Investment support gives higher survival possibilities for starting farms;
  - No or very small chain and territorial competitiveness approaches (low multiplier effects).
- Environmental impact:
  - Main focus on reduction of negative impacts;
  - Difficult to assess;

- No clear objectives regarding the role of nature and environmental resources in territorial development.
- General impact:
  - Low coordination among measures resulting in no or very low synergy effects on both development of agriculture as local development (no chain approach and no local territorial approach);
  - Low multiplier and spill over effects between sectors because of lack of coherence in vision and actions;
  - Spatial and horizontal/vertical dimension is mostly lacking;
  - Still high dead weight payments (paying for status quo). This questions benchmarking.
- Importance of RD initiatives:
  - Mind shift is developing;
  - Small contribution to promoting new role of agriculture.

A main reason for this mixed and in general low impact of rural development measures is that most RD programs focus on the micro or individual farm level (with direct payment for agri-environmental or touristic services) but are not well coordinated at the regional or meso level. Research also indicates that these individual contractual arrangements result in high transaction costs both for the farmer (Mettepenningen, *et al.*, 2009) as for the public authorities (Mettepenningen, *et al.*, 2011a). Therefore a lot of authors advocate a more collective and territorial approach towards rural development (Polman, *et al.*, 2010). However this requires other institutional arrangements. In the next section we develop a theoretical framework for such arrangements.

### **3 Institutional arrangements for the delivery of public goods**

Many aspects of rural areas have indeed a collective dimension which goes further than the private farm in the sense that they are linked not only with farming skills but also with the wider society and often local histories, habits, cultures and environments. While agricultural policy was primarily concerned with commodity production, appropriate incentives for farm decision-makers in managing public goods such as water, soil and landscape were often absent. Moreover, the objectives of the delivery of these public goods often require coordination of decision-making, for instance at a landscape or catchment scale across farm holdings. However, in practice to date, rural development and in particular agri-environmental policies rely more often on individual contracts with, and thus decisions taken by, individual farmers in isolation. This indicates the need for new elements of policy that support greater co-ordination across space (Hodge, 2007).

If environmental issues increasingly need to be addressed at the landscape or catchment scale, this raises questions about the institutional arrangements necessary at such scales. To ensure that group efforts deliver maximum environmental benefit, some form of geographical targeting and cooperation will be required. The geographical area at which this takes place can be a catchment area, another hydrological unit (e.g. estuary or floodplain), registered common land, or defined locations for a particular species or habitat.

Collective management can be seen as a form of hybrid governance structure (Ménard, 2004) which may be defined as cooperative arrangements between different actors or stakeholders. So far the theory on hybrid governance structures (Ménard, 2004; Ménard, 2007) has mainly been developed for private good markets. However, we can easily extend

this theory to public good markets in which a public body is demanding services to private agents who are able to provide them. In this case hybrid governance structures may be a tool to improve the functioning of the “public” market. However, two main differences between private and public market provision are important (Rangan, *et al.*, 2006). The first is that there are benefits (positive externalities) generated towards third parties who are not directly involved in the transaction (e.g. citizens in agri-environmental schemes). In such cases, it is well known that, because of individual rationality (oriented toward maximum private benefits at minimum private costs) and the nontrivial governance costs of collective action (i.e., fair allocation of costs among all potential beneficiaries and enforcement of sanctions against free riders), public “goods” tend to be underprovided. This then calls for public actors to step into the market. The second difference is the position of public actors, which are different from private actors in the sense that they have more legal authority, which can be used to change the institutional environment as a tool for shaping and regulating the behavior of other actors.

However, when there are both high positive externalities involved as well as high public resource costs relative to private-actor resource costs (e.g. in nature conservation practices implying highly specific agricultural methods), partnerships between public and private actors can be formed. Public actors want to get involved because of positive externalities and the great potential public benefits, but they will be hesitant to get involved alone, because the effectiveness and efficiency implications indicate otherwise. Private actors, on the other hand, will be reluctant to invest in such transactions by themselves because, while they might have resource (i.e., cost) advantages, they do not have the governance advantages required to close the public-private payment wedge and to adequately reap positive net benefits.

For such cases, we may think about more advanced hybrid governance structures such as trusts, user associations, cooperatives, private or public agencies and other intermediate structures to lower transaction and governance costs. In particular for transactions that require highly specific knowledge, technology and/or investments, such elaborated hybrid structures for public-private coordination will be more efficient than working on an individual contractual basis. Examples of such institutional arrangements include water user associations for the management of irrigation schemes (Herrera, *et al.*, 2005), environmental cooperatives for agri-environmental conservation (Slangen and Polman, 2002) or private-public organizations for the protection of property rights of genetic resources and biodiversity (Van Huylenbroeck and Espinel, 2007).

In providing public goods, such structures will be particularly advantageous in cases where (1) different stakeholders possess specific assets which need to be pooled in order to make possible such provision, and (2) providing green services requires highly specific investments whose scale goes beyond the individual stakeholder. An example of the first category is the maintenance of a typical regional landscape for which it does not make sense to make individual contracts with farmers, as the value of the measure lies in the combination of different farm types, crops or practices. In such cases, an intermediate structure is needed in which maintenance rules are negotiated. Examples of the second categories are investments in highly specialised machines for maintenance of hedges or other landscape elements which are too costly for individual farmers and where cooperatives or other structures may be the ideal intermediary.

According to Ménard (2007), mechanisms that can be deployed for coordination and safeguarding of such activities are – in increasing order of authority – information systems, contracts, external regulation and formal organisation. Hybrid arrangements for providing public goods can be grouped into four similar categories (Van Huylenbroeck, *et al.*, 2009, 181-182):

- i. Information devices: here, the coordination centre only provides information to coordinate the actions of the individual actors with the objective of achieving higher

overall performance than would be the case with uncoordinated actions by each farmer. For example, the regional landscape centres in Flanders bring together farmers for information on landscape maintenance, and try to convince them of the usefulness of certain management practices. As these structures have no real authority, the shift in property rights from the individual farmers to the centre is slight. This coordination mechanism remains therefore rather weak.

- ii. Contractual arrangements: here, the coordination centre makes individual contracts with private actors who can render a service to society. In this category, we find individual agri-environmental contracts. The coordination lies in the fact that the state can decide on the terms of contract, the target area and the eligibility criteria, but overall coordination remains weak since the outcome is dependent on the decisions of individual farmers. Further, all property rights not regulated by the contract remain in the hands of the individual actors.
- iii. Exogenous regulation or monitoring: here, public authorities use an external (private, or public-private) body as an intermediary for coordinating the actions of individual actors. This body can take the form of a cooperative (e.g. agri-environmental cooperatives), an association (e.g. water user associations), or another legal form that can be installed or developed endogenously or exogenously. The exogenous regulation refers to the fact that the intermediary receives from the public authority some regulatory and incentive power (mostly on a contractual basis) to regulate, coordinate and monitor the actions of its members or those actors that fall under its power. In most cases, membership or entrance remains voluntary, but, once entered, individual actors are tightly bound by the rules of the regulating body. However, the individual actors keep the greater part of the bundle of their property rights.
- iv. A governing body: in extreme cases, the state can pass juridical and other legal power to a new public or public-private body. In contrast to the previous coordination instruments, adherence to rules is more mandatory, and there is a significant shift of property rights to the governing body. Examples include natural parks where a state-installed authority receives most of the relevant property and management rights (e.g. on the land), or a polder council that receives authority over dams to regulate the water levels.

This classification provides us with a framework to design proper institutional arrangements for collective approaches to rural development as an alternative to the present approach based on individual contracts. In the next section we argue that a territorial approach to rural development may form the basis for such institutional arrangements.

#### **4 New institutional arrangements to strengthen rural development processes based on local identity**

Since the 1980s, there is a growing awareness of the importance of “soft” factors for the success of regional development processes, such as social, cultural and political factors, next to “hard” factors as location, resources and transport infrastructure (Pike, *et al.*, 2006). Regional identity is one of these socio-cultural factors that is taking a more central role in discussions about endogenous development. Especially in the context of globalization and a world economy that is becoming more and more integrated, regions show an increased need to stand out from the crowd and capture significant mind- and market share through, e.g., regional branding (Van Ham, 2008). Regional branding is aimed at creating a more distinctive image or reputation for a region, which helps to increase regional competitiveness (Maessen, *et al.*, 2008).

According to Mettepenningen et al. (Mettepenningen, *et al.*, 2011b), who have investigated the success factors for identity-based regional development through an extended (comparative) case study in a Belgian setting, there is no such thing as a blueprint institutional organization that guarantees successful identity-based regional development processes. While experiences of other, best practice, regions can be used as a guide, every regional development process has to start from the local context and the place of regional characteristics, identities, institutions and residents therein.

Agriculture certainly contributes in many rural areas to the territorial identity. By using the right institutions agriculture can certainly benefit from these contributions towards local identity and rural development. One possible avenue is rural tourism. Well established agri-tourism industries and collective organisations to support this have been developed in many European countries such as Austria, Italy, Croatia, Germany and Poland. In Austria, for example, farm holidays (“Urlaub am Bauernhof”) annually attract a large number of tourists. About 14% of Austria’s total capacity of touristic accommodation is provided by farmers, and tourists annually spend between 1 and 1.2 billion Euro on farm holidays (Hubbard and Kaufmann, 2008). Agri-tourism, however, not only provides direct economic benefits, it can also add value to other products or services the farm provides (Beall, 1996, cited in Comen T., 2009). Das and Rainey (2010) have shown that agri-tourism can have a positive impact on the retail and service sector, in terms of income and employment.

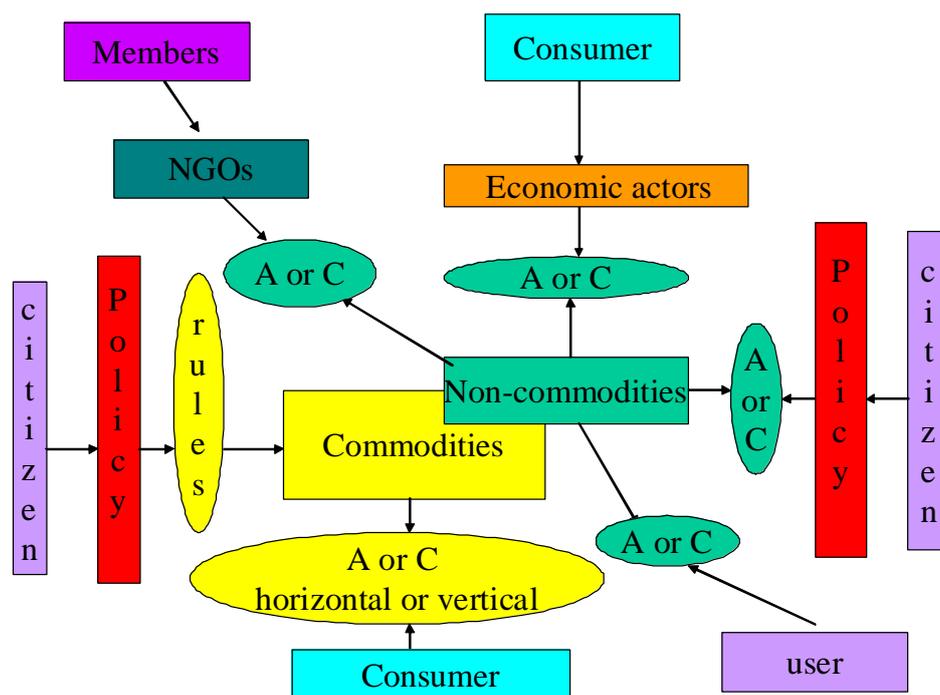
The MUSICAL research by Mettepenningen et al. (2011b) showed that regional development processes can also have an impact on the potential for farmers to diversify their activities. The research showed that in regions where the regional development process is more advanced, and where inhabitants are more attached to the region, there are more farmers taking up diversification and also more people buying products on the farm. However, in line with previous research (see e.g. Kilic, *et al.*, 2009), it couldn’t be proved that diversification also means an increase in income for the farmers, rather it compensates losses in agricultural production so that in the end the income remains equal. As such, it may however prevent farmers from marginalization and from leaving the sector.

It is also possible to directly compensate farmers for their contribution to the identity of regions. Because the services through which agriculture contributes to regional identity are usually non-excludable and non-rival (e.g. landscape), governments usually compensate farmers for this. However, ‘green services’ that are linked to the use values of agricultural landscapes, and that generate economic or social benefits to local actors, could also be capitalized through a private demand. One mechanism to capitalize private demand is a ‘landscape auction’, which has been applied a few times successfully in the Netherlands. At a landscape auction industrial companies, conservation organizations, individuals and/or other businesses can bid for biodiversity or landscape elements on offer. The buyer doesn’t receive ownership of the landscape element, but receives a certificate that assures that the adopted landscape is maintained and that can also be used to deduct the donation from taxes. For businesses a landscape auction offers a convenient way in which corporate social responsibility can be put in practice. Other private actors (e.g. schools, citizens) have more ideological reasons to participate in a landscape auction (Kort, *et al.*, 2008).

Another possibility is a Visitor Payback system. Tourism/recreation businesses are providing services/products (for consumers) that receive a lot of added value due to the surrounding landscape qualities. The mechanism of Visitor Payback allows reinvesting the added value, which is obtained from visitors/tourists through taxes on tourist accommodation or through higher prices of products such as walking maps, in the management and further development of the landscape (Wassenberg, 2002). Another concept is a regional account, which has been applied for the first time in the ‘Groene Woud’ region (the Netherlands). At the centre of the mechanism is the (regional) account, in which different actors (governments, companies, inhabitants) can deposit an amount of money. The bank agrees to hand over a

percentage (5%) of the total amount of interest payment (on the invested sum) to a regional development fund. Furthermore, the account holders have the possibility to transfer a part of the received interest to the fund. These regional development funds, or landscape funds, are usually founded by local or higher level organizations and bundle private and public means which can be used for compensating farmers for landscape management. There are many different varieties of fund constructions, which can be organized on a short or a long term (Kort, et al., 2008).

The above examples only are some examples of innovative institutional arrangements that can be used to compensate farmers for the delivery of public goods. In Fig. 1 a number of other theoretical options are schematically given. Space does not allow us to develop them fully in this contribution (see for more explanation Van Huylenbroeck, 2008). An acceptability analysis of alternative financing mechanisms for multifunctional agriculture in two Belgian cases within the MUSICAL project, learns us that voluntary mechanisms are the most acceptable for the actors involved. However, voluntary schemes, such as donations through a regional account or landscape auctions, do in general not guarantee that enough money can be collected to sustain the development process in the long run. The best option seems to use a combination of different financing mechanisms in one region: voluntary mechanisms, together with taxes/payments linked to the use of the landscape, and fund constructions. Especially fund constructions seems to be promising (Capon and Leinfelder, 2010; Mettepenningen, et al., 2011b).



**Fig. 1.** Intermediate institutions (A = arrangements and C = Coalitions) to deliver a changed commodity-non commodity output bundle (source van Huylenbroeck, 2008)

## 5 Conclusions

The literature discussed in this paper leads us to conclude that multifunctional agriculture, through its contribution to regional identity, is an asset that becomes more important for regional development in the context of globalization and that has the potential to contribute to rural competitiveness. Local economic sectors, such as the real estate and tourism sector, can indeed profit from agricultural elements in the regional landscape. This, however, requires a couple of conditions to be fulfilled. Cooperation in and between regions, coordination of the

development process backed-up by a long-term vision, and participation of local people are the most important success factors. Regional identity could provide a means to strengthen the concept of multifunctional agriculture. According to Renting et al. (2009), nowadays the concept of multifunctionality is still rather weak, since it is often used to legitimize existing subsidies by linking them to the supply of positive externalities. Strong multifunctionality, however, requires that agriculture is incorporated into an integrated and territorial rural development approach. Imbedding agriculture in regional development processes based on regional identity could create new markets for multifunctional agriculture, as such strengthening the concept and making it more attractive. These new markets can be linked with increasing possibilities of farmers to diversify their activities, as well as direct compensation of farmers for their contribution to regional identity. As such, rural development processes based on a regional identity with agricultural elements, can create a dynamic in regions where agriculture is the main local asset and where agricultural landscape maintenance is crucial for other local businesses. The described new institutional arrangements may help to finance these processes and to bring the development process to a higher level.

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# **Information Management and Quantitative Methods**



# Customised Training for New Businesses

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**Annotation:** The paper reflects the fact that when bachelor graduates leave the formal education system a very small minority will start their own ventures immediately. The most of graduates start their own business not until they are in their mid- to late-thirties. A study using the Delphi method was conducted to identify and rank topics for system of self-education and courses assigned directly to young entrepreneurs who started or who consider they will start their own business. Experts were selected with respect to their experience in the field of techno-entrepreneur development, strategic management and small business management with focus on SMEs in regions. The Delphi procedure was performed by 14 experts: managers of prosperous SME and managers who have just established functioning enterprise. Following the completion of the fourth round of the assessment, Kendall's "W" were computed to measure the level of consensus among the experts. For p-value  $p < 0,05$  the study using the four-round Delphi method resulted in selection of thirteen courses and their ordering according to importance in the practically curriculum for starting young entrepreneurs..

**Key words:** small and medium enterprises, portfolio of study materials, starting new businesses, entrepreneurship, Delphi method

**JEL classification:** A23

## 1 Introduction

The universal aim of enterprise education is to help young people develop skills and attributes that allow them to be innovative and to identify, initiate and successfully manage personal and work opportunities, including working for themselves define enterprise education as the process or series of activities which aims to enable an individual to assimilate and develop knowledge, skills, values and understanding that are not simply related to a narrow field of activity, but which allow a broad range of problems to be defined, analysed and solved (Garavan, 1995; Mastekaasa, 2011).

There is a growing interest in ascertainment what abilities and competencies are being developed by the higher education system and the degree to which these influence or equip students career choice and attitudes to own businesses.

Research papers indicate that students' attitudes towards small business are positive. Scott and Twomey (1988) report that university graduates are increasingly disenchanted with career prospects as organisational employees: intense competition, cost cutting pressures, and acquisitions and take-overs have resulted in large company restructuring. Authors argue that this has undermined traditional values such as employee loyalty, security, and ownership of results. Consequently, more and more graduates view the possibility of starting their own business as a real and viable alternative to being employed in an established company.

Other surveys support this view. Birdthistle (2006) reveals that 46% of college students consider a "business of one's own" an excellent way to get ahead in 1985 while this number increased to 51% in 1989 and to 63% in 2005.

Final report from the "Questioning of graduates" of the Czech university of Life Sciences Prague (Havlíček, 2008), based on data collected from 4200 Czech graduates from 2002 till 2008, reported that 25% had a business idea and that 47% aspired to be self-employed. The

questioning found that 78% expressed an interest in taking one or more courses in entrepreneurship; high proportion 45% of this sample reported that the course had a positive effect on their subsequent career decision. The data correspond well with similar research provided by other authors (Cooper, 2006; Klofsten, 2000; Liesbeth, 2011).

However, many students and graduates perceive several obstacles that militate against entrepreneurship, such as lack of experience, or lack of finance, which block the path towards their preferred choice. The problem of this inconsistency may lie in the present business curricula, which have until recently, focused almost entirely on the needs of aspiring middle and functional managers rather than the needs of aspiring small and medium entrepreneurs (Hashimoto, 2011; Thomopoulos, 2010).

## **2 Materials and Methods**

### **2.1 Aims and targets**

The paper presents information about development of courses and study materials which will better suit the promotion of entrepreneurship into programs which are being developed for young graduates from universities. Special attention was given to graduates from agricultural schools which are involved in businesses in rural regions directly associated with agricultural production and country life.

The used methodology of the research reflected the fact that when bachelor graduates leave the formal education system a very small minority will start their own ventures immediately. The most of individuals who start ventures, particularly in technology-oriented sectors, do not do so until they are in their mid- to late-thirties (Cooper, 2006). Thus, the skills and attitudes associated with innovation and enterprise on which they come to rely as they identify their own opportunity and shape their enterprise around it, are matured for, on average, a decade or more after graduation and through authentic experience, gained within the workplace.

Delphi method was applied to employ experts by identification of needs of potential new entrepreneurs in order to prepare the list of courses for adult graduates: (i) improve or change their qualifications, (ii) support their ability to maintain and improve their own contributions to the market, (iii) support their decisions to establish new own business.

The target group thus consists of former graduates from upper high or higher (bachelor) levels of higher education who want to start his/her own business. Of course, school/college/university-based curricula differ as well as the world and market opportunities are rapidly changing. That is why the content of study should reflect this reality: content of courses should be more informative than specialized and at the medium level of exactingness. Thus, the content should be comprehensible for both technicians and humanists. This suggests that a wide range of topics must be included so that entrepreneurship education material would design for a heterogeneous cohort of users. The study material may also be beneficial for other employee and citizens to help them to better-place and better understand the challenges to day-to-day problems using both books and nets (Krebner, 2001; Noyes, 2005).

### **2.2 The Delphi Technique**

A study using the four-round Delphi method was conducted to identify and rank topics for system of self-education and courses assigned directly to young entrepreneurs who started or who consider they will start their own business.

Names and contact address of interdisciplinary group of experts were screened as potential candidates for involvement in this study. Experts were selected with respect to their

experience in the field of techno-entrepreneur development, strategic management and small business management with focus on SMEs in regions. After several rounds of vetting, the respondents of this study were narrowed down to 14 experts – 4 females, 10 males. These individuals each had experience in their field and were either managers of prosperous small end medium enterprises or managers who have just established functioning enterprise, Table 1.

**Table 1.** List of experts involved in DELPHI

<i>Source of experts</i>	<i>N<sup>o</sup> of experts</i>
Prosperous SMEs	<b>4</b>
Just starting SMEs	<b>7</b>
Professional Chamber	<b>2</b>
University	<b>1</b>
Total	<b>14</b>

The Delphi technique was used because the experts foresaw difficulty in organizing meetings and workshops during the span of the study because of time, financial and spatial constraints. Since this technique did not require that the experts involved in the research meet face-to-face in meetings or workshops, the Delphi method was deemed a useful tool in conducting correspondence surveys with qualified people living in various locations throughout the Czech Republic.

### **3 Results and Discussion**

#### **3.1 Organisation of the Panel**

##### *a) Preparation phase*

Each expert was contacted personally and was informed about the procedure. Survey instruments were constructed for each of the four rounds of the Delphi technique. In the first round performed by e-mails, the 14 experts were presented with the aim of research. The first round survey asked only one question:

*List as many courses (subjects) for useful curriculum for a starting businessmen. Keep in mind, that (1) courses concerns adult education, (2) courses should support entrepreneurship and competitive advantage of SMEs, (3) participants are graduates from upper high education and/or higher bachelor level of education, (4) see the term “course” in a very practically sense. (5) Graduates are graduating from different universities: technological, economic, and humanistic.*

*Courses will serve the potential young entrepreneurs as a base of study materials for self-study. Potential users of study materials will use them to create own study portfolio.*

*Extend of each course is planed up to 50 pages.*

*Describe the content of each course using at lest 25 appropriate key words.*

The responses to this question were analyzed and common offers were reworded so that there were no duplications. A list of the courses was constructed and proposed to the second round procedure Havlíček, Pelikán (2006).

The first round Delphi assessment identified 13 courses that were ordered as follows:

**Table 2.** List of selected courses

Nº	List of recommended courses
1	Marketing
2	Communication and negotiation
3	Financial sector
4	Enterprises start-ups
5	Competencies in knowledge economy
6	ICT competences and skills
7	Intellectual property
8	Efficiency in enterprise
9	Decision Making Support
10	Opportunities in renewable resources
11	Services in Bio environment
12	GIS in SMEs businesses
13	Services for aging population

The list of subjects was fulfilled by key words representing the potential content of each subject.

### ***b) Second round***

The second round survey presented a synthesized list of responses from the first round. The experts were asked to develop the content of subject. The experts were then asked to rank each course based on their importance, whereby “1” is rated as most important and “10” is rated as least important.

### ***c) Third and fourth rounds***

In the third and fourth rounds, a separate survey was constructed for each member of the panel boldfacing evaluation of courses that differed from the consensus opinion based on mean rank scores of each course. Each expert was given an opportunity to change his/her response or to present an argument for disagreement. These arguments were incorporated as comments in subsequent sections allowing the experts to look beyond the calculated data. The whole study was completed in the course of time 6 months.

## **3.2 Outcomes**

Subsequent 2nd, 3rd and 4th rounds Delphi assessments produced categorized ranking for rounds 2, 3, 4, as well as score ranking and ordinal ranking for the all fourth round as presented in the Table 3:

**Table 3.** Ranking of courses according to their importance in the system of courses

Order	Ordering	Ranking of experts				Ranking in round 4	
		Round 1	Round 2	Round 3	Round 4	mean score	mean ordinal
1	Marketing	1	1	1	1	1,4	1,5
2	Enterprises start-ups	4	2	2	2	2,9	2,2
3	Efficiency in enterprise	8	5	6	3	3,1	3,4
4	Financial sector	3	3	3	4	4,6	5,1

5	Intellectual property	7	4	5	5	4,8	5,7
6	Decision Making Support	9	6	4	6	5	6,5
7	Opportunities in renewable resources	10	7	7	7	5,7	7,6
8	Competencies in knowledge economy	5	9	8	8	6,9	7,6
9	Services in Bio environment	11	10	9	13	8,5	10,2
10	Communication and negotiation	2	11	10	10	8,7	11,2
11	ICT competences and skills	6	8	11	11	8,7	11,2
12	GIS in SMEs businesses	12	13	12	12	9,3	11,4
13	Services for aging population	13	12	13	9	9,5	11,6
		<b>77</b>	<b>77</b>	<b>77</b>	<b>77</b>		
<b>W</b>	Kendall's test of concordance ( $p < 0,5$ )					<b>0,68</b>	<b>0,44</b>

Following the completion of the fourth round of the assessment, Kendall's "W" were computed for both the scored ranking and ordinal ranking to measure the level of consensus among the experts. For the fourth round  $\mu_{score} = 0,68$  with  $p = 0,04$  and  $\mu_{ordinar} = 0,44$  with  $p$ -value = 0,021. Both coefficients were found to be statistically significant for  $p < 0,05$ .

The mean ordinal ranking makes it possible to order courses according to importance in the system of courses, see Table 4:

**Table 4.** Optimal ordering of courses – the output of Delphi Assessment

<i>Nº</i>	<i>List of selected courses</i>
1	Marketing
2	Enterprises start-ups
3	Efficiency in enterprise
4	Financial sector
5	Intellectual property
6	Decision Making Support
7	Opportunities in renewable resources
8	Competencies in knowledge economy
9	Services in Bio environment
10	Communication and negotiation
11	ICT competences and skills
12	GIS in SMEs businesses
13	Services for aging population

### 3.3 Discussion

The surprise of the Delphi procedure is the location of two modules at relatively higher places in order of importance: "Opportunities in renewable resources" and "Decision Making Support". Both courses were shifted up the higher positions. Decision support is an important discipline for the management of enterprise in unstable and turbulent environment of the current economy. Preference of this course can also be caused by the current economic crisis. In the field of renewable energetic resources, experts see a very lucrative and promising business area in the future.

Although most students completed marketing courses in their former studies, and thus should be familiar with it, the subject occupies the highest position in the list in order of importance.

The second order of the subject “Enterprises start-ups” seems to stem from its inherent importance in the study portfolio of the young manager.

Similarly, the highest ranked traditional disciplines concerning efficiency and finances are highly ranked despite the fact that the young entrepreneurs should be familiar with them from previous studies.

The outcomes are beneficial for educational institutions as well as for decision makers in the area and are transferable for different countries as well.

The research should start permanent and self-supporting processes for monitoring the needs and requirements of people living in strongly changing rural areas. Courses should be sustained by contributions from those participating in the courses.

The courses should not follow the principle of "fast and easy" and should not neglect more difficult information and quantitative approaches. On the contrary, special pedagogic and didactic means such as e-multimedia techniques must be considered in the methodology so that the participants can get excellent, practical, and effective knowledge. A general information concerning environmental problems as well as basic information technologies will be an integral part of each curriculum although these courses were put to last places in the list.

The teaching methods used should be combined: teaching material will be available in e-forms on the Internet and also traditional didactical approaches will be used according to the pedagogic needs.

Experts recommend establishing of Information service, available for participants regardless of the gender and former education. Special attention should be given disabled people.

The outcomes are beneficial for all participating institutions in the research and the results can be transferable for different countries as well. The courses could be developed in master English version and delivered thus in other East European training companies involved.

## **4 Conclusion**

The content of developed study modules is a source of the newest knowledge and information for postgraduates that lead young people in their businesses as well as in their personal life. Graduates will learn how to make decisions using economic tools and newest technologies to satisfy the social needs of people – both material and spiritual, while fully respecting environmental limits. In the whole structure of all 13 developed study modules are (in addition to the necessary degree base) subjects that represent the economic area, science and technology, the social, natural and political-social subjects. Responsibility towards the future, but the present generation as well, is highlighted in time (environmental limits) and space (the whole world from global and local self-sufficiency of the globe). Users, creating their own study portfolio, are required to take social responsibility. The objective of the developed study materials is not only the transfer of the latest findings in selected subjects but also the promotion of the paradigm of respect for the conscious modesty that leads discernment to renounce everything that is not necessary and focus on higher quality of life that is not based on consumption, leading to alienation, but on its own active and creative approach to the world.

The content of study modules is more informative than specialized and at the medium level of exactingness. Wide range of topics is included so that this entrepreneurship education material would design for a heterogeneous cohort of users. The study material may also be beneficial for other employees and citizens to help them to better place and better understand the challenges to day-to-day problems. Should some problems or difficulty with understanding some professional terms the reader finds at the end of each module a glossary of technical terms occurring inside.

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More information on the web: <http://projects.czu.cz/LEBEBO>.

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# On Decision Making Process in Agricultural Cooperatives

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**Annotation:** An important part of the decision making and management process in collective farms is carried out by farm board teams. They decide on big investment plans for the coming year as well as on many less important items like purchase price of pork and corn or service workshops and transport. The decision-making process nevertheless remains the same: they use statistical voting system to accept (or refuse) individual items. In standard situation of limited financial resources they have to create preference lists of individual items. This paper deals with mathematical properties of such preference lists and their comparison to statistical voting. If a board is to decide between two alternatives  $a$  and  $b$ , usually the majority rule procedure is applied and the alternative with the most votes is declared a winner. From mathematical point of view the majority rule properties were formulated by May (1952), who showed that if the number of board members is odd and each election procedure produces a unique winning item then the majority rule is the only so called social choice procedure for two alternatives that satisfies the following three conditions: it treats all the board members the same, it treats both alternatives the same and it is monotone. Nevertheless, if there are more than two possible choices, the situation is completely different. The inner structure of the problem is very rich and needs more detailed research. The situation is demonstrated on voting for investment items of the agricultural marketing cooperative Mrákov in South Bohemia.

**Key words:** management of agricultural cooperatives, decision making, multicriteria evaluation, social choice procedures

**JEL classification:** C44

## 1 Introduction

Agricultural farms often are joint-stock companies. Such a company is managed by a director appointed by the farm board team. When making an important decision like drawing a budget for the next year, the director asks the top management of the company to come up with suggestions and plans for their sector (crop production, animal production, mechanization, economy, other services). The chief economist puts together all individual plans and prepares business plan for the next calendar year. The business plan is then discussed by the farm board. Finally, the farm board votes on the plan. There are several different techniques of voting: to vote separately on individual items of the plan (yes-or-no voting applied), the second possibility is to vote for the whole plan (yes-or-no voting) and the third one to compile an ordered list of items, based on individual preference lists of the board members. All three techniques require a rule on which the final decision is made. Such a rule is called a *social choice function* in decision theory. Properties of social choice functions have been extensively studied in decision theory and mathematical economics, see e.g. Chernoff (1954), Saari (1989). There are some interesting aspects of applying them to decision making process which are not generally known and which the paper would like to highlight.

## 2 Materials and Methods

In this paper, a *case study* is presented as an example of problems associated with the decision making process of a farm board, in fact, with any decision making process.

Let us start with some general remarks on the problem.

## 2.1 Methodology

Let us consider two sets: a set of  $n$  voters (members of the farm board), the voters in this set will be numbered by natural numbers  $1, 2, \dots, n$  and a set  $A = \{x_1, x_2, \dots, x_k\}$  of alternatives (items on the budget list). Each voter (farm board member) orders the alternatives in the set  $A$  (budget items) producing thus his/her individual preference list of the alternatives (without ties). Sequence of such individual preference lists is called a *profile*. What is needed is a good rule how to find the winning alternative (the most important budget item) for each profile (each possible outcome of voting). A *social choice function*<sup>1</sup> (or *social choice procedure*) (see e.g. Taylor, Pacelli, 2008) is a function defined on a set of profiles which for each profile delivers an element of  $A$  (the winning item) or a subset of  $A$  (winning tied items) or NW (no winner).

In the following text we shall try to apply what is known on the mathematical properties of the social choice functions to the case study mentioned in the Introduction and described in more detail in the paragraph (3.1).

Let us start with the case of *two alternative categories* (e.g.  $A = \{x_1, x_2\}$ ). In this case as social choice procedure usually *majority rule* is applied. Majority rule states that an alternative is a winner if it appears at the top of at least half of the individual preference lists, see e.g. Taylor, Pacelli, 2008, p. 4. May (1952) proved that majority rule is the *only* social choice procedure for two alternatives that satisfies the following properties

- (1) *anonymity* (if any two voters exchange their individual preference lists, the outcome of the election is unaffected),
- (2) *neutrality* (if every voter reverses his/her vote then the election outcome is also reversed),
- (3) *monotonicity* (if some voter were to change his/her individual preference list from a vote for the loser to a vote for a winner, then the election outcome would be unchanged).

Thus, for decision process where only two alternatives are involved, the majority rule is the best choice (first and second technique of voting mentioned in the Introduction).

Let us consider the case of *three and more alternatives* now. There are several possibilities how to construct the social choice function in this case (e.g. Condorcet's method (de Condorcet, 1972), Borda method, sequential pairwise voting, Hare system, dictatorship, approval voting). What are the desirable properties of a social choice function now? It is usually required (see e.g. Taylor, Pacelli, 2008) that a good social choice function meets five conditions that are listed below:

- (1) *always a winner condition* (every sequence of individual preference list has at least one winner),
- (2) *Condorcet winner criterion* ( $x_i$  is a Condorcet winner if for every other alternative  $x_j$ ,  $i \neq j$ ,  $x_i$  appears above  $x_j$  on more than half of the individual preference lists. Social choice procedure satisfies the above mentioned criterion if it selects the Condorcet winner as the social choice provided there is one),
- (3) *Pareto condition* (for every pair  $x_i$  and  $x_j$  of alternatives holds: if everyone prefers  $x_i$  to  $x_j$ , then  $x_j$  is not the social choice),
- (4) *Monotonicity* (for every alternative  $x_i$  holds: if  $x_i$  is the social choice – or tied for such – and someone changes his/her preference list by moving  $x_i$  up one spot, then  $x_i$  should still be the social choice – or tied for such),

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<sup>1</sup> We will use the theory of social choice terminology through this paper in spite the fact that we have broader scope of applications in mind.

- (5) *independence of irrelevant alternatives* (for every pair of alternatives  $x_i$  and  $x_j$ ,  $i \neq j$ , holds: if the social choice set includes  $x_i$  but not  $x_j$ , and one or more voters change their preferences, but no one changes his/her mind whether  $x_i$  is preferred to  $x_j$  or  $x_j$  to  $x_i$ , then the social choice set should not change so as to include  $x_j$ ).

It was shown by Arrow (1950) that without restrictions on either individual preferences or neutrality to feasible alternatives, there *exists no social choice function* that satisfies several plausible requirements similar to those above (this result is known as *Arrow's impossibility theorem*). There are many similar "impossibility" theorems and the whole area is intensively studied, see e.g. Balinski, Laraki (2007).

## 2.2 Fair functions

Thus, resolving ties is a difficult problem. Let us now use a simpler scheme than the one mentioned in the paragraph 2.1. We will concentrate on possibility of resolving the ties. We will assume that the final rank of an alternative  $x_i$  is determined (*only*) by all the ranks of  $x_i$  of all  $n$  voters.

Let  $A$  be the set of alternatives,  $A = \{x_1, x_2, \dots, x_k\}$ . Denote by  $L(A)$  the set of all linear orderings of  $A$  (such orderings will be denoted by  $o$ ,  $o'$  and  $o''$ ). A *social choice function*  $F$  (a general rule how to find results of voting) is then a mapping

$$F: L(A) \times \dots \times L(A) \rightarrow L(A).$$

In the other words, to any choice of orderings  $o_1, o_2, \dots, o_n$  of the set of alternatives  $A$  given by voters  $1, 2, \dots, n$ , the social choice function  $F$  assigns an ordering  $F(o_1, o_2, \dots, o_n)$ . Let us now seek a "fair" social choice function. By *fair* we understand a function  $F$  with the following property:

Suppose that each voter chooses two distinct orderings, say orderings  $o_1$  and  $o_1'$  are orderings of the first voter,  $o_2$  and  $o_2'$  are orderings of the second voter, ..., and  $o_n$  and  $o_n'$  are orderings of the  $n$ -th voter. Then the results of the fair function should be distinct, too. Symbolically,

$$F(o_1, o_2, \dots, o_n) \neq F(o_1', o_2', \dots, o_n').$$

In other words, we demand that any fair function maps inputs distinguished by every voter to distinct outputs.

Yet in another form, if  $\sim$  denotes the inequality relation then we formally say that a function  $F: L(A)^n \rightarrow L(A)$  is a *fair function* if  $F(o_1, o_2, \dots, o_n) \sim F(o_1', o_2', \dots, o_n')$  whenever  $o_i \sim o_i'$  for  $i = 1, 2, \dots, n$ . Under this assumption  $F$  defined above is a social choice function. Any function  $F$  with the above properties is called *fair social choice function*.

Do there exist fair social choice functions? The answer is: *yes*, but the result we will present bellow (Statement 1) is, in fact, of a negative nature.. Before we show this, we will introduce a special social choice functions.

A social choice function is called *dictator function* if there exists an  $i_0$  from the set of voters and a permutation  $\pi$  such that

$$F(o_1, \dots, o_n) = o_{\pi(i_0)},$$

where  $o_{\pi(i_0)}$  is the permutation of alternatives representing ordering (individual preference list) of the voter  $i_0$ . This means that a dictator function assigns to each alternative from the set  $A$  position determined by a single voter  $i_0$ . In fact, the following theorem holds:

**Statement 1:** Any fair social choice function  $F: L(A)^n \rightarrow L(A)$  for  $|A| \geq 3$  is a Dictator function.

This result follows from Greenwell, Lovász (1974) and more generally from Luczak, Nešetřil (2006).

Statement 1 says that if there are more than two alternatives and if we want our social choice function to be fair, then there exists one single voter (dictator) among all the voters such that the social choice function (result of voting) represents his/her own preference list. So, independently of how many people vote, their preference lists are *almost* ignored in the final results which represent the preference list of the dictator. The “almost” means the condition of *fairness of the function*. (But the identity of the dictator is, of course, unknown.)

*Remark:* In the above the definition of fair function we considered only the relation  $\sim$  inequality. From a broader point of view we could consider not only inequalities but also orderings of alternatives and even general preference relations on the set  $A$ , say  $(A, R)$ . It may happen then that the statement analogous to the Statement 1 does not hold. However asymptotically for almost all relations  $(A, R)$  (i.e. with large number of alternatives) Statement 1 holds. More precisely this can be formulated as follows:

We consider a function

$$f: A \times \dots \times A = A^n \rightarrow A,$$

Let  $A$  be the set of alternatives,  $A = \{x_1, x_2, \dots, x_k\}$ . Assume that  $f$  preserves the relation  $R$ .

By this we mean that if all pairs  $(x_1, x_1'), (x_2, x_2'), \dots, (x_n, x_n')$  belong to  $R$  then also the pair  $((x_1, x_2, \dots, x_n), (x_1', x_2', \dots, x_n'))$  belongs to  $R$ . In such case we say that  $f$  is a homomorphism.

We have the following:

**Statement 2:** Asymptotically almost all relations  $R$  on  $A$  satisfy the following:

For every  $n$  the only homomorphism  $f: A \times \dots \times A = A^n \rightarrow A$  is a projection:

There exists  $i_0$  such that  $f(x_1, x_2, \dots, x_n) = f(x_{i_0})$ .

This shows a remarkable stability of Statement 1 (for the proof one has to use results of Luczak and Nešetřil, 2006). Any homomorphism also induces in a natural way a social choice function which, in turn, for most preference relations, is fair.

In another direction one could consider several weaker forms of dictator function. For example one could demand that the social choice function depends on a few coordinates only (2, 3, or a fixed number  $t$ ). Even in this case we get approximate results. This very active recent research is covered e.g. by Kalai, 2005a and 2005b.

### 3 Results and Discussion

#### 3.1 Case study

The agricultural marketing cooperative Mrákov in South Bohemia is to prepare a plan of investments for the coming year. The farm board team decides to set the budget preferences by voting of its (seven) members<sup>2</sup>. There is a list of items (alternatives) which are to be considered in the budget:

- (a) tractor (crop production sector), approx. 3,2 mil. Kč,
- (b) reconstruction of the rearing of young cattle (incl. subsidies), approx. 14,4 mil. Kč,
- (c) self-propelled feed wagon (animal production sector), approx. 4,9 mil. Kč,

<sup>2</sup> The board team in Mrákov has, in fact, 11 members. The number of board team members was reduced to seven so as to keep presented results in a simpler form.

(d)) sprayer (crop production sector), approx. 3,8 mil Kč.

Due to the fact, that the budget may not be able to cover all items on the list, each member of the farm board team is asked to order the items on the list according to their importance to the farm.

Now, a *general rule* is sought which would produce a “fair” ordering of the items (a) – (d) on the budget list for any possible outcome of voting of the farm board members.

Let us suppose that the voting of the seven members of the farm board on the importance of the budget items gave the following individual preference lists, see Tab.1.

**Table 1.** Voting of farm board members

Board member	1	2	3	4	5	6	7
	<i>c</i>	<i>c</i>	<i>c</i>	<i>b</i>	<i>b</i>	<i>b</i>	<i>c</i>
	<i>a</i>	<i>a</i>	<i>b</i>	<i>d</i>	<i>a</i>	<i>a</i>	<i>a</i>
	<i>b</i>	<i>b</i>	<i>a</i>	<i>a</i>	<i>c</i>	<i>d</i>	<i>b</i>
	<i>d</i>	<i>d</i>	<i>d</i>	<i>c</i>	<i>d</i>	<i>c</i>	<i>d</i>

As follows from the Arrow’s impossibility theorem there exists no social choice function that satisfies the requirements from the paragraph (2.1). However, in this particular example we could save the situation by breaking of ties and by the procedure suggested in the paragraph (2.2).

So, we would like to construct a fair social choice function for the farm budget preferences votes. Let us consider again the results of voting of the seven farm board members and let us show that the function *f* defined in Tab.2. is fair.

**Table 2.** Fair social choice function for voting of farm board members

Board member	1	2	3	4	5	6	7	<i>f</i>
	<i>c</i>	<i>c</i>	<i>c</i>	<i>b</i>	<i>b</i>	<i>b</i>	<i>c</i>	<b><i>b</i></b>
	<i>a</i>	<i>a</i>	<i>b</i>	<i>d</i>	<i>a</i>	<i>a</i>	<i>a</i>	↦ <b><i>d</i></b>
	<i>b</i>	<i>b</i>	<i>a</i>	<i>a</i>	<i>c</i>	<i>d</i>	<i>b</i>	<b><i>a</i></b>
	<i>d</i>	<i>d</i>	<i>d</i>	<i>c</i>	<i>d</i>	<i>c</i>	<i>d</i>	<b><i>c</i></b>

There are  $\binom{4}{2} = 6$  pairs of the four alternatives, these are  $(a,b)$ ,  $(a,c)$ ,  $(a,d)$ ,  $(b,c)$ ,  $(b,d)$   $(c,d)$ .

Which of the pairs are such that the preference relation is the same for all the voters? Evidently, it is only the pair (b,d). All voters prefer the alternative *b* (reconstruction of the rearing of young cattle) to *d* (sprayer for the crop production sector). The constructed social choice function *f* respects this relation, thus it is a fair social choice function. Note that *f* is identical with the preference list of the council member 4, so this member is the dictator in this case. Note that in this particular case other council member could serve as dictators. However, for large number of council members and in a full generality of the results the dictator is unique. Note also that a statistician computing frequencies of the top choices only, would declare the alternative *c* to be the winner (with relative frequency 4/7), greater than the relative frequency of *b* (3/7).

## 4 Conclusions

We characterized all fair social choice functions and showed their relevance to social choice procedures. For social choice procedures with two alternatives the majority rule is the best choice of the social choice function. In case of more alternatives, the situation is more complex and fair social choice functions then correspond with the existence of a dictator. We demonstrated this in a case study in which a farm board votes for budget preferences. Nevertheless, the same approach can be used in other applications: voting for a director of a farm by board members, in managing companies, municipal administration. This paper presents some classical results but also problems that are recent and are intensively studied at present.

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# Application of Data-Mining Techniques in Customer Segmentation

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**Annotation:** The paper is focused on the data-mining techniques that can be used for customer segmentation. For companies of all sizes it is important to understand each customer individually, to understand his needs, expectations, and behavior in a highly competitive environment. The paper discusses the possibilities of using the various methods of customer segmentation by mining the information in the databases. The paper analyzed data containing information about customer's purchasing behavior within a hypermarket. The data-mining model was constructed from approximately 60 thousand transaction records. Only food records were selected for the analysis. The partial objective of the paper was to examine the possibilities of data preparation such as restructuralization, logarithmic transformation, and dimensionality reduction. The main goal of the paper was to find meaningful patterns in the analyzed data and identify clusters of customers with similar behavior and needs. The segmentation was realized by various data mining techniques as follows: K-means clustering, Two Step clustering, and unsupervised algorithm based on neural networks called Self-Organizing Maps. The quality of results was evaluated by the Silhouette measure, which combines the principles of clusters separation and cohesion. After that the detailed analysis of the final segments was done. The data mining software tool IBM SPSS Modeler 14 was used for an exploratory analysis, preparation of data matrix and for modeling.

**Key words:** Data mining, Clustering, Customer Segmentation, IBM SPSS Modeler.

**JEL classification:** C38, D83

## 1 Introduction

Many organizations have collected and stored a wealth of data about their current customers, potential customers, suppliers and business partners. However, the inability to discover valuable information hidden within the data prevents the organizations from transforming this data into valuable and useful knowledge. Data mining tools could help these organizations to discover the hidden knowledge in the enormous amount of data and better discriminate and more effectively allocate resources to the most profitable group of customers (see NGAI 2009, BERSON 2000).

WANG et al. (2009) state that the question: 'How to extract the potential useful information from this massive, incomplete and noise data and build smart customer segmentation models?' has become the consensus of business decision-makers. Dividing customers into segments through the application of clustering techniques can be used to analyze customers' shopping behavior (WU and CHOU 2011). Effective segmentation can help companies increase revenue by acquiring and retaining high value customers at low cost. It can also help in aligning cost-to-serve to customer value, perhaps reducing overall marketing, sales and service costs (ZHANG and CHEN 2007).

The main goal of the paper was to find meaningful patterns in the analyzed data and identify clusters of customers with similar behavior and needs. The segmentation was realized by various data mining techniques, as follows: K-means clustering, TwoStep clustering, and unsupervised algorithm based on neural networks called Self-Organizing Maps. The quality of solutions was evaluated by the Silhouette measure.

## 2 Materials and Methods

The paper analyzed data containing information about the customer's purchasing behavior within a hypermarket. The data-mining model was constructed from approximately 60 thousand transaction records. Only food records were selected for the analysis. The shopping item categories were also obtained from the hypermarket as well as the database. The items were hierarchically divided into 3, 8, or 37 categories. Firstly, eight categories were selected for analysis. But the final models had a poor quality. The models with three item categories achieved a better segmentation quality than models with more categories. Therefore three shopping item categories were selected for further analysis.

Preparation of the input variables should include restructuralization, logarithmic transformation, standardization, or dimensionality reduction. The clustering techniques were used to find the segments with similar customer behavior. The automatic cluster detection is described as a tool for undirected knowledge discovery. The algorithms themselves are used for finding structure that exists in the data without regard to any particular target variable. It is different to classification in that clusters are unknown at the time the algorithm starts. The clustering algorithms search for groups of records – the clusters – composed of records similar to each other. The algorithms discover these similarities (see BERRY and LINOFF 2004, NGAI et al. 2009). Concept clustering determines clusters according to attribute similarity as well as conceptual cohesiveness as defined by domain knowledge. Users provide the domain knowledge by identifying useful clustering characteristics (SHAW et al. 2011). However, the process of grouping similar data objects is subjective and highly dependent on the clustering criteria used (BAE et al. 2010).

We can search for clusters graphically by plotting the observations. If there are only two variables, we can do this in a scatter plot (RENCHEER 2002). Even in three dimensions, picking out clusters by eye from a scatter plot cube is not too difficult. If all problems had so few dimensions, there would be no need for automatic cluster detection algorithms. As the number of dimensions (independent variables) increases, it becomes increasingly difficult to visualize clusters. Our intuition about how close things are to each other also quickly breaks down with more dimensions (see BERRY and LINOFF 2004). For more dimensions it is possible to plot the data in two, or three dimensions using principal components or use cluster analysis (RENCHEER 2002).

In cluster analysis we generally wish to group the  $n$  rows into  $k$  clusters. Two common approaches to clustering the observation vectors are hierarchical clustering and partitioning. In partitioning the observations are divided into  $k$  clusters. This can be done by starting with an initial partitioning or with cluster centers and then reallocating the observations according to some optimality criterion. The value of  $k$  must be fixed before starting the procedure. (see LLETÍ et al. 2004, or RENCHEER 2002).

If a single algorithm is used, many different alternative clusterings can still be generated, simply by changing the initial conditions/parameters of the algorithm. Given this situation, researchers often need to compare, or measure, the similarity between two clusterings (BAE et al.). The Silhouettes can be used as an index to measure the quality of the final clustering. The Silhouette value for each point is a measure of how similar that point is to points in its own cluster compared to points in other clusters (see LLETÍ et al. 2004). This coefficient combines ideas of cohesion and separation, for individual points, as well as clusters and clusterings.

To group the observations into clusters, many techniques begin with similarities between all pairs of observations. In many cases the similarities are based on some measure of distance. A common distance function is the Euclidean distance between two vectors. Other cluster methods use a preliminary choice for cluster centers of a comparison of within – and

between – cluster variability. The scale of measurement of the variables is important consideration when using the Euclidean distance measure. Changing the scale can affect the relative distances between the items. Each variable could be standardized in the usual way by subtracting the mean and dividing by the standard deviation of the variable (see RENCHER 2002, or ŘEZANKOVÁ 2007).

The software tool IBM SPSS Modeler 14 was used for the exploratory analysis, preparation of data matrix and also for the modeling.

### **3 Results and Discussion**

#### **3.1 Data Understanding**

In a data mining process it is important to understand the input variables. Therefore the exploratory and graphical analysis was realized. Preparation of the input variables included restructuralization and standardization. First, the data matrix was restructured, so every row corresponds to one market basket.

In this part the appropriate structure of the data set was suggested. Six input variables were selected for the cluster analysis: the value of the shopping basket in CZK, the number of items in the basket, the proportion of special price goods in the basket, and three shopping item categories. The proportion of special price goods in the basket was computed as a value of the special price goods divided by the total value of the basket. Three shopping item categories were selected for modeling, because this model achieved a better segmentation quality than models with more categories. The first shopping item category (FOOD1) included alcoholic beverages, cigarettes, packaged food, and drugstore products, the second category (FOOD2) included fresh food (such as packaged meats and meat products, dairy products etc.), bread, fruits and vegetables, and the last category was represented by butcher products (FOOD3). This categorization was obtained together with the database and remains unchanged. In further research it would be useful to create a new meaningful taxonomy, which excluded cigarettes, alcoholic beverages and drugstore products.

Before modeling, the input variables preparation is necessary. The outliers, which can influence the results of the analysis, were winsorized, because the cluster analyses are not robust to extreme value. The standardization of variables by subtracting the mean and dividing by the standard deviation of the variable was realized. The scale of measurement of the variables is an important consideration when using the Euclidean distance measure. Finally, the logarithmic transformation was considered, but it did not improve the quality of the model.

#### **3.2 Customer segmentation**

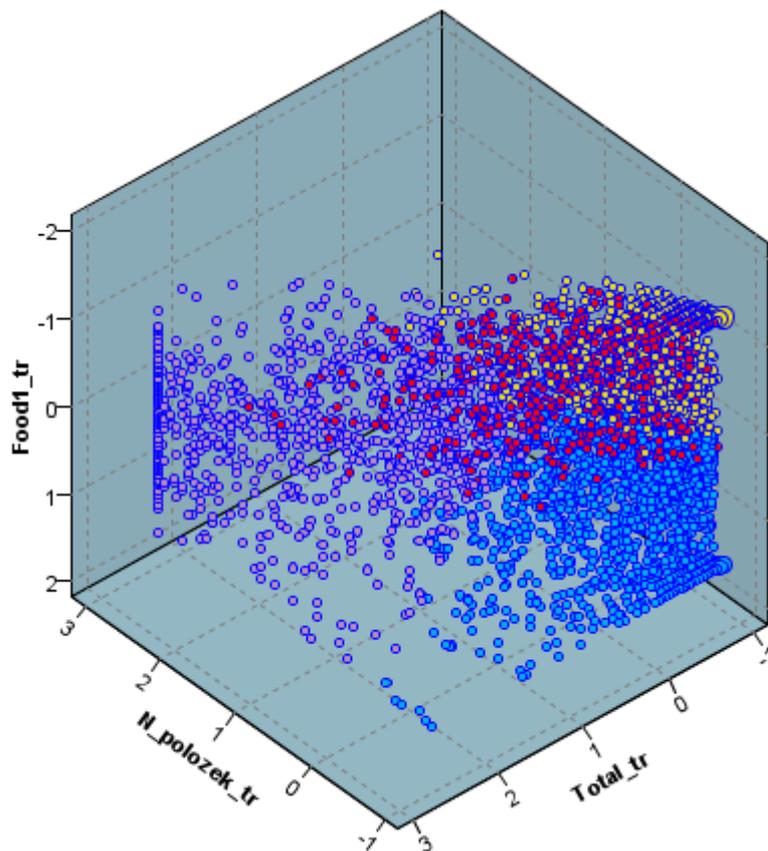
The customer segmentation was realized in the modeling part. The object of this analysis was to find an optimal grouping for which the baskets within each cluster are similar, but the clusters are dissimilar to each other. The segmentation was realized by various data mining techniques, as follows: K-means clustering, Two Step clustering, and unsupervised algorithm based on neural networks called Self-Organizing Maps. These techniques were applied to the six mentioned input variables.

The models with the highest value of the Silhouette measure were developed by the K-means technique. This is one of the most commonly used segmentation techniques. Four-cluster and five-cluster models were created. These models reached the same value of the Silhouette measure (0.51), which means that the models have a good quality. A Two Step cluster analysis was also performed. This model, having eight clusters, reached a slightly lower value of the Silhouette rate (0.5).

The models obtained by the Self-Organizing Maps technique were examined too, but all reached a low value of the Silhouette measure. This technique usually provides a large number of clusters; the best model had 20 clusters. The goal for further research would be an examination of possibilities to combine this technique with hierarchical clustering. The Self-Organizing Maps analysis would be realized in the first step and hierarchical clustering analysis would be done in the second step.

The model with four clusters, obtained by K-means cluster analysis, was chosen for another analysis. The clusters are homogenous and relatively well separated, which means that the K-means clustering technique is appropriate for this analysis. The algorithm ranked all input variables, except the proportion of special price goods, as important for the creation of clusters.

Three input variables were selected for plotting, as follows: Total price, Number of items, and FOOD1 category (alcoholic beverages, cigarettes, packaged food). The scatter plot shows the spread of the points. Each color represents one segment in the following plot.



**Fig. 1.** Scatter plot of selected variables colored by clusters

One of the objectives of plotting is to check for cluster's homogeneity. Clusters of the baskets are evident in Fig. 1. Similar 3D diagrams were obtained by selecting other combinations of the input variables. From this point of view it is evident that clusters are relatively well separated, which means that the K-means clustering technique is appropriate for this analysis. The separation of baskets into clusters reflects existing differences between customers.

A detailed analysis of individual segments follows after segmentation. The baskets were divided into four different clusters (segments). The largest segment included 35% of all customers. This segment is characterized by high proportion of FOOD1 category (beverages, drugstores, food packaging and cigarette), and low proportion of remaining categories:

FOOD2 (fresh food, bread and fruit and vegetables) and FOOD3 (butcher products). This segment consists of small baskets with a low overall value.

The second largest segment contains 30% of customers. This segment is characterized by high proportion of FOOD2 category. There are the smallest baskets, which contain mainly fresh food, bread, fruits and vegetables.

The third segment of 20% of customers is the segment with the largest and most expensive baskets, with an average value of 1.150 CZK. The FOOD categories are balanced; baskets contain all kinds of food.

The last segment contains the lowest percentage of customers (15%). It is characterized by medium sized baskets. In this segment the FOOD3 category dominates, a low proportion takes FOOD2 category, and FOOD1 is almost absent.

It can be assumed that individual customers from different segments will behave differently. That is the reason why the cluster analysis is used as an input for other analyses, for example, for market basket analysis or regression analysis.

## 4 Conclusion

The results of cluster analyses confirm that many approaches can be used for customer segmentation. The final segmentation was realized by various data-mining techniques, as follows: K-means clustering, Two Step clustering, and Self-Organizing Maps. The quality of results was evaluated by the Silhouette measure.

The K-means clustering technique provides the best segmentation model. The original group of customers was split into four meaningful segments. The segments are homogenous and relatively well separated. The separation of baskets reflects existing differences between customers. The final segments can facilitate and make more effective the communication to customers. This could be used as a source of competitive advantage.

The cluster's homogeneity was evaluated by plotting. Scatter plots of selected variables colored by clusters were created. From these 3D diagrams it was evident that clusters are relatively well separated, which means that the K-means clustering is appropriate for this analysis. As a useful dimension reduction device it is possible to use the first three principal components and construct a scatter plot. This approach will be examined in the next research.

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# Analysis of the Development of the Agricultural Insurance and Risk Management in Agriculture

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**Annotation:** This paper provides a comprehensive view of the development of the agricultural insurance in the last decade in Czech Republic. The beginning of the 90th, which is associated with the transition from centrally planned economy to market economy, brought dramatic changes in the development of agricultural insurance. In particular, the abolition of the statutory insurance in 1990 had a major impact on the situation in the agricultural insurance. From the early to mid-nineties, the level of agricultural insurance rapidly declined, and since mid-nineties on there has been some stabilization in the level of insurance in this sector. The state was aware of unfavorable financial situation of farmers and was trying to encourage farmers with various subsidy schemes to take out policy. PGRLF (Podpůrný garanční a lesnický fond) played important role in the context of agricultural insurance. This fund through the subsidies partially offsets the costs related with the payment of insurance premium. Agricultural insurance is thus becoming more affordable, but there is still no significant increase in the number of insured farmers. Development of the agricultural insurance is described by elementary statistical characteristics of time series. There is also made an extrapolation in the time series beyond the known values. The most suitable model for smoothing this time series is Brown's exponential smoothing model, because the time series do not show significant trend (at least in the last decade) and significant seasonal and cyclical components. This model is suitable for stationary time series. Due to increasingly extreme weather events, recorded at least in the last decade (flood, storm Kyril, windstorm Emma, etc.), risk management, as well as the need for insurance is becoming increasingly more important topic. At close, there is presented some of the proposals for effective risk management in agriculture, taking into account also the foreign experience. As an alternative to agricultural insurance, which is based on transferring risk to insurance company, there is existing trade with weather derivatives based on „betting“ on weather. The data in this paper were obtained from the databases of the Czech Insurance Association. For statistical processing of data is used SPSS statistical software.

**Key words:** agricultural insurance, decline of policy holders, risk management, weather derivatives

**JEL classification:** C3

## 1 Introduction

Paradigm shift in the amount of income from agricultural insurance premiums brought revolutionary year 1989. Along with economic and social changes in the transition to a market economy, there were changes reflected also in the field of agricultural insurance. Mandatory insurance in 1990 was repealed and replaced by commercial insurance on a "voluntary" basis (Prášilová, Hošková 2010). This step resulted in the beginning of decline in agricultural insurance. In 1990 the volume of agricultural insurance premiums reached 5588 million CZK whereas in 2009 the volume of insurance reached only 18 % of the amount of 1990. This paper discusses the development of the level of insurance of entities involved in agricultural production and also risk management options in this sector. The aim of this paper is to analyze the development of agricultural insurance and also estimate its future development using appropriate statistical method. Aside the statistical analyses there are listed causes and reasons for specific developments, as well as major achievements in promoting insurance for farmers from the state. The partial aim of this work is also to introduce alternative methods of risk management in agriculture that can compete strongly of classical non-life insurance in the

future. Considerable attention is devoted to a weather derivatives, which according to Campbell and Diebold making pre-specified payouts if pre-specified weather events occur.

## 2 Materials and Methods

### 2.1 Elementary characteristics of time series

For the analysis of time series evolution of insurance premiums are used fundamental indicators that characterize the dynamics of time series in time. These indicators include the absolute difference of different order, indexes and growth coefficient. The first absolute difference, representing an absolute increase or decrease of the value of the parameter is defined as:

$$d_{yt} = y_t - y_{t-1} \quad t = 2, 3, 4, \dots, n \quad (1)$$

The second absolute difference reflects an absolute acceleration or deceleration in the observed time series. Determined as the difference between two adjacent values of the first absolute difference:

$$d^2_{yt} = d_{yt} - d_{yt-1} \quad t = 3, 4, 5, \dots, n \quad (2)$$

The time series can also be described by relative indicators. The most commonly used characteristic is the relative elementary growth coefficient. Growth coefficient is characterized by a gradual rate of change of relative values for the parameters of time series. If this indicator is expressed in % we call it rate of growth. Determined as the ratio of two neighboring values in time series:

$$k_t = y_t / y_{t-1} \quad t = 2, 3, 4, \dots, n \quad (3)$$

### 2.2 Time series and their decomposition

The decomposition of time series is based on the assumption that time series can be decomposed to the following components:

- **Trend component** (  $T_t$  ) characterizes the major long-term trend indicator values of time series shows. The trend may exhibit either increasing or decreasing character. If the indicators show values fluctuating character and oscillate around a stable level, we speak of a time series without trend or with a constant trend.
- **Periodic component** (  $S_t$  ) arises as a result of other factors, which are periodically repeated. Values of indicators of time series are regularly deflect the trend. According to the length of the period we distinguish cyclical fluctuations and seasonal fluctuations
- **Random component** (  $\varepsilon_t$  ) describes the small, irregular and unique fluctuations in the value of time series that can not be predicted. It is therefore a part of the time series, which remains; when the trend and periodic component is removed (Chen, Shumbo 2009).

Trend and periodic component together create deterministic part, whereas the random component creates the so-called “white noise”. Time series can contain all these components, but its existence is not contingent on it. In the case of decomposition of time series components can be distinguished by two fundamental ways:

- Additive model:  $y_t = T_t + S_t + \varepsilon_t$
- Multiplicative model:  $y_t = T_t * S_t * \varepsilon_t$

### 2.3 Brown's model of exponential smoothing

For time series that do not contain a significant trend and seasonal component the Brown's model is appropriate. This model is the simple exponential smoothing model, which considers the trend in short sections to be constant. The prediction is created by using the latest observation time series with weight  $\alpha$  and the estimated trend from the previous period, with weight  $1 - \alpha$ . It is thus obvious that the forecast is constructed as a weighted average with weight  $\alpha$  ( $0 < \alpha < 1$ ) [5]. The entire model can be mathematically expressed as follows:

$$y'_t = \alpha y_t + (1 - \alpha) y'_{t-1} \quad (4)$$

## 3 Results and Discussion

### 3.1 The development of agricultural insurance

Before 1989 the agricultural insurance was statutory for organizations in the agrarian sector, and contributed significantly to the total income from insurance premiums for all insurance sectors in the former Czechoslovakia. Prášilová and Hošková (2010) state that the annual premiums in the agriculture sector in the years 1989/1990 exceeded the value of CZK 5 billion, representing nearly 40 % of the total premiums for all insurance sectors.

Figure 1 shows the development of agricultural insurance premiums in the ČR in 1990 - 2009. According to the development of the values of the indicators of agricultural insurance revenues over time it is evident a significant declining trend till 1995. Since then the stabilization of this sector without major fluctuations persists to this day. In 1990, act No. 594/1990 Coll. abolished mandatory insurance of agricultural organizations. Insurance is hence based on the commercial and voluntary basis. Precarious financial situation and problems of farmers with the reorganization of the former collective farm to enterprises which should be capable of competing in a market economy, led to a rapid decrease in the volume of agricultural insurance.

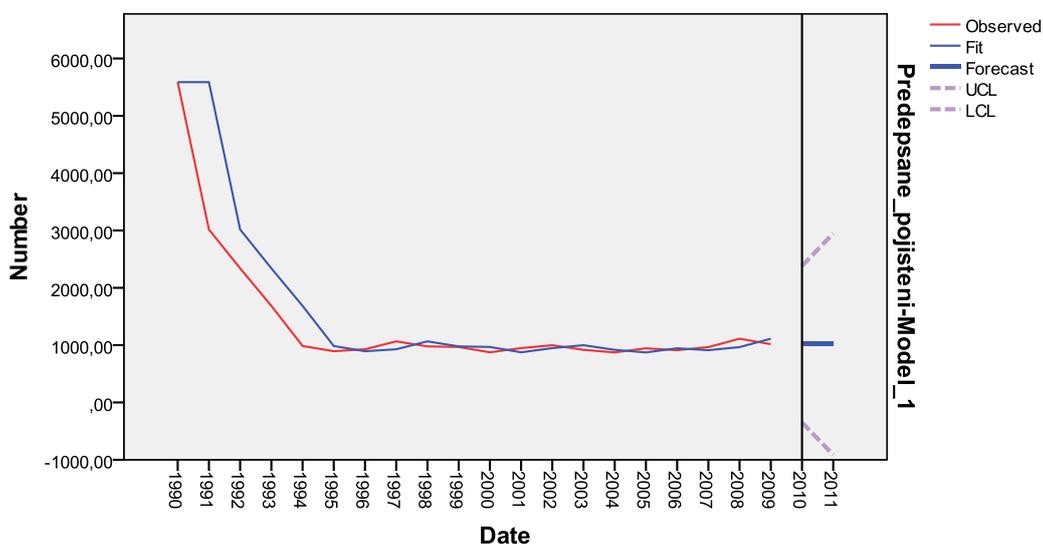


Fig. 1. The development of the agricultural insurance in 1990 - 2009

The same development is also reflected in Table 1. Growth coefficient ranges far below 1 since 1990, and the first absolute difference also indicates a significant decrease in the amount of agricultural insurance. Since 1996, however, agricultural insurance market has stabilized. As suggested by the base index, the market of agricultural insurance has stabilized at only about 18 % of 1990.

**Table 1.** The development of the agricultural insurance in 1990 - 2009

<b>Indicator</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>
Imposed insur.	5588	3017	2340	1685	985	894	928	1066	978	968
1. abs.diff	-	-2571	-677	-655	-700	-91	34	138	-88	-10
2. abs.diff	-	-	1894	22	-45	609	125	104	-226	78
Growth coeff.	-	0,540	0,776	0,720	0,585	0,908	1,038	1,149	0,917	0,990
Basic index	-	0,540	0,419	0,302	0,176	0,160	0,166	0,191	0,175	0,173
<b>Indicator</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>
Imposed insur.	875	948	999	918	873	945	912	966	1112	1017
1. abs.diff	-93	73	51	-81	-45	72	-33	54	146	-95
2. abs.diff	-83	166	-22	-132	36	117	-105	87	92	-241
Growth coeff.	0,904	1,083	1,054	0,919	0,951	1,082	0,965	1,059	1,151	0,915
Basic index	0,157	0,170	0,179	0,164	0,156	0,169	0,163	0,173	0,199	0,182

Severe financial situation of farmers, along with a dramatic drop in insurance forced the state to take a more proactive role in supporting farmers. At the turn of 1999/2000, the state established health fund, and started to subsidize agricultural insurance. Grant program contains four pillars. Pillar 8.A served to mitigate the economic losses caused as a result of the implementation of procedures ordered by livestock. 8.B program served to encourage farmers to cover costs associated with laboratory diagnosis, 8.C focused on the same support as the program 8.A only to target the different categories of farm animals. The final and most important pillar of the program was 8.D., which was designed to cover the cost of crop insurance and insurance costs associated with diseases of livestock. Maximum amount of support under the crop insurance was set at 10 % of the costs of insurance against natural disasters and 35 % of the costs of insurance for livestock.

Although the state has declared a policy of subsidies to encourage farmers to take out an insurance policy, there was still the decline of volume of agricultural insurance in the same year the program was launched. As shown in Table 1, the decrease amounted to 93 million CZK. The state still continue to develop activities to promote risk management in agriculture. In 1993 state founded Podpůrný garanční rolnický a lesnický fond, which at the beginning of the new millennium has extended its activities to promote the agricultural sector in the area of agricultural insurance. Since 2004, it was one of the fundamental pillars of the Ministry of Agriculture grant PGRLF trying to access a wide range of insurance protection for farmers. The aim of this support is to partially compensate premiums spent on agricultural insurance. The amount of support in the early startup grant program was at the level of 15 % of proven insurance costs paid by the livestock and 30 % of proven cost of crop insurance. Current program called Zemědělské pojištění intends to support up to the amount of 50 % of the cost reimbursed by insurance, both for crop insurance and insurance for livestock.

Even though the subsidy policy of the state is trying with various tools to stimulate the farmers to take out insurance policy, since 1995 there were almost no changes in the level of revenues from agricultural insurance. This trend is even more surprising in terms of the increasing number of extreme weather events in Czech Republic. Let's mention, for example, events such as a devastating flood in 2002, hurricanes KYRRIL or EMMA, and other devastating floods in 2010. Although natural disasters can cause farmers even existential problems, the agricultural insurance has maintained its stationary character since the mid-90. The dramatic changes in this area should not occur in 2010 and 2011, for which the forecast

has been made by Brown's exponential smoothing model. The forecast for 2010 and 2011 calculated the value of revenues from agricultural insurance at 1 017 million CZK

If the insurance segment of agriculture is playing rather marginal role, there should be seeking for another way to make it even more accessible for farmers, or to look for alternatives to conventional agriculture insurance. It is just the agricultural sector, which according to the Špička (2006) deserves special attention in risk management. Špička (2006) identifies three main reasons why risk management is crucial in agriculture. First of all agricultural produces food, and significant threat to operators in this sector could threaten food security. Risks in agriculture are therefore as important to the individual farmers as to entire society (Gulseven, Kucuksenel, Nas, 2011). Secondly, agriculture has biological nature exposed to a higher degree of risk than any other industry, and last but not least is the negative attitude of farmers towards agricultural insurance. This fact is related to what is stated in study of Chen Yan and Yao Shunbo (2009), who highlight the correlation between education and the farmers' insurance policies. Along with the increasing number of natural disasters and together with liberalization of trade, risk management is becoming increasingly hot topic. As said by Socol and Iuga (2009), a profitable agriculture can not be done without the agriculture insurance.

### **3.2 Weather derivatives**

Risk management options is wider than only insurance, there exists diversification, specialization, growing crops with shorter production cycles, vertical integration, joint ventures, etc., but in recent years, the weather derivatives business is gaining popularity. Originally, the weather derivatives business was at interest of companies in the energy industry, and only later the agricultural organizations and companies in the sector of tourism realized its potential. In 1999, the Chicago Mercantile Exchange (CME) as a first in the world, started to offer weather derivatives. Weather derivative is a financial instrument based on an index of temperature in various cities. Since then, the volume of business climate as well as a number of derivatives contracts negotiated increases significantly. The whole principle of the contract is based on future weather changes. Garman et al (2000) demonstrates the fundamental workings of the weather derivatives on the example of a tow owner who is trying to avoid fluctuations in income by the use of risk management option "bets" on the weather. For this purpose it is necessary to quantify the appropriate form of weather. Garman et al claim that one of the areas of controversy in the weather derivatives markets is the choice of the pricing methodology to use in order to obtain the "fair" value of the different contracts. Method of measuring the weather depends on the type of contract, there are basically two approaches. Most weather derivatives are based on so-called Heating degree day (HDD) and Cooling degree days (CDD). These indicators reflect how many degrees has been exceeded the average daily air temperature and over / under its basic level. From mentioned above it is obvious that successful weather derivatives require the utilization of carefully selected weather data obtained from meteorological stations in close proximity to the area being insured (van Asseldonk 2003). In agriculture the also exists Growing degree day (GDD) which is bounded to grow stage of particular plant. If you are able to assess the value of weather derivative, you can than buy it and sell it as a tool for managing the weather risks.

## **4 Conclusion**

The volume of agricultural insurance revenues rapidly declined from 1989 to 1995. From 1995 this segment has been stabilized and according to predictions of Brown's model, there should not be significant changes in agricultural insurance in following years. The main determinant of the decline is oppressive financial situation of farmers. Risk management

options in agriculture are numerous; however, business with climate derivatives is becoming increasingly popular. Weather derivatives are newer form of hedging the weather-related agricultural yield risk (Seth, Ansari, Datta, 2009). This financial instrument uses a CCD, HDD and GDD for comparison day's degrees with the base, which consists of the average daily temperature. Musshoff, Odening and Xu claim that weather fluctuations will increase due to climate change and thus it could be expected increasing volume of trade with weather derivatives in the future. Topic "weather derivatives" certainly deserves more space and in the future other studies will be undertaken in this area.

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# Integration of a Scientific and Scholarly Research Journal's Content into the Central International Repository

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**Annotation:** The paper treats effective options of integration of open access content of a scientific and scholarly research journal's local archives into the central international repository, here in the form of a study case related to agricultural economics and informatics. Open access publishing has spread widely in recent years. Open access to scientific/scholarly content removes various barriers, first of all barriers related to copyright retention. The open archives' platform aims at making accessible available materials on web pages, using mutual sharing of metadata among repositories, their publishing and archiving. In the case of the above stated scientific and scholarly research journal's local archives version 2.0 of OAI-PMH (Open Archive Initiative – Protocol for Metadata Harvesting) is used for metadata harvesting. This protocol defines the mechanism of the metadata's records' harvesting. It means that OAI-PMH provides a simple technical means to make metadata open to services based on widely-spread standards HTTP (Hypertext Transfer Protocol) and XML (Extensible Markup Language). The service for the basic level of the metadata exchange provides support for unqualified DC (Dublin Core), e.g. the metadata format based on an international agreement defining 15 core elements for an easy description of the source objects. The architecture of open access content of the scientific and scholarly research journal's local archives itself determines two logical roles - the role of the data provider and the one of the service provider. The Czech University of Life Sciences Prague as the data provider controls the data store of the scientific and scholarly research journal and makes accessible source objects stored in the local archives via their display for metadata harvesting by the service provider. The foreign partner UAH (Universidad de Alcalá) as the service provider uses the harvested metadata and the content of the scientific and scholarly research journal for the central international repository together with other added functions such as search engines, the system of the public reviews' comparison, etc.

**Key words:** Metadata, repository, open access, OAI-PMH, Dublin Core.

**JEL classification:** C88

## 1 Introduction

Open access publishing has spread widely in recent years. One of the reasons is the rising cost of subscriptions to magazines and journals. Due to rising prices of academic journals research workers find it more and more difficult to obtain the information they need for their own research. Open access is an important alternative of publishing which was developed to solve the above mentioned problem (Stranack, 2006). The Swedish University of Agricultural Sciences organized a two-day workshop with open access archives and their significance as its main topics. One of the most important results of this workshop was that research results might be obtained from open access archives. Moreover papers published through OA (Open Access) are cited more than non-OA ones (Ericsson, 2010). For the last few years, digital technology has become very familiar in cultural organizations, providing enhanced access to the content (Kounoudes, 2010). The last few years have seen the emergence of several open access (OA) options in scholarly communication, which can be grouped broadly into two areas referred to as gold and green roads. Several recent studies have shown how large the extent of OA is (Miguel, 2011). The OA publishing model promotes the availability of content online, including grey literature, which is not available through commercial

distribution channels but which significantly contributes to agricultural research and development (Subirats, 2008).

The open archives' platform aims at making accessible available materials on web pages, using mutual sharing of metadata. Metadata is data on data. Metadata can be used for the description of all objects (in their electronic form) or of a database report. It can be a book, a picture, music, SW, www page or research papers. Nevertheless metadata should characterize the objects in a relevant form which is not always the case (mainly with web pages) (Ardö, 2010).

There are a lot of metadata formats describing various types of objects via individual elements developed within research projects, by various associations or directly by standardizing institutions. One of basic standards is metadata format Dublin Core which includes 15 elements for the basic characteristics of the object. (Dublin Core Metadata Initiative, 2010). This universal metadata format is suitable for the description of individual papers in scholarly and scientific research journals.

## **2 Materials and Methods**

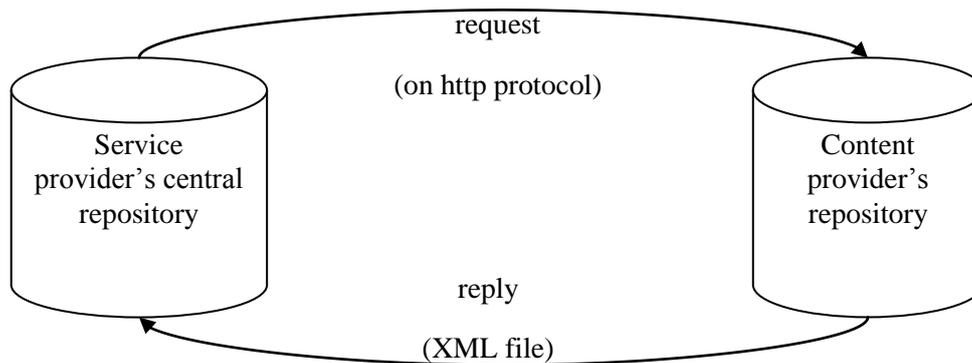
The international journal AGRIS on-line Papers in Economics and Informatics is a scholarly open access, blind peer-reviewed, interdisciplinary, and fully refereed scientific journal published quarterly by the Faculty of Economics and Management (FEM), Czech University of Life Sciences Prague. AGRIS on-line Papers in Economics and Informatics covers all areas of agriculture and rural development; agricultural economics, management, agrobusiness, agrarian policy, information and communication technologies, information systems, e-business, social economy and rural sociology. This scholarly journal provides a leading forum for interaction and research on the above-mentioned topics of interest by which it has reached the position of a valuable resource for academics, policy makers and managers.

In its current form this scholarly scientific journal has existed since 2009 when it took over from the original scientific journal Agris on-line. Since 2009 it has already published tens of important scholarly and scientific papers and studies. Every year Agris on-line journal publishes 30 – 40 new original papers. All the published materials are stored in a local archive and are open access available in .pdf format.

Recently a new need arose: to provide the content of this scholarly scientific journal's local archive in a clear and easily accessible form to other institutions, for example libraries, quoting/citing databases, the Czech University of Life Sciences Prague (CULS) partners etc. One of CULS's partners is UAH (Universidad de Alcalá) with which it co-operates on the solving of its central repository with open access. Toolsets that provide a coherent presentation of information across multiple standards are important for data search and access (Devarakonda, 2011). There are a lot of tools for providing local archives' content and they were analyzed in detail. Based on this analysis one of the most universal ways of contents' providing was chosen – OAI – PMH (Open Archive Initiative – Protocol for Metadata Harvesting) protocol. The Open Archives Initiative Protocol for Metadata Harvesting has been widely adopted since its initial release in 2001. Initially developed as a means to federate access to diverse e-print archives through metadata harvesting and aggregation, the protocol has demonstrated its potential usefulness to a broad range of communities. Two years out from the release of the stable production version of the protocol (2.0), there are many interesting developments within the OAI community (Shreeves, 2005).

In the protocols of the Open Archives Initiative (OAI) currently in use, information is shared by providing metadata of digital files (data providing) that can be read in by someone

else (data harvesting). A URL is used to refer to an object in an external site (Dijk, 2005). OAI-PMH protocol for metadata harvesting defines the mechanism for metadata's records harvesting from repositories. OAI-PMH provides a simple technical means to data providers to make its metadata open to services based on widely-spread standards HTTP (Hypertext Transport Protocol) and XML (Extensible Markup Language). Metadata designated for harvesting can be offered in any format which a certain community or a group of data and service providers agree on.



**Fig. 1.** The principle for metadata harvesting's protocol

In this way metadata from many sources can be stored in a single database, and services provided can make accessible centrally harvested or aggregated data. Basic objects in the case of OAI-PMH implementation are:

- Harvester: a client application which issues OAI-PMH requests
- Repository: a network accessible server which can process 6 OAI-PMH requests in a defined way
- Item: a concrete object described by metadata records
- Unique identifier: a unique identifier which clearly identifies an item in repository
- Record: a metadata record in a specific format
- Set: an optional group enabling sorting metadata records for the purpose of selective metadata harvesting

The service for the basic level of metadata exchange supports unqualified DC (Dublin Core), i.e. metadata format based on an international agreement defining 15 basic elements for the purpose of an easy description of source objects (Open Archive Initiative, 2008). However, for the description of individual papers in the scholarly and scientific research journal Agris on-line Papers in Economics and Informatics not all 15 elements are used (Dublin Core Metadata Initiative, 2010) but - based on the original analysis - 13 elements were chosen which is completely satisfactory for the defined tasks of solution.

### 3 Results and Discussion

Before the implementation of OAI-PMH solution itself for the needs of scholarly and scientific research journal Agris on-line Papers in Economics and Informatics an analysis of

free and easy to install software (SW) supporting OAI-PMH was carried out – for example DSpace, Drupal, etc. Digital repository software like DSpace, Fedora, and CONTENTdm. expose bibliographic metadata through the Open Archives Initiative Protocol for Metadata harvesting (Reese, 2009). The result of the analysis proved that - because of technical reasons - it is not possible to install freely accessible SW and run it at the Czech University of Life Sciences Prague or that the analysed software doesn't fully provide required service. This was the main reason why the Information and Consultancy Centre of the Faculty of Economics and Management, the Czech University of Life Sciences Prague, developed its own universal solution consisting of a new repository for metadata storing and an application for servicing OAI-PMH requests and harvesting data from individual repositories of the Czech University of Life Sciences Prague.

SW application for OAI-PMH servicing is run in the setting of WWW server Apache setting using an efficient PHP framework Nette and a database dibi layer. Nette framework was chosen because of the requested quality of the final application and to eliminate possible security risks. The local metadata repository has been developed and is run in the MySQL database server. The whole SW solution on the World Wide Web platform has been created as a robust modern application with a possibility of further extension and development.

SW application for OAI-PMH servicing itself is run separately from the original local archive of the scholarly and scientific research journal Agris on-line Papers in Economics and Informatics. An alternative proposition of the protocol OAI-PMH support implementation in the local archive of the scholarly and scientific research journal was dismissed. The main reason was the possibility of using the new metadata repository by other local archives run by the Faculty of Economics and Management or the Czech University of Life Sciences Prague. Web application supporting metadata harvesting is able to obtain data from local archives automatically and provides a simple interface for the obtaining of concrete objects' metadata stored in local databases and archives.

### **3.1 Requests to the applications of the local metadata repository**

The OAI-PMH solution is able to - without problems and without huge time demands – send back a valid XML file for all six Open Archives Initiative requests including some additional parameters or reports on errors or exceptional conditions.

To the request of the type Identify general information is sent back such as the title, basic URL (Uniform Resource Locator), supported OAI-PMH protocol version, the policy of records' deleting, contact to the administrator etc. The described local metadata repository supports OAI-PMH version 2.0, the records aren't being deleted or adapted, and time – i.e. the imprint of the time stamp is shown in UTC (Coordinated Universal Time). The only thing which the application of the local metadata repository doesn't support is metadata compression.

The list of accessible metadata formats is available by the ListMetadataFormat request. At present only DC metadata format is supported nevertheless the whole application and local repository are constructed from the point of view of general metadata formats' support. In this way metadata storage or their transformation into various formats are guaranteed. The request ListMetadataFormat can be completed with the argument identifier to find out the format of metadata of an individual concrete record.

The local repository – in order to enable easy sorting of metadata records and to make possible a selective choice of metadata harvesting – supports so-called sets. The list of all sets is accessible by the ListSets request. The records of the scholarly and scientific research journal Agris on-line Papers in Economics and Informatics are stored in the oai:aol set. This

acronym is of course completed with the full name of the set and its description. In the case of an extreme growth of sets in the local metadata repository, the file produced will be interrupted after 100 records and completed with a value `resumptionToken` and on its base it will be possible to obtain the remaining parts of the sets' list.

The XML file with headers of concrete metadata records is available by `ListIdentifiers` request. The header of each metadata record consists of: a) an unambiguous record identifier, b) sets which the metadata record belong to, c) time - in the case of above described scholarly and scientific research journal it means the date of the paper's publication. The XML file can also be interrupted after 100 megadata records (headers) and completed with the value `resumptionToken`. The number of the returned headers of metadata records can be time limited using attributes `from` or `until` or preferred sets with attribute `set`.

Against the `ListRecords` request an XML file is sent back with the full list of metadata records. The papers of the scholarly and scientific research journal are described by thirteen out of fifteen basic elements: title, creator, subject, description, publisher, date, type, format, identifier, source, language, coverage a rights. This list can be limited or eventually interrupted following the same principles as in the case of the request `ListIdentifiers`.

To retrieve individual metadata records from the local repository, the created WWW application will provide a valid XML file by the `GetRecord` request. However this request must be completed with a parameter identifier which defines a concrete metadata record.

### **3.2 Developed and run solution**

The clearly arranged scheme of the whole final solution is shown in figure 2. The local repository is separated from the scholarly and scientific research journal's archive. Web application automatically obtains from the scholarly and scientific research journal's archive data on new objects – papers (in a batch, always after a new issue of the journal), converts them into the DC metadata format and stores in the metadata repository. The whole solution is constructed in such a way to enable its future use for other databases, archives and repositories run not only by the Faculty of Economics and Management but by other faculties of the Czech University of Life Sciences Prague as well. The original web application of the scholarly and scientific research journal, which provides users with basic information about the journal and individual published papers, was kept untouched.

The central repository application has been developed and is run by the service provider UAH. This application harvests via OAI-PMH protocol metadata from other repositories, herein from the Czech University of Life Sciences' repository. The request for metadata records of the local CULS metadata repository (above mentioned `listRecords`) and returned XML files are described by data flows 1 a – 1 h. The list of metadata records is interrupted after 100 records and completed with the value `resumptionToken` which contains the number of the interruption, connection with the next part of the list and the metadata format.

The concrete metadata record about the content of the scholarly and scientific research journal is provided against request 2a. The full version of the published paper is obtained by the service provider's application against a direct request for a paper. This request is now directed straight to the local application of the scholarly and scientific research journal (request 3a) or eventually to a different archive of the Faculty of Economics and Management or the Czech University of Life Sciences Prague.

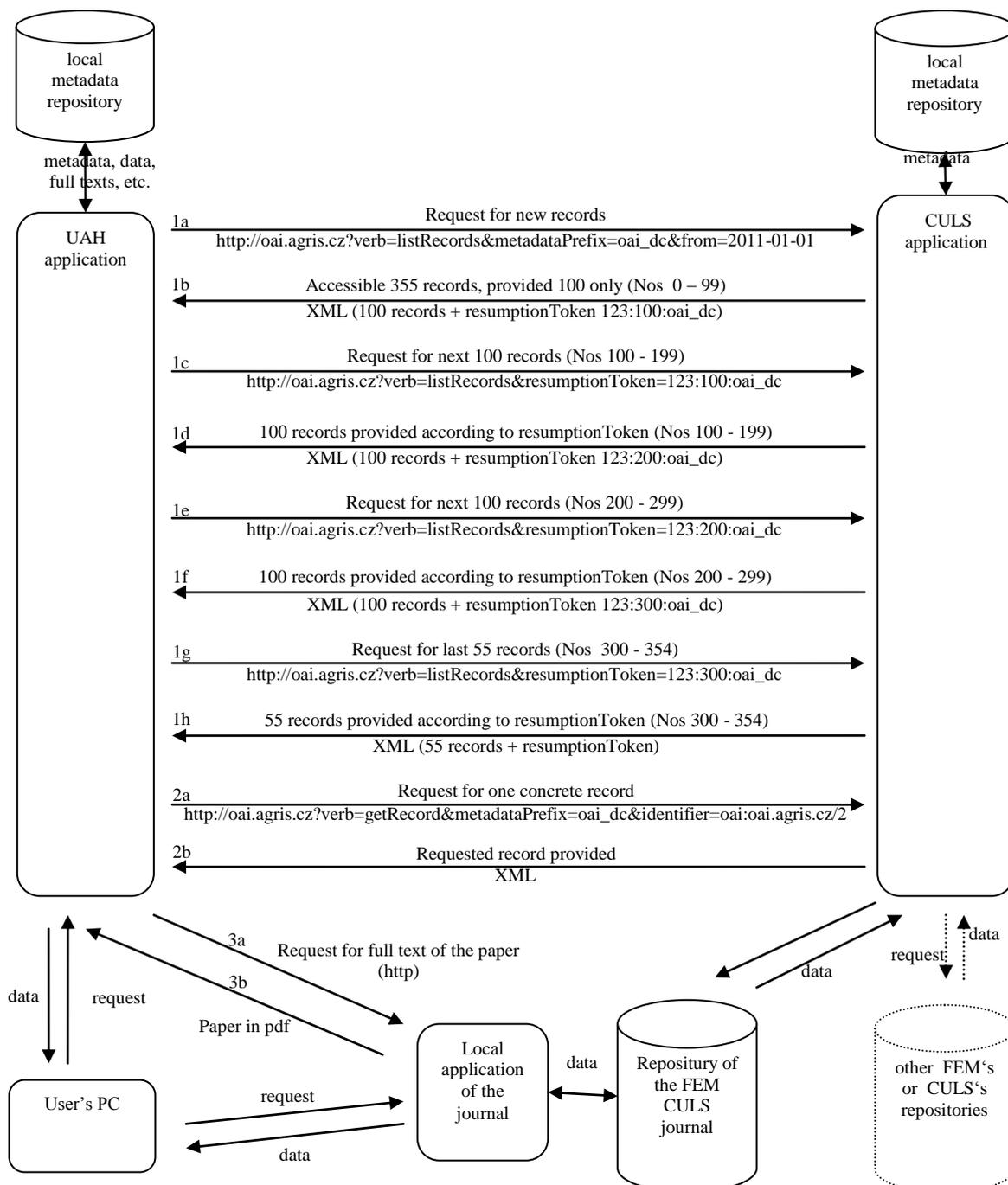


Fig. 2. The scheme of the developed solution for supporting OAI-PMH.

## 4 Conclusion

The architecture of open access content of the scientific and scholarly research journal's local archives itself determines two logical roles - the role of the data provider and the one of the service provider. The Czech University of Life Sciences Prague is in the role of the data provider where it makes accessible source objects stored in the local archives via their display for metadata harvesting by the service provider. As it was not possible to use freely accessible software supporting metadata harvesting protocol OAI-PMH version 2.0, a new system was proposed and developed by the Information and Consultancy Centre of the CULS Prague.

The whole architecture of the system to support OAI-PMH was proposed in a universal and robust way. At the Faculty of Economics and Management and the Czech University of Life Sciences Prague as a whole there are various archives and repositories with a rather different content and their own functionality. It would be demanding and time consuming to use OAI-PMH solution for individual archives and to run them afterwards. Therefore an independent metadata repository was created in the shape of a metadata library. Metadata records containing individual objects in independent archives are stored in this repository. The software application of the metadata library independently obtains data or metadata from individual archives. In the case when these archives don't have either these data in a structured form or metadata records at their disposal, it is possible to create the metadata concerned in the settings of the WWW application of the metadata repository manually.

The WWW application of the metadata repository is able to respond automatically to all six types of requests, e.g. to requests identify, listMetadataFormat, list Sets, listIdentifiers, list Records and getRecord including reports on errors or exceptional conditions. In the case of data from the local archive of the scholarly and scientific research journal metadata are stored in the oai:aol set and the metadata record contains 13 elements of DC.

One of our foreign partners UAH has the role of the service provider and uses the harvested metadata and the content of the scientific and scholarly research journal (or other archive) for the central international repository which have at its disposal other added functions such as search engines, the system of the public reviews' comparison, semantic search etc.

The SW for supporting automatic metadata harvesting at the Czech University of Life Sciences Prague was implemented in the first half of 2011 and is fully functioning now.

The results of the OAI-PMH solution will be available for Research Program titled "Economy of the Czech Agriculture Resources and Their Efficient Use within the Framework of the Multifunctional Agri-food Systems" of the Czech Ministry of Education, Youth and Sports number VZ MSM 6046070906.

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# Model Transformation

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**Annotation:** The paper presents the partial achievements of our research on transformations of the models between the various phases of the information system's analysis. Business Object Relationship Modelling [BORM] was chosen as a starting point of the transformation due to business oriented approach to analysis. Its models are studied and along with its meta-model are presented here. Unified Modelling Language [UML] was selected as the output of the transformation. Main reason for this choice is the fact that UML is a widely used standard in the area of software development. The output is represented by the class diagrams in UML. Simplified meta-model of the UML class diagram is presented as well. These meta-models represent the two sides of the transformation. The rules and recommendations for the transformation process between those two sides are presented in the paper. The solution of the transformation process brings new ways of knowledge exchange between the business and technology sectors.

**Key words:** BORM, UML, class diagram, business analysis, transformation

**JEL classification:** M15

## 1 Introduction

This paper introduces the basic issues and work procedures of the analysis and transformation based on BORM models and UML class diagrams. The core of the paper is the conjunction of the concepts created to support the transformation of the models from one notation to the other.

Existing CASE tools support some ideas of the model of concept transitions, e.g. Craft.CASE (<http://www.craftcase.com>) modelling tool performs checks, whether the added element conforms to the method. To further improve the quality of analyst's work, it would be a great contribution to implement complex support for the concept transitions model. A CASE tool could thus better lead an analyst through the process of analysis, give him hints, check and record his steps (Picka and Pergl, 2006).

The transformation of models presented in this paper brings new approaches to business analysis and modelling in UML. As List and Korherr (2005) explain, current UML Profiles for Business Process Modelling realise a narrow focus of the process, and capture the process flow on a low level of detail. They do not provide a comprehensive coverage of domain ontological aspects. The idea of transformation presented in this work represents one of the approaches which overcome this drawback of UML.

Gray, Pierantonio and Vallencillo (2010) stated that models are becoming essential in development of complex IT systems and model transformation represents key activity. Knott, Merunka and Polak (2000) write that incorrectly specification of the system is one of the major causes of software systems failure. Not only based on this statement the goal of the research is to identify the group of such methods, which could serve as a foundation for CASE tools supporting transformation of the analytic models' parts created during the business analysis into the computational model independent on the specific computer platform. The source part of the business analysis models would be typically business processes of the problem domain, its processes or the user interface of the application. Brozek, Merunka and Merunkova (2010) write that any tool or diagram used at early stage of

model creation should be comprehensible to the stakeholders, many of whom are not 'computer system literate'.

Business Object Relationship Modelling [BORM] was chosen as a starting point of the transformation and a representative of a business modelling methodology due to its expressive notation. Unified Modelling Language [UML] was selected as the output of the transformation from the BORM business models. Main reason for the usage of UML as a destination modelling language is the fact that the UML is a widely used standard in information and communication technology and UML is well-known among the professional staff in this sector. The class diagrams in UML represent the output of the transformation process. Meta-model of the BORM business models and meta-model of the UML class models represent the two sides of the transformation.

## **2 Materials and Methods**

The following methods and materials were used during the research described in this paper. Subsequent subjects are mentioned in the order of importance for the research.

### **2.1 Business analysis**

The International Institute of Business Analysis (IIBA™) defines business analysis as “the set of tasks and techniques used to work as a liaison among stakeholders in order to understand the structure, policies, and operations of an organization, and recommend solutions that enable the organization to achieve its goals” ([www.theiiba.org](http://www.theiiba.org)).

Carkenord (2009) writes that business analysis consist of elicitation of needs and constraints from stakeholders, analysis of stakeholder needs to define requirements for a solution, assessment and validation of potential and actual solutions and management of the “product” or requirements scope.

Organizations have introduced business analysis to make sure that business needs are paramount when new computer systems are being introduced. However, recognizing the importance of this principle is easier than considering how this might be achieved (Paul and Yeates, 2006). The concept of Business analysis is mainly used for the first phases of the information system's analysis. The performing of the business analysis can have a different reasons and one of them is the formal description and storage of the initial phases of the information system's development. Mainly the formal description of these phases needs to be recorded using user friendly and simple techniques due to the need of easy verification and validation. This fact precludes the use of the many tools for the software engineering because of their complex structure, interface or working techniques. Detailed description of these phases is vital for the late phase checks of the system functionality. The main functions of future information system and also current information system are described during the business analysis.

Tools for the business analysis have to support simple and general system of the notation for the system functions. The main reason for this need is the involvement of the stakeholders who doesn't know complex notations. Classic tools for the software engineering are well designed for the area of analysis, but their complexity and demands for understanding by far exceeds the capabilities of the stakeholders without a deep knowledge of this domain.

BORM has proven to be effective and beneficial in the process of describing and subsequently understanding how real business systems evolve. Such knowledge is the key for the success of any business and is especially crucial for those employees who are responsible for business development (Paul and Yeates, 2006).

## 2.2 BORM

Business Object Relationship Modelling [BORM] is an object-oriented system development methodology, which has proven to be very effective in the development of business systems. The effectiveness gained is largely due to a unified and simple method for presenting all aspects of the relevant model. The BORM methodology makes extensive use of business process modelling (Knott, Merunka and Polak, 2006). BORM was designed as a method covering all phases of the software development. BORM has the main focus on the first phases of the project also known as business analysis, unlike the other methods. BORM process models and also other BORM diagrams can be used for initial steps of system analysis (Knott, Merunka and Polak, 2003). The next significant difference is that BORM uses for every lifecycle phase only a limited group of concepts. The group of concepts contains for the first phases only a few of them. This makes it easy to understand even for first-time users with almost no knowledge of business analysis. Because of this even this first time user can be a full-value member of development team.

Another fact that makes BORM methodology more expressive is that it doesn't need the division to the static and dynamic views of the model and therefore creation of different diagrams with a different annotation.

BORM uses the following types of diagrams:

- *Business architecture diagram*
- *Object relationship diagram*
- *Class diagram*

BORM represents every concept with the same symbols in data structure, communication or other diagrams. BORM uses for visual presentation of the information a simple diagram, which contains only a necessary number of concepts and symbols. These concepts and symbols cover most of the needs for the initial description of the model and its processes. The following symbols belong to the symbols used in initial description:

- *Participant – object representing the stakeholder involved in one of the modelled processes, which is recognized during the analysis.*
- *State – sequential changes of the participants in time are described by these states.*
- *Association – data-orientated relation between the participants or them and their states.*
- *Activity – represents the aspects of the behaviour of the object recognized during the analysis.*
- *Communication – represents the data flow and dependencies between the activities. Data can flow during the communication both ways in the direction of the communication or against it.*
- *Transition – represents activity, which needs to be done to allow object change its state*
- *Condition – expresses constraint valid for the communication or activity (Polak, Merunka and Carda, 2003)*

## 2.3 MDA

Model Driven Development [MDD] approach to software development suggests that one should first develop a model of the system under study, which is then transformed into the real thing (i.e., an executable software entity). The most important research initiative in this

area is the Model Driven Architecture [MDA], which is being developed under the umbrella of the Object Management Group (Gasevic, Djuric and Devedzic, 2006).

MDA is not itself a technology specification but it represents an evolving plan to achieve cohesive model-driven technology specifications. MDA is built on OMG standards including the UML (Kuznetsov, 2007). Models represent a major part in the whole concept of MDA as its name suggests. MDA uses models for direction of the development's lifecycle.

Other research initiative next to the MDA is Model Driven Engineering [MDE]. In general MDE consists of the following two main artefacts: Modelling languages, which are used to describe a set of models and model transformations, which are used to translate models represented in one language into models represented in another language (Staab, Walter, Groener, et.al., 2010).

Another important part of MDD is Meta-Object Facility [MOF]. MOF is a specialized modelling language for defining meta-models of MDA models. MOF provides a metadata management framework, and a set of metadata services to enable the development and interoperability of model driven systems. The systems that use MOF include modelling and development tools.

We intend to use MDA, MDE and MOF in our research to accomplish the transformation of BORM model. Approach to model transformation used in MDA and MDE combined with MOF could serve as a basis for our transformation from BORM model to UML Class diagram. Kuznetsov (2007) says: "An effective application of the MDA software development calls for methods and techniques for specifying of software model transformations like the one we are describing in this paper".

## 2.4 UML Class Diagram

Unified Modelling Language (UML) Class Diagram is a static diagram. The Class diagram is probably the most widely used diagram of the UML. In fact, the Class diagram is the primary modelling tool for describing UML itself (Pender, 2003). This diagram describes the data structure of the system and displays its classes along with their attributes and relations between them. Class diagram is in many cases really close to the database structure of the final application.

Sometimes they are used for modelling the vocabulary of the system. This implies a decision that is based on which concepts or entities are part of the system and which concepts or entities are outside its boundaries (Favre, 2003).

This diagram is used for capturing of the static part of the system which is mainly represented by the relations between the objects. UML defines a few types of the relations between the objects in the class diagram besides the description of the classes:

- *Class* – represents an object identified during the analysis
- *Attribute* – represents an attribute of the object identified during the analysis
- *Method* – activity which could be done by the object identified during the analysis
- *Association* – general relation between the objects,
- *Aggregation* – relation between the objects in which is one object consists of the other, but each of them could exist separately
- *Composition* – relation between the objects in which is one object consists of the other and the existence of the contained object alone won't make any sense
- *Generalization* – relation representing the inheritance between the classes

Class diagram can be different for each of the phases of the system development and analysis and becomes more accurate during the development.

### 3 Results and Discussion

This paper summarizes *the* achievements of our research work which is moving on from the first two phases to the Definition phase of the methodology. Majority of the current outcomes are kind of literature search and more or less on the theoretical level and needs to be proved or disapproved in the coming phases of the methodology.

Basic idea behind this transformation is dealing with the meta-model. Meta-modelling is a powerful technique to specify families of models. A meta-model is a model that defines the language for expressing a model, i.e. "a model of models". A meta-model is an explicit model of the constructs and rules needed to build specific models. It is a description of all the concepts that can be used in a model (Gasevic, Djuric and Devedzic, 2006). Meta-model contains all important information stored in the diagram by its author, but is free of any limitations of the diagram itself.

Transformation presented in this paper is based on the information from the previous paragraph. Meta-model of the BORM diagram and meta-model of the UML class diagram are both models describing constructs and rules needed for their creation. The conversion of the diagram created in BORM to meta-model takes us closer to the meta-model of the UML class diagram and also makes the search for the common attributes of both easier. A simple diagram showing the scheme of the transformation is presented in the figure 1.

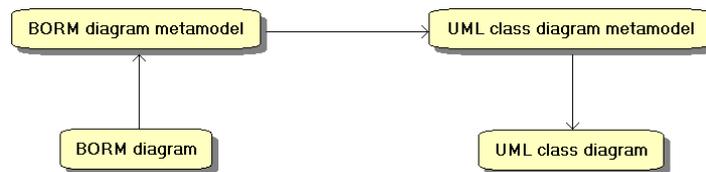


Fig. 1. Transformation scheme.

We use for the needs of this transformation the meta-model of the BORM which is presented in the figure 2. This model is modelled using the UML class diagram. Diagram captures the basic parts (typically abstract) of the meta-model and other auxiliary elements like comments.

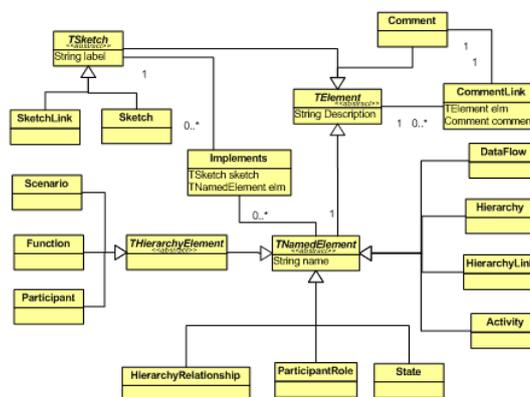


Fig. 2. Meta-model of BORM basic elements (Picka, 2010).

Meta-model of the UML class diagram is also needed to be able to specify the rules of the conversion between this meta-model and the BORM meta-model. We have created a simplified version of the UML class diagram for the needs of this paper. This version,

presented in figure 3, is sufficient for the basic explanation of the idea and the area of problem to solve.

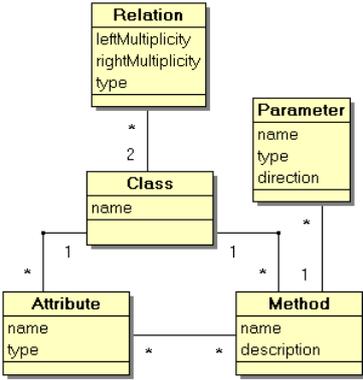


Fig. 3. Simplified meta-model of UML Class diagram.

The conversion rules can be specified for the transfer of the information from the former to the later. These rules would be based on the knowledge of the problem domain of these models as well as of the objects these models represent. BORM model may contain both the static and dynamic information, because of that one BORM model could be transformed to more than one in the cases where this is true. A part of the BORM ORD diagram is shown in the figure 4.



Fig. 4. BORM – Business diagram.

Currently our research is in a phase when we have created first set of transformation rules. This set isn't definitely complete and other rules have to be amended. We will present one rule as an example of transformation from BORM model to UML Class diagram.

We will take the Originator's activity called 'Creation of new event proposal and project list' from the BORM model presented in figure 4 for this example. The activity represents some kind of an aspect of the behaviour of an object identified during the business analysis and here it is represented by Originator. The object shows a behaviour which is presented by this activity. The transformation from BORM model into its meta-model is the mapping of A onto B.

$$\forall b \in B, \exists a \in A \text{ such that } b = f(a) \tag{1}$$

Where in our example A is a set of all elements in BORM model and B is a set of all elements of BORM meta-model, therefore activity which is part of the set A is represented by one element of set B. It is meta-models class called 'Activity'.

Analogically to this we can describe the rule for mapping between the UML Class diagram meta-model and UML Class diagram. This transformation uses inverse mapping as shown in equation 2.

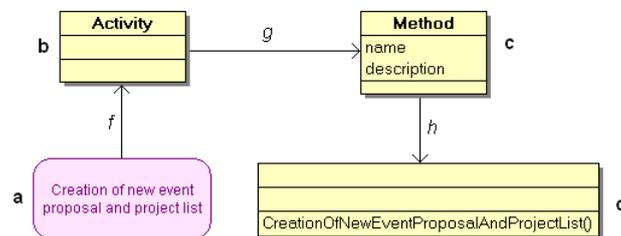
$$f^{-1} : D \rightarrow C : f^{-1}(c) = d \quad \text{if and only if} \quad d = f(c) \quad (2)$$

These mappings define the first and last step of transformation outlined in figure 1.

Now the only missing mapping for the whole process of transformation is mapping of the transformation between the meta-models. This transformation is using in case of Activity element of BORM model using mapping type A into B presented in equation 3.

$$f : B \rightarrow C : c = f(b) \quad (3)$$

The whole transformation process of Activity element of BORM model then uses schema displayed in figure 5 which is modified version of transformation scheme presented in figure 1.



**Fig. 5.** Transformation scheme of BORM's Activity element.

Transformation of BORM's Activity is an example of straightforward transformation. This we can't say about transformation of other elements. The example of more complex transformations is communication element. Data flow in figure 4 is called 'New Action' and is representing the data-oriented relations between the participants. Communication in BORM represents a general type of relation which can be in later parts of implementation identified as association. Because of this uncertainty and fact that communication represents not only relation, but data transfer as well the transformation rules for such element is more complicated and not finished yet.

## 4 Conclusion

The paper presents the partial achievements of our research on transformations of the models between the parts of the analysis of information system.

So far, the goal and foundation of the transformation was set and nowadays we study the various mappings and rules of them. The analysis shows that the transformation is quite a complex task and it will be probably not possible to specify simple and straightforward rules. However, some kind of heuristics and methodological rules along with the semi-automated algorithm for the transformation represents a contribution to this research area that is currently missing.

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# Information Security Characteristics in Non-Trivial Models of E-mail Communication

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**Annotation:** With the strengthening importance of information risk management, all organizations including agrarian sector are placing an increasingly greater emphasis on ensuring information integrity and confidentiality in information systems. Within the frame of ensuring communication channel integrity and confidentiality, existing technical means offer a high level of quality for the basic protection of these two critical information characteristics. It appears, however, that in connection with business processes, technical means (application software) are not always able to sufficiently cover more complex communication flows and workflows. The article focuses on the matters of ensuring integrity and confidentiality of e-mail communication within business processes requiring non-trivial communication models of the user-group type and substitutability within the group. The implementation of these communication models is a means of enhancing the quality of processes in organizations while maintaining the current level of security. The article is a case study dealing with a solution targeted at the support of group and public folder communication in the Microsoft Exchange, Outlook and Active Directory environment with the application of the public key infrastructure that is naturally supported by this environment in the basic user-user mode. The first part of the article deals with theoretical approaches to information integrity and confidentiality in the area of e-mail communication and the enhancement of security of business processes while the second part concentrates on discussing the outcomes of the case study and the proposed solution. The article has been prepared on the basis of the analysis of secondary sources and standards, synthesis of knowledge and evaluation of findings. One of the conclusions of the article is that for current processes of e-mail communication the solution may be implemented on the basis of the existing technical standards and transparently while preserving openness to common e-mail systems. The proposed method of implementation may also improve the quality of communication processes in organizations and thus the performance of the entire organization.

**Key words:** information, integrity, confidentiality, e-mail, communication models, public key infrastructure, agrarian sector

**JEL classification:** L86

## 1 Introduction

In the present information and knowledge economy, information is critically important for organizations operating in all sectors. A prerequisite for developing information culture in any organization is to realize the importance of information as a crucial asset, i.e. to realize its value and price (Smejkal and Rais, 2006). Regarding agrarian sector information refers to patents, manufacturing processes, business information, economic results and other assets leading to the development and supporting an operational performance and a competitive advantage (Ezingard and Birschal, 2002). With the increasing involvement of farming enterprises in the information society and due to regulations of European Union and Commission (Rimantas et al., 2006) also increase demands for utilization of cutting-edge information technologies in agriculture and there is associated need for crucial information protection.

Information contained in information systems has to be transmitted efficiently and in compliance with the information security policy in order to eliminate the potential loss of this

asset (Brykrzynski and Small, 2003). Communication in private or public networks are still emerging trends are recognized as crucial (Kumar et al. ,2006; Koh et al., 2001). Extensively used way for transmission of the information is the electronic mail. The transmission ensured within the frame of business and company processes shows a high level of sophistication in terms of the techniques and modes of communication utilized. Informational systems and software for securing the content of e-mail messages provide these processes with the basic level of support in basic modes of one-to-one communication (between individuals). In other modes, however, they are determined by technical restrictions of individual e-mail systems that do not permit the full use of all modes of communication offered by e-mail as a communication channel. This refers in particular to the support of the mode ensuring communication between an individual and a group mailbox (“one-to-many”). When attempting to preserve the required level of security, this shortcoming causes unwanted changes in the communication flows and business processes of organizations.

The objective of this contribution is to identify the assumptions for the application and the assumptions for the proposed solution of a prototype software module to protect information transmitted using electronic mail as a transmission channel in one-to-many communication modes. This contribution deals with the possible solutions in the environment of an e-mail system built on the Microsoft Exchange 2010 and Microsoft Outlook 2003 platforms.

## **2 Material and Methods**

The first part of the contribution is dedicated to the theoretical background of information security issues and e-mail communication modes. The second part of the contribution deals with features of individual modes and the desired attributes of a software module prototype solution identified based on prototype implementation in the private sector.

The contribution has been produced based on the analysis of secondary sources, and the synthesis of findings from the implementation of the prototype solution for a business customer.

## **3 Results and Discussion**

### **3.1 Informational security characteristics**

Smejkal and Rais (2006) state that the conception of confidential information protection is based on the principle of utilization of information only where it is needed. Protected information may be used solely by those individuals that need to know it or exploit it for the benefit of their organization or in compliance with its interests. This corresponds to the definition of one of the three critical characteristics of information – confidentiality.

Whitman (2010) defines confidentiality as a characteristic whereby only those with sufficient privileges and a demonstrated need may access certain information. When unauthorized individuals or systems can view information, confidentiality is breached. To protect the confidentiality of information, a number of measures are used including information classification, application of general security policies, education of information custodians and by applying an encryption (Whitman, 2010).

The second critical characteristic of information is, according to Whitman (2010), Kouns and Minoli (2010), Kwok (1997) and others, is integrity. Integrity is the quality or state of being whole, complete and uncorrupted. The integrity of information is threatened when it is exposed to corruption, damage, destruction or other disruption of its authentic state. To compensate for internal and external threats to the integrity of information during

transmission, algorithms, hash values and error-correcting codes ensure are often applied. Other critical characteristics are availability, privacy and accountability.

The goal of information security is to ensure the relevant protection of all forms of data and information possessed by an organization (Smejkal and Rais, 2006). Besides non-automated parts of systems and written documents, telephone conversations and fax messages, this refers in particular to automated information systems.

E-mail communication falls within the group of automated information systems transmitting information and supporting co-operation within organizations (Dagorn, 2009). In connection with the above, it is necessary to ensure within e-mail systems and e-mail messages the above-mentioned critical characteristics of information transmitted.

E-mail as a communication means is, in terms of communication structure, classified as an asynchronous type of communication with the following communication modes:

- One-to-one – an individual sends electronic mail to another individual. The recipient is identified by his/her e-mail address.
- One-to-many (distribution) – an individual sends (distributes) electronic mail to a group of individuals who receive it. There is no hierarchy or substitutability among recipients. The mode is characterized by a set of recipients, out of which each is identified independently by his/her e-mail address. Within the frame of organizational and business processes, this mode is utilized for selective distribution (circulation) of messages.
- One-to-many (group) – an individual posts electronic mail to an organized group of individuals who receive it. The group is created with the aim of fulfilling a selected task (e.g. the processing of certain data) and the members of the group are substitutable among themselves in the process of processing. This mode is characterised by the fact that the group of recipients has a common e-mail address while at the same time individual recipients have their own personal e-mail addresses. Within the frame of organizational and business processes, this mode is used in operational organizational units for large-scale manual processing (call centre, branch, a collective mailbox).

One-to-many communication modes are, from the point of view of an e-mail system, non-trivial, requiring special e-mail system features. In relation to the existing e-mail systems, for the one-to-many communication mode (distribution) it refers to the feature of “distribution group expansion” (break-down of a symbolic name into recipients’ e-mail addresses); for one-to-many communication (group) this entails the following features: “shared mailbox“, “group mailbox” or “public folder”.

### **3.2 Ensuring the characteristics for e-mail**

The confidentiality of information transmitted by electronic mail is ensured by encrypting the content of messages. Technical means used for this purpose are user content encryption and an asymmetric cryptography application on the basis of electronic certificates (public key infrastructure - PKI), or possibly Pretty Good Privacy (PGP). Integrity is achieved by obtaining hashes of electronic document content or the asymmetric cryptography application on the basis of electronic certificates, or possibly PGP.

Encryption and an electronic signature of content for electronic mail are, starting from 1999, part of the transmission protocol extension by means of the S/MIME standard (Secure Multipurpose Internet Mail Extensions) and are supported by the majority of e-mail systems. For this reason the above-mentioned technologies are quite widely used in the organization environment and in communication based on electronic certificates issued in compliance with

the Act on Electronic Signature and generally wherever certificate administration processes are ensured.

For the encryption utilizing asymmetric cryptography, communicating parties must adhere to the following:

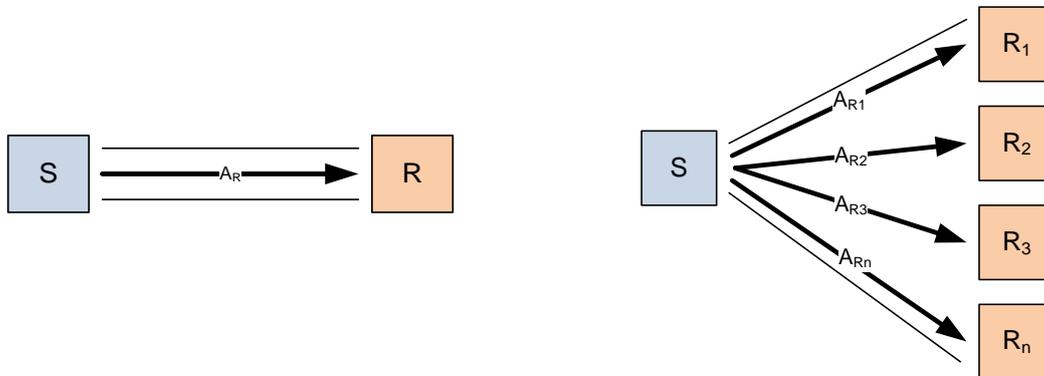
- *Sender S* sends a message and uses the recipient's public key  $PubK_{Rn}$  to encrypt the content.
- *Recipient Rn* receives the message and uses his/her own private key  $PrivK_{Rn}$  to decode the content (Zhengping and Qiaoyan, 2011).

For the electronic signature of content and verification of the message integrity using asymmetric cryptography, communicating parties must adhere to the following:

- *Sender S* sends a message and for the electronic signature uses the sender's private key  $PrivK_S$ .
- *Recipient R* receives the message and uses the sender's public key  $PubK_S$  to verify the electronic signature and message integrity (Zhengping and Qiaoyan, 2011).

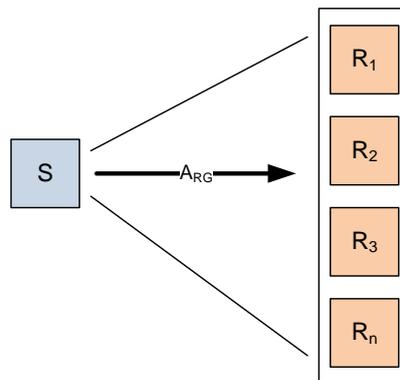
In all cases it means ensuring confidentiality with the use of end-to-end encryption, i.e. the content in its open form is only available to the sender and to the recipient. From the above said it follows that end-to-end encryption requires the evaluation of all end recipients and their  $PubK_{Rn}$  at the time of creation and the sending of the message.

End-to-end encryption features significantly determine the one-to-one and one-to-many communication modes. This situation is more common in the one-to-one mode. The sender has to know the recipient's address  $A_R$  and  $PubK_R$ . In the one-to-many mode (distribution), after the expansion of the distribution group to the addresses of recipients  $\{ A_{R1}..A_{Rn} \}$ , it is necessary, with respect to these recipients, to evaluate the relevant set  $\{ PubK_{R1}..PubK_{Rn} \}$ .



**Fig. 1.** E-mail routing in one-to-one communication mode

**Fig. 2.** E-mail routing in one-to-many (distribution) communication mode



**Fig. 3.** E-mail routing in one-to-many (group) communication mode

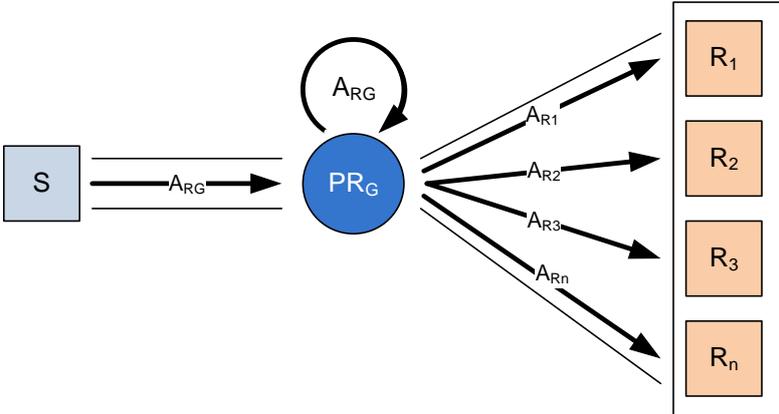
In the one-to-many mode (group), the group is identified by a group address  $A_{RG}$  and simultaneously, in order to preserve the end-to-end encryption, it is necessary for all recipients to evaluate the set  $\{ PubK_{R1}..PubK_{Rn} \}$ .

The above-mentioned non-trivial modes place requirements on the  $PubK_{Rn}$  administration. With the growing number of recipients, the number of administered  $PubK_{Rn}$  stored on the part of the sender grows linearly. According to Zhu et al. (2011) this mechanism lack scalability and interoperability in environments with a large number of users. E-mail systems facilitate the administration by central address services that provide  $PubK_{Rn}$  (based on the recipient's address  $A_{Rn}$ ) at the moment of message sending.

A survey of technological limits aimed at non-trivial communication modes in the environment of the Microsoft Exchange 2010 and Microsoft Outlook 2003 e-mail systems integrated with Microsoft Active Directory services was carried out within the frame of a commercial project. It has been identified that these systems supported one-to-one and one-to-many (distribution) encrypted communication modes. The one-to-many (group) mode is not functional, as it does not support the feature of group mailbox or public file expansion to a set of members of the group with access to the group mailbox or the public file. In this case the analysed environment responds as if in the one-to-one mode (S communicates with  $A_{RG}$ ), where the public key  $PubK_{RG}$  is evaluated instead of  $\{ PubK_{R1}..PubK_{Rn} \}$ .

For this reason, the system cannot be directly used for secured one-to-many (group) communication, which significantly affects an organization's ability to ensure confidentiality of information transmitted by e-mail in this mode. The identified conditions of non-functionality enable us to define three independent variants of ensuring functionality:

1. When sender S sends a message to an  $A_{RG}$  address, the system evaluates public keys for the group of recipients  $\{ A_{RG}, A_{R1}..A_{Rn} \}$ , i.e.  $\{ PubK_{RG}, PubK_{R1}..PubK_{Rn} \}$ .
2. It is organizationally ensured that the following applies to all recipients:  $PubK_{RG}=PubK_{R1}=...=PubK_{Rn}$  and therefore  $PrivK_{RG}=PrivK_{R1}=...=PrivK_{Rn}$ .
3. There is a reliable person  $PR_G$ , to whom the following applies:  $A_{PRG}=A_{RG}$  and  $PubK_{PRG}=PubK_{RG}$  and who assumes the role of a substitute (proxy) recipient who, following the receipt of a message, first decodes and then encrypts the message for a set of recipients  $\{ R_G, R_1.. R_n \}$  and in the one-to-many (distribution) communication mode sends the message back to the address  $A_{RG}$ , or forwards it to the recipients' addresses  $A_{R1}..A_{Rn}$  pursuant to Fig.4.



**Fig. 4.** E-mail routing in one-to-many (group) communication mode with proxy receiver

Variant 1 may be implemented solely by extending the Microsoft Exchange e-mail system by an automated evaluation of recipients' public keys. Variant 2 may be organizationally ensured by the distribution of a private key to all potential recipients (this variant is further eliminated as unacceptable). Variant 3 can be implemented manually or automatically. In the manual

mode, the role of the proxy recipient is assumed by a person that redistributes the message to the current group. The automated variant requires the implementation of a software module that plays the role of the proxy recipient identically with the manual mode.

### 3.3 Discussion

The discussed issues are generally applicable to all e-mail systems. The need of encrypted communication in non-trivial modes is independent of the e-mail system used. For organizations this issue is quite relevant. For example, in the public administration environment this issue is comprehensively dealt with by the introduction of the Data Mailbox Information System. Information systems based on open solutions utilize PGP encryption and the provision of recipients' public keys is realized by a public PGP KeyServer, such as the PGP Global Directory or OpenPGP Public Key Server. This public solution is not always suitable for organizations as it does not provide a sufficient level of control over the administered public keys.

Within the frame of evaluation of the presented variants of ensuring functionality and following the evaluation of their suitability, plausibility, and feasibility, it is necessary to exclude variant 2 as unacceptable from the point of view of information security since it means that the access to messages (for all recipients) is ensured by means of one identical private key  $\text{PrivK}_{\text{RG}}$ , which is in sharp contrast with the definition of information confidentiality and leads to confidentiality violation. Variant 1 is only theoretical and presupposes the enhancement of functionality on the part of Microsoft Exchange. In the long-term perspective, however, it is likely to be the most suitable as it does not interfere with communication flows and is transparent for all communicating parties.

A software module prototype has been used to verify the feasibility of variant 3. In an automated version, it is able to fulfill the role of a proxy recipient  $\text{PR}_G$  that re-encrypts messages. In the process of prototype implementation the above-mentioned findings were applied and the prototype has revealed some other features:

- the re-encryption using the S/MIME standard is easy in terms of implementation
- the re-encryption has no effect on the internal structure and content of e-mails that remain unchanged and the integrity of messages is not violated and may be subsequently verified by all recipients
- re-encrypted messages may be sent from  $A_{\text{PRG}}$  back to  $A_{\text{PRG}}$  address using a standard mechanism
- re-encrypted messages may be sent from  $A_{\text{PRG}}$  directly to addresses of recipients  $A_{R1}..A_{Rn}$
- in order to ensure  $\text{PR}_G$  reliability, it is suitable to store  $\text{PrivK}_{\text{PRG}}$  private keys in a safe key deposit
- the mechanism of a proxy recipient is not dependent on the e-mail system used
- a proxy recipient may implement other support logic and manage the processing flow

## 4 Conclusions

The analysis made and the implemented prototype have shown that non-trivial ways of one-to-many communication may be carried out not only through an unsecured transmission, but also through ensured end-to-end encryption (using a reliable proxy recipient). Implementing a solution on the basis of a prototype will permit organizations to ensure a safe transmission of e-mail messages and thus satisfy not only the information security requirements, but also keep the business and operational processes in an unchanged form, which leads to the optimisation of operating costs and enhancement of the level of information security while maintaining process efficiency.

## Acknowledgements

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# A Map Portal for Regional Development - MPRR 1.0

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**Annotation:** The present paper is aimed at introducing map data creation software – a map portal for regional development - MPRR 1.0. MPRR 1.0 is a purpose-made application representing a universal software solution that can be used for a map presentation of virtually any suitable database.

The portal is being developed within the framework of the Faculty of Economics and Management Research Program in mutual cooperation between the Department of Information Technologies FEM and the Information and Consulting Centre FEM. Pilot stage implementation was carried out in close cooperation with the Department of Economics and other external partners, especially the Ministry of Agriculture.

The SW solution on the World Wide Web platform has been created as a modern robust application enabling further enhancement and development. It is available on a wide range of end-use devices, including the mobile and dedicated ones, using common web browsers.

The portal runs within the Apache Web Server and all visualised objects have been saved under the form of UTF-8 character set in MySQL 5 database. To visualize the geographical position of the individual elements, Google Maps API was implemented as it provides constant updating and makes other related Google Inc. functions available. The SW solution itself was developed in JavaScript and map data loading was realized by means of JSON technology using PHP Nette Framework and Dibi database layer.

The MPRR 1.0 solution represents qualitatively a brand new perspective of map data creation and it entails many original elements and functionalities (cluster analysis, object aggregation and disaggregation, viewing basic information and optional detailed information, customized preview etc.).

MPRR 1.0 was verified by implementation over two kinds of data: a relatively wide and detailed database of organic farms and biogas stations database – in the pilot stage, the region of South Bohemia has been chosen for both cases. The maps have been certified by respective authorities of the Ministry of Agriculture of the Czech Republic.

**Key words:** Map portal, web browser, Google Maps, MPRR 1.0, regional development

**JEL classification:** Q, R

## 1 Introduction

Nowadays world and society is commonly known as the "information" one. This reality of life can be seen from many different points of view. Data and information – as far as their retrieval, acquisition, transfer and storing is concerned - do not constitute a real problem, however, their quantity, validity, processing and suitable presentation do. Integrating data to maps seems to offer a very interesting perspective, bringing along a significant added value to data presentation and interpretation.

A relatively broad field of information and communication technologies inheres in the "Economy of the Czech Agriculture Resources and their Efficient Use within the Framework of the Multifunctional Agri-food Systems" Research Program. At present, two sub-periods are being solved, the "Information Technologies for a Better Information Availability in Regions" sub-period and subsequently the "Information Technologies for Regional Development" sub-period.

Map creation is one of domains with a significant practical application impact. The paper is aimed at introducing the potential of a map data creation software – a map portal for regional development - MPRR 1.0, which is a purpose-made application representing a universal software solution that can be used for a map presentation of virtually any suitable database. Its potential and functionalities are shown here using the databases of Czech organic farms and biogas stations. In other words, we are dealing with the implementation of a universal software system for presenting a set of specialist data as one of the map layers.

The output presented in the paper has been developed and implemented in mutual cooperation of the Department of Information Technologies, Information and Consulting Centre, other departments of the Faculty of Economics and Management CULS Prague with external partners, in particular with the Ministry of Agriculture (Environment and Ecological Agriculture Section, Department of Ecological Agriculture) and the Institute of Agricultural Economics and Information (UZEI) - Division of Agro-environmental Policy in Brno. "

## **2 Materials and Methods**

The analysis and development within the framework of the above-mentioned Research Program resulted in the creation of a map portal for regional development - MPRR - version 1.0 MPRR is a complex software solution of geographical object presentation within the World Wide Web platform.

Basic map application functions are as follows:

- visualizing an object in the map (intuitive icons option);
- visualizing basic information on the object marked;
- "Detailed information" option;
- map scale change (zoom);
- aggregation of objects into clusters (facilitating the view with a higher number of objects);
- clusters disintegration into individual objects (detailed view);
- customized object filtering and classification by specific criteria;
- dynamic change of the number of visualized objects.

Basic features of MPRR 1.0 application:

- general applicability (universality);
- intuitive navigation (user-friendliness);
- accessibility on most end-use devices;
- high speed (fast response time and data loading);

- modification of displayed object information (customized choice of information);
- relatively simple modification concerning graphic object interpretation in the map;
- safety

Several interesting aspects concerning the present issues can be found e.g. in Watson (2009) and Zervaas (2008). MPRR 1.0 was created and runs within the Apache Web Server. All objects visualized in the map portal have been saved under the form of UTF-8 character set in MySQL 5 database. To visualize geographical position of the individual elements, Google Maps API version 3 by Google Inc. company was implemented – further information in e.g. Synodinos (2007), Mielke et al (2007), Choimeun et al (2010), Svennerberg (2010) or Lewis (2010) - in order to provide constant map updating and to make other related Google Inc. functions available. The SW solution itself was developed in JavaScript - in which the Google Maps application is accessible - using the JQuery framework while jQuery plugin bMap 1.3 was implemented – see e.g. blocsoft.com (2010) or De Volder (2006) – and modified to meet the requirements of the portal. MarketCluster Library for Google Maps API v3 was used for further SW functions – see In The Attic (2011) for further information.

Map data loading was realized by means of JSON technology based on JSON.org (2011) using PHP Nette Framework (Nette.org, 2011) and Dibi database layer (DibiPHP.com, 2011). The Nette Framework was chosen for the sake of required application quality and elimination of safety threats. Google Maps Icons (Google, 2011), modified to the required form, have been used as graphical elements to visualize the individual objects in maps.

The whole SW solution on the World Wide Web platform has been created as an application available on a wide range of end-use devices - from PCs or portable computers to mobile and dedicated devices. The application was tried out on five most used web browsers (MS Internet Explorer, Mozilla Firefox, Google Chrome, Safari, Opera) and many minor web clients. The solution has been created as a modern robust application enabling further enhancement and development with a view to upgraded version 2 – the development of which is now being envisaged. In consideration of a potentially high number of visualized objects in the first map preview (eventually in any further previews too), these objects have been aggregated into the so-called clusters. The aggregation is automated upon map scale and number of objects on a certain area. Changing the map scale leads on one hand to an automated disaggregation of bigger clusters into smaller ones, or eventually to the individual objects (zoom in), or on the other hand, to the aggregation into bigger clusters (zoom out). Aggregate objects (object clusters) are indicated by the zoom icon with a numeric indication of the exact number of objects included.

For clarity and user comfort sake, the objects are classified according to the defined criteria into individual clusters. Application users then dispose of a very simple and effective tool that enables filtering certain object clusters (groups) and view only the objects required (choose data objects preview).

### **3 Results and Discussion**

The MPRR 1.0 solution represents qualitatively a brand new perspective of map data creation and, in comparison with the existing solutions, entails many original elements (optimized original icons, cluster analysis, object aggregation and disaggregation, viewing basic information and optional detailed information, customized preview etc.). The map output includes as well a detailed methodology clarifying what kind of data can be obtained by the users, what the criteria are etc.

The final SW solution displayed in the map portal has to be of course complemented with a high-quality database. The output presented in the portal (data structure and validity, map location accuracy) stems from the best effort to validate and complete all data, including efforts to find out an accurate and relevant location of objects and their subsequent map positioning.

With a view to verify MPRR 1.0 functionalities and present effectively the research of the Department of Economics in an effective way, maps of Organic Farms in the Czech Republic and Biogas Stations in the Czech Republic were created by means of the portal – in the pilot stage, the region of South Bohemia has been chosen for both cases as the highest numbers of these objects are recorded in this region.

The map portal is intended to be widely used especially by the state administration, professionals in the field and students. However, it can be used by general public too as it is freely available on the specialist AGRIS web portal:

<http://mapy.agris.cz/ekologicke-farmy/mapove-podklady/>

<http://mapy.agris.cz/bioplynove-stanice/mapove-podklady/>.

Detailed information on the issue (i.e. on the implementation level) is not included in the present paper as its results are being published continuously and are as well obvious from the figures below (fig. 1 – fig. 5). Further information on the MPRR 1.0 pilot stage of the organic farms mapping etc. can be obtained e.g. in Vaněk et al (2010).

## 4 Conclusion

The maps have been certified by respective authorities of the Ministry of Agriculture of the Czech Republic and represent an official output of the Research Program (purpose-made map with specialist content in accordance with the applicable policy of the Research and Development Council).

The SW solution MPRR 1.0 as well represents one of the official Research Program outputs (Software - according to the applicable policy of the Research and Development Council). It is therefore freely available to prospective users – the license provider (Department of Information Technologies, FEM CULS) does not require any license fee. Information website <http://ipc.pef.czu.cz/kit/mprr> entails SW description, license agreement, references, contact details etc. The system is recently offered for free to a wide range of bodies, from Local Action Groups in the regions to research institutions, the National Club of Agricultural Journalists and Publicists and other users.

Map data related to organic farming (eco farms) have not been created yet, as far as the authors are aware. On the other hand, map data concerning biogas stations exist in more versions. Their quality, i.e. validity and accuracy, is however disputable.

## Acknowledgements

The knowledge and data presented in the paper were obtained as a result of the Research Program titled “Economy of the Czech Agriculture Resources and Their Efficient Use within the Framework of the Multifunctional Agri-food Systems” of the Czech Ministry of Education, Youth and Sports number VZ MSM 6046070906.

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## Appendix A

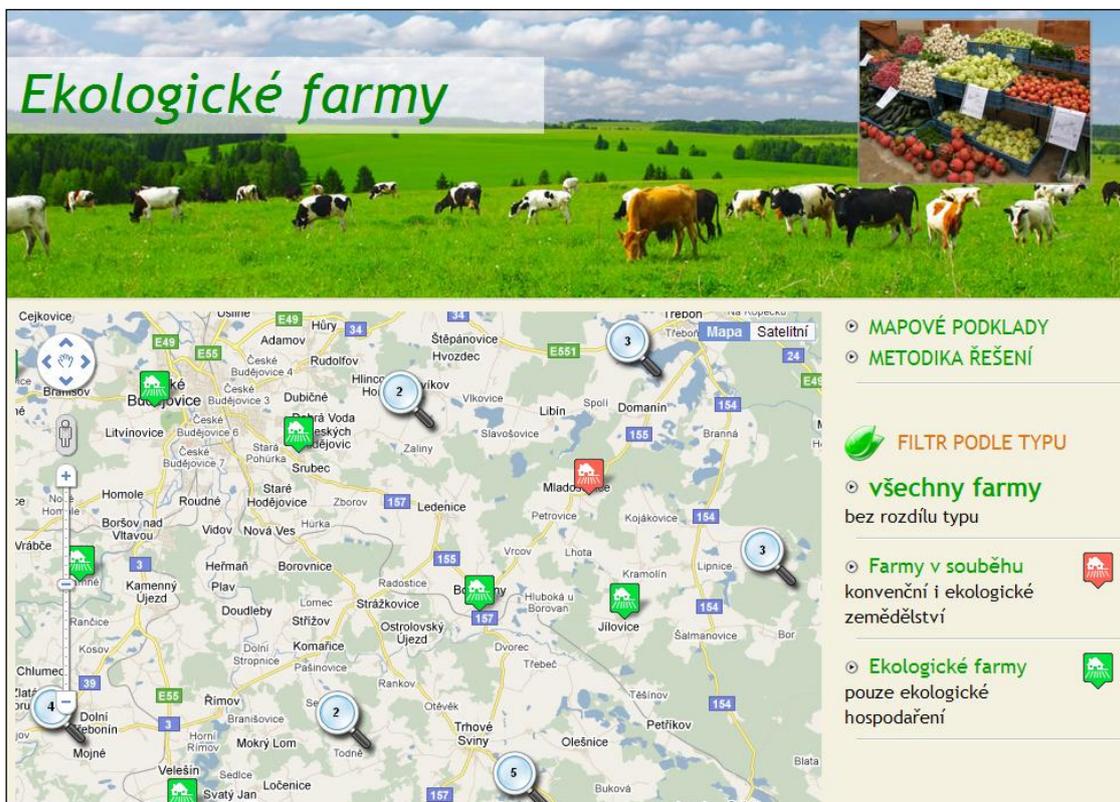


Fig. 1. Preview of the individual organic farms or organic farms groups (South Bohemian Region)



Fig. 2. MPRR – methodology preview (organic farms)

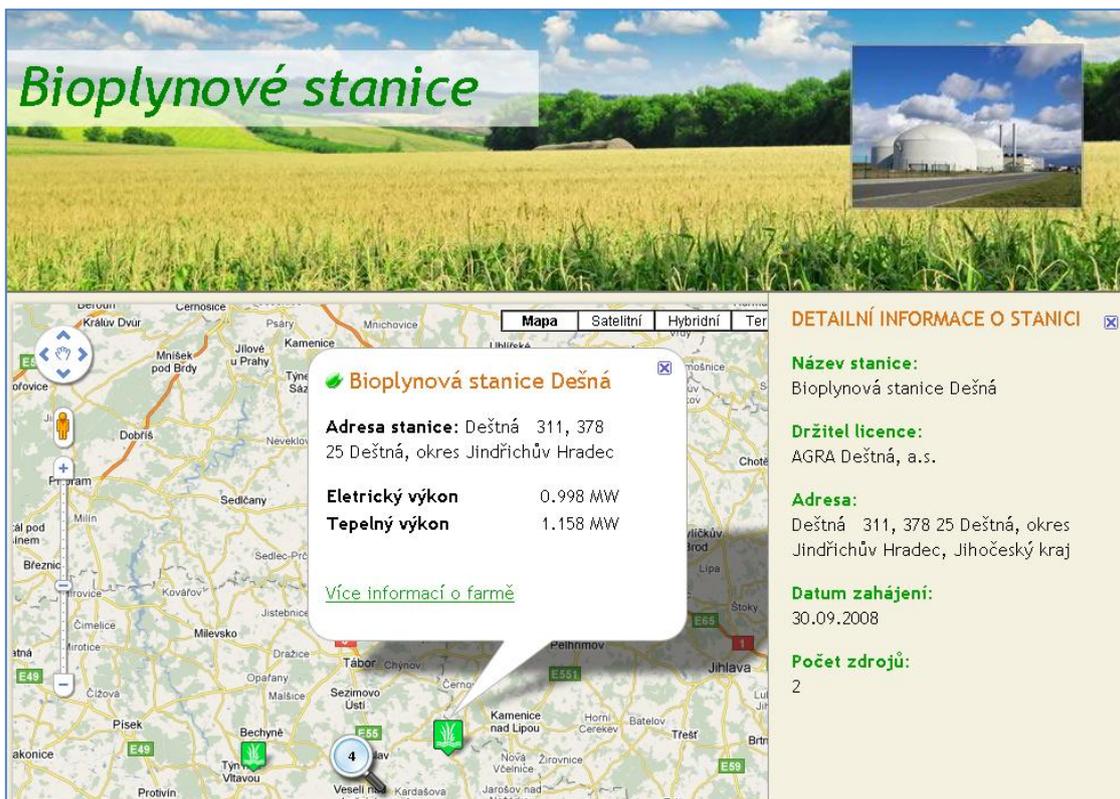


Fig. 3. Basic and detailed information on the object (biogas stations)

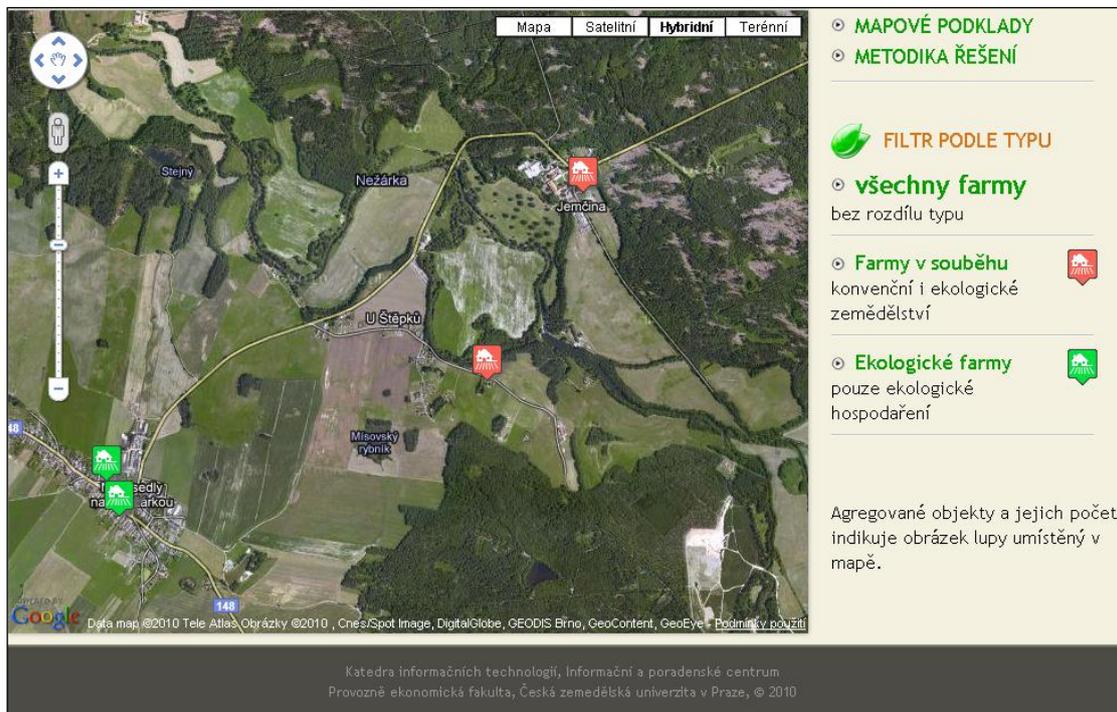


Fig. 4. Hybrid map with zoomed objects



**Fig. 5.** Detailed map (satellite map - detailed visualization of the Deštná Biogas Station)

# Evaluation of Indicators of Labour Market Using Logistic Regression

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**Annotation:** This paper aims to identify and quantify variables that currently have a large impact on the labour market in the Czech Republic. The paper focuses on exploring the influence of individual variables which will be included in the model and their assessment with the help of multivariate statistical analysis - logistic regression model. The analysis of the relationships between variables should lead to finding the best and meaningful model that describes the relationship between the explained variable - the labour market and a group of explanatory variables, thus, to deeper understanding of relationships and connections in the given market. Employment, unemployment and economic activity are the basic statistical indicators which facilitate monitoring the situation in the labour market. The indicators are always related to a particular period. The labour market is characterized by many variables and many structural factors which influence its development. Currently, the most discussed problems nowadays probably are: so called the issue of gender (male, female) and education policy (classification according to the international standard classification of education - people without education, primary education, secondary schools without graduation (vocational schools), secondary schools education, colleges and universities). These two factors are especially in the focus of this contribution. Based on testing criteria such as Wald's criterion, the influence on the two variables - of gender and education was proved. When comparing the sexes, we can claim that men, compared to women, have 2.108 times bigger chance to be employed. For the factor of education is valid that, in the comparison of most frequently represented groups in the Czech Republic (middle secondary education and higher), the chance to be employed is 0.531 times lower for high school students than for undergraduates (university students). The created logistic regression model correctly classified 75.5% of respondents, which is not a small percentage but indicates insertion of other explanatory variables. Data are obtained from the Labour Force Survey, which examined the Czech Statistical Office. The statistical calculations were carried out in the SPSS statistical software, version 18th.

**Key words:** logit, logistic regression, the labour market, gender, classification of education.

**JEL classification:** C3

## 1 Introduction

Authors of the paper examine the impact of variables that affect the labour market in the Czech Republic. Currently, the most commented are the issues of gender and education policy. This is the content of the Lisbon strategy and Agenda 2020, which are the European Union's plan for an improvement of the economic, social and political situation of the Member States.

Unemployment is perceived increasingly not only as a factor affecting living standards, but also as a factor impairing social relations, which gives a sense of a limitation. Therefore, mainly, the repeated and long-term unemployment is associated with the social exclusion. (Jahoda, 1982)

Similar issues are discussed by the authors in the article "Labour market structures and women's employment levels", which describes the status of women in Switzerland. In the analyses that were applied in a scientific article, the authors used the logistic regression. (Buchmann, Kriesi and Sacchi, 2010) Compared to the Prix that examines differences in

generating the graduates in the labour market in four EU countries (Netherlands, Norway, Finland, Sweden) using a multivariate logistic regression model (multinomial logistic regression models). (Prix, 2009)

Even Smyth in a part of his memoirs focuses on differences between men and women in Europe. The paper is called "Gender differentiation is an early Labour market Gross Integration Europe. The author focuses on the influence of education and states that despite the fact that women now have the same education as men, there are still significant differences between men and women in the labour market. The article also shows the differences between European countries. (Smyth, 2003) Similar conclusions can be found in the study which was conducted in Spain and Germany by Reimer and Steinmetz. The academic article, of these authors, quoted in the report continues the mentioned study. (Reimer and Steinmetz, 2007)

Differences in employment between men and women were proved by the author of *Diversity in Work: The heterogeneity of Women's Employment Patterns* (Yerkes, 2010). Differences were found even in such developed countries as the Netherlands, Germany and Great Britain. In a sub-section Yerkes also mentions a very different position of childless women and women who are mothers.

Reimer is focused on the impact of gender differences in tertiary education at the two selected risk factors of the labour market - unemployment and low employment. Again, in the paper, the author uses logistic regression for solving to the objective. (Reimer and Steinmetz, 2009)

## **2 Materials and Methods**

Categorical data are gathered mainly by virtue of surveys and at work with them we start from one-, two-dimensional or multidimensional frequency tables. Each dimension of the table then corresponds with the classification into categories according to the certain variable. The paper is focused on finding the best and meaningful regression model that describes the relationship between the explained (predicted) variable and a group of explanatory variables (predicting). (Meloun, Militký and Hill, 2005)

The calculation of the model for the given relation will be done with the aid of logistic regression, which is one type of regression models that takes into account the specifics of categorical explained variables. According to the type of explained categorical variable we can divide the models of logistic regression to binary (alternative, dichotomous), multi-categorical (polynomial, multinomial). (Hebák et al., 2007) The binary logistic regression is based on the assumption that illustrated by the variable takes only two values.

In this case the logistic regression is numerically but also interpretively easiest. Multi-categorical linear regression is based on the assumption that the explained variable has the character of nominal or ordinal data

In the logistic regression function we reflect the explanatory variables generally. The explanatory variables can be by the quantitative as well as categorical character in all models of logistic regression (the particular categories are expressed by means of indicators).

The created regression model should not describe only the best selective data but on this basis there should be the possibility of generalisation for the whole population.

The logistic model is evaluated according to the ability of decision whether at the monitored units a phenomenon occurs or not (procedures appropriate for unsorted data) then according to correspondence of the real and expected percent occurrence considering the accession of the given phenomenon (appropriate for sorted data). Logistic regression differs

from the linear regression mainly by the ability to predict the probability of the given event which either has happened (a value equals to 1) or has not happened yet (the value is 0).

For creation of conditions of detention is used so-called logit transformation. (Meloun, Militký and Hill, 2005)

The estimation of parameters of the logistic regression function ( $\beta_0, \beta_1, \beta_2, \dots, \beta_k$ ) is based on the method of maximal veracity which results from maximization of the veracity function of the optional data with regard to unfamiliar parameters.

The result is a system of nonlinear veracity equations the actual estimates of parameters are obtained by iterative procedures (Newton-Raphson method). For testing whether the regression coefficient  $\beta_k$  is statistically significantly different from

zero, the Wald test criterion  $z = \frac{\beta_k}{SE_b}$  is used. It tests the statistical significance of the zero hypothesis for the particular estimates of regression coefficients.

$SE_b$ , in this case, represents the standard deviation of regression coefficient  $b_i$ . (Meloun, Militký and Hill, 2005) The decision made on the basis of Wald characteristics should be motivated by the evaluation of change in the logistic model in the event of insertion or inclusion of a variable into the model. The evaluation of the classification power of the model is done on the basis of the classificatory table. This is a four-cell table, in terms of this table we can specify how many objects were classified correctly.

For testing of the statistical hypotheses and the subsequent analysis there was chosen the level of significance  $\alpha = 0.05$ . Statistical calculations were carried out in SPSS statistical software, version 18<sup>th</sup>.

### 3 Results

Based on the results of the investigation and after a detailed analysis of individual cases the data matrix which contained the answers of respondents in the 4<sup>th</sup> quarter of the year 2009 has been compiled.

The matrix was reduced mainly by virtue of the selection of respondents. The age limit which was chosen is within the interval 15-64 years.

These are the people who were included in the analysis. The reason of this selection is their economic activity.

The explained variable with a status employment was recoded for the purpose of analysis into binary variable that takes values unemployed, inactive = 0, employed = 1

The explanatory variables in the model were selected on the basis of a logical assessment of relations and with the help of simple relations calculated on the basis of compiled contingency tables.

The explanatory variables which were included in the logistic regression can be divided into qualitative variables of age and categorical (indicator) variables of sex, educational attainment and employment office registrations. Therefore, three sets of indicator variables enter to logistic regression. The indicator variables, whose reference category was always the last category of categorical variables.

In the chosen method of calculation we start from the algorithm - indicator, where each category creates a variable 0 - 1.

In order to find the best model of calculation of the logistic regression the stepwise method Forward LR was chosen. Based on this method 3 models were developed.

The preliminary classification table of the entry model (Table 1) gives us a percentage representation of correctly classified objects in every class and at the same time the overall percentage of correctly classified objects.

This model predicts that all respondents are employed. This means that the model correctly classified only 63% of respondents. It should be noted that this model involves only constant  $b_0$  ( $b_0 = 0.533$ ) to the calculation.

**Table 1.** Classification table of the model input

Observed		Predicted			
		Employment		Percentage Correct	
		yes / no			
		unemployed, inactive	employed		
Step 0	Employment	unemployed, inactive	0,000	14785	0,000
	yes/no	employed	0,000	25193	100,000
Overall Percentage					63,000

Source: SPSS

The statistical significance of the model is shown in Table 2, where on the basis of chi-square statistics is tested the zero hypothesis with a zero value of all parameters in the model ( $\beta_0 = \beta_1 = \beta_2 = \dots = \beta_k = 0$ ). For all of these three models the achieved significance level (p-value) is less than the selected significance level ( $p = 0.05$ ). In this case we refuse the zero hypothesis and we can claim that information about the values of explanatory variables allows us to predict the values explained by the variables.

**Table 2.** Summary table of statistical significance of the model

		Chi-square	df	Sig.
Step 1	Step	5634,109	4	,000
	Block	5634,109	4	,000
	Model	5634,109	4	,000
Step 2	Step	3445,260	1	,000
	Block	9079,369	5	,000
	Model	9079,369	5	,000
Step 3	Step	962,432	1	,000
	Block	10041,801	6	,000
	Model	10041,801	6	,000

Source: SPSS

By the detailed analysis of Table 3 we find which of these models describes the given relation in a best way.

This table shows the analogues for the coefficients of determination  $R^2$ . In the outputs of the logistic regression procedures we cope with the characteristics of Cox and Snell  $R^2$  with  $R^2$  of Nagelkerke. The interpretation of the coefficient values is the same as in the case of the coefficient of determination in linear regression. In the 3rd step of the logistic regression there was achieved the highest value of these coefficients (0,222, respectively. 0,303). In terms of assessing the quality this is a model of medium-low dependency.

**Table 3.** Summary table of quality assessment model

Step	Cox & Snell R		Nagelkerke R
	-2 Log likelihood	Square	Square
1	47046,044 <sup>a</sup>	,131	,180
2	43600,784 <sup>a</sup>	,203	,277
3	42638,353 <sup>a</sup>	,222	,303

Source: SPSS

Further for the basic evaluation of the quality of a model the value of statistics -2 Log likelihood is used. It has asymptotic division  $\chi^2$  and it presents the degree of tightness of data interlay by the logistic model.

This statistic takes positive values and larger values indicate a worse prediction of the explanatory variables.

The success of the classification of the created model is shown in Table 4 This table gives us information about the percentage correctly classified observations of objects at each step forward the logistic regression. The highest value is reached in the third step of regression 75,5%.

**Table 4.** Classification table of the model output

	Observed	Predicted			Percentage Correct
		Employment yes / no			
		unemployed, inactive	employed		
Step 1	Employment	unemployed, inactive	4915	9870	33,200
	yes / no	employed	1392	23801	94,500
	Overall Percentage				71,800
Step 2	Employment	unemployed, inactive	6460	8325	43,700
	yes / no	employed	1470	23723	94,200
	Overall Percentage				75,500
Step 3	Employment	ne unemployed, inactive	6460	8325	43,700
	yes / no	employed	1470	23723	94,200
	Overall Percentage				75,500

Source: SPSS

The estimates of the parameters of the regression model are shown in Table 5 Based on the results of the Wald test criteria we can conclude that a significant effect was observed at the variables of sex, education and employment office registrations.

**Table 5** The resulting regression model

	variable	B	Wald	df	Sig.	Exp(B)	
Step 3	Sex_1 (Male)	b <sub>1</sub>	,746	938,659	1	,000	2,108
	education_3			4418,238	4	,000	
	education_3 (no education)	b <sub>2</sub>	-4,964	47,204	1	,000	,007
	education_3 (primary)	b <sub>3</sub>	-2,708	3010,565	1	,000	,067
	education_3 (secondary without graduation certificate)	b <sub>4</sub>	-,558	168,723	1	,000	,572
	education_3 (secondary to graduation certificate)	b <sub>5</sub>	-,632	219,131	1	,000	,531
	Labour Office_5 (Registered)	b <sub>6</sub>	-3,906	1358,597	1	,000	,020
	Constant	b <sub>0</sub>	1,220	962,667	1	,000	3,386

Source: SPSS

The other statistics that allow us to interpret the results of the logistic regression is a value of the chance changing Exp (B). The change of the chance higher than 1 indicates that with increasing value of the explanatory variables, the chance of implementation of the output variables also increases.

On the contrary the value smaller than one indicates that as the explanatory variable decreases the chance of implementation of the output variable decreases as well. The explained variable which, as the first, enters significantly into the model is a variable of gender.

During the monitoring of the chances there is obvious or evident that men have 2108 times bigger chance of being employed compared to women. Another explanatory variable characterizing the statute yes/no employment is a variable of education.

From the values of the coefficient of the change of the chance is perfectly clear that if the interviewee has completed secondary education without a graduation certificate (GCSE) his chance to be employed is 0,572 times lower than the interviewee secondary educated with the certificate. But still people who completed secondary education have a chance 0,531 times lower than people who graduated from a college (or university).

For respondents with primary education or no education compared to those college-educated is a chance reduced in a minimum rate (0,067 times, respectively 0,007 times). Another variable that is statistically shown in the model is a variable of registration at an employment office.

Here is a value of the chance very low only 0,020 and it implies that if the respondent is registered at the Employment Office's his/her chances to succeed are lower than for those who are not. In another part of the analysis we proceed to build the regression model. The formulation of the Logit model can be written in the form of - see relation 3:

$$\text{Ln} \frac{\pi}{1-\pi} = 1,220 + 0,746 X_1 - 4,964 X_2 - 2,708 X_3 - 0,558 X_4 - 0,632 X_5 - 3,906 X_6 \quad (3)$$

For interpretation of this relation we begin with the coefficient at the variable of gender – male, whose value of the regression parameter is positive (0,746). It represents the change of logit in comparison with the female gender. What we assume of this value is that if the graduate is a man his logit for employment increases. The next variable which has a very significant impact on the logit model is a qualitative variable of education. If the value of this variable in all monitored categories changes by one unit and the other variables remain constant, the logit reduces the value of 0,4964 among respondents with no education, respectively 2,708 (basic education), -0,558 (secondary without GCSE), -0,632 (secondary school GCSE).

The last variable which significantly enters into the logit model is a quantitative variable of the registration at the office - yes. If the value of this variable changes by one unit and the other variables remain constant, then the logit reduces the value of 3,906.

By using the logistic regression Prix proved the different status of persons in the labour market which was influenced by the attained education. It states that the higher the education is the higher the chances of finding the work. Even shows that the basic idea of the labour market is that education is the most important asset in the labour market. (Prix, 2009)

On the contrary Reimer and Steinmetz, on the basis of their results of the logistic regression, confirm their expectations that gender explains a considerable part of the difference in the (un)employment and low employment status. (Reimer and Steinmetz, 2007) There were also proved the differences between countries that were examined but the difference of the status of men and women in labour market was evidenced in all countries. (Buchmann, Kriesi and Sacchi, 2010), (Reimer and Steinmetz, 2007), (Reimer and Steinmetz, 2009), (Smyth, 2003)

Also Katrňák and Mareš in their article dealt with the issue of employment and unemployment in the Czech Republic. In their work they describe the influence of the gender, 5year age groups and education related to the probability of employment. In the model, which is listed in this article, is extended to the registration at the employment office. Therefore the faster success in finding the job is explained. (Katrňak and Mares, 2007)

## 4 Conclusions

The aim of any regression model should be meaningful and finding of the best model that describes the relation between the explained variable and a group of explanatory variables. The effort of the authors was (on the basis of the logistic regression) to analyse qualitative data on employment reps. unemployment and show that analyses of these issues based on data gained from the surveys can be useful and providing a deeper understanding of the context of the labour market. From the final classification of objects found in the logistic regression model results that the model correctly classified 75,5% of respondents. It is not a low percentage but nevertheless the authors are aware of that it would be appropriate to include other explanatory variables to the model. This would be the matter of the further investigation.

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The main outcome of the project will be the creation of an innovative study programme called International Business. During 30 months of the implementation of task (January 2011 – June 2013) we will create electronic support for all subjects taught in this programme. The electronic version of study materials will provide the latest scientific and practical knowledge to the students and to all other beneficiaries that they will be able to use for their professional purposes.

The aim of the project is to prepare highly qualified business professionals for the global workplace. During the two – year studies students will gain a combination of general business skills, language experience and specialised knowledge of the global marketplace.

This innovative course will prepare students who will have excellent transferable skills in communication, presentation, group working, and analysis. All of these will prepare them for a number of careers not just in the world-wide business arena but also in international organisations. More information can be found at the website <https://projekty.czu.cz>.

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The European Social Fund (ESF) is one of the EU's Structural Funds, set up to reduce differences in prosperity and living standards across EU Member States and regions, and therefore promoting economic and social cohesion.





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The main outcome of the project will be the creation of a sophisticated system of lifelong learning for FEM CULS’s teachers to increase knowledge and skills to the level of interdisciplinary. This will increase the adaptability of academics to changes in the global environment, information and communication technologies, sustainable development, social skills and language culture. During 30 months of the implementation of task (January 2011 – June 2013) we will create courses and electronic support for all interdisciplinary subjects taught in this programme.

The aim of the project is to expand interdisciplinary skills through better knowledge transfer between academics, improve language skills, effective use of information and communication technology for education and research activities and ultimately the unification of professional glossary.

A sub-objective is to strengthen communication channels between academics, both within universities and between universities and businesses. This system supports knowledge-based economy. More information can be found at the website <https://projekty.czu.cz>.

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