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## The Problem Of Youth Unemployment in Rural Area

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### Abstract

The development of Czech agricultural labour market has been continuously predominantly negative since 1989 and recently, the problem of youth unemployment is acute in many countries, not only in the Czech Republic, but also in the Russian Federation, where most of graduates of agricultural universities work in non-agricultural sphere and in urban area. The present paper tries to consider the problems faced by youth in the labour market after graduating from the university, the reasons for working in any sphere but not in agriculture and not in rural area. It identifies the factors influencing the profession choice by young people. It considers the opportunities for attracting young people to work in agriculture and rural area.

### Key words

Agriculture, agricultural labour market, youth, youth unemployment.

### Introduction

Labour and employment have been and remain the main sources of social reproduction, which associated with the production not only the subsistence, but the man himself, his spiritual and physical strength. Lot of researchers considered the problem of unemployment in different countries: Tor Jacobson, Anders Vredin and Anders Warne (1997) in Sweden, Yongsung Chang, Jaeryang Nam and Changyong Rhee (2004) in Korea, Charles R. Bean (1994) in Great Britain, Ragnar Nymoen and Asbjorn Rodseth (2003) in Norway, Robert A.J. Dur (2001) in the Netherlands, Roberto Bande, Melchor Fernández, Víctor Montuenga (2008) in Spain.

The problems that employers face in rural areas are very much determined by the low population density levels that characterize these settlements. This means that there are less people 'to choose from' when a vacancy arises, and it can be increasingly challenging to find a suitable candidate as the level of specialization required increases (Hoyos M., 2011). The drift of population away from the countryside is one of the main factors affecting the regional structure in many countries, and although the temporal course of this effect may differ from one country to another, in fact it is always the case that the consequences are most dramatic in the marginal areas of settlement (Muilu T., 2003). As noted Linda Marie Bye (2009), many rural communities in the Western world have experienced stagnation, migration and 'brain drain' in recent decades, and

as a result remote rural districts have been portrayed as profoundly masculine societies, unattractive to contemporary women and unsympathetic to their demands for equality.

In recent years, due to intense competition in labour market and the growing demand for highly skilled labour force, clarify issues related to youth employment.

These problems are caused by recession and job cuts, early release of youth into the labour market because of low income families, greater demands from employers for quality to labour force, while reducing the cost of its preparation. This problem was considered by many authors from different countries.

With the development of market relations youth unemployment is particularly negative.

For employment and unemployment purposes, „youth“ is generally defined as the period from the age when mandatory schooling ends through age 24. For most countries, that means the time span from 15 years old through 24 years old (Martin G., 2009).

Youth are three times more likely to be unemployed than adults, even in economies with strong economic growth. Especially this phenomenon spreads in rural areas.

In almost all instances, the unemployment rate for teenagers (aged 15 or 16 years to 19 years) is

consistently higher than that for 20- to 24-year-olds. Germany is the lone exception. All the reasons that make youth unemployment higher than the norm could be expected to make those who are the youngest within the youth range have the higher unemployment rate.

The aim of the article is to consider the situation of youth in the labour market of the countryside in the Czech republic and the Russian Federation, to analyze the main problems faced by young people and to identify new employment opportunities for youth in rural areas.

## Material and Methods

The starting data and figures included in Table 1 were obtained from the web pages of the Czech Statistical Office. These are absolute numbers of population by the age groups. The tables contain the data as of 31st December 2009, according to which the age of the population in the particular regions of the Czech Republic was assessed. Also it contains relative change of number of population of the country by the age groups. Nominal monthly wages in agriculture, industry and national economy of the Czech Republic were taken from the web pages of the Czech Statistical Office. The paper contains data which were obtained from the web pages of Russian Federal State Statistic Service. It includes absolute numbers of population by the age groups at 31st of December 2009 and its relative change, results of research made by Russian Union of Rural Youth about plans, motives, attitudes and expectations of rural youth.

Methodologically, the paper is based on secondary analyses of quantitative data. For the analysis, we used the methodology of comparing data obtained from the Czech Statistical Office and Russian Federal State Statistic Service.

## Results and discussion

### General demographic situation in Czech Republic and the Russian Federation

According to the data of the Czech Statistical Office the population of the Czech Republic, similarly as populations of other European countries, is getting old. Since the end of 2001, when the last population census took place and the demographic data were updated accordingly, the total population of the republic has grown by 300thousand during the period from 2001 to 2009. According to the definitive demographic data, the population exceeded 10.5 million at the end of the 2009 (Table 1). However, this increment was very unbalanced from the viewpoint of age. The part of the population in the pre-productive age up to twenty years decreased at the same time by 186thousand persons. The long-term negative trend in the birth rate development is documented by the fact that the number of children and young people up to 20 years of age decreased from the end of 1991 by more than 903thousand, i.e. by 30%.

The age group of 20-64, which has a decisive influence on the level of economic activity of the population, recorded the eight-years' increment by 13,6% (higher than the total increment in the

Age group	Status as at 31 Dec. 2009, thousands	Increment / loss according to status as at 31 December, %		
		2009/1991	2009/2001	2009/2008
<b>Total</b>	<b>10506.8</b>	<b>1.88</b>	<b>2.94</b>	<b>0.38</b>
0-14	1494.4	-29.54	-7.86	0.97
15-24	1316.7	-17.31	-11.27	-2.09
25-34	1686.4	24.68	6.38	-2.36
35-44	1546.9	-5.15	14.76	2.97
45-54	1380.7	8.86	-12.82	-0.35
55-64	1482.9	43.57	26.84	0.75
65 and more	1598.8	21.6	13.03	2.75
0-19	2110.4	-29.98	-8.1	-0.33
20-64	6797.6	13.6	4.65	0.05
65 and more	1598.9	21.59	13.03	2.74

Source: CZSO - definitive demographic data.

Table 1: Age structure of the population in the Czech Republic as at 31 December 2009.

Czech Republic population). However, within such a defined group of productive age (young people up to 20 years are mostly involved in the educational process and, on the other hand, retirement age is postponed for later), the development was very diverse. In eight years, similarly as in case of pre-productive age group, the number of young people (15-24) decreased by more than 167thousand or 11,27 %. A large decline was recorded also in the age group of 45-54 (by 12,82%). The losses resulting from changes in life-tree were offset by extraordinarily strong increase in the number of thirty-year old people by more than 380thousand and in the number of persons in the oldest ten-year group of 55-64 (by nearly 26,84%).

At the same time, the population in post-productive age (65+) increased by 184thousand persons in the monitored period or 13,3%. This increment practically equaled to the loss in the number of all children and young people up to twenty. That was the group which recorded absolutely the biggest year-on-year increment by 2,74%, as compared with the end of 2008, while the total population increased by less than 40thousand persons, y-o-y.

The resident population of the Russian Federation on 31 December 2009 amounted to 141.9 million (Table 2). In rural areas 27% of the total population of Russia lives. This is more than in Germany or the UK (11-12%), North America (20%) and even in Brazil (17%), although not as much as in China (60%). But Russia is losing many countries on the total agricultural production, and, most importantly, the productivity of labour. One of the main features of the demographic situation of recent decades in

the country is urban concentration in a small number of densely populated centers. Rural municipalities in the Czech Republic are usually classified municipalities with fewer than 2,000 inhabitants. They represent 89.82 % of all the municipalities and administer the territory covering 73.6 % of the total territory of the Czech Republic. Only one fourth (26.3 %) of the population, however, lives in rural municipalities. So we can conclude that situation in the both countries is very similar, most of people prefer to live in big cities

For rural municipalities, the agriculture constitutes a stabilizing factor especially for non-commuting population and helps the inhabitants identify themselves with the rural area concerned. Nevertheless, the process of aging of persons working in agriculture continues as well as the decrease in its numbers. According to international criteria, population is considered to be old, if the proportion of people aged 65 years and over in the total population more than 7%. Currently, nearly one in eight Russian, i.e. 13,3% of the population, are aged 65 and over. In the Czech Republic the same indicator constitutes 15,22%, that can be explained by a reduction of more active part of the population of the countryside. The minimum creation of job opportunities in agriculture and a limited offer of jobs in rural areas generally are reflected in the labour market imbalances and growth of the agrarian unemployment rate. The Czech Republic seeks to support greater diversification of agricultural activities and to strengthen its non-productive functions in order to increase the number of jobs. Unfortunately, these efforts have so far failed to bring about any major

Age group	Status as at 31 Dec. 2009, persons	Increment / loss according to status as at 31 December, %		
		2009/1991	2009/2001	2009/2008
<b>Total</b>	<b>141903979</b>	<b>-4.3</b>	<b>-3.01</b>	<b>-0.07</b>
0-14	21092427	-37.87	-18.62	1.29
15-24	21833481	10.47	-6.81	-4.95
25-34	22572792	-7.52	12.47	2.75
35-44	19254338	-14.01	-19.72	-1.29
45-54	22879474	41.28	9.77	-0.1
55-64	15372993	-6.76	10.59	7.9
65 and more	18898474	25.35	4.07	-3.52
	30353370		-20.62	-2.18
0-19		-31.34		
20-64	92652135	4.11	3.06	1.38
65 and more	18898474	25.35	4.07	-3.52

Source: Russian Federal State Statistic Service.

Table 2: Age structure of the population in the Russian Federation as at 31 December 2009.

positive results. The rate of increase of population in the age 65 and more in 2009 in the Russian Federation in comparison with 2001 was 4,07%, that is more than the rate of increase of people aged 20-64 which constitute 3,06% and amount of young people for the period from 2001 to 2009 decreased by 20,62%. The down-sizing of young people in the age of 0-19 in the Czech Republic is less significant than in Russia but the share of this group of population in the both countries is approximately the same (21,4% in the Russian Federation and 20,1% in the Czech republic)

Thus, one can say that the situation in the Russian Federation is worse than in the Czech Republic, on the one hand, because in the Czech Republic the decrease of young people is less and the growth of working population is more. But on the other hand, the increase of the old population is more significant in the Czech Republic than in the Russian Federation (13,03% against 4,07%).

The population aged 0-15 years for 18 years (1991 to 2009) declined. In 2008, due to increased number of births in this age group increased slightly - by 44 thousand, or 0.2% in 2009 - by 313 thousand or 1.4%. The rate of birth in the Czech Republic in 2009 is 8,3 per 1000 population, which has tendency of insignificant decline. So the share of age group 0-14 rapidly decrease on 7,86% in the period from 2001 till 2009, that less than in the Russian Federation, in which this decline for the same period is 18,62%.

The population of working age, compared with the beginning of 2009 decreased by 0,9 million or 1,0% (in 2008 0,4 million or 0,5%) and amounted to the beginning of 2010 by 88,4 million people. Indicator demographic pressures increased to 606 per 1000 working age population (in 2009. - 590), including the burden of children - 259 (253), and people of retirement age - 347 (337). In 2009, the majority part of the population of the Russian Federation, 16,12%, was in the age category 45-54 years. Little more than in the previous and following age groups, which contain 13,57% and 10,83% respectively. In the Czech Republic the most part of population concentrate in age group 25-34 and 65 and more. It shows that on the one hand the population of the Czech Republic own labour force of high quality, because in this age people usually has work experience and they are not old. But on the other hand, one can observe the process of "greying" of the labour force of the Czech Republic.

The most vulnerable in the labour market (as in the Czech Republic as well as in the Russian Federation) are young people particularly in rural areas. For

employment and unemployment purposes, „youth“ is generally defined as the period from the age when mandatory schooling ends through age 24. For most countries, as for the Czech Republic, that means the time span from 15 to 24 years old. Spain, Sweden, the United Kingdom and the United States have the youngest youth age: 16 years. In Italy, it was 14 before 1990, but has been 16 years old from 2009 year. In the Russian Federation "youth" defines as the group of people at the age 15-29. For them it is especially difficult to find suitable work due to the lack of job vacancies. In rural areas, today there are almost no well-functioning enterprises with suitable job vacancies for young people. Practically, there are no working farms, and those who operate, offer jobs for low pay, delayed payment of salaries of practice or the payment of the final result, which doesn't attract young people.

Some scientists suggest different ways to decide the problem of youth unemployment. One of them is developing of the rural nonfarm sector (RNFS). One of the direction development of RNFS is rural tourism. Rural tourism focuses on participating in a rural lifestyle. It can be a variant of ecotourism. Rural tourism - a form of tourism, which involves a temporary stay of tourists in rural areas to rest or participate in farm work. Mandatory requirement: accommodation facilities for tourists, individual or special, shall be located in rural areas or small towns with no industrial and multi-store buildings (Hájek T., 2002). There is European Centre for Ecology and Tourism (ECAT) is an organization which supports the development of rural tourism in Europe, and the Czech Republic is its member. One of the main tasks of this organization is to create new job opportunities for village people (Antoušková M., 2009). There are lots of prospects for development this kind of activities in the Czech Republic and in the Russian Federation, as both countries have vast rural territory.

### **Reasons of youth unemployment and problems of young people on labour market**

Accordingly, a number of recent studies have sought to investigate the dynamics of the unemployment problem within labour markets, resulting in the identification of a range of barriers to work faced by rural job seekers. These barriers include: demand-side problems related to industrial restructuring, geographical remoteness, and low population density; localised skills mismatches; an over-reliance on low-skilled, casual (often seasonal) work; the preponderance of small enterprises that are more likely to fall victim to sectoral downturns; and a weak transport and service infrastructure (Lindsay C., 2003).

Youth unemployment rates are relatively higher for a number of reasons. First, young people are among the most vulnerable during an economic downturn when workers are being laid off and there are hiring slowdowns or freezes. Youths typically have the least seniority, the least work experience, and the least amount of company training invested in them, and they are more likely to be working on a short-term contract. They are, therefore, the most likely to be let go. Indeed, even if, on the one hand, there were no layoffs at all, but only a general hiring freeze, unemployment among young people would still grow as they attempted to move from school into the labour force upon completing their education; and if, on the other hand, employers were forced by economic conditions simply to be more discriminating in their hiring, those with no experience or with very little experience would be the least likely to be hired, and these, too, are most likely to be the young. Numerous studies have shown that youth unemployment rates are more sensitive to the business cycle than are adult unemployment rates.

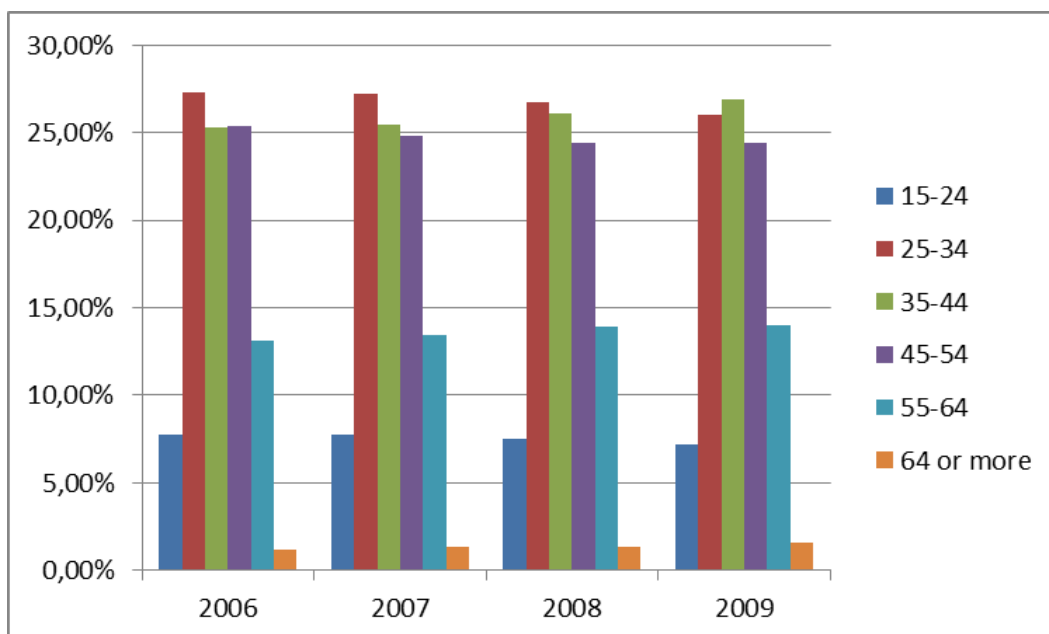
Second, whatever the state of the economy, young people simply have less experience in looking for work. Lack of experience at work is counteracted to a degree by the willingness and ability of youths to work for less money, but lack of experience in the process of finding a job is not.

Third, young people, generally with fewer resources than older workers and a stronger financial attachment to family, tend to be less

mobile. Consequently, they are somewhat less able or willing to move to places where more jobs might be available. This is especially true for those in the 15- to 19-year-old category, and in countries where attachment to home is particularly strong, the more important that factor would be.

Fourth, young people, with fewer financial obligations and often with family support, can typically afford to take immediate employment less seriously – especially as family sizes have shrunk and the pressure to get a job to help support the family has subsided. The younger the prospective workers, the less serious they tend to be about paid work. If they are students, the jobs they are likely to get, or to lose, are typically not full-time, career-track jobs, and they usually pay very little. Young people sacrifice less by passing up such jobs than do older people, whose search for employment is typically for career-type jobs. Whether the jobs are career track jobs or not, young people with financial support from parents can usually afford to wait longer for just the right job to come along. Thus, in this instance, a higher rate of unemployment actually may reflect economic strength, rather than economic weakness, for youths (Martin G., 2009). We can also identify the following reasons of youth unemployment:

- increase the total number of unemployed in relation to the already held and the upcoming bankruptcy of a large part of agricultural enterprises



Source: CZSO - definitive demographic data.

Figure 1: The shares of various age groups employed in "significant rural regions" in national economy of the Czech Republic between 2006 and 2009.

- in recent years, industrial enterprises are mainly aimed at self-preservation and survival, rather than on the development and expansion of production
- increase in the number of young unemployed largely related to the mismatch of their vocational training with labour market requirements and the lack of up-to-date career guidance for young people
- absence of demand of young people on the labour market concerned with the fact that a significant portion of youth unemployment aims to get a job corresponding to his training and highly paid, but does not receive such, that is due to inconsistency of supply and demand of labour.

Thus, there are a lot of reasons, which young people can't find worthy job as on labour market. All these reasons have negative effect on youth. Unemployment leads to loss of young people skills, the loss of ability to work intensively in some cases it leads to personal degradation, adversely affects the demographic situation.

#### **Youth in the labour market of the Czech Republic and the Russian Federation**

Classification NUTS 3 regions based on the share of population in rural grid cells. More than 50% of the total population in rural grid cells is predominantly rural, between 20% and 50% in rural grid cells - significantly rural and less than 20% - predominantly urban. For the Czech republic this means that the capital of the Czech Republic - Prague comes under the category „predominantly urban regions“, region Vysočina comes under the category „predominantly rural regions“ and all other regions (NUTS 3 level) represent the category „significantly rural regions“ (Bednarikova, 2006). But it is very difficult to separate these three levels. That is why NUTS 3 level in the present research includes not only the population living in the countryside, but also in the city, but the share of the first one is more significant than of the last one.

Pursuant to the OECD methodology applied for the determination of rural areas in the European Union the total area of rural regions of the NUTS 3 level in the Czech Republic is 78 370.9 km<sup>2</sup>, that means 99.37 % of the country territory and it is inhabited with approximately 9.05 million inhabitants, that means 88.55 % of the country population.

The shares of various age groups employed in “significant rural regions” in national economy of the Czech Republic are represented by Figure 1.

The highest share of employed in “significant

rural regions” falls within the age category of 35-44 years (26,85% in 2009) against the share of employed in the age category 15-24 years, which constituted 7,16%. During the period between 2006 and 2009 year the share of youth on labour market of “significant rural regions” decreased, at the same time the share of people in the age group 55 or more has a tendency to increase.

Many rural areas in North-West Europe experience a net outmigration of the young population. Highly educated young people in particular are inclined to leave these areas. Policymakers are concerned about this ‘brain drain’ and see the selective outmigration of socially mobile young people as a threat to the economic development and reputation of the region (Thissen. 2010).

Since 1989, the age of agricultural workers has been generally increasing, establishing the most important problem within the set of the socio-demographic characteristics of agricultural population. While in 1989 the share of workers under 30 years of age amounted to more than one fifth (21.4%) of the total, in 1995 it was already 17.8%, in 2000 13.5% and by 2003, the share was nearly a half of the original number (11.4%). Since then, the share of this category has been stabilized at about 11%, yet, as a whole, agricultural workforce is still growing older. Their average age has increased by almost four years between 1989 and 2008 and now it reaches approximately 46 years. Although the average age of country's labour has been increasing as well (copying the natural aging of the economically active population), agricultural workers are presently by about four years older – in the mid-1990s, the difference was about three years and it peaked in 2004 at about 4.5 years.

The highest share of agricultural workforce falls within the age category of 45–59 years (48.5% in 2008, in case of women it is even higher – 54.3%). The higher percentual share of this category as compared to the category of 30–44 years on the one hand, and a less than half-sized share of the youngest category of 24 years and less on the other, are the main differences in comparison between the agricultural and the entire country's workforce. Also, within the agricultural sector, the share of the oldest category of 60+ years (which is the lowest within the entire country's workforce) has reached the same values as the share of workers in the category of 25–29 years. In other words, the share of workers over 45 years of age constitutes 55% of the agricultural workforce and only 40% of total country's workforce (Spesna. 2009).

One more important factor influences the choice of profession by youth is wages level. Its dynamic is

shown in Figure 2. The average monthly nominal wage in agriculture reached 17941 CZK in 2009, compared 22862 CZK in the industrial sector and 23488 CZK in the national economy total. In both comparisons, the absolute difference reaches about five thousand CZK, in case national economy the difference is more than five and a half thousand CZK. This deficit contributes to the agriculture's reputation of low-paid work.

The disparity of agricultural wages for the period between 2000 and 2009 has been oscillating around the 71,6 % for the last ten years. In 2009 it reached 72,8 % in industry and 77,7% in national economy of the Czech Republic. Thus the growth of wages in agriculture was the smallest for the last period of time.

If we consider the situation with the wages in the Russian Federation, it looks significantly worth than in the Czech Republic. The difference between the wages level in industry, agriculture and national economy of the Russian Federation and salary in agriculture of the Czech Republic is presented in Figure 3. As can be seen from the graph the average monthly wage in Russian agriculture reached 222 € in 2009, compared to 382 € in the industrial sector and 430 € in national economy total. In both cases, the absolute difference reaches more than 150 €. At the same time the salary in agriculture of the Czech Republic is almost three times higher than in agriculture of Russia. Despite this fact, agriculture in both countries is unattractive for young people and has the characteristic as a low-paid job. And most of them try to find better and high-paid job

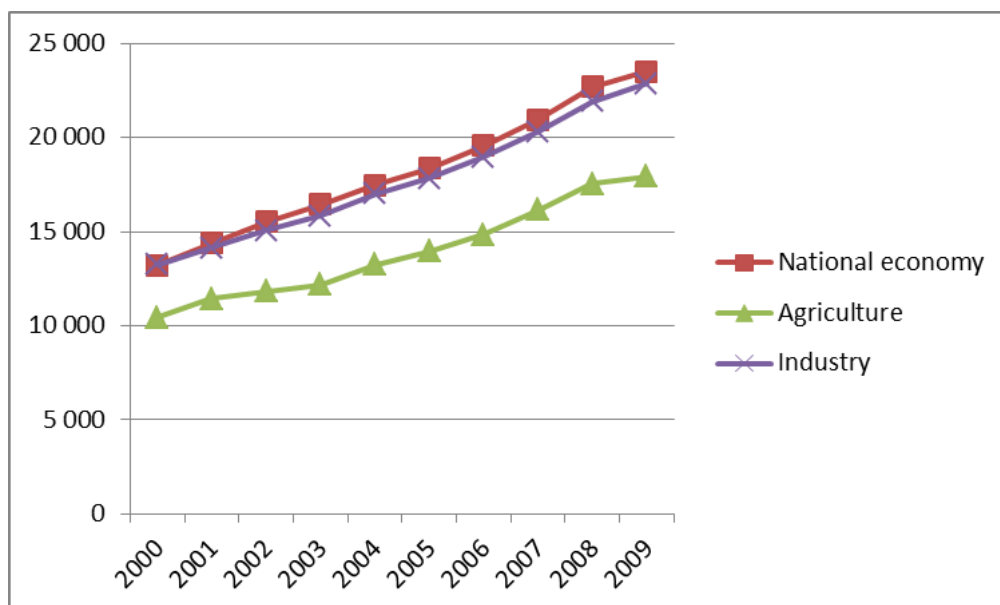
in industry and service, which is concentrated in urban regions.

In agriculture of the Russian Federation, there is deterioration in the quality structure of the labour force. Annually declining number of graduates of agricultural institutions fixed on the village. Less than 15% of the graduates continue to work in the countryside in recent years. This, in turn, leads to aging of the rural population. Reduction of human resources has a negative impact on production efficiency. One of the major reasons for the outflow of rural youth is the low prestige of rural labour, low pay and irregular payment of wages (Babekina. 2009).

In April-May 2010, the Russian Union of Rural Youth for professional consulting support of All-Russian Public Opinion Research Center conducted a case study whose purpose was to study plans, motives, attitudes and expectations of rural youth.

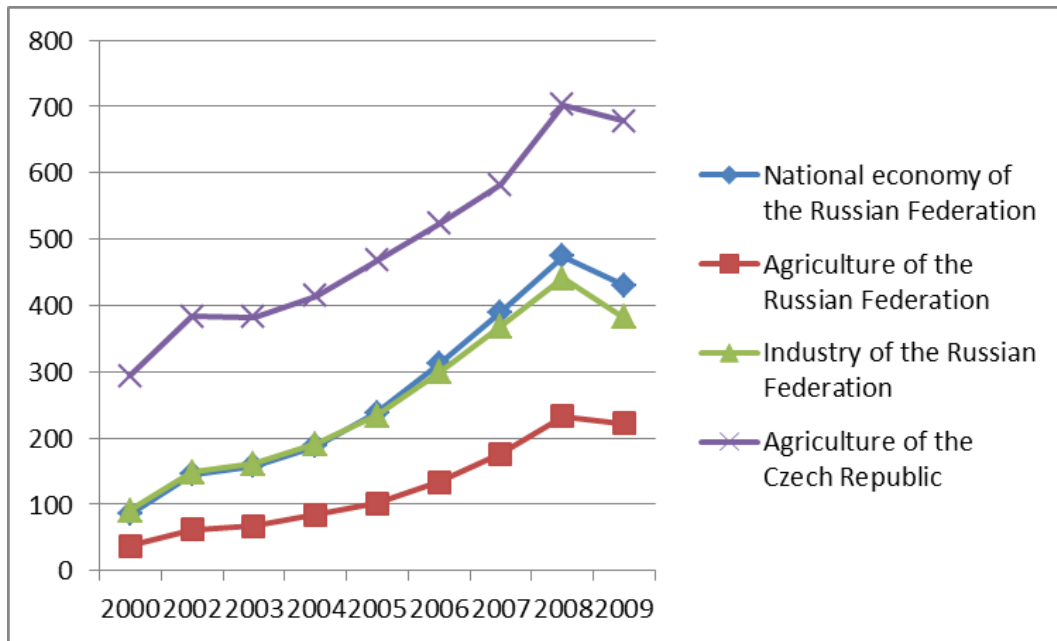
As the results of the study, life plans of rural youth have different directions. In this case, most young people (48,8%) have no plans to connect his life to the village. At the same time more than the third of young men (35,9%) in the future plan to live and work in rural areas or to return there after receiving vocational training.

It is noteworthy that among men the percentage of those who intend to live in the village is significantly higher than among women. In particular, almost two-thirds of girls (61,2%) are inclined to leave the village.



Source: CZSO - Labour Statistics.

Figure 2: Nominal monthly wages in agriculture, industry and national economy of the Czech Republic (Czech Koruna).



Source: Source: Russian Federal State Statistic Service, CZSO.

Figure 3: Nominal monthly wages in agriculture, industry and national economy of the Russian Federation and in agriculture of the Czech Republic (Euro).

There are noticeable differences in life plans in different age groups of youth. The study showed that the percentage of those planning to leave the village, with age, gradually increases and reaches its maximum to 21 years (66,5%). There is a pronounced tendency to decrease the desire to leave the village in the future. Only a third of young people (33,5%) aged 25-30 years has not yet parted with plans to move into the city.

It says, that population of rural area (on NUTS3 level) becomes older. It can negatively influence labour market of "significant rural regions" of the Czech Republic and rural area of the Russian Federation. In the future, if the tendency doesn't change, there will be less specialists, which could change the old ones.

## Conclusions

Youth in the labour market is quite vulnerable category, the issues of providing effective employment which are matters of public policy. Of course, the decision of this problem is impeded in the social, economic, legal and political spheres of our live, so the appropriate measures should be adopted correspondingly.

The interest of young people in working in agriculture is low, because of high demand for unskilled labour, low wage levels in comparison with industry and total national economy of the Czech Republic.

The effective problem solution of youth employment in rural regions can be a complex program of adaptation of students in the labour market.

The most important of its directions should be the following activities as in Russia as in the Czech Republic: first of all it is necessary to teach students the process of employment, broad information about employment opportunities, professional growth and development; teaching students the labour legislation, more knowledge about the rights and responsibilities of job seekers; important point is to stimulate the activity of students through participation in the development of their activities (social organizations, business games, etc.).

One more measure to increase the potential size of the demand for worker-student (as an intern and full-fledged employee) can be the development of incentives to employers (tax benefits, partial compensation of expenses for employee additional training and joint projects to address the internal problems of the enterprises, etc.). It is necessary to develop this activity in both countries as in The Czech Republic as well as in the Russian Federation.

Restoration and development of rural infrastructure – this measure is especially relevant for the Russian Federation. A lot of Russian villages have a lack of basic infrastructure, electricity, drinking water, transport chain, school, and hospital. Information system is also one of the priority directions in the development of the countryside. It expands opportunities for integration into the global

economic system. All the enterprises face with the problem of collecting, analysis and proceeding of big amount information. There is always the need to work in the following directions: identification of issues and information requirements; selection of information sources; information gathering; information processing and evaluation of its completeness and relevance; analyzing information and identifying trends in selected areas. The development all of these services can create new jobs and attract young people to the countryside

The rural nonfarm sector (RNFS) is increasingly playing an important role in the development of rural areas. The RNFS will need to become more and more a major provider of employment and income to many rural people. It should be noted, however, that RNFS is not a substitute for employment in agriculture but rather a supplementary measure. RNFS can include such activities as production of fertilizer, maintenance and repair of agricultural equipment; transport; the construction or maintenance of market facilities and commerce. As Russian center of agricultural consulting reports the share of rural tourism in Russia is low and currently stands, according to expert estimates, 1,5 - 2%. However, Russia has all the prerequisites for the development of this type of tourism. In developed European countries, rural tourism in the popularity ranks second after the beach. Currently, rural tourism in Europe brings about 20-30% of the total income of tourism industry. Rural tourism is not really one of the most seminally developing branches of travel industry in the Czech Republic, but it has a great prosperity in future. In the Russian Federation there is National Association of Rural Tourism, which was founded in 2010, if put into comparison with ECAT which was founded in 1994. Also there is The State Tourism Policy Concept in the Czech Republic for the period of 2007 – 2013 which constitutes a mid-term strategic document, which is first of all based on development potential of tourism in the Czech

Republic. The main problem for development of rural tourism in the Russian Federation is the absence of common national concept for the development of rural tourism and a clearly articulated state policy on rural tourism and, accordingly, a system of normative-legal framework for this activity as in the Czech Republic. Therefore, the authorities of Russia, firstly, should project the national program of agro tourism development that could contribute the extension of this branch. In the frame of this program government should define the tasks, such as project of standards and regulations applicable in the field of rural tourism as a special sector of the tourism industry; increase of qualification of labour force and knowledge and experience in the service of foreign and domestic tourists. This kind of tourism saves the landscape, especially the one that is provided on ecological farms. The money earned by accommodating tourists and other related services helps to develop other agricultural activities. The development of rural tourism has a lot of advantages: reducing unemployment, promoting job creation, revenue growth and improving living standards of rural residents with relatively small financial costs; improving villages, the development of engineering and social infrastructure; the development of small rural business as well as environmental attractiveness of the countryside.

These measures will improve the situation of the youth labour market. On the one hand it will be advisably for young people as potential employees and for employer on the other hand. Graduates can get knowledge about how to behave during job search, their rights and responsibilities and development of their career. Employers can get young workforce that has such advantages as educability, mobility, fresh look, ability to adapt quickly to changing conditions in comparison to older generation. All these characteristics need for innovation development of national economy of the Czech Republic and the Russian Federation.

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## Analysis of financial support influences on management of agricultural enterprises

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### Abstract

The paper deals with monitoring of a height, a structure and impact of supports in frame of exercitation of EU CAP on income from operations of selected Czech agricultural enterprises. The selection of enterprises has been implemented on base of differentness in the enterprise form, in the acreage of managed farm land and a differentiation of the enterprise subject. From a comparison of volume and structure of the supports it results that an agricultural cooperative uses a wide spectrum of particular types of subsidies, which is caused by a big acreage of almost 7 800 ha with orientation to both the plant and the animal productions. Similar situation is in the valued joint-stock company. Without received subsidies the economy of private farmer would be unprofitable in both the years. In monitoring it was proved that differentiation of enterprise activity in form of raw material process in excess of framework of agricultural basic industry decreases dependence of the income from operations on obtained financial means in form of supports. From the mentioned facts it is obvious that the received financial subsidies significantly positively influenced the operating results of all agricultural enterprises where the basic activity subject is plant and animal production.

Pieces of knowledge introduced in this paper resulted from solution of an institutional research intention MSM 6046070906 „Economics of resources of Czech agriculture and their efficient use in frame of multifunctional agri-food systems.“

### Key words

Common agricultural policy, financial support, direct payments, income from operation, loss, profit, agricultural enterprise.

### Anotace

Příspěvek se zabývá sledováním výše, struktury a působení podpor v rámci uplatňování SZP EU na výsledky hospodaření vybraných českých zemědělských podniků. Výběr podniků byl proveden na základě rozdílnosti v podnikatelské formě, ve výměře obhospodařované zemědělské půdy i diferenciaci předmětu podnikání. Ze srovnání objemu a struktury podpor vyplývá, že zemědělské družstvo využívá široké spektrum jednotlivých typů dotací, což je způsobeno velkou výměrou téměř 7800 ha s orientací jak na RV, tak na ŽV. Obdobně to platí i pro hodnocenou akciovou společnost. Bez přijatých dotací by bylo i hospodaření soukromého zemědělce v obou sledovaných letech taktéž ztrátové. Sledováním se prokázalo, že diferenciacie činnosti podniku v podobě zpracování suroviny nad rámec zemědělské prvovýroby, snižuje závislost výsledku hospodaření na získaných finančních prostředcích v podobě podpor.

Z uvedených skutečností je zřejmé, že přijaté finanční podpory měly výrazný pozitivní vliv na výsledek hospodaření všech hodnocených zemědělských podniků, kde základním předmětem činnosti je rostlinná a živočišná výroba.

Poznatky prezentované v článku jsou výsledkem řešení výzkumného záměru MŠM 6046070906 „Ekonomika zdrojů českého zemědělství a jejich efektivní využívání v rámci multifunkčních zemědělskopotravinářských systémů“.

### Klíčová slova

Společná zemědělská politika, finanční podpora, přímé platby, výsledek hospodaření, ztráta, zisk, zemědělský podnik.

## **Introduction**

Principles and forms of realization of the Common Agricultural Policy have developed and gradually changed throughout its existence. For Czech agriculture these rules acted already for two budget periods, for short 2004 – 06 and the whole period 2007 – 13. For both the periods there were and are hold partly unchanging rules but some forms of application have changed also according to circumstances. The aid system applied by the CAP of EU influences in a significant way the economic situation of agricultural enterprises.

“Accession to the EU and the introduction of CAP support, and in particular the direct payments per hectare have improved the market conditions in the CR and have increased farm incomes” (Latruffe, Davidova, 2007).

Proposed reform measures of the CAP from 2003 concerned also areas of provided aids. A transition from price support and a high intervention into the market mechanism towards the direct help – it was planned to decrease prices and their approximation to the world prices and providing of direct compensations with an emphasis on the Less Favoured Areas (LFA). The decrease in prices should have happened in the sector of cereals, beef meat and milk products; during the first half of new decade by 10 to 30 %. A fall of market incomes will be compensated by direct payments separated from production (decoupled payments). The direct payments will be accompanied by two new elements (Neumann, 2004):

- a) degressivity – a gradual decrease of direct payments at time
- b) modulation – a determination of maximal payment per farm or a progressive decrease of payments per tonne or hectare according to growth of total payments per one farm.

The degression and modulation principle will start to refer to new member state when their direct payments reach the level of direct payments in the original EU 15 member states.

The European Union declared at a meeting in Dauha that it did not want to abandon the possibility to keep a certain support. Most of member states wishes to preserve the union intervention system. The reason is a sustenance of farmer incomes, a market stabilization and a maintenance of the traditional function of European agriculture – the maintenance of rural landscape. Without subvention for example agrarian production in mountainous Austria or in unfavourable climate of Scandinavian states

(Štolbová 2007) would not be sustained.

In Germany, “direct payments currently make a great contribution to agriculture incomes. The absence of direct payment, therefore, would cause a huge income gap, particularly in extensive livestock farms” (Uthes at al, 2011).

Different amount of subsidies according to the type of farming together with increasing subsidy rate may influence the type of farming. Therefore, it may cause a paradox that the structure of subsidies according to the type of farming will stimulate products that are currently suppressed. The difference in subsidies in comparison with the largest producers with a similar structure of agricultural production is significant for the Czech Republic and it is possible to compare it to the increase of the SAPS by 75 % (Střeleček, Zdeněk, Losová 2009).

The results indicate that the current subsidies have an impact on the stability of the farmers' income. Partially or fully decoupled payments serve as a “financial pillow” increasing the level of the farmers' income and extending the farmers' decision-making possibilities. Furthermore, the current subsidies reduce the variability of the farmers' income. The current subsidies are a suitable complement to other commonly used risk management tools primarily designed to reduce the farmers' and farm income variability (Špička, Boudný, Janotová 2009).

For example, “under the past Common Agricultural Policy (CAP) olive oil subsidy regime, farmers were eligible for subsidies on the basis of amount of olive oil produced. This led to an intensification of production and negative environmental effects on sloping land, such as loss of biodiversity and more soil erosion. In 2004 the olive and olive oil regime changed, with integration of support to olive farmers in the Single Payment Scheme (SPS). From 2006 to 2013 farmers receive a constant amount of subsidies, based on the average amount they received in the 4-year reference period 1999–2002. This paper shows financial results for four major types of olive groves: traditional, organic, semi-intensive and intensive. It shows that without subsidies only intensive farms are now financially viable, and that traditional and organic farms, even with present subsidies, have to deal with returns to labour below local wage rates.” (de Graaff, Kessler, Duarte, 2011)

This paper deals with the possible impact of one RDP measure – the reduction of LFA payments according to farm size. Taking into account the variety of regions in Europe and the different

situations at national level, it is difficult to provide a single guideline to solve the problem. Implementation without a deep analysis could lead to undesirable consequences. A specific adjustment to the situation of the given country will be advisable (Štolbová, 2007).

The paper deals with the employment of decoupled direct payments as the model of targeted lump-sum financial transfers to the farmers. It considers whether decoupled payments may alter producers' resource allocation over time and lead to effects on production. Decisive topics of influence through which decoupled payments as an instrument of income redistribution could affect production through recipient' decisions in both short and long time horizons are bringing to the attention as follows: wealth and investment effects, sector consolidation and payment basis effects in the framework of agricultural policy (Bečvářová, 2007).

Mosnier et al. (2009) dealt with whether implementation of the CAP MTR, (involving decoupled payments reduced by "modulations" and subject to cross-compliance measures) can be effective in improving the environmental impact or arable farming. Decoupling and modulation result in a fall in the total gross margin of around 3 %, principally because of the 5 % modulation rate, while "buffer strips" requirement leads to a further decrease of around 1 %. Moreover, this requirement improves the environmental indicators at the farm level.

To successfully obtain supports in frame of the CAP of EU, farming subjects have to meet conditions of environment protection, food safety, health and animal welfare as well as safety and protection of health in work (cross compliance conditions). Beside that they have to maintain all agricultural land in good farming state (GAEC's - Good agricultural and environmental conditions).

The present philosophy of the common agricultural policy develops in a different direction than at time of its origin. Newly, direct payments stimulating intensive ways of farming have to be replaced by certain payments for so called services of agricultural sector exercised in a public interest, i.e. food safety, conservation of nature and landscape maintenance, preservation of the countryside as a cultural heritage. A presumption is that European farmers will not rely only on financial supports.

"It will, of course, be some years before farmers adjust to the new support arrangements: it takes time to assess the changes, and their implications for the farm business; and it would be understandable

if many farmers initially adopted a "wait to see" stance, worried that if they did make early changes without fully understanding the ramifications, they might prejudice their eligibility for Single Farm Payment" (Tranter et al., 2007).

## **Aim and Methodology**

The aim of this paper is an analysis of influence of financial supports in frame of EU CAP application on operating results of selected Czech agricultural enterprises. Fulfilment of the aim is realized by means of an analysis of height and structure of the provided financial supports from both sides the resources of the European Union and the national resources. The analysis is focused on two groups of entrepreneurial subjects: a group of legal persons and a group of natural persons. It is dealt with a cooperative, a joint-stock company, a limited company and enterprises of private farmers. An evaluation is made over the years 2006 and 2007. The data were obtained from accountancy of agricultural enterprises, a reviews of SZIF ČR (State Agriculture Intervention Fund of the Czech Republic), and other public available information on entrepreneurial subjects. For possibility of comparison the data on subsidies and the achieved incomes are recalculated per ha of managed agricultural land. The subsidies are analyzed according to particular forms, their height and impact on the income of enterprises.

## **Results and discussion**

Particular supports have their rules and conditions under which they are provided. Subjects applying for the supports bound to keep these rules and conditions. Their observance is subsequently controlled by a payment agency that is the State Agricultural Intervention Fund of the CR and other institutions.

### **Characteristics of selected enterprises**

An activity subject of the valued agricultural cooperative is agricultural production, miller's trade, and providing of various services for agriculture and outside it. The agriculture cooperative manages c. 7 800 ha of agricultural land and raises 817 pieces of cattle.

The decisive enterprise subject of the joint-stock company is agricultural production, both the plant and animal ones. It manages on 2000 ha of agricultural land. It keeps only cattle with all age categories of animals.

The activity subject of the limited company is fruit growing, purchase of goods in order to sell them,

and cereal bar production, which became the main aim of the company. It can be said that a structure of the enterprise is differentiated; therefore it is not dependent only on the agricultural production. The company manages on of 250 ha of agricultural land of which a large part are plantations of fruit trees, and a small part is the acreage of arable land where cereals for production of cereal bars are grown.

Private farmers evaluated in a group farm on an area from 117 to almost 2000 ha of agricultural land. Tree of the groups practice only a plant production without differentiation of the activity subject. Farmers under No. 2 and 3 deal also with the animal production. It is possible to state that the valued farmers use above all production factors characteristic for agricultural primary production.

#### Analysis of structure and extent of spent financial supports

Spending of financial supports is divided according

to a financing source into supports paid by means of SZIF and supports from a budget of the Ministry of Agriculture of the CR. The structure and height of particular types of supports in the monitored enterprises is shown in the table 1 and 2.

From the table 1 of comparison of subsidy volume and structure it results that the agricultural cooperative uses a wide range of particular kinds of subsidies that is caused by a large acreage of 7 800 ha of agricultural land and by orientation to both the plant and animal productions. In a low rate, this farm also spends endowments from a budget of the Ministry of Agriculture of the CR (MZe ČR). The enterprise size enables to realize projects in frame of the Operational Rural Development Programme. The most significant role in endowment volume is taken by Unified payment per area SAPS and the National Supplemental Payments TOP-UP. The total volume of provided subsidies per ha of agricultural land is 6 670 CZK (2006) and 6 630 CZK (2007).

Enterprise	Data comparison for 2006/2007 (thous. CZK)	State Agricultural Intervention Fund (SZIF)						MZE	Other	In total without reconstructions
		Unified payment per area (SAPS)	Separated payment for sugar (SSP)	TOP-UP	LFA	AEO	Reconstruction of operating facilities (OP)			
agri-coop	2 006	19 693	341	17 129	3 009	6 992	6 109	718	4 336	52 218
	per ha (7823.74 ha)	2.517	0.044	2.189	0.39	0.89	0.78	0.09	0.55	24 624
	2 007	21 425	344	14 921	3 644	6 090	2 730	503	4 055	50 982
	per ha (7676.46 ha)	2.791	0.044	1.943	0.474	0.793	0.355	0.065	0.528	23 163
limited company	2 006	631	0	6	0	2 275	1 968	5 563	1 040	9 515
	per ha (250.68 ha)	2.517	0	0.024	0	9.075	7.851	22.191	4.148	37.95
	2 007	698	0	4	0	2 167	1, 953	1 097	1	3 967
	per ha (250.08 ha)	2.791	0	0.015	0	8.665	0.007	4.386	0.002	15.87
Inc.	2 006	5 049	0	4 954	0	1 910	0	238	1 226	13 377
	per ha (2006 ha)	2.517	0	2.47	0	0.952	0	0.18	0.61	6,67
	2 007	5 629	0	4 587	0	1 950	2 700	99	1 196	13 461
	per ha (2017ha)	2.791	0	2.27	0	0.966	1.338	0.04	0.59	7

Source: Final accounts for 2006, 2007 of agricultural enterprises.

Table 1: The structure and height of particular types of supports in the big enterprises.

Enterprise	Data comparison for 2006/2007 (thous. CZK)	State Agricultural Intervention Fund (SZIF)						MZE	Other	In total
		Unified payment per area (SAPS)	Separated payment for sugar (SSP)	TOP-UP	LFA	AEO	Reconstruction of operating facilities (OP)			
1.	per ha (155,17 ha)	2.517	0.00	2.23	0.00	0.00	0.00	0.00	0.416	5.17
	per ha (155,14 ha)	2.791	0.00	1.81	0.00	0.00	0.00	0.00	0.85	5.39
2.	per ha (2751 ha)	2.52	0.00	2.11	0.00	0.59	0.00	*	*	5.22
	per ha (1987 ha)	2.79	0.00	2.32	0.00	0.33	0.00	*	*	5.43
3.	per ha (319 ha)	2.52	0.00	2.45	0.00	0.43	0.00	*	*	5.41
	per ha (319 ha)	2.79	0.00	2.21	0.00	0.43	0.00	*	*	5.44
4.	per ha (168ha)	2.52	0.00	1.69	0.00	0.95	0.00	*	*	5.17
	per ha (168 ha)	2.79	0.00	1.76	0.00	0.95	0.00	*	*	5.52
5.	per ha (117 ha)	2.52	0.00	2.09	0.00	0.52	0.00	*	*	5.16
	per ha (117 ha)	2.59	0.00	1.77	0.00	0.52	0.00	*	*	5.10

Notice: \* impossible to find out

Source: Final accounts for 2006, 2007 of agricultural enterprises.

Table 2: The structure and height of particular types of supports in private farmers.

The height of subsidies per ha in 2006 matches with values showed in a collection of cooperatives in the CR over this year and it was slightly below this level in 2007 (Green Report 2008). The height of operating costs per 1 ha of agricultural land is according to the Profit and Loss Statement 34 315 CZK (2006) and 29 545 CZK (2007). The share of subsidies in operating costs moves about 20.29 % (2006) and 22.8 % (2007). The total volume of direct payments for the mentioned enterprise was c. 47 mil. CZK in the given period. The possibility of influence of a measure modulation of direct payments on the total extent of possible paid subsidies for large agricultural enterprises was highlighted by Štolbová (2007).

The valued joint-stock company has a substantially smaller acreage that the mentioned cooperative. Also the number of used endowment titles is lower. The total extent of operational supports is for both the valued years balanced and amounted to 6 670

CZK per ha of agricultural land. In comparison with data in the Green Report (2008) it is dealt with approximately by 300 CZK higher sum in 2006 and vice versa in 2007 by this sum lower than the collection showed.

In case of the limited company, which specializes in fruit growing and production of cereal bars, there was an evident difference from typical agricultural enterprises in rate of received subsidies in 2006 when the subsidies from MZe budget, the Operational Rural Development Programme, subsidies for agri-environmental measures, have a substantial influence; and where an important item was also the insurance of plant production from PGRLF. Significantly less amount money was spent for a unified payment per area and supplemental payments TOP-UP. From EU resources, 42.44 % was drawn in 2006 from the total financial means and the rest from national resources. In 2007, a rate of spent subsidies changed; 27.84 % of finances

flew from CR resources and 72,15 % already from the EU means. The height of obtained means per ha of agricultural land amounted to 38 660 CZK (2006). In 2007, there was a fall to height of 15 870 CZK/ha which was only 41 % of the foregoing sum.

The valued private farmers who manage outside the LFA areas, used subsidies in form of the unified payment per area, the subsidiary payment TOP UP and payment for agri-environmental measure. With exception the farmer No. 1 it was not able to find out an extent of other supports. The total values of proven subsidies in the mentioned years moved in a range 5 100 to 5 440 CZK per ha of agricultural land and for all subjects it was relatively balanced (table 2). It is dealt with a lower sum than the Green Report (2008) presents in regard to a missing share of the national subsidies. After the analysis of accounting documents for the farmer No. 1, the amount of expenditures to secure incomes was expressed in the value 14 558 CZK/ha (2006) and 18 337 CZK/ha (2007).

From the realized analysis a consistent result ensues with which Špička, Boudný, Janotová (2009) present that the operational subsidies have a direct influence of stability of agricultural incomes. Also it is obvious from the analysis, presented also by Střeleček et al (2009), that the height and structure of the supports can be partially connected with the production orientation.

For comparison, "direct payments play an important role in the financial viability also of organic farms in both Western and Eastern European countries. The level of specific support for organic farming is put into perspective, as other support payments and

market returns contribute larger shares to total farm revenue in all the countries analysed. Modelling analyses show that support payments will continue to play an important role in the profitability of organic farms in Western Europe after implementation of the 2003 reform of Common Agricultural Policy in the EU" (Offermann et al, 2009).

### Influence of financial supports on income from operations

From the gained data it is possible to express the influence of subsidies on income from operations in particular enterprises. In particular kinds of subsidies it is possible to express in numbers their influence on operating income from operations, so consequently also the influence on the total income from operations over the common activity of the firm in the monitored accounting period. Within accounting of financial supports, mostly these supports are included in the operational yields of enterprises. Payments in frame of operational programme used for investments then decrease an input value of this long-term property. Return premiums of consumption tax for diesel oil then decrease consumption of material and energy. The influence of operational subsidies on incomes from operations of the monitored enterprises is shown in the table 3.

In expression of the influence of received subsidies on RV (resultant value) in absolute value it is necessary from data showed in the Profit and Loss Statement to deduct the sum given for particular years from the value of other operational yields and to add sums decreasing costs for material consumption. After the adjustment, the shown

	2006				2007			
"Adjustment of income from operations (thous. CZK)"	operating income from operations with subsidy and supports	operating income from operations with subsidy and supports per ha of agricul. land	operating income from operations without subsidies and supports	operating income from operations without subsidy and supports per ha of agricul. land	operating income from operations with subsidy and supports	operating income from operations with subsidy and supports per ha of agricul. land	operating income from operations without subsidies and supports	operating income from operations without subsidy and supports per ha of agricul. land
Agricultural cooperative	547.00	0.07	-51701.00	-6.61	14788.00	1.93	-36394.00	-4.74
Limited company	9447.00	37.69	5482.00	21.87	9447.00	37.78	4723.00	18.87
Private farmer	221.08	1.42	-585.30	-3.77	659.58	4.25	-177.42	-1.14
Joint-stock company	1306.00	0.65	-12071.00	-6.01	3248.00	1.61	-12913.00	-6.40

Source: Final accounts for 2006, 2007 of agricultural enterprises.

Table 2: The influence of operational subsidies on incomes of the monitored enterprises.

income – a profit of the cooperative in amount of 547 thous. CZK changed to a loss from operational activity in height of -51 701 thous. CZK (2006) and in 2007 the profit 14 788 thous. CZK changed to the loss -36 394 thous. CZK.

Similar relations were hold also in the valued joint-stock company where the reached positive operating incomes in both the monitored years after deduction of received subsidies changed in significantly negative.

The evaluated private farmer carries business on base of trade license. An accounting is kept by form of tax accounts where it is possible to find out only incomes and expenditures connected with the business and the value of enterprise value. Without received subsidies its economy would be unprofitable in both the monitored periods.

From the mentioned facts it is obvious that the received subsidies have absolutely fundamental influence on the resultant value of the agricultural cooperatives whose basic activity subject is the plant and animal production.

The limited company is characteristic by diversified structure of its activities. The main aim of the firm is production of cereal bars and their sale which supports fruit production and brings a decisive part of incomes. After the adjustment of operating income from operations there is an obvious difference from other enterprises specialized on agricultural production when the operating income from operation remains positive in the value 5 482 thous. CZK (2006) and 4 723 thous. CZK (2007). This proves that the differentiation of activity of the

enterprises reduces dependence of the income from operations on received financial means in form of supports from outside-plant resources.

## **Conclusions**

From the comparison of volume and structure of financial supports it results that the agricultural cooperative used a wide spectrum of particular types of subsidies which is caused by a large acreage of almost 7 800 ha with orientation to both the animals and the plant production. The total volume of provided subsidies per 1 ha of agricultural land was 6 670 CZK (2006) and 6 6630 CZK (2007) and represented a full fifth of expenses incurred for agricultural production in the enterprise. Similar results are hold for the valued joint-stock company.

Without the received subsidies in 2006 and 2007, the farming of the private farmer (where only accounting data were at disposal) would be also loss-making in both the monitored years. The observation proved that differentiation of the enterprise activity in form of processing of raw material in excess of the frame of agricultural primary production decreases dependence of the incomes from operations on received financial means in form of supports. This enterprise was profitable even without subsidies in both the monitored years.

From the mentioned facts it is evident that the received financial subsidies had a positive effect on the income from operations of all valued agricultural enterprises where the basic subject of activity is the plant and animal production.

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## Factors Affecting Intercropping and Conservation Tillage Practices in Eeastern Ethiopia

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### Abstract

In order to combat adverse effects of farmland degradation it is necessary for farmers to adopt sustainable land management and conservation strategies like intercropping and conservation tillage. However, efforts to adopt these strategies are very minimal in Ethiopia. In an attempt to address the objectives of examining factors affecting use of intercropping and conservation tillage practices, this study utilized plot- and household-level data collected from 211 farm households and employed a bivariate probit model for its analysis. The study revealed that intercropping and conservation tillage decisions are interdependent, and that they are also significantly affected by various factors. In addition, conservation tillage and intercropping practices as short-term interventions are found to augment the long-term interventions like terraces, diversion ditches, and tree plantations. The paper highlights important policy implications that are required to encourage intercropping and conservation tillage measures.

### Key words

Bivariate probit, conservation tillage, farm management practices, intercropping’.

### Introduction

Land degradation has become a global environmental threat currently drawing wide-spread attention from the international community. The coverage in terms of degraded area and its direct effect on the livelihood of the world population signals the severity of the threat. Globally, 24 percent of the land area has been degrading of which about one-fifth is cropland. Viewing it differently, more than 20 percent of all cultivated areas are degrading. In terms of the population being directly affected, about 1.5 billion people depend on these degrading areas for their livelihoods (Bai et al., 2008). It has an abysmal effect on agricultural productivity especially in developing countries where agriculture remains one of the largest sectors in the economy.

Various studies have indicated that the continent of Africa is seriously threatened by land degradation. In effect, countries like Zimbabwe, Ghana and Ethiopia were found to be losing five to nine percent of their agricultural output every year due to land degradation (Bojō, 1996). In such agriculture-based low-income countries, reversing the deterioration of land productivity resulting from environmental degradation, and ensuring adequate food supplies

to the fast growing population is a formidable challenge.

Ethiopia, with a population that doubled from about 39.8 million in 1984 to over 79 million in 2009 just within 25 years, is now the second most populous country in Africa with a current annual growth rate of 2.6 percent (CSA, 2008). On the contrary, food gap has increased since the early 1980s, though per capita food availability has remained relatively stable over the years owing to the generous inflow of food aid; and the agricultural sector has registered a growth rate of only 1.7 percent since 1992 with more volatile production as compared to most developing countries (Rashid et al., 2007).

Hence, the country is confronted with the challenge of feeding its population, almost year in and year out. As a result, food insecurity and pervasive poverty epitomize the country as these ravage the lives of a significant portion of the population. According to FAO estimate, for instance, 44 percent of the population in Ethiopia is undernourished with 47 percent of the children suffering from malnutrition (FAO, 2009). Furthermore, the proportion of a population living below 1 US dollar a day (at PPP) is 39 percent (WHO, 2009).

The causes for food insecurity and poverty may be numerous among which land degradation problem mainly resulting from soil erosion and nutrient depletion can be singled out as causing a formidable threat. An estimate based on remote sensing tools indicated that about 26 percent of the land area in Ethiopia has been degrading over the years 1981-2003, directly affecting the livelihoods of about 29 percent of the population (Bai et al., 2008). Available estimates of economic impact of soil erosion also show that it is among the factors contributing to the country's structural food insecurity problem. Soil erosion is estimated to reduce food production by at least 2 percent annually (FAO, 1993). This definitely has a repercussion on the country's national income. In this regard, Sonneveld (2002) indicated that the cost of soil erosion to the national economy is about 1.0 billion US dollars per year. Various studies (Hurni, 1993; Zeleke, 2000; Sonneveld, 2002) have also reported land degradation as a major constraint to agricultural production and food security in Ethiopia.

The problem of accelerating land degradation is especially serious in the intensively cultivated highland parts of the country (Hurni, 1993; Bewket, 2007). Owing to the inherently good soils and relatively abundant rainfall the highlands (>1500 meters above sea level) cover about 46 percent of the land mass, account for 95 percent of the regularly cultivated lands, and support about 88 percent of the human and 75 percent of the livestock population; and these aggravate degradation problems.

In order to combat the adverse effects of land degradation it is necessary for farmers to adopt sustainable land management and conservation strategies, among others, that result in increased productivity and farm income and at the same time maintain the fertility levels of land resources. Farmers' land management strategies affect land degradation level positively or negatively (Norman & Douglas, 1994), as mismanagement of land may lead to land degradation. In addition, it can directly affect productivity (Tchale et al., 2004). Generally, the measures can be long-term conservation structures like terracing, construction of diversion ditches, and tree planting; or it can be short term measures like manure application, fertilizer use, intercropping, and conservation tillage practices.

Intercropping and conservation tillage practices are common practices especially in the highland parts of Ethiopia. These tillage and cropping practices are exercised by the farmers in order to curb problems of soil nutrient depletion and degradation problems in general. Intercropping of sorghum and

maize with legumes like haricot beans is a common practice. Farmers have also soil conserving tillage practices like plowing along the contour and minimizing number of tillage which are treated as conservation tillage under this study.

Despite the importance of these practices, there are also farmers who do not adopt some or all of the available techniques either because they are not aware of the increasing problem of land degradation and/or its damaging consequences or because they are trapped in various constraints impeding adoption of the available techniques. These impediments may include factors related to capacity in terms of different livelihood assets, the knowledge or awareness about conservation and land management strategies, and farm-related features.

In this regard, solid empirical analyses on the details of factors affecting use levels of intercropping and conservation tillage are very scarce in the country. This study, therefore, responds to this paucity of empirical information using data at household and plot levels collected from a total of 211 households in three districts of Eastern highlands of Ethiopia. Specifically, this study intends to address the objective of examining factors affecting use of intercropping and conservation tillage practices and how these are interrelated. The paper is organized as follows. The next section discusses about intercropping and tillage practices in the study area, the third section gives details of the analytical frameworks, third section presents the empirical results obtained, and the last section provides concluding remarks.

### **The study areas in relation to intercropping and conservation tillage**

The study area, Eastern Highlands of Ethiopia, is found in Oromia regional state of Ethiopia. It consists of two zones, East Hararghe and West Hararghe zones. Farming systems in the East and West Hararghe zones of Ethiopia constitute complex production units involving a diversity of interdependent mixed cropping and livestock activities. The major annual crops grown in these zones include sorghum, maize, groundnuts, sweet potato, wheat, haricot beans, barley, and others. In addition, the major cash crops like t'chat and coffee have a long-standing tradition in these zones. Production of t'chat (a mild narcotic perennial bush the leaves of which are chewed as stimulants) makes the farming system in Hararghe highlands to be a cash crop-based mixed crop-livestock farming system, and not a mere grain-based mixed crop-

livestock system, unlike the case in other parts of the country.

Increasing population density coupled with lack of alternative employment opportunities in rural areas has led to progressive land pressure and caused subsequent shrinking of individual land holdings, fragmentation of available holdings, and expansion into fragile and marginal areas. Despite all these problems in these zones, the technological setup has not been transformed. Farming is still traditional with limited use of yield enhancing modern inputs like improved seeds, fertilizers, irrigation, and others. Use of chemical fertilizer, for instance, was only on 16.7 percent of cereal farms in East Hararghe zone while natural fertilizer was applied on 40.6 percent constituting a total fertilized cereal area of about 57 percent in 2008 (CSA, 2008). Furthermore, investments in a long-term soil and water conservation structures are not to the adequate levels resulting in accelerated land degradation problems.

In a bid to curb a serious trend of land degradation and the resulting dwindling agricultural productivity, some farmers have already made significant progress in dealing with soil erosion problems in their farms by adopting soil conservation and fertility maintenance techniques. Among these practices are intercropping and conservation tillage practices. In the study areas, these practices are considered preferable to other measures like use of fertilizers and manures. This can be because of the fact that intercropping and conservation tillage practices are less costly in terms of the requirements of labor and financial resources, and that they are also more environmentally friendly.

Intercropping, a type of multiple cropping systems involving simultaneous growing of two or more crops in space and time on the same land is a common practice of small-scale farmers in the study areas. In particular, cereal and legume intercropping is recognized as a cropping system with substantial benefit. The main reason for using intercropping system is the fact that it involves use of land and labor more efficiently and hence thought to offer higher benefits for small-scale farmers in terms of productivity, in fact together with the advantage of enhancing soil fertility and lowering production risks as compared to sole cropping. In intercropping, some crops (usually cereals) form relatively higher canopy and deeper root structures than others (e.g. legumes) indicating that the intercropped crops probably have differing spatial and temporal use of radiation, water and nutrient resources resulting in efficient use of these resources. Especially in areas like Hararghe highlands where there is

chronic land shortage, intercropping can be among recommended strategies.

The intercropping practice considered in this study is where one annual crop is intercropped with another annual crop; a very common practice in the study area. Typically, cereal crops such as maize and sorghum are dominant crop types; whereas haricot beans, faba beans, field pea, potato, and sweet potato are the associated plant species in the intercropping system. Usually, farmers intercrop one dominant crop type with one or two other associated crop types. In addition, intercropping of maize and sorghum is also common in the area.

The other practice considered here is conservation tillage. Soil losses from water erosion recently are reported to be in excess of natural replacement rates, which in turn adversely affect farm productivity. Land preparation practices are among the most important factors contributing to the erosion problem. It has been recognized that conventional tillage aggravates soil erosion and hence degradation. Conventional tillage tends to create degradation over time by exposing soil to water and wind erosion and by weakening soil structure. This has led to the development of alternative tillage practices to reduce the loss of soil, while keeping the benefits of tilling. These methods can generally be referred to as conservation tillage.

Conservation tillage is the generic term given to soil management systems which aims to conserve natural resources with minimal use of external inputs. It is sometimes synonymously used with conservation farming and conservation agriculture (Fowler & Rockstrom, 2001). According to the glossary of soil science terms, conservation tillage is any tillage sequence, the object of which is to minimize or reduce loss of soil and water (SSSA, 2008). Minimum tillage and contour plowing, which are common in the study area, are among such practices. The critical component of conservation tillage is the minimization of soil disturbances. Reduced (minimum) tillage is a tilling practice with minimum number of plowing frequency as compared to the conventional tillage. It enables to leave some crop residues on the farm. Minimum tillage can also be in terms of depth of plowing. This practice uses minimal disturbance to prepare the seedbed for planting. Contour plowing, on the other hand, is a practice of plowing perpendicular to the slope to discourage soil and water erosion down the slope.

## Methodology

### Data sources and measurements

Multi-stage sampling techniques were employed to select the final sample units. Initially three districts, two from East Hararghe zone and one from West Hararghe zone, were selected purposively based on severity of degradation problems. These districts were Meta and Goro-Gutu from East Hararghe zone, and Tulo from West Hararghe zone. In the second stage, a total of 9 kebeles (the smallest administrative unit) were randomly selected using highland kebeles in the selected districts as a sampling frame. In the third stage, the survey drew a total of about 211 farm households based on probability proportional to size sampling technique. Then household-level and plot-level data were collected.

Household-level data included variables like extension contact, credit access, farm training, membership to organizations, land holding, livestock holding, number of parcels, farm equipments owned, proportion of a perennial crop t'chat, family size, dependency ratio, age, sex, education of the household head, involvement in non-/off-farm activities, and others. Plot level variables collected about all plots owned by the selected households, on the other hand, included use of different inputs, land management and conservation activities on the plot, size of the plot, slope of the plot, fertility level of the plot, ownership of the plot and others.

Since there are considerable differences in how farmers manage land depending on the characteristics of specific plots, analyses of land management practices are made at plot levels. Among the major land management strategies in the study area are use of intercropping and conservation tillage practices. As to the measurement of these dependent variables, both intercropping and conservation tillage practices are considered as dichotomous with values zero for non-users and one for users. Description and measurements of all the variables used in econometric analysis are presented in Table 1.

### Analytical framework

Conservation tillage and intercropping are practices related to undertaking the existing farming activities differently, rather than using additional inputs unlike the case for fertilizer and manure applications. The purpose here is to assess determinants of these tillage and cropping practices. However, there are important assumptions to be made for this study: both decisions of using conservation tillage and

intercropping are functions of same regressors (X); and conservation tillage and intercropping do not directly affect one another. However, since farmers make these decisions based on the same factors at their disposal including availability of farm resources, these decisions cannot be totally independent.

Let  $Y_1$  and  $Y_2$  be observed values for use of conservation tillage and intercropping, respectively, taking a value of 1 for using and 0 for not using; and  $Y_1^*$  and  $Y_2^*$  be the respective latent variables which are not observable. Then, the binary probit for the two choice models can be written as:

$$Y_1^* = \beta_1 X + U_1 \quad (1)$$

$$\text{Where } Y_1 = \begin{cases} 1 & \text{if } Y_1^* > 0 \\ 0 & \text{if } Y_1^* \leq 0 \end{cases}$$

and

$$Y_2^* = \beta_2 X + U_2 \quad (2)$$

$$\text{Where } Y_2 = \begin{cases} 1 & \text{if } Y_2^* > 0 \\ 0 & \text{if } Y_2^* \leq 0 \end{cases}$$

Statistically, Equations (1) and (2) can be consistently estimated by single equation probit models. However, this is inefficient because of the possibility of correlation between the two disturbances  $u_1$  and  $u_2$  (Greene, 2003). The problem here follows a seemingly unrelated regression (SUR) model (because the regressors do not include endogenous variables and the errors may be correlated) with identical regressors.

In the situation where the disturbance terms of the two models are correlated, the bivariate probit model is employed to circumvent inadequacies of the single probit or logit models. The bivariate probit model is based on the joint distribution of two normally distributed variables (Green, 2003 for details).

The choice of conservation tillage and intercropping as land management strategies by farmers is, therefore, analyzed using a bivariate probit model.

Under bivariate probit model, it is necessary to make a test of the independence of the error terms of the two equations using the likelihood ratio test of the covariance of the error terms ( $\rho$ ). This helps to assess whether the two models can be treated as a system of equations or as a single equation models. Putting it differently, it is to test whether the two disturbance terms are correlated or not.

Variables	Description	Obs	Mean	S.D
Intercropping	1 if intercropping is applied, 0 otherwise	489	0.738	0.440
Conserv. tillage	1 if cons. tillage is used, 0 otherwise	489	0.419	0.494
Parcel size	Parcel size (ha)	489	0.37	0.259
Slope: Flat	1 for flat slope, 0 otherwise	489	0.313	0.464
Gentle	1 for gentle slope, 0 otherwise	489	0.410	0.492
Steep	1 for steep slope, 0 otherwise	489	0.239	0.427
V. steep	1 for very steep slope, 0 otherwise	489	0.039	0.193
Fert. level: Poor	1 for poor fertility, 0 otherwise	489	0.438	0.497
Medium	1 for medium fertility, 0 otherwise	489	0.213	0.410
Good	1 for good fertility, 0 otherwise	489	0.349	0.477
Farm distance	Home-farm distance in kilometer	489	2.06	2.033
Terracing	1 if stone terraces are available, 0 otherwise	489	0.534	0.499
Ditches	1 if diversion ditches are available, 0 otherwise	489	0.425	0.495
Trees	1 if trees are available, 0 otherwise	489	0.055	0.227
Land holding	Total land holding (ha)	211	0.84	0.466
Livestock hold.	Livestock in Tropical Livestock Unit (TLU)	211	3.26	2.187
Farm equipment	Value of farm equipments (Br)	211	192.2	120.00
Fragm. (SI index)	Land fragmentation in Simpson Index (SI)*	211	0.48	0.226
Prop. of t'chat	Proportion of earnings from t'chat (Br)	489	0.25	0.247
Extension	1 if there is ext. contact, 0 otherwise	211	0.569	0.496
Membership to org.	1 if a household is a member, 0 otherwise	211	0.332	0.472
Trainings	1 if attended trainings within 5 years, 0 otherwise	211	0.251	0.435
Land ownership	1 if owned, 0 if rented-/shared-in	489	0.914	0.280
Age	Age of the household head (years)	211	40.8	9.96
Sex of HH head	1 if a household is male-headed, 0 otherwise	211	0.877	0.329
Level of educ.	Level of education of a household head			
no formal ed.	1 if no formal education, 0 otherwise	211	0.360	0.481
Primary	1 if primary level of education, 0 otherwise	211	0.450	0.499
Secondary	1 if secondary level of education, 0 otherwise	211	0.190	0.393
Adult equiv.	Family size in adult equivalents	211	4.47	1.743
Depend. ratio	'dependents' (0-14 & 64+) to 'active' members (15-64)	211	1.32	0.768
Market dist.	Distance to the nearest market in kilometers	211	6.57	4.431
Districts: Metta	1 if Metta district, 0 otherwise	211	0.304	0.021
Goro-gutu	1 if Goro-gutu district, 0 otherwise	211	0.355	0.480
Tullo	1 if Tullo district, 0 otherwise	211	0.341	0.475

\* Simpson Index (SI) is computed as  $SI = 1 - \frac{\sum_{i=1}^n A_i^2}{(\sum_{i=1}^n A_i)^2}$ , where  $A_i$  is area of  $i^{th}$  parcel and  $n$  is number of parcels; SI lies between zero and one; and a higher SI means a higher degree of fragmentation.

Table 1: Description and summary Statistics of explanatory variables.

Furthermore, the possible non-independence of error terms across plots within a household need to be corrected; that means robust standard errors have to be generated.

Just like the case for univariate probit models, it is also necessary to calculate marginal effects in bivariate probit models. Marginal effects are the

sum of the direct and indirect effects (through the relationship between the residuals of the two models) of the independent variables on dependent variable. Since separating the total marginal effect into direct and indirect components is a tedious work as described in Greene (1996), only total marginal effects are reported in this study.

Variables	Intercropping			Conservation tillage		
	Coef.	Rob. S.E.	Marg. Pr <sup>☆</sup>	Coef.	Rob. S.E.	Marg. Pr <sup>☆</sup>
Parcel size	3.902***	0.546	0.866	0.179	0.277	0.058
Slope (cf. flat)						
Gentle	0.278	0.188	0.067	0.332**	0.151	0.110
Steep	0.123	0.216	0.030	0.469**	0.203	0.162
Very steep	0.259	0.340	0.057	0.788*	0.452	0.180
Fertility level (cf. poor)						
Good	0.429**	0.176	0.109	0.072	0.161	0.023
Medium	0.699***	0.243	0.205	-0.123	0.211	-0.041
Farm distance	0.071*	0.042	0.108	-0.068	0.056	-0.022
Terracing	-0.116	0.195	-0.029	0.377**	0.158	0.121
Ditches	0.321*	0.169	0.077	-0.53***	0.167	-0.166
Trees	0.617*	0.377	0.114	-7.88***	0.545	-0.419
Land holding	-0.61***	0.224	-0.150	-0.150	0.225	-0.049
Livestock holding (TLU)	-0.005	0.044	-0.001	-0.087	0.059	-0.028
Farm equipments	-0.001	0.001	-0.000	0.003***	0.001	0.001
Land fragmentation (SI index)	0.419	0.522	0.104	0.054	0.475	0.018
Proportion of tchat	-0.780**	0.343	-0.193	-0.527	0.365	-0.071
Extension	0.588**	0.258	0.119	0.695**	0.276	0.189
Organization member	0.220	0.188	0.052	0.221	0.210	0.073
Training	0.219	0.185	0.057	0.891***	0.220	0.316
Land ownership	0.755***	0.232	0.238	0.047	0.244	0.015
Age	0.009	0.011	0.002	-0.022*	0.013	-0.107
Gender	-0.415	0.348	-0.086	-0.128	0.271	-0.043
Educ. (cf. no formal ed.)						
Primary	0.125	0.221	0.031	0.742***	0.256	0.236
Secondary	0.292	0.333	0.066	1.059***	0.356	0.269
Adult equivalents	0.040	0.049	0.010	-0.068	0.054	-0.022
Dependency ratio	0.209*	0.122	0.106	-0.153	0.130	-0.050
Market distance	-0.025	0.019	-0.006	-0.027	0.021	-0.009
District (cf. Metta)						
Goro-gutu	1.203***	0.222	0.257	-0.519**	0.233	-0.160
Tullo	0.858***	0.199	0.179	-0.868***	0.253	-0.246
Constant	-1.384*	0.799		2.225**	0.904	
Rho ( $\rho$ )	-0.302***					
Log likelihood function	-442.099					
Wald $\chi^2$ (significance)	1627.26 (P<0.0000)					
Number of observations	489					

Notes: \*\*\*, \*\*, and \* indicate significance at 1%, 5%, and 10% levels, respectively; The indicated marginal probabilities include both the direct and indirect effects of the variables; for dummy variables, a discrete change from 0 to 1 is considered; and the reference probabilities (at mean levels of continuous variables and modal levels of dummy variables) are 0.836 for intercropping and 0.261 for conservation tillage.

Table 2: A Bivariate Probit Estimates for Intercropping and Conservation Tillage.

The marginal effects, in this case, show the effect of a given change in the independent variable on one dependent variable by keeping all other continuous variables at their mean levels and categorical variables at their modal value.

## **Results and discussions**

Table 2 presents the results of the maximum likelihood bivariate probit estimates of the equations explaining the probabilities of farmers' decision to use intercropping technique and conservation tillage practices in order to manage the fertility of their farm plots. The marginal effects of the regressors on the probability of practicing intercropping and conservation tillage are also reported as marginal probabilities in the same table.

The likelihood ratio test of the covariance of the error terms ( $\rho = -0.302$ ) that maximized the bivariate probit likelihood is used to make a test of the independence of the error terms of the equation in the bivariate probit system of equations. The significance of  $\rho$  ( $p$ ) suggests that the random disturbances in the two decisions are affected (in opposite direction) by random shocks and that the two decisions are not statistically independent. It indicates that the error terms of the two equations are interdependent and hence treating the two equations as a bivariate probit model, rather than two univariate probit, is more appropriate. The bivariate probit model fits the data well ( $\chi^2 = 1627.26$ ;  $P < 0.0000$ ), suggesting that the independent variables taken together influence the two decisions.

Several variables are found to influence farmers' decisions of managing their farm in terms of intercropping and plowing strategies. For most of the variables the estimated coefficients for the two decisions differ either in terms of sign or in terms of their significance. Discussions on variables significantly affecting intercropping practice, and that on variables significantly affecting conservation tillage are separately presented in the following sub-sections.

### **Determinants of intercropping**

The result from bivariate probit model reveals that parcel size has a positive and significant effect on the decision to use intercropping. When combining direct and indirect effects, for a unit (1 ha) increase in parcel size the predicted probability of using intercropping technique increases by 86.6 percent, holding all other variables constant at their reference points (at mean levels for continuous and modal level for dummies). This is the highest marginal effect among all other explanatory

variables. That means as farm plots are fragmented into small pieces, the probability of maintaining its fertility through intercropping decreases. Furthermore, the probability of using intercropping increases on fertile plots as compared to less fertile ones. This is probably because the technique is more of maintaining the available fertility rather than making additions to the fertility statuses. In addition, less fertile lands may not provide adequate nutrients required for two or more crops and hence crop intensification may not be paying on such farms.

Intercropping techniques are more likely practiced by households with higher dependency ratio. It is probably because of a lesser labor requirement for intercropping practices than other measures like manure application and construction of terraces; as higher dependency ratio implies less availability of active labor force in the family relative to 'inactive' members. The probability to practice intercropping technique increases on owned plots as compared to shared/rented ones. Putting it specifically, ownership increases the probability of practicing intercropping by 23.8 percent. This implies that ownership boosts the incentives to invest not only on long-term conservation measures but also on short-term fertility maintenance techniques.

Not surprisingly, as access to extension increases the probability to practice intercropping also increases (by 11.9%) implying that the technical information provided to farmers through extension agents incorporate intercropping techniques, among others. In addition, the probability to adopt intercropping is higher on distant farms as compared to that on nearby plots. The probable reason is the difficulty to use labor intensive techniques like manure application on distant farms making farmers to opt for alternatives like intercropping which does not require more labor input. Tree plantations and diversion ditches on the farm also increases the probability to adopt intercropping indicating that intercropping can be applied in conjunction with structural measures.

Although larger parcel sizes encourage intercropping, larger farm size does not. Intercropping is negatively related to total land holding depicting that at present it is a small farm, rather than large one, that contributes to improvement in soil-fertility status. Furthermore, an increase in the proportion of t'chat crop on the field reduces the probability of practicing intercropping measures due to various probable reasons. First, the canopy of t'chat crop may not allow two or more annual crops to be efficiently intercropped on the field. In addition, as an important cash crop in the

study area, t'chat increases the financial position enabling the owner to pay for expensive chemical fertilizer input or for long-term structural measures like terraces instead of short-term intercropping activities. In terms of differences in location, farmers in Goro-Gutu and Tulo districts are more likely to use intercropping strategies than those in Meta district.

#### **Determinants of conservation tillage**

Based on the results of the Bivariate Probit Model indicated in Table 2, use of conservation tillage practice is significantly affected by many important variables. As the slope of the plot increases, the probability to practice conservation tillage increases. The possible reason is that degradation problem is severe on steep slopes as compared to flat fields. In addition, steeper slopes are associated with higher probabilities of using plowing techniques rather than applying other short-term measures like fertilizer because of the farmers' concern that fertilizers are more likely to be washed away if applied on steeper slopes.

Availability of terraces on the plot also increases the probability of using conservation tillage by 12.1% implying that terracing as a long-term investment complements the short-term strategy of adopting plowing techniques. In addition, due to the obvious reason of the requirement of farm implements for applying conservation tillage, value of farm equipments also influence conservation tillage positively and significantly.

The probability to use conservation tillage also increases with an increase in the level of education of the household head, with involvement in farm trainings, and with access to extension services, a result supported by many research reports (Jansen et al., 2006). These reveal that the technical knowhow required to implement conservation tillage can be acquired through education, farm trainings, and extension services. Use of plowing techniques has a negative relationship with age of the household head as also depicted from Savadogo et al. (1998) indicating that conservation tillage is practiced more among younger farmers than among older ones. Prior investments in the form of trees and diversion ditches which were indicated to affect intercropping techniques positively are found to affect conservation tillage negatively, as these are more effective measures by their own in preventing soil erosion. In terms of geographical differences, using plowing strategies for soil conservation is very common in Meta district as compared to Goro-Gutu and Tulo districts.

#### **Conclusions**

Though there are opportunities to apply short-term low-external input investments like intercropping and conservation tillage, adoption levels of these practices are not to the adequate extent owing to various impeding factors. The complexity of these factors in affecting land management strategies calls for making careful decisions for enhancing adoption and use levels and thereby increasing or maintaining fertility status of the soil.

The results from a Bivariate Probit model, for intercropping and conservation tillage decisions, showed that the two decisions are not independent. Furthermore, parcel size, fertility level of the soil, farm distance, diversion ditches, tree plantations, extension contact, land ownership, and dependency ratio are found to positively and significantly affect the probability to practice intercropping techniques while land holding and proportion of t'chat affected the same technique in a negative way. On the other hand, the probability to practice conservation tillage is positively and significantly affected by slope, terraces, farm equipments, extension contact, trainings, and levels of education while it is negatively and significantly affected by ditches, tree plantations, and age of the household head. Notably, short-term interventions in preventing the problem of fertility depletion like conservation tillage and intercropping are found to augment the long-term structural interventions like terraces, diversion ditches, and tree plantations.

The overall results of the study lead to make the following important implications. The significances of parcel size and land ownership call for the need to revisit the existing land tenure structure and to gradually relax it so as to allow land markets (buying, selling, renting) which are not currently available in the country. It is also very essential to strengthen and support both long-term and short-term land management and conservation strategies. Furthermore, it is necessary to provide institutional support to farmers in terms of creating access to extension, farm trainings, and rural education programs.

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## Investigation the Role of Exchange Rate Volatility on Iran's Agricultural Exports (Case Study: Date, Pistachio and Saffron)

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### Abstract

Modern methods of quantitative risk analysis, specifically value-at-risk and expected shortfall approach, provide comprehensive and coherent risk evaluation throughout entire distribution of outcomes and can take agricultural business from the realm of uncertainty to specific, quantified risks. Monte Carlo simulation with autocorrelation of standard deviation shows the best results in risk modeling and is used for this research. The analysis showed that production risk is systemic within climatic regions of Ukraine with coefficients of correlation ranging from 0.25 to 0.85. Yield correlation among crops in several oblasts is low to negative, creating opportunities for diversification. However, positive price-yield correlation is dominant for agricultural products in Ukraine due to high dependency on global prices and a large share of export. It is hypothesized that price-yield correlation is directly proportional to the share of country's international trade in that agricultural product.

### Key words

Production risk, price risk, value-at-risk in agriculture, expected shortfall.

### Introduction

Trade is widely accepted as a major engine of economic growth (Omojimi & Akpokodje, 2010). The relationship between exchange rate and trade flows has been studied in a large number of theoretical and empirical papers. It is commonly accepted that the movements of the real exchange rate have a permanent effect on exports and imports. The widespread popular perception, that greater exchange rate risk reduces trade, has helped motivate monetary unification in Europe and is strongly related to currency market intervention by central bank (Bayoumi & Eichengreen, 1998; Hosseini & Moghaddasi, 2010). Most current microstructural and theoretical models of exporter behavior predict a negative relationship between exchange rate risk and volumes of trade, reflected in the conditional variance of exchange rate and export volumes (Barloulas et al., 2002). The increase in exchange rate volatility is widely believed to have detrimental effects on international trade and thus has a negative economic impact.

If exchange rate movements are not fully anticipated, an increase in exchange rate volatility may lead risk-averse agents to reduce their international trading activities. The presumption of a negative

nexus between exchange rate volatility and trade is an argument routinely used by proponents of managed or fixed exchange rates (Chit et al., 2008).

Yet a vast economic literature yields highly inconsistent empirical results on this issue. One common argument is that exporters can easily ensure against short-run exchange rate fluctuations through financial markets, while it is much more difficult and expensive to hedge against long-run risk. Cho et al. (2002) for example, demonstrate that long-run changes in exchange rates seem to have more significant impacts on trade volumes than do short-run exchange rate fluctuations that can be hedged at low cost.

On the other hand, Vianne and De Vires (1992) show that even if hedging instruments are available, short-run exchange rate volatility still affects trade because it increases the risk premium in the forward exchange rate. Doroodian (1990), Mundell (2000), and Wei (1999) argue that hedging is both imperfect and costly as a basis to avoid exchange rate risk, particularly in developing countries and for smaller firms more likely to face liquidity constraints. This leads to the conventional argument that exchange rate volatility causes revenue uncertainty that will dampen trade due to risk aversion, irreversible investment in productive capital, or both (Demers,

1991; Sercu & Vanhulst, 1992).

The dependence of Iran on crude oil exports had important implications for the Iran's economy since the oil market is a highly volatile one. For example, being dependent on the exports of crude oil, the Iran's economy became subject to the vicissitudes and vagaries of the international oil market so that international oil price shocks were immediately felt in the domestic economy. Coupled with this, Iran has implemented a different exchange rate system that engendered overvaluation of the domestic currency, serving as a disincentive for increased exports through non-competitiveness of the country's non-oil exports. On the other hand, the overvalued exchange rate enhanced imports thereby exacerbating the already precarious balance of payment position (Biria, & Jebelameli, 2006).

The paper is organized as follows: Section 2 briefly reviews the theoretical and empirical literature on the impact of exchange rate volatility on international trade. Section 3 presents the research methodology. First a simple model is specified to investigate the impact of exchange rate volatility on exports. Then data sources, definitions of variables, and econometric methods are discussed. Section 4 presents the estimation results and the discussion. Section 5 draws conclusions.

## **Theoretical and empirical literature**

There exists an abundance of studies on the topic that have been undertaken internationally, both at theoretical and empirical levels. Two most popular and related approaches have been used in the analysis of trade and exchange rate volatility. One approach is to estimate a simple export demand equation generally with real exports as a dependent variable and exchange rate volatility together with relative prices and a measure of economic activity variable as regressors. The other approach is to use the so-called gravity equation model (Hosseinipour & Moghaddasi, 2010).

Chit et al. (2008) employed a generalized gravity model that combined a traditional long-run export demand model with gravity type variables to analyze the impact of bilateral real exchange rate volatility on real exports of five emerging East Asian countries among themselves as well as to thirteen industrialized countries. In the empirical analysis they used a panel comprising 25 years of quarterly data and perform unit root and co-integration tests to verify the long-run relationship among the regression variables. The results provided strong evidence that exchange rate volatility has a negative impact on the exports of emerging East

Asian countries.

Doyle (2001) used error correction model to estimate Irish exports to Britain. He found that both real and nominal exchange rate volatility are significant determinants of changes in total exports and in a number of sectors. Both positive and negative short-run elasticities for exchange rate volatility were estimated, although positive elasticities predominate.

Exchange rate volatility and misalignment in Iran are recognized as two major limits on export promotion during last three decades. These occurred primarily due to some breaks like Iraq imposed war against Iran which brought serious problem for our economy (Hosseinipour & Moghaddasi, 2010). So it's really a matter of debate that to what extent export is responsive to exchange rate volatility. This paper seeks to provide some evidence on the above topics.

## **Material and methods**

In this section we discuss our approaches to estimation of export demand equation and to specifying exchange rate volatility.

The empirical export demand equation: We follow Hosseinipour and Moghaddasi (2010) and De Vita and Abbotte (2004). Amongst others and specify a demand equation of the following from:

$$LEX = \beta_0 + \beta_1 LRP + \beta_2 LIN + \beta_3 VOL + \varepsilon_0 \quad (1)$$

Where LEX is natural logarithm of real export; LRP is natural logarithm of relative prices; LIN is natural logarithm of income in our trading partners and is an indicator of potential demand for our exports; VOL is the exchange rate volatility and measures uncertainty associated with fluctuations in the exchange rate.  $\beta_0$  and  $\varepsilon_0$  are a constant and a normally distributed error term, respectively. This equation says that our exports depend on the relative prices, income in our trading partners and uncertainty/risk associated with exchange rate fluctuations. Theoretical priors dictate that we should expect  $\beta_1 > 0$  and  $\beta_2 > 0$  and as discussed in the introduction, the sign of  $\beta_3$  is theoretically ambiguous.

There are different econometrics techniques that can be used to estimate equation (1). If all the variables are stationary, then equation (1) can simply be estimated by ordinary least squares (OLS). If all or some variables are I(1) and not co-integrated, some data transformation may be necessary before estimating by OLS. If there exist some co-integration

among the variables of interest, then there are a number of approaches different complexities to estimate the model. Some main approaches are Engel Two step procedure proposed by Engel and Granger (1987) and the Johansson maximum likelihood reduced rank procedure proposed by Johansson (1995). Both these procedures work well when all variable are I(1). This paper employs the autoregressive distributed lag (ARDL) approach to co-integration proposed by Pesaran and Pesaran (1997). This methodology allows testing for the existence of co-integration irrespective of whether the underlying regressors are I(0), I(1) or mutually co-integrated.

## Data description

This study uses annual data for the period 1978 to 2008. The variables are constructed as follows:

Real export is defined as nominal exports deflated by the export price index (EPI) in natural logarithm as follows:

$$EX_t = \ln (NEX_t / EPI_t) \quad (2)$$

Where  $EX_t$  is real exports,  $NEX_t$  is nominal exports and  $EPI_t$  is the export goods price index.  $EX_A$ ,  $EX_D$ ,  $EX_P$  and  $EX_S$  are real exports of agriculture sector, date, pistachio and Saffron, respectively. In this paper we used gross domestic product (GDP) of European Union as a measure of income for Iranian trading partners. More to, bilateral trade between two countries depends upon, exchange rate and relative price level of the two partners. Hence, the following definition of real exchange rate in Iran captures both the effects related to the price of countries and of goods and services (Hosseinipour & Moghaddasi, 2010).

$$RP_t = (ER_t * CPI_F / CPI_{IR}) \quad (3)$$

Where  $CPI_F$  is consumer price index in the U.S. and  $CPI_{IR}$  is consumer price index in Iran and  $ER_t$  is exchange rate in open market.

## Modeling volatility

Exchange rate volatility is a measure that intends to capture the uncertainty faced by exporters due to unpredictable fluctuations in the exchange rate clearly, this is an unobservable variable and thus its measure is a matter of serious contention. Consequently, the literature is not unanimous as to which measure is most appropriate. Recent literature, however, seems to be increasingly

adopting the use of Bollerslev's GARCH models and the moving average standard deviations and to a very less extent, simple standard deviations (Hosseinipour & Moghaddasi, 2010). This paper follows recent literature and uses the measures derived from the AR-GARCH(1,0) model as measures of exchange rate volatility. Conditional variance of the first difference of the log of exchange rate is a measure of exchange rate volatility. We use the generalized conditional heteroskedasticity (GARCH) proposed by Bollerslev (1986), which is the generalization of ARCH model. We assume exporters from expectations of the real exchange rate series following an ARMA(m,n) process, with conditional specified variance as a GARCH(p,q). In this paper we simplify the notation and denote the appropriate GARCH model by VOL.

Equation (1) will be used separately to examine the role of exchange rate volatility on agricultural ( $EX_A$ ), date ( $EX_D$ ), pistachio ( $EX_P$ ) and saffron exports ( $EX_S$ ).

## Results and discussion

After estimation of the exchange rate volatility we check the unit roots using Augmented Dickey-Fuller (ADF) and Philips-Peron (PP) tests. Table (1) provides the results of unit root tests on the data. Results of the ADF and PP tests showed that some of the variables are I(0) and some are I(1). Then, using of ARDL approach will be provided.

### Estimation of export demand by using ARDL approach

Table (2) show the results of the estimation of agricultural, pistachio, saffron, and date exports by using ARDL approach based on Schwartz-Bayesian criterion showed that there is a positive and significant relationship between exchange rate volatility and demand for agricultural exports, but negative and significant relationship between relative prices and income of Iran's trading partners. Sign of the variables VOL and RELP that are marked as exchange rate volatility and relative prices were consistent with the theory, but sign of the variable income of Iran's trading partners is inconsistent with theory. Perhaps, Reduction of the volume of trade flows among Iran and its trading partners due to existing political pressures is the most reason for being a negative relationship between incomes of Iran's trading partners and demand for agricultural exports. Results of estimation for agricultural sector, date, pistachio, and saffron exports show that relative prices and exchange rate volatility have had negative impacts on exports of date but income of trading partners has a positive impact on date

exports in the period of study. Income of trading partners and exchange rate volatility have had positive impacts on pistachio and saffron export, but relative prices had a negative impact on exports of pistachio and saffron that shows the results are consistent with the theory.

### Estimation of long-run relationships

Long-run relationships were estimated for agricultural sector, pistachio, saffron and date demand functions. The results are given in table (3). All variables are significant in agricultural sector function, so that only positive sign in the model is VOL. But considering the exports of date, pistachio and saffron, the only variable which has positive and significant impact is LIN with positive effect on the export of these products at one percent significant level. Variable VOL in agricultural exports demand function is more sensitive than

other explanatory variables. So, if a percentage is added to the amount of exchange rate volatility it will be added about 2.04 percent on demand for agricultural exports.

### Estimation of error correction model (ECM)

Table (4) shows the results of the estimation of error correction model (ECM) for agricultural sector, pistachio, saffron, and date exports in short-run. As can be seen, the error correction coefficient for agricultural sector is -0.26 and it is significant at one percent level. This coefficient indicates that the impact of adopted policies in this case will be seen after about four years. The coefficient for date, pistachio, and saffron equals to -0.61, -0.62, -0.53 and is significant at one percent level respectively. In fact, it indicates that the rate adjustment of date and pistachio is faster as compared to agricultural sector and saffron.

Variables	ADF test		PP test	
	Level	First difference	Level	First difference
LEXA	-1.91	-4.9***	-1.91	-4.88***
LEXD	-2.72*	-7.5***	-2.71*	-8.21***
LEXP	-1.63	-5.81***	-1.61	-6.36***
LEXS	-0.68	-5.74***	-0.63	-5.72***
LRP	-3.85***	-3.43**	-3.42**	-3.66**
LIN	-0.46	-5.51***	-0.38	-5.56***
VOL	-3.83***	-6.87***	-3.83***	-10.54***

Note: \*, \*\* and \*\*\* denotes 10%, 5% and 1% significance levels, respectively.

Source: Research findings.

Table 1: Results of ADF and PP unit root tests on variables of model.

products	Agricultural sector	Pistachio	Date	saffron
Variables				
LEX(-1)	0.762*** (11.53)	0.381** (2.66)	0.38** (2.7)	0.475*** (3.65)
LRP	-0.022** (2.3)	-0.04 (-0.95)	-0.03 (-0.6)	-0.043 (-0.95)
LIN	-0.034*** (-4.37)	0.32*** (4.2)	0.386*** (4.06)	0.505*** (4.21)
VOL	0.48*** (2.87)	0.52 (0.43)	-0.035 (-0.026)	0.68 (0.54)
C	2.69*** (-3.86)	2.92 (1.35)	-1.52 (0.6)	-7.39*** (-2.9)
R2	0.88	0.80	0.81	0.92
D.W	1.78	1.98	2.13	2.19

Note: \*, \*\* and \*\*\* denotes 10%, 5% and 1% significance levels, respectively.

The numbers in parentheses are (t) statistics.

Source: Research findings.

Table 2: Results of the estimation of agricultural, pistachio, saffron, and date exports by using ARDL approach.

Variables	C	LRP	LIN	VOL
Products				
LEX <sub>A</sub>	11.37*** (8.12)	-0.096* (-1.76)	-0.15*** (-2.9)	2.04** (2.26)
LEX <sub>D</sub>	-2.5 (-0.58)	-0.04 (-0.61)	0.63*** (5.21)	-0.06 (-0.026)
LEX <sub>P</sub>	4.72 (1.5)	-0.07 (-.89)	0.52*** (5.58)	0.84 (0.44)
LEX <sub>S</sub>	-14.1*** (-3.58)	-0.1 (-0.9)	0.96*** (8.25)	1.3 (0.54)

Note: \*, \*\* and \*\*\* denotes 10%, 5% and 1% significance levels, respectively.

The numbers in parentheses are (t) statistics.

Source: Research findings.

Table 3: Results of the estimation of long-run relationships for agricultural, pistachio, Saffron, and date exports functions.

Variables	dc	dRP	dIN	dVOL	ECM
Products					
LEX <sub>A</sub>	2.87*** (3.64)	-0.02 (1.49)	-0.31*** (-3.36)	0.26 (1.49)	-0.26*** (-3.35)
LEX <sub>D</sub>	-1.53 (-0.6)	-0.03 (-0.61)	0.38*** (4.05)	-0.035 (-0.025)	-0.61*** (-4.24)
LEX <sub>P</sub>	2.92 (1.34)	-0.04 (-0.95)	0.32*** (-4.19)	0.51 (0.43)	-0.62*** (-4.32)
LEX <sub>S</sub>	-7.4*** (-2.9)	-0.043 (-0.95)	0.51*** (4.22)	0.68 (0.53)	-0.53*** (-4.03)

Note: \* and \*\* and \*\*\* indicate significance at the 10%, 5% and 1% percent respectively.

The numbers in parentheses are (t) statistics.

Source: Research findings.

Table 4: Results of the estimation of ECM for agricultural, date, pistachio, and saffron exports.

## Conclusion

The main purpose of this study is investigating the effect of exchange rate volatility on exports of agricultural products with emphasis on pistachio, saffron and date. In this case, after estimating exchange rate volatility from GARCH model, the models of research were estimated to investigate long-run and short-run relationships between variables of model by using ARDL approach. The results of the exchange rate volatility show that this factor has different impacts on exports. For example, exchange rate volatility has had a positive effect on exports of pistachio and saffron but a negative effect on export demand of date. So, exchange rate volatility can have different effects on exports of different products. Accordingly, it will be important that Iran's agricultural trade policies toward different countries, should be developed based on exchange rate fluctuations. Moreover, other effective factors on trade relationships such as

marketing and gross domestic product of importing countries should be noted.

According to the negative relationship between relative prices and the exports of date, pistachio and saffron, effort to reduce the relative prices is one of the important points for a stronger presence in international markets. This can be achieved through the reduction of production and products marketing costs. As a clear solution, allocation of export subsidies can reduce export prices in the face of high prices as a result of fewer production and fluctuations can be prevented. However, it will be advisable as long as the World Trade Organization (WTO) rules on export subsidies are not still implemented in Iran.

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## Examination of existence of the law of one price at Czech meat markets

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### Abstract

This paper deals with the problem of the law of one price. The topic is examined on wholesaler level of pig meat and beef meat agri-food chains in the Czech Republic. The aim of the paper is to examine whether the law of one price holds at these markets. To fulfill the aim the multivariate time series analysis is employed, concretely co-integration analysis and Vector error correction model (VECM). The analysis is based on time series of wholesale price in individual regions of the Czech Republic which contain bi-weekly data in period from May 2004 to June 2011. The analysis shows that the law of one price does not hold at both markets. However, if the transaction costs are omitted there might be found some regions where it works. Finally, some dominant as well as submissive regions were detected at both pig meat as well as beef meat market.

### Key words

Price transmission, law of one price, agri-food market, pig meat, beef meat, co-integration analysis, VECM.

### Anotace

Tento článek se zabývá problematikou existence zákona jedné ceny. Téma je zkoumáno na zpracovatelské úrovni vertikály vepřového a hovězího masa v České republice. Cílem článku je ověřit, zda zákon jedné ceny na zvolených trzích platí. Pro naplnění cíle je použita analýza vícerozměrných časových řad, konkrétně kointegrační analýza a Vector error correction model (VECM). Analýza je založena na časových řadách cen potravinářských výrobců vepřového a hovězího masa v jednotlivých regionech České republiky, které obsahují čtrnáctidenní data v období květen 2004 – červen 2011. Provedená analýza ukazuje, že zákon jedné ceny na trhu vepřového ani hovězího masa neplatí. Nicméně při zanedbání transakčních nákladů byla platnost zákona jedné ceny prokázána mezi některými dílčími regiony. Dále byly detekovány regiony, které lze považovat na daném trhu za dominantní, popř. submisivní.

### Klíčová slova

Cenová transmise, zákon jedné ceny, zemědělsko-potravinářský trh, vepřové maso, hovězí maso, kointegrační analýza, VECM.

### Introduction

Pig meat and beef meat belong among the most important sectors of livestock production. Pork meat is the most popular meat in the Czech Republic. Its consumption reaches level of 40 kg/year/capita even its long-term tendency is decreasing; it decreased from level of 50 kg/year/capita in year 1990 to 41 kg/year/capita in year 2010. Then, the consumption of poultry meat reaches level of 25 kg/year/capita, however, its tendency is increasing. The consumption of poultry meat increased from 13.5 kg/year/capita in year

1990 to 25 kg/year/capita in year 2010. Poultry meat is favorite especially due to its price, taste and cooking features. Finally, the third place in meat consumption belongs to beef meat. The consumption of beef meat reaches level of 10 kg/year/capita, however, its long-term tendency is decreasing. The consumption of beef meat decreased from almost 30 kg/year/capita in year 1990 to 10 kg/year/capita in year 2010. The decreasing tendency of beef meat consumption is connected especially with relatively high price compared to other meats. The consumption at domestic market as well as foreign demand is fundamental for the farmers as well as

processors. The production of meat is driven by its consumption. Moreover, the supply of meat is affected by the price level as the main factor of economic relationships. Thus, the level of farm-gate price, wholesale price and consumer price and their transmission in both vertical and horizontal direction are crucial.

Due to the data availability the paper is focused just on pig meat market and beef meat market. Pig meat and beef meat markets in the Czech Republic were already analyzed e.g. in Lechanová (2006), Čechura et al (2010), Mach et al (2010), Malý et al (2011a) or Malý et al (2011b).

The price transmission can be analyzed in both vertical and horizontal direction as it was already mentioned. At horizontal level the analysis might be connected with the question of the law of one price. The law of one price is usually examined in connection with foreign trade at world level. It means that usually the price transmission among different countries all around the world is examined. Then, transaction costs play an important role as well as foreign policies. However, the law of one price may be applied also in the case of one economy and its partial markets. Thus, an inter-regional existence of the law of one price might be examined.

Spatial price transmission at selected agri-food chains and the law of one price were analyzed e.g. in Ardeni (1989), Baffes (1991), Goodwin et al (1990), Asche (1999), Goodwin (2006), Serra et al (2006), Bakucs, Fertő (2007), Hockman, Vőneki (2007), Pippenger, Phillips (2008), Šobrová, Čechura (2008), Babiker, Abdalla (2009), Goodwin et al (2011) or Graubner et al (2011).

## Material and methods

The aim of this paper is to examine whether the law of one price does hold at selected meat agri-food markets in the Czech Republic, concretely pig meat and beef meat markets. To fulfill the aim the following hypotheses were defined.

*H1: The law of one price does not hold among all regions at wholesaler level at pig meat as well as beef meat market in the Czech Republic.*

*H2: The position and the strength of analyzed regions are not equal. Among these regions there may be found dominant regions that influence the prices in other regions.*

To verify the hypotheses the multivariate time series analysis is employed, concretely co-integration analysis and Vector error correction model are used in the following steps:

- i) detection of time series stationarity using Augmented Dickey-Fuller test (ADF) and Phillips-Perron test (PP);
  - ii) detection of long-run relationship between analyzed variables using co-integration analysis;
  - iii) estimation of Vector Error Correction Model (VECM) to describe the relationship between prices in selected regions. VECM model is estimated 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  $C_s$  for  $s > p$ ,  $X_t$  is a  $k \times 1$  vector of variables which are supposed to be integrated of order 1,  $(I(1))$ ,  $u_1, \dots, u_k$  are iid  $(0, \Sigma)$  and  $\Pi$  is a matrix of the long-run relationship;
- iv) examination of the law of one price based on the estimated models, price transmission elasticity and test of weak exogeneity.

The time series of wholesale price of pig meat and beef meat in individual regions of the Czech Republic contain bi-weekly data in period from May 2004 to June 2011. The time series contain 172 observations except the time series in North-west region and Moravia Silesia region where several missing values are included due to not available data. The data set was provided by State Agricultural Interventional Fund. The law of one price is examined at pig meat and beef meat market in the Czech Republic, i.e. it is analyzed the price transmission of the wholesale price among the following regions: Middle Bohemia region (MB), North-east region (NE), North-west region (NW), South-east region (SE) and Moravia-Silesia region (MS). The calculations were done using an econometric software RATS 6.35 and CATS 2.0.

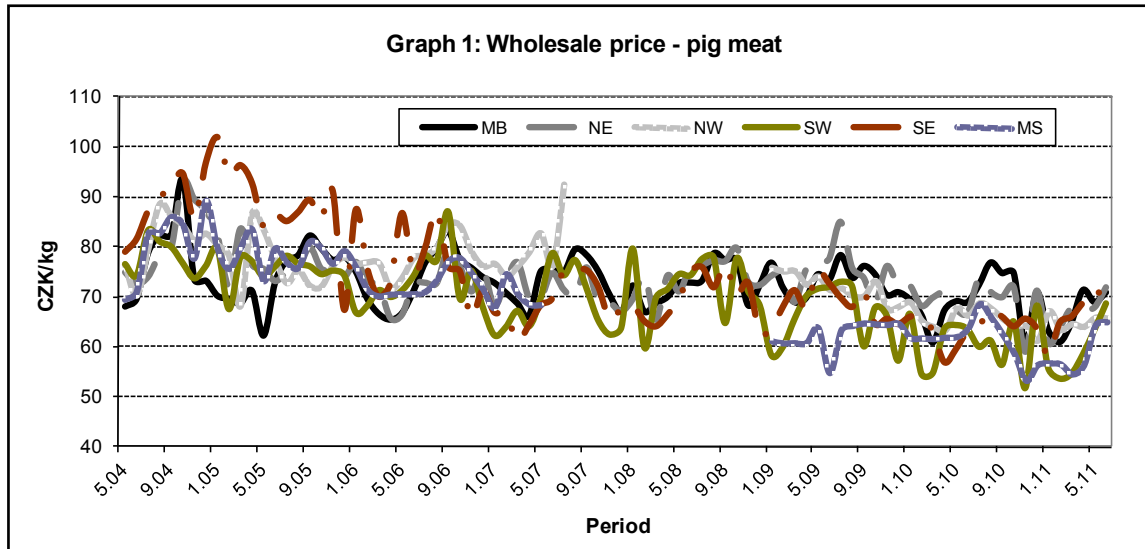
## Results and discussion

The following text consists of two parts. First of all, the main statistic characteristics of analyzed time series, i.e. the wholesale price of pig meat and beef meat in individual regions of the Czech Republic, are introduced and their main properties described. Subsequently, the law of one price is examined based on price transmission analysis among individual regions at selected agri-food markets.

### I. Description of analyzed time series

#### Pig meat

Graph 1 shows the development of the wholesale price of pig meat in individual regions of the Czech



Source: author's processing.

Graph 1: Wholesale price - pig meat.

Region	MB	NE	NW	SW	SE	MS
Mean (CZK/kg)	72.52	73.20	73.63	69.90	73.32	69.07
Std. deviation	5.34	5.49	6.64	6.88	10.70	8.75
Variation coefficient (%)	7.37	7.50	9.02	9.84	14.60	12.67
Index number (%)	106.66	94.84	85.44	80.58	86.64	93.73

Source: author's calculations.

Table 1: Main characteristics of pig meat time series.

Republic in period from May 2004 to July 2011. The graph shows decreasing tendency of all time series in analyzed period except the time series in Middle Bohemia region where the wholesale price increased by 6.66 % between May 2004 and June 2011. The other time series decreased by approximately 5.0 – 19.5 % in the same period (see table 1). The highest decrease of the wholesale price was detected in South-west region.

The decreasing tendency of the wholesale price of pig meat is connected with the situation in pig meat agri-food chain after the EU accession. The Czech Republic is former competitive producer of pig meat; however, EU conditions and requirements have affected the extent of pig meat production in the Czech Republic. The production is not efficient anymore and many of the Czech farmers had to finish their production due to profit-loss reasons. Decreasing tendency of the wholesale price of pig meat in the Czech Republic is connected with cheap import of pork meat that has devastated Czech pig producers. Anyway, the development of the consumer price of pork meat does not really correspond with the development of the wholesale price.

Table 1 shows average level of wholesale price of pig meat in individual regions of the Czech

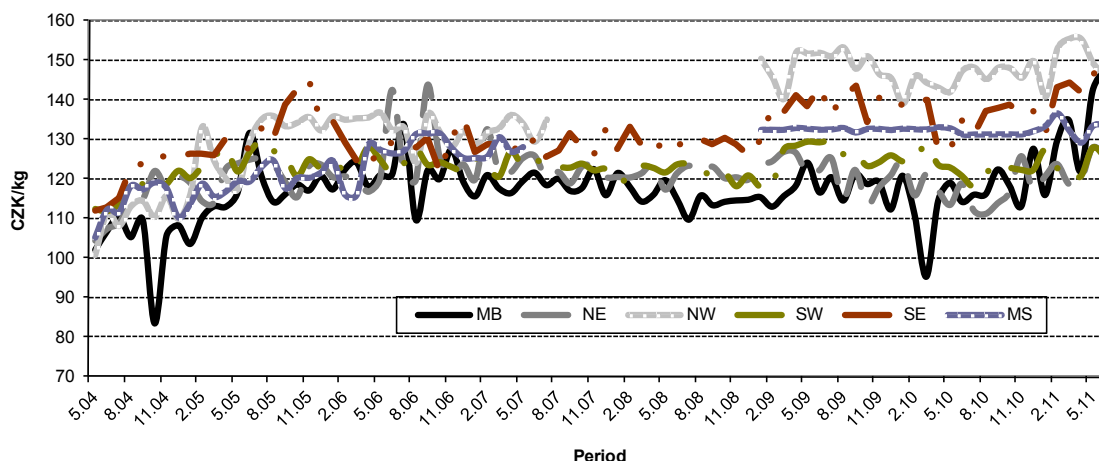
Republic, their standard deviations and coefficients of variation. Average value of wholesale price reach values between 69.07 CZK/kg and 73.69 CZK/kg. Then, North-west region might be considered as the region with the highest price level while Moravia-Silesia region might be considered as the region with the lowest price level.

The variation of examined time series in analyzed period is quite high. The values of coefficient of variation equals from 7.37 % to 14.60 %. The highest fluctuation was detected in the time series of wholesale price in South-east region while the lowest fluctuation was detected in Middle Bohemia region and North-east region.

#### Beef meat

Graph 2 shows the development of the wholesale price of beef meat in individual regions of the Czech Republic in period from May 2004 to July 2011. The graph shows increasing tendency of all time series in analyzed period. The wholesale price in individual regions of the Czech Republic increased by approximately 9.5 – 54.5 % between May 2004 and June 2011 (see table 2). The highest increase of the wholesale price was detected in North-west region. Thus, the level of wholesale price in this region became the highest of all regions of the

Graph 2: Wholesale price - beef meat



Source: author's processing.

Graph 2: Wholesale price - beef meat.

Region	MB	NE	NW	SW	SE	MS
Mean (CZK/kg)	117.22	120.59	136.06	123.01	132.01	126.26
Std. deviation	7.75	5.00	13.30	3.38	7.18	7.40
Variation coefficient (%)	6.61	4.14	9.77	2.75	5.44	5.86
Index number (%)	140.67	120.30	154.37	109.63	133.09	125.92

Source: author's calculations.

Table 2: Main characteristics of beef meat time series.

Czech Republic.

Table 2 contains mean values of the wholesale price time series of beef meat in individual regions of the Czech Republic in period from May 2004 to June 2011, their standard deviations and coefficients of variation. Average values of beef meat reach the values from 117.22 CZK/kg to 136.06 CZK/kg. Based on these values North-west region might be considered as the region with the highest price level while Middle Bohemian region might be considered as the region with the lowest price level.

The variation of examined time series in analyzed period is not as extreme as in case of the wholesale price of pig meat. The coefficient of variation reaches the values between 2.75 % and 9.77 %. The lowest fluctuation was detected in South-west region while the highest fluctuation was detected in North-west region.

## II. Examination of existence of the law of one price at selected markets

To examine the existence of the law of one price and to verify the hypotheses defined the co-integration analysis was employed and Vector error correction model (VECM) was estimated. Finally, the results

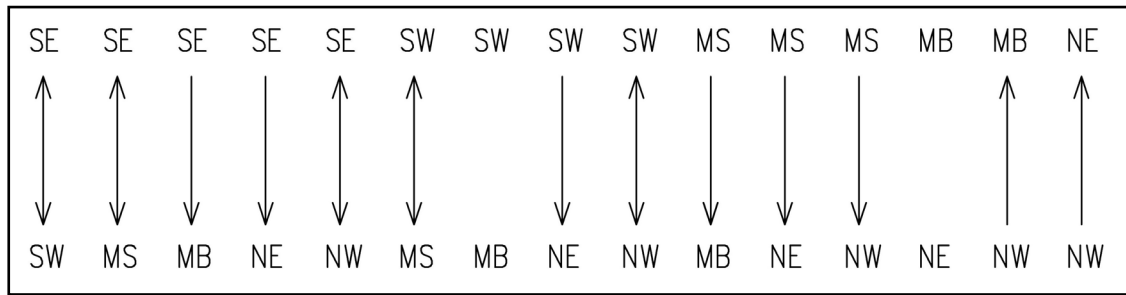
are discussed and the conclusions stated.

### Pig meat

First of all, the stationarity of the time series of the wholesale price of pig meat in individual regions was examined using Augmented Dickey-Fuller test and Phillips-Perron test. Based on these tests all time series might be considered as non-stationary and integrated of order one, i.e.  $I(1)$ . Thus, the long-run relationship might be examined.

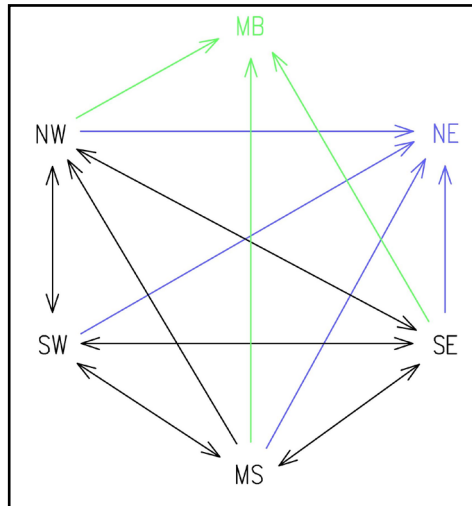
The co-integration analysis and the test of weak exogeneity proved the long-run relationship between each two regions of the Czech Republic except the regions South-west – Middle Bohemia and Middle Bohemia – North-east. Subsequently, the VECM model was estimated for each two regions to find whether the relationship between the wholesale prices is one-way or simultaneous. Estimated models proved simultaneous relationship between some regions and one-way relationships between another (see Scheme 1).

Then, complex relationships among all analyzed regions were examined. The final result is shown in Scheme 2. According to the results of estimated models several regions with specific position were



Source: author's calculations.

Scheme 1: Price transmission between regions – pig meat.



Source: author's calculations.

Scheme 2: Complex price transmission – pig meat.

	SW	MS	MB	NE	NW
SE	0.5	0.9	0.2	0.4	0.5
SW		0.9	x	0.8	<b>1.0</b>
MS			0.4	0.5	<b>1.0</b>
MB				0.4	0.5
NE					0.7

Source: author's calculations.

Table 3: Price transmission elasticity – pig meat (%).

detected. First of all, two regions were detected in submissive position in relation to other regions, concretely Middle Bohemia and North-east region. These regions are connected just with one-way relationship with other regions of the Czech Republic. Thus, Middle Bohemia and North-east regions seem to be the price takers. On the other hand region Moravia-Silesia might be assumed as the region in mainly dominant position. The region is connected with other regions with both simultaneous and one-way relations. However, the other regions take its price changes. Moreover, among the analyzed regions partial circle of simultaneous relationships was detected. The regions South-west – South-east – Moravia-

Bohemia are connected with partial simultaneous relationships with almost perfect price transmission.

Finally, the price transmission elasticity was quantified to examine whether the law of one price hold at pig meat market. The coefficients of elasticity reach the values between 0.2 % and 1.0 % (see table 3). Then, it might be concluded that the law of one price does not hold at analyzed market. However, some of the partial relations might be characterized by its existence. The law of one price does hold among regions South-west – North-west and Moravia-Silesia – North-west. Among these regions perfect price transmission does exist; even in case of Moravia-Silesia – North-west regions the relationship is just one-way. Moreover, among the

regions South-east – Moravia-Silesia and South-west – Moravia-Silesia the price transmission might be considered as almost perfect (the price transmission elasticity equals approximately 0.9%).

### Beef meat

First of all, the stationarity of the time series of wholesale price of beef meat in individual regions of the Czech Republic was examined using Augmented Dickey-Fuller test and Phillips-Perron test. The tests showed that all analyzed time series are non-stationary and integrated of order one, i.e.  $I(1)$ . Thus, the long-run relationship between individual regions might be examined.

The co-integration analysis and the test of weak exogeneity proved the long-run relations between each two analyzed regions except the relationship between South-west – North-east regions. Among the regions several cases of simultaneous relationships were proved as well as several one-way relationships (see scheme 3). In case of beef meat market more one-way relations were detected compared to pig meat market.

Then, complex relationships among all analyzed regions were examined. The final result is shown in scheme 4. Also in case of beef meat market some regions in dominant position as well as the regions in submissive position were found. Two regions were detected to be in submissive position, concretely North-east region and South-west region. These two regions might be assumed as the price takers. The level of their wholesale price and its changes do not influence the level of the wholesale price in

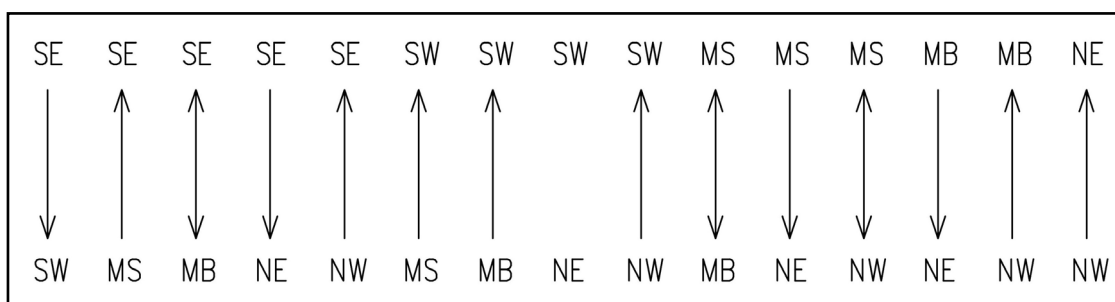
other regions. On the other hand North-west region and Moravia-Silesia region were detected as mainly dominant regions. Thus, the price in these regions influences the price level in other regions.

Finally, the law of one price was examined based on the price transmission elasticity. The values of coefficient of elasticity equal 0.1 – 0.8 % (see table 4). Based on this examination it might be concluded that the law of one price does not hold at beef meat market in the Czech Republic. Moreover, at this market even partial perfect price transmission was not proven. Generally, the relations at beef meat market are less elastic compared to the relations at pig meat market.

### Conclusions

The aim of the paper was to examine whether the law of one price holds at wholesaler level of pig meat and beef meat markets in the Czech Republic. The aim was fulfilled using co-integration analysis and Vector error correction model. The analysis was processed based on the time series of wholesale price of pig meat and beef meat in individual regions of the Czech Republic. The time series contained bi-weekly data in period from May 2004 to June 2011.

The analysis was connected with two hypotheses to verify. The first hypothesis which says that the law of one price does not hold among all regions at wholesaler level at pig meat as well as beef meat market in the Czech Republic was accepted (except of some partial relations). It means that



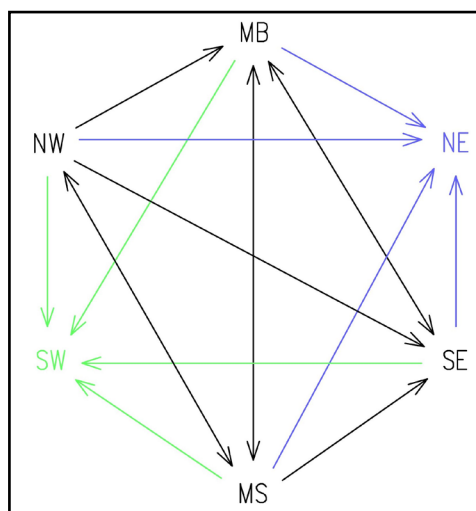
Source: author's calculations.

Scheme 3: Price transmission between regions – beef meat.

	SW	MS	MB	NE	NW
SE	0.2	0.3	0.8	0.1	0.5
SW		0.3	0.2	x	0.1
MS			0.6	0.1	0.5
MB				0.3	0.4
NE					0.1

Source: author's calculations.

Table 4: Price transmission elasticity – beef meat (%).



Source: author's calculations.

Scheme 4: Complex price transmission – beef meat.

even the transaction costs are omitted the price transmission is not perfect. It might be caused e.g. by an asymmetric information that influences the smoothness of the price transmission as well as other reasons. Even the law of one price does not hold the long-run relationship between the wholesale prices in individual regions was proven (in almost all cases).

The second hypothesis which says that the position and the strength of analyzed regions are not equal and that among these regions there may be found dominant regions that influence the prices in other regions was accepted, too. The analysis showed that some regions are connected with mutual relationships while the other regions are connected just with one-way relations. Also the price transmission elasticity showed differences in price transmission between individual regions. Thus, some regions with the specific position were detected. For example North-east region might be considered as submissive at both pig meat and beef meat market and Moravia-Silesia might be considered as region with dominant position at both markets.

To conclude, it may be said that the wholesale prices are transmitted among the regions; however, they are not transmitted perfectly. Moreover, some relations are just one-way relations. Thus, some of the regions might be considered as dominant while other regions might be considered as submissive in this transmission.

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## Online Web portal of competence-based training opportunities for Organic Agriculture

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### Abstract

A number of Information and Communication Technology (ICT) tools such as web portals, learning portals and course management platforms have been developed and used in order to support EU-funded research and training projects in the area of Organic Agriculture (OA). These tools transfer the technological infrastructure needed in order to facilitate specific tasks, such as the organization of educational, research and information content, like the competences, learning opportunities, certificates and vocational opportunities. This paper presents the case of the CerOrganic Web portal (<http://portal.cerorganic.eu>), which is used for providing access to resources related to vocational education and training in the context of OA.

### Key words

Competences, competence model, organic agriculture, OA, ICT tools, web platform.

## 1. Introduction

Organic agriculture (OA) is a rapidly developing sector of agriculture. According to statistical information from the Research Institute of Organic Agriculture FiBL (2011), there has been an increase of about 36% in the organically cultivated land in European Union (EU) from 2005 to 2009. A corresponding increase is also noted to various aspects regarding OA, such as the land in conversion process, the number of OA producers and processors, as well as the research made and published in the context of OA comes as a reply to intensive and polluting forms of agriculture, and as a suggestion for healthy living and a different approach of both producers and consumers. OA in EU is supported by a corresponding legislation and a framework based on the “European Action Plan for Organic Food and Farming”, which “sets out 21 initiatives to achieve the objectives of developing the market for organic food and improving standards by increasing efficacy, transparency and consumer confidence. It follows the rapid increase in the number of farmers producing organically and strong demand from consumers during the past few years” (Commission of the European Communities, 2004).

In order to support this ever-growing movement of OA, a number of research projects have been funded by EU, in order to scientifically support the

research made in the context of OA, as well as to provide solutions and increase opportunities for the vocational education and training of the actors involved, including OA trainers, advisors, extension officers and farmers. In order to meet the constantly increasing training needs of the aforementioned groups as well as for facilitating the delivery of education and information to geographically remote stakeholders, these projects have produced a number of ICT tools, such as web portals (Šimek et al., 2010), learning portals (Manouselis et al., 2009), course management platforms (Mylonakis et al., 2011), e-commerce platforms and other tools that make use of the latest technological advances. The main aim of such tools is to make the information available to all stakeholders, by removing geographical and other barriers. In addition, these tools facilitate the organization, classification and publication of digital informative, educational and scholarly resources in an organized manner. However, despite the wealth of information related to vocational education and training in the area of OA, it seems that there is no central point of access to information related to job profiles and the corresponding competencies, training opportunities and the corresponding certificates as well as the related learning outcomes.

Competence-based development of vocational education and training supports the design of improvements to Human Resources Management

systems, including job redesign, recruitment, internal organizational training, career management, performance improvements and compensation systems (UNIDO, 2002) in several professionals sectors, as well in OA.

This paper presents the CerOrganic Web portal, a portal that was developed during the CerOrganic: Quality-Certified Training of Farmers on OA project ([www.cerorganic.eu](http://www.cerorganic.eu)), a 24-months project, supported and co-funded by the European Commission through the Lifelong Learning Programme as a Leonardo da Vinci, Development of Innovation (DoI) project. The overall aim of CerOrganic was to develop and test a quality assurance procedure for the continuing vocational education and training of agricultural experts, based on the European Quality Assurance Reference Framework (EQARF, 2009). One of the major products of the CerOrganic project is the CerOrganic Web portal, which supported the aims of the project by providing a point of access to the aforementioned material related to the context of vocational education and training in OA.

## **2. Background**

### **2.1 Definitions**

Based on the European Qualification Framework for Lifelong Learning (EQF, 2012) and the German Reference Framework, PAS 1093 (Publicly Available Specification), competence is defined as the ability to reasonably and intentionally perform a specific job and task in an unknown situation with success: Competences encompass a combination of knowledge, skills, and (intentional) behaviour and are constituted by defined activities for the observation and measurement. Competences are built and are normally demonstrated by individuals (but also by teams and whole organizations) (PAS 1093, 2009).

Knowledge is defined as one of the “outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study. Knowledge depicts the awareness, information, or understanding about facts, rules, principles, guidelines, concepts, theories, or processes needed to successfully perform a task (Marrelli, 2001; Mirabile, 1997). The knowledge may be concrete, specific, and easily measurable or more complex, abstract, and difficult to assess (Lucia & Lepsinger, 1999). Knowledge is acquired through learning and experience. According to the EQF definition, knowledge means the outcome of the assimilation of information through learning.

Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study (EQF, 2008).

The skills are defined as “the ability to apply knowledge and use know-how to complete tasks and solve problems. In the context of the European Qualifications Framework, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments)” (EQF, 2008). A skill is a capacity to perform mental or physical tasks with a specified outcome (Marrelli, 1998). Similar to knowledge, skills can range from highly concrete and easily identifiable tasks, such as filing documents alphabetically, to those that are less tangible and more abstract, such as managing a quality improvement project (Lucia & Lepsinger, 1999). According the EQF, skills are defined as the ability to apply knowledge and use know-how to compete tasks and solve problems (EQF, 2008).

“Learning outcome” is defined as a statement of what a learner knows, understands and is able to do on completion of a learning process. The EQF therefore emphasizes the results of learning rather than focusing on inputs such as length of study. Learning outcomes are specified in three categories – as knowledge, skills and competence. This categorization identifies that qualifications – in different combinations – capture a broad scope of learning outcomes, including theoretical knowledge, practical and technical skills, and social competences where the ability to work with others will be crucial.

Job Profile plays a critical role in managing human resources, including better understanding and definition of the duties and responsibilities in a work place, recruitment, job evaluation, performance appraisal, training and development.

Finally, certificate is the proved declaration of the successful fulfillment of the training.

### **2.2 Related Competence-based Web Portals**

Several research, EU-funded projects have already worked on the direction of the development of competence models and identification of competences, supporting the professional training. The TEN-Competence project ([www.tencompetence.org](http://www.tencompetence.org)) aimed to integrate online tools and learning environments in a common infrastructure, based on the lifelong competence development (Fig.1). In addition, the iCOPER project ([www.icoper.org](http://www.icoper.org)) developed the best practice guides and online environment for the exchange of competence models and learning

outcomes, collaboration in terms of learning design and reuse of digital training objects (Fig. 1).

The WACOM project ([www.wacom-project.eu](http://www.wacom-project.eu)) focused on the identification competence models and competences for professionals in the water sector, enhancing the improvement of professional training and workplace training (Stracke, 2011). Online

representation of the WACOM Competence Model was designed in a way to describe the competences and workplaces tasks of the actors in fields like the waste water treatment management (Thanopoulos et al., 2011). The WACOM Competence Models Online Form for the description of competence is presented in the Figure 3.

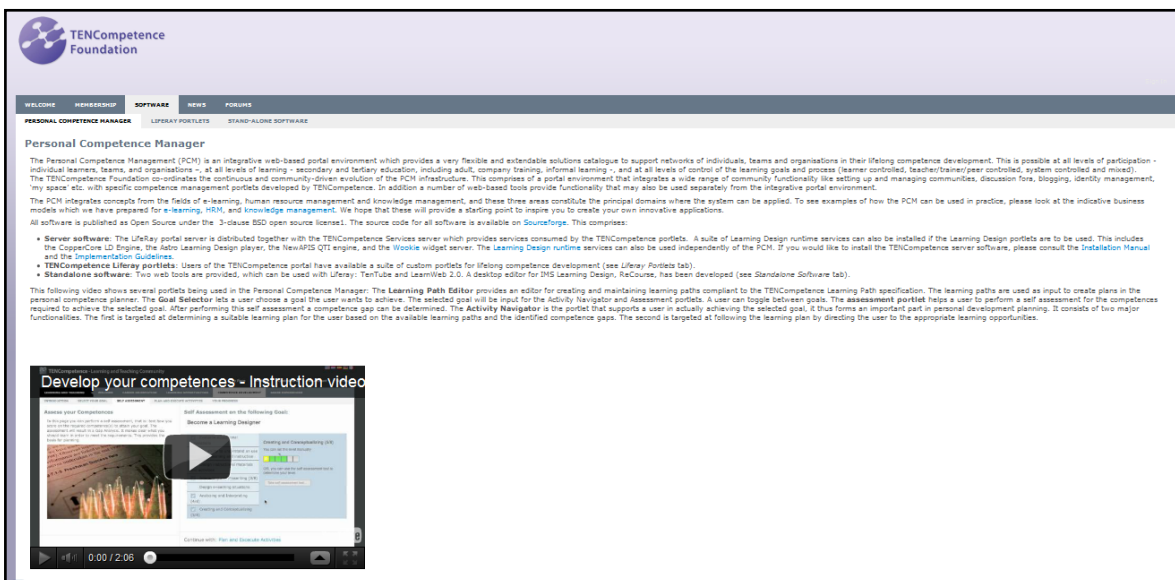


Figure 1: TEN Competence portal with the tutorial video on how to build your own personal competences



Figure 2: iCOPER repository with training content based on competences and learning outcomes.

The screenshot shows the 'Upload Competence Element' form in the WACOM portal. The form is organized into several sections:

- Title:** A single text input field labeled 'Title'.
- Description:** Two text input fields, 'Action Verb' and 'Description'.
- Level in Context:** Three dropdown menus labeled 'EQF Details', 'WACOM / eCOTOOLS Details', and 'ISCED Details'.
- Competence Elements Relation:** Four dropdown menus labeled 'Competence', 'Source', 'Scale', and 'Operator', followed by an 'Add' button.
- Classification:** A partially visible section at the bottom.

Figure 3: WACOM Competence Model Online Form for the description of competences.

### 3. The CerOrganic Web Portal

The CerOrganic Web Portal (<http://portal.cerorganic.eu>) was developed in order to meet the vocational education and training needs raised in the context of OA. It is a portal that supports the development of innovative ICT-based content, services, pedagogies and practices for lifelong learning, focusing on the vocational education and training sector of agriculture (Thanopoulos et al., 2011). It lists, collects, describes and categorizes vocational training content that help stakeholders of the vocational education/training of agricultural advisors/trainers, based on the European Quality Assurance Reference Framework (EQARF). A typical user of the CerOrganic Web Portal is able to browse through its content and find information about available jobs and vocational training opportunities, particularly in the rural and agricultural areas, as well as certificate supplements that can be obtained from the corresponding vocational training opportunities. Through the CerOrganic, the user has access to the following services:

- Upload / Create Digital training Objects

(DTOs). A user can fill in the online form for the description of a new DTO or review an existing DTO. For instance, the online form for a new training opportunity object includes the metadata elements: a) training opportunity provider details, b) training opportunity instance, c) classification (based on the European standards of NACE codes, Organic. Edunet ontology and coverage), d) (related) certificates, e) entry / access requirements and f) objectives (competence and / or learning outcomes).

- Browse DTOs. A user can browse through the available DTOs and select the preferable result. The first step is to hit the appropriate link from the left side menu (e.g. "Browse Training Opportunities"). All available Training Opportunities are categorized by type, by provider, by country, by language and by classification. The user can select the category of the Training Opportunity by clicking on the appropriate link.
- Search DTOs. A user can search for DTOs, using the simple search or advanced search

tool. The first step is to hit the appropriate link from the left side menu (e.g. “Search Training Opportunities”). The available Training Opportunities elements are available for the user to select.

- View My Contribution (DTOs uploaded by the user): This is a private place where each user can view his own DTOs (e.g. training opportunities) than he has previous uploaded.
- Registration to the portal. A user can registered to the CerOrganic portal in order to have full access to the portal services. E.g. the description of a new DTO (e.g. a new training opportunity) is accessible only to registered users.

Figure 4 shows the available filters of the search mechanism for competencies.

A number of DTOs have been described and stored in the CerOrganic Portal so far, including competences elements, learning outcomes, training opportunities and their certificates, as well as job profile objects. The organization of the DTOs objects into these specific categories helps the users when searching for particular material to develop the CerOrganic use cases of the learning resources (Maroudas et al., 2011).

### 3.1 Methodology

The steps that were followed in order to design and develop CerOrganic Web portal are:

- a) Identification of the main information resources that will be stored, annotated, shared and accessed through the portal.
- b) Outline of the general architecture and user roles involved.
- c) System analysis and specification using the Unified Modeling Language (UML, [www.uml.org](http://www.uml.org)).
- d) Development of the required metadata application profile (AP) for the description of the resources available through the portal.
- e) Interface design and prototype development.
- f) Public operation and testing with a sample set of real users.

### 3.2 Content

DTOs include a variety of resources, containing different types of information. For example, they represent rural and agricultural professions that are described and stored in the database, in order to support the scenarios of the project. These are

**Search Competence Elements**

Search Value:

Type: Competence, Skill, Knowledge, Activity

Category: Key Competence, Individual Competence, Sector Competence

Classification Schema: A - Agriculture, forestry and f..., A1 - Crop and animal production, A1.1 - Growing of non-perennial cr..., A1.1.1 - Growing of cereals (except ...)

Purpose: discipline, idea, prerequisite, competency

[Switch to Simple Search](#)

Figure 4: Searching for competence elements in the CerOrganic Web portal.

registered according to the category / classification to which they belong and decomposed in their appropriate competences and other lower level components. Another type of DTOs are Learning Opportunity Objects (or Training Opportunities Objects), pertinent to rural and agricultural professions which are related to the appropriate competences that they offer. Further Learning Opportunity Objects have been collected in the future from distributed databases existing in other systems.

DTOs also include Certificate Supplement Objects, pertinent to rural and agricultural vocational training that are correlated to the appropriate competences that they certify and to the appropriate learning opportunities from which they can be obtained. Further Certificate Supplement Objects (e.g. Europass Certificate Supplements or descriptions of other types of Certificates) have been collected from distributed databases existing in other systems. Besides, Vocational Objects (or Job Profiles objects) have been included in the design of the CerOrganic Web Portal, even if it was not in the

overall objectives of the CerOrganic project.. The Vocational objects offers a n efficient solution for the better understanding and identification of the working places and the jobs tasks for the OA.

Finally, another type of DTOs are Competence Elements Objects (competences, knowledge, skills and activities) and learning outcomes, pertinent to rural and agricultural vocational training. Competences are a building and supporting block for all other types of DTOs stored and categorized in the the CerOrganic Web Portal. All the aforementioned DTOs are described and stored in the database of the CerOrganic Web portal.

### 3.3 Architecture of the CerOrganic Web Portal

The main architecture of the CerOrganic Web Portal, as well as the types of users of the CerOrganic Web Portal and their interaction with the portal are illustrated in Figure 5, where the users accessing the portal, the corresponding services as well as the repositories involved are depicted.

The figure 5 depicts the conceptual overall architecture of the CerOrganic Portal.

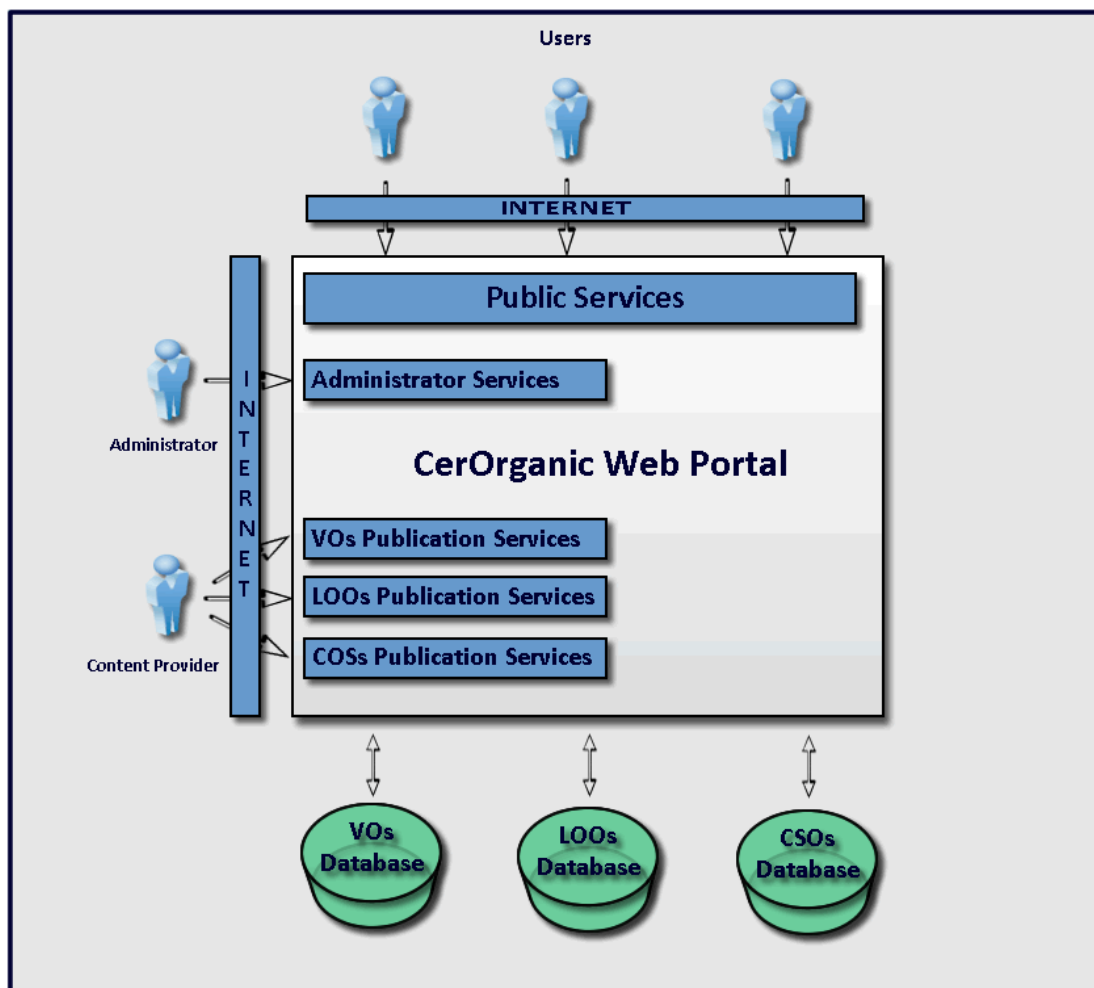


Figure 5: Overall Architecture of the CerOrganic Web Portal.

- At the lower level the database can be seen. The database is where the actual information of the objects is held. Since three core different DTOs (VOs: Vocational Objects, LOOs: Learning Opportunities objects and CSOs: Certificate Supplements objects) and supporting DTOs (Competences Elements and Learning Outcomes) have been chosen to be hosted in the Web Portal, three different databases exist, one for each DTO type. Of course this is the conceptual view, since technically a single database will be employed, divided in three different areas.
- The “Publication Services” represent the available services that will be provided by the CerOrganic Web Portal, i.e. upload / edit a VO / LOO / CSO and review it,
- Outside the CerOrganic Web Portal, the different user types that interact with it can be seen, each accessing the specific functionality available to his type.
- As regards the envisaged users of the portal, there are three main types of users, each one accessing the CerOrganic Web portal in a different way:
- Visitors, who can use the services of the portal such as browsing or searching for VOs / LOOs / CSOs and Competence Elements (e.g. competences) and Learning Outcomes. Visitors can be either registered or unregistered, with the registered ones having access to a wider set of the portal’s functionalities.
- Content Providers (CPs), who can insert VOs / LOOs / CSOs and Competence Elements (e.g. competences) and Learning Outcomes and describe them by creating the corresponding metadata records. Content Providers have the ability to upload DTOs and the corresponding Metadata.
- Administrators, who perform all the administrative functions related to Visitors, Content Providers and DTOs. Those include Viewing/Deleting/Deactivating DTOs and the corresponding metadata, Accepting or Declining Requests for Registration from CPs, Viewing / Activating / Deactivating Registered Visitors or CPs, etc.

### 3.4 Use Cases

During the design and development of the CerOrganic Web portal, the Unified Modeling Language (UML) was used, in order to analyze the system and its expected operations. UML is the software industry standard modeling language

for visualizing, specifying, constructing and documenting the elements of systems in general, and software systems in particular. UML helps towards the top-down refinement of software systems from the early stages of collection of requirements until the development of the required software components, by providing a user-friendly approach of graphical artifacts (Boggs and Boggs, 2002).

Based on the UML approach, the use case diagrams for the three types of users have been developed and are shown in the figures 6, 7 and 8.

### 3.5 CerOrganic Web Portal Design and Specifications

DTOs available through the portal are described with metadata according to the CerOrganic Metadata Application Profile (Manouselis and Maroudas, 2011), which is based on the Learning Object Metadata published by the Institute of Electrical and Electronics Engineers Standards Association (IEEE LOM) application profile (IEEE 2002), widely used for describing educational resources with metadata. Interoperability and reusability were two factors taken into consideration during the development and implementation of the CerOrganic AP, as the interconnection of the CerOrganic Web Portal and other closely related online portals such as the Organic.Edunet Web Portal ([www.organic-edunet.eu](http://www.organic-edunet.eu)) and the ARIADNE foundation ([www.ariadne-eu.org](http://www.ariadne-eu.org)) was a critical factor for the availability of the portal’s content through these additional means of publication.

Thus, the CerOrganic Web portal supports the harvesting of the metadata records of its content to other learning repositories through the OAI-PMH protocol (Open Archives Initiative Protocol for Metadata Harvesting - [www.openarchives.org/pmh](http://www.openarchives.org/pmh)). This specific classification supports the users in their search for particular material to develop the CerOrganic use cases of the learning resources (Maroudas et al., 2011). The metadata elements of the CerOrganic AP used for the description of the Training Opportunities and Competencies are depicted in Figures 9 and 10 respectively.

To facilitate searching and locating all Objects hosted by the CerOrganic Web Portal (i.e. VOs, LOOs and CSOs), they should be adequately described, detailing important characteristics. In this way, users can simply go through the various descriptions, and select the most appropriate resources for their needs. Apart from reflecting the most important characteristics, descriptions also have to be available in the language of the users (that is, multilingual descriptions will be necessary).

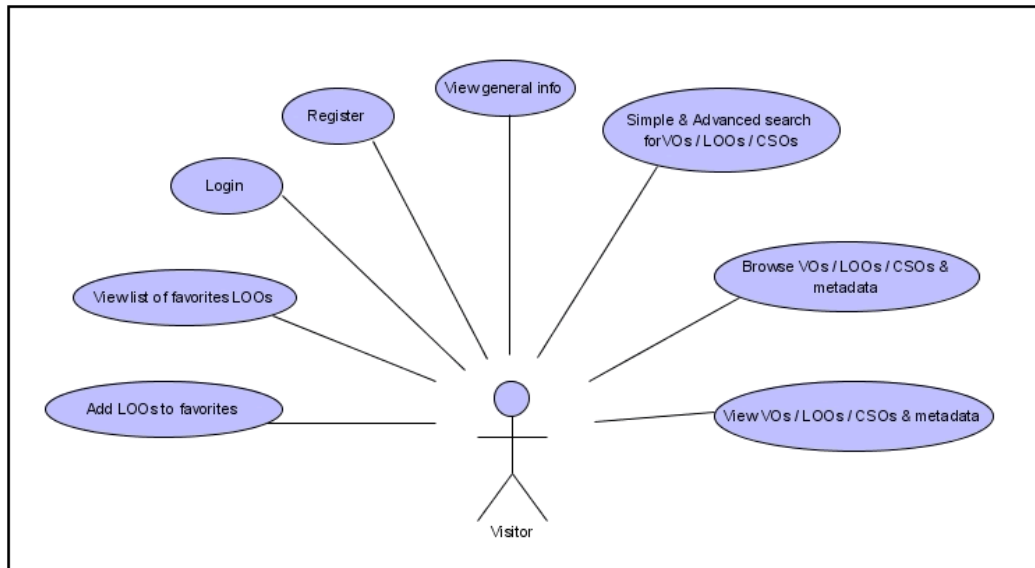


Figure 6: Use case for the Visitors of the CerOrganic Web portal.

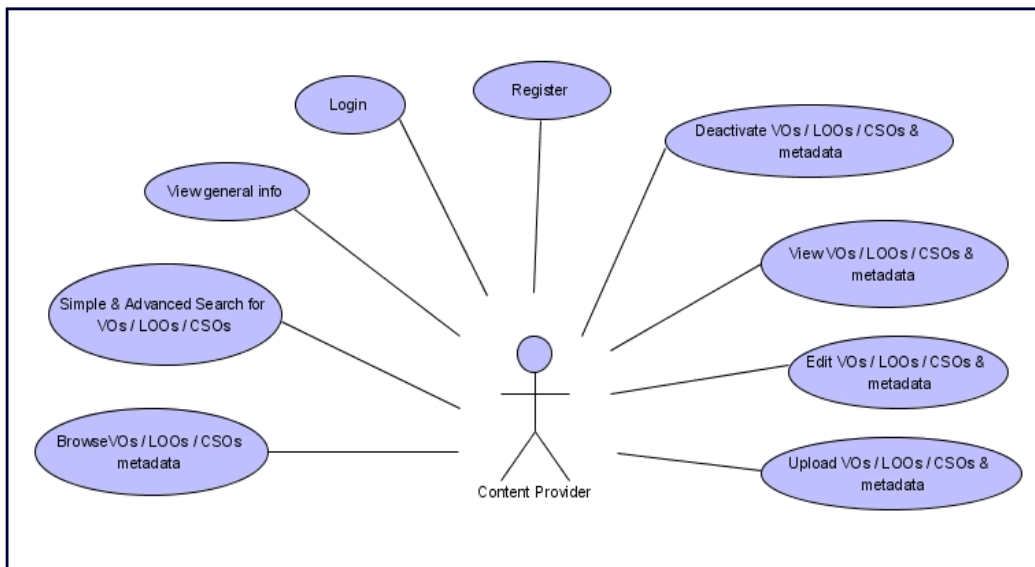


Figure 7: Use case for the Content Providers of the CerOrganic Web portal.

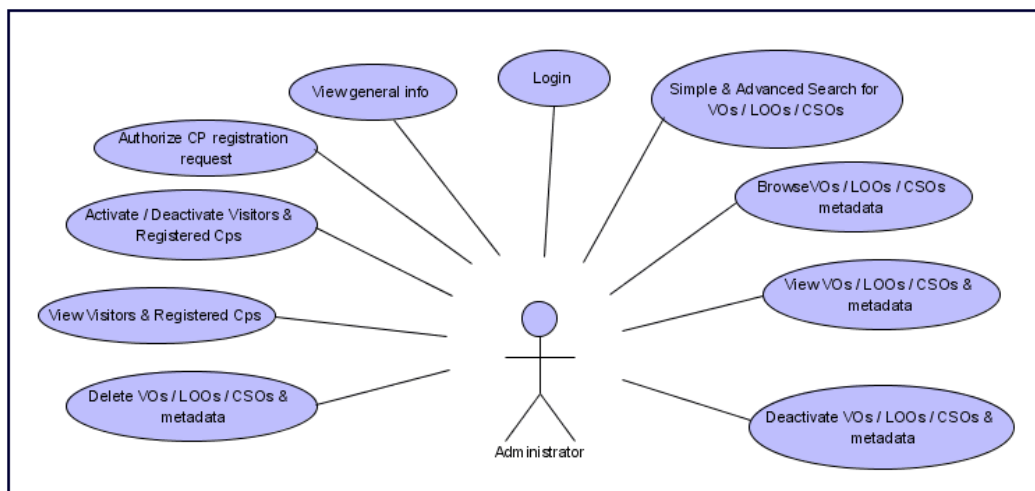


Figure 8: Use case for the Administrators of the CerOrganic Web portal.

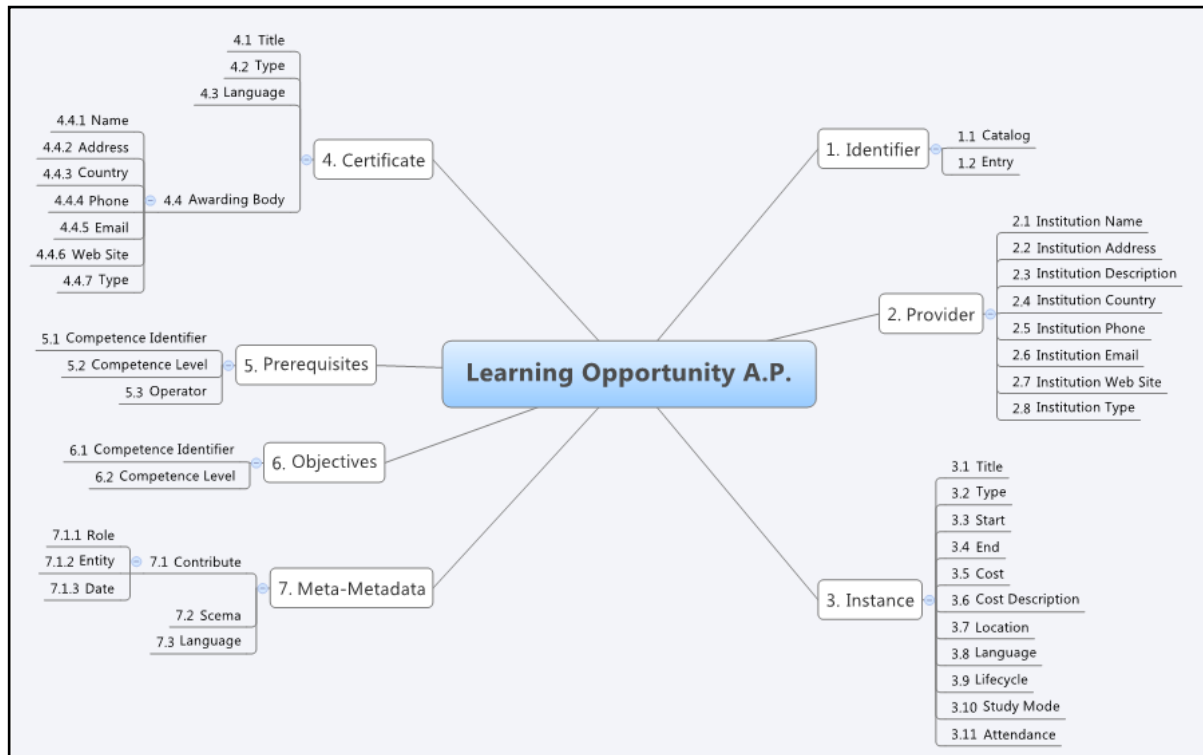


Figure 9: Metadata elements of the CerOrganic AP, used for the description of the training opportunities.

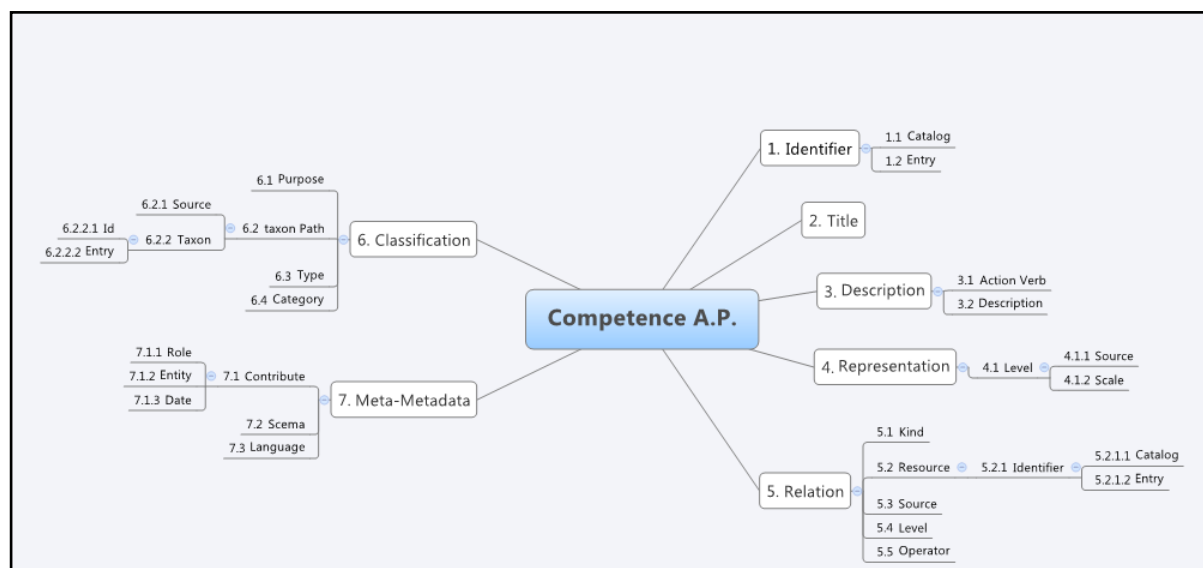


Figure 10: Metadata elements of the CerOrganic AP, used for the description of the competencies.

The Competence Element Objects, pertinent to rural and agricultural vocational training have been described and stored in the database, in order to support the descriptions of training, Certificates and Job Profiles that are related to. The analysis of the Competence Elements objects follows:

### 3.5.1 Competence Elements (Competence, Knowledge and Skills) Objects

The competences were carefully selected in order to

provide the future extension workers with a variety of skills and knowledge that today's professionals in OA pointed out as crucial in order to fulfill the new challenges an OA extension worker is facing.

For the purpose of the CerOrganic Web Portal the online representation of the Competence Element objects is consisted of the fields:

- Title,
- Description (Action Verb, Description),

- c) Level in Context (Source, Level),
- d) Relation (Competence Element, Source, Level, Operator),
- e) Classification (Purpose, Type, Category, Classification Schema).

### 3.5.2 Learning Outcomes Objects

In the case of CerOrganic the key competences of an excellent OA extension work are knowledge transfer between the different stakeholders, identification of site specific problems in organic farming and finally decision making.

For the purpose of the CerOrganic Web Portal the online representation of the learning Outcome Element objects is consisted of its description.

### 3.5.3 Training Opportunities Objects

Descriptions of the Training Opportunity Objects have been designed in away to include all the available types of vocational education and training for the OA (e.g. seminars, lectures, professional schools).

For the purpose of the CerOrganic Web Portal the online representation of the Training Opportunities Objects is consisted of the fields:

- a) Training Opportunity provider (name, address, description, country, phone, email, web Site, type),
- b) Training Opportunity instance (title, type, start - end date, months, days, hours, cost, cost description, location, language, lifecycle, attendance, url),
- c) Classification (classification schema, Organic. Edunet, coverage),
- d) Certificates,
- e) Entry / Access requirements (competence, source, scale, operator) and
- f) Objectives (profile of skills and Competence and Learning Outcome).

### 3.5.4 Certificates (of the trainings) Objects

For the purpose of the CerOrganic Web Portal the online representation of the Certificates Objects is consisted of the following fields:

- a) Certificate details (title of certificate, type of certificate, language of Certificate, url, logo),
- b) Entry / Access requirements (competence, source, scale, operator),
- c) Objectives (profile of skills and Competence and Learning outcome),

- d) Awarding body (name, address, country, telephone, email, web site, status),
- e) Regional national authority (name, address, country, telephone, email, web site, status),
- f) Classification (classification schema, Organic. Edunet, coverage),
- g) Range of Occupations accessible to the holder (Job Profiles) and
- h) Level in context (Source).

### 3.5.5 Job Profile Objects

For the purpose of the CerOrganic Web Portal the online representation of the Job Profile objects is consisted of the fields:

- a) Job organization (existing organizations, organization name, telephone, address, country, email, URL, organization type, organization size, organization coverage, organization region),
- b) Job description (title, description, target group, group of employees),
- c) Competence element (competence, source, scale, operator) and
- d) Classification (classification schema).

## 3.6 Interface design

The first step towards the development of the CerOrganic Web portal interface was based on blocks that contained the information provided by the portal. Based on that, an initial version was developed and circulated to CerOrganic project partners that provided feedback, which led to the corresponding revisions of the interface. Additional revisions were made at a later stage, in order to enhance the usability of the portal and the access to its most frequently used functions. The current and final version of the CerOrganic Web portal interface can be seen in the figure 12.

## 3.7 Current Status

The CerOrganic Web portal is currently available at <http://portal.cerorganic.eu>. In order to facilitate the usage of the portal by non-English speakers, the portal provides a multilingual user interface, currently available in eight languages: English, Greek, German, Czech, Hungarian, Romanian and very adapted Italian. It currently contains more than 150 DTOs of the five different types mentioned earlier, provided by 9 content providers.

Since its official deployment in September 2011, the portal has received about 500 visits and more than 3,500 page views from 143 unique visitors coming from 20 different countries.

Competence Element
<b>Title</b> Title: Soil Fertility
<b>Description</b> Action Verb: Understand Description: Understanding the importance of soil fertility in organic agriculture, identifying several problems in the field of soil fertility and suggesting solutions for the its increase and maintenance
<b>Level in Context</b> Source: EQF Scale: Level 4, Level 5, Level 6, Level 7, Level 8
<b>Competence Elements Relation</b> Competences: Enhancement and Maintenance of the Soil Fertility, EQF, Level 5, greater or equal to Enhancement and Maintenance of the Soil Fertility, EQF, Level 5, greater or equal to
<b>Classification</b> Purpose: competency Source: <a href="http://ec.europa.eu/competition/mergers/cases/index/nace_all.html">http://ec.europa.eu/competition/mergers/cases/index/nace_all.html</a> Id: A Entry: Agriculture, forestry and fishing Type: Competence Category: Sector Competence
<b>Metadata</b> Language: Greek Schema: eCompVET v1.0  Role: Creator, User: Charalampos Charalampos, Date: 2011-08-01 16:21:41.0

Figure 11a: Competence element examples: “competence”, “knowledge” and “skill” (from left to right).

Competence Element
<b>Title</b> Title: Knowledge in Soil Biology
<b>Description</b> Action Verb: Know Description: Basic knowledge in topics of soil biology
<b>Level in Context</b> Source: EQF Scale: Level 4, Level 5, Level 6, Level 7, Level 8
<b>Competence Elements Relation</b> Competences:
<b>Classification</b> Purpose: prerequisite Source: <a href="http://ec.europa.eu/competition/mergers/cases/index/nace_all.html">http://ec.europa.eu/competition/mergers/cases/index/nace_all.html</a> Id: A Entry: Agriculture, forestry and fishing Type: Knowledge Category:
<b>Metadata</b> Language: Greek Schema: eCompVET v1.0  Role: Creator, User: Charalampos Charalampos, Date: 2011-08-01 15:36:18.0

Figure 11b: Competence element examples: “competence”, “knowledge” and “skill” (from left to right).

Competence Element
<b>Title</b> Title: Consultation Skills in Soil Fertility
<b>Description</b> Action Verb: Consult Description: developed consultation skills on the broad field of soil fertility
<b>Level in Context</b> Source: EQF Scale: Level 4, Level 5, Level 6, Level 7, Level 8
<b>Competence Elements Relation</b> Competences:
<b>Classification</b> Purpose: prerequisite Source: <a href="http://ec.europa.eu/competition/mergers/cases/index/naoe_all.html">http://ec.europa.eu/competition/mergers/cases/index/naoe_all.html</a> Id: A Entry: Agriculture, forestry and fishing Type: Skill Category:
<b>Metadata</b> Language: Greek Schema: eCompVET v1.0 Role: Creator, User: Charalampos Charalampos, Date: 2011-08-01 15:48:00.0 Role: Validator, User: Charalampos Charalampos, Date: 2011-08-01 15:47:20.0

Figure 11c: Competence element examples: “competence”, “knowledge” and “skill” (from left to right).

Figure 12: The homepage of the CerOrganic Web portal.

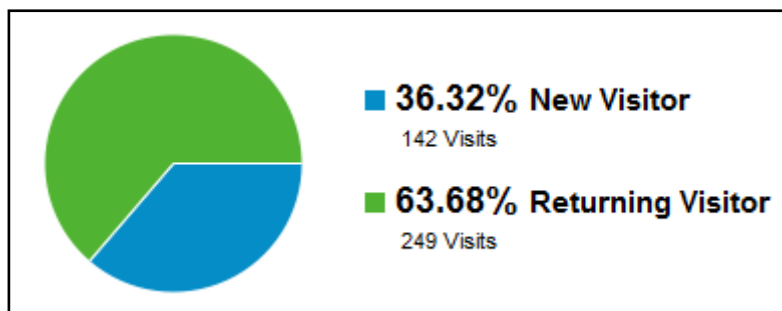


Figure 13: New vs returning visitors of the CerOrganic Web portal.

Due to the relatively short lifetime of the portal, the numbers are expected to increase within the next months. The traffic to the portal is also expected to be increased after the interconnection with related portals (e.g. the Organic.Edunet Web portal – [www.organic.edunet.eu](http://www.organic.edunet.eu)) and repository networks (such as the ARIADNE network – [www.ariadne-network.eu](http://www.ariadne-network.eu)) is implemented.

#### 4. Conclusions

Through the CerOrganic Web Portal, vocational training opportunities are mapped with the required competences and skills of targeted stakeholders, supporting the connection of training actions (course, modules and units) with the learning outcomes, which satisfy the needs of individuals and the requirements of specific working places for accurate and up-to-date training. The main idea of the design and development of the CerOrganic Web Portal is the reusability and interoperability of learning resources through the interconnection of the portal with other federation of resources such as the Organic.Edunet Web Portal ([www.organic-edunet.eu](http://www.organic-edunet.eu)) and the ARIADNE Foundation ([www.ariadne-eu.org](http://www.ariadne-eu.org)). The description of the digital training objects is based into educational metadata standards, the IEEE LOM, which adapts the recommendations from the Learning Resources Exchange (LRE) Metadata Application profile (AP) developed by the European Schoolnet (EUN) Consortium (EUN Consortium, 2007) and specifications from other application profiles for agricultural learning repositories, like the Organic.Edunet Application Profile and FAO's Ag-LR AP (Manouselis et al., 2009, Kastrantas et al., 2009).

Through the CerOrganic Web Portal, vocational training opportunities will be mapped with the required competences and skills of targeted stakeholders, supporting the connection of training actions (courses, modules and units) with

the learning outcomes, which satisfy the needs of individuals and the requirements of specific working places for accurate and up -to-date training.

Additionally, the CerOrganic Web Portal will be further extended in more use cases from other European countries (e.g. Italy) and it will be enriched with more DTOs from other fields of agriculture. New DTOs (Training Opportunities, Job Profiles, Competences) will be described in the field of hydroponics and in general the water management in agriculture (e.g. irrigation), covering the growing needs of professionals, training providers and individuals for a better understanding of the workplace descriptions and the competence-based analysis of available training opportunities in Europe through the EU-funded project AGRICOM ([www.agriculture-competence.eu](http://www.agriculture-competence.eu)).

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