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Association of Agricultural Economists of the Republic of Macedonia
The Association of Agricultural Economists of the Republic of Macedonia was founded 20 years ago as a non-governmental organization in the area of agricultural economics. Since its foundation in 1996, its goal is the development of sustainable agriculture in Republic of Macedonia. Traditionally, the organization cooperates with different governmental and non-governmental domestic and international institutions. The organization acts as an umbrella organization summoning the human capacities in the country, competent for economic analysis in the agricultural sector. It is an Association with a tradition in organizing scientific meetings with agricultural producers, entrepreneurs, agricultural associations and governmental representatives. These meetings enable experience and knowledge sharing among competent scientists and experts from different institutions.

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Local knowledge transfer for optimal cooperative structures in Romanian agriculture: an AHP approach

Agapie Adriana

Abstract
For the legislative effort of instituting the content and the functions of the Agricultural Chambers and Agricultural Co-operatives, at a point where Romania is facing systematical lags in agricultural development in terms of infrastructure, property rights and market integration it is imperious necessary to deeply reflect over the desired functions of these institutions, embed the existing knowledge of experts in agriculture at every level of activity and from every major agricultural region, the history of the functioning of these institutions in Romania and come up with a legislative proposal which is more than an imported and eventually adjusted one from other countries in the European Union.

This paper is the result of an innovator philosophy over the way of defining institutions, of a brand new modelling approach in Romania and of an extensive consultation with experts in various fields and regions in the Romanian agriculture. The output is precise, in terms of every concrete aspect needed to be stated in defining the structure of either Agricultural Chambers or Agricultural Co-operatives.

Key words: Agricultural chambers, agricultural co-operatives, legislative, innovator philosophy.

Introduction
The innovatory philosophy over the way of defining institutions consists in considering as focal the desired functionalities of the institution to be legally defined. Starting from this conceptual thinking, an integrative view of the institution to be created is developed in relation with the agricultural market and with the rest of the economy. The final conceptual scheme with detailed desired functions for Agricultural Chambers in connection with the social economy and markets is regarded as an example of an innovative social policy.

The brand new modelling approach in Romania is the usage of the Analytical Hierarchy and Network Processes (AHP/ANP). Although this is a long time, highly reputed method of decision making with various and famous applications in the USA, it is marginally mentioned in the Romanian scientific environment. Its applications in Romanian economy and policies are virtually inexistent.

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Upon a prototype of an AHP/ANP model for the optimal functioning of the Agricultural Chambers, starting from a careful consideration of their desired functionalities and their integration on the social and market Romanian economy an extensive consultation with experts in various fields and regions in the Romanian agriculture was conducted under the National Network of Regional Development agency (RNDR). After presenting the conceptual framework as well as the historical backgrounds, the AHP model for the Agricultural Chambers was discussed and amended by the participants and finally estimated. Results together with their interpretations conclude the paper.

Associative structures in the agriculture as well as in other fields emerge as organisms designed to absorb, process and respond as individual interests’ representation of their members to the pressures of the market economy and to the social economy. Based on general principles as the principle of voluntary association or the principle of democratic control, their objectives are to maximize the farmers’ revenues and to minimize the corresponding profits. Revenues maximization is usually aimed to be achieved within associative structures through the attempt to obtain the highest possible prices for their products. These efforts are limited and distorted by specific national and agricultural policies regarding subsidies for different activities as well as by specific asymmetries of information regarding the markets. Minimization of the input factors is aimed through increasing bargaining power, due to grouping into specific associative structures. Also, the innovative initiatives have always better chances to be nurtured and properly developed within the context of specific associative structures.

Methodology and Model

Specific associative structures in the Romanian agriculture contribute to the specific goals of the social economy through monitoring the state activities and react in real time and through assuring a continuous respect of the human rights and liberties.

These complex relationships are synthetized through the identification of the next main risk factors which pose the most threat in the good functioning of the Romanian agricultural Chambers (RAC) : 1. Institutional formation of the RCA’s, 2 Influence of the political factors, 3. The associating structure, 4. Setting the main Objectives, 5. Sources for financing, 6. The practical Implementation of the existing rules.

The problem of the institutional formation of the RCA’s was further splinted into two types of potential definition of the formation for such an institution: top-down, through public decision and down-top, through the organisation of a competition. Thus, in the sub-criterion cluster, the node 1. 1. Institutional formation of the RCA’s is unilateral connected with the next two nodes: 1.1. Public Decision (top-down) and 1.2. Competition (top-down). The influence of the political factors is considered to be discernable either through the interference with the management or by imposing certain members with political affiliations. As a consequence, node 2 Influence of the political factors is further connected with the following nodes in the sub-criterions cluster: 2.1. Policy Decisions’ interference with the RCA’s management and 2.2. Politically imposition of managers and/or members. For defining the structure of the RAC’s it was considered important to focus on an exhaustive list of the potential associates, on the hierarchy of the potential members and on the degree of representation. Therefore, the node 3. The associating structure is top-down connected with the following nodes in their sub-criteria layer: 3.1. The list of potential associates 3.2. The hierarchy of the potential members’ 3.3. The degree of representation. The objectives were splint into fixed objectives, common to every type of Agricultural Chamber and flexible objectives, specific to the size, the region and the goals. So the node 4. Setting the main Objectives is further connected to the nodes 4. 1. Fixed, rigid objectives 4. 2. Flexible objectives. The node 5. Sources for financing is connected with 5.1. Financing from the Budget and 5.2. Other sources of financing. The node 6. The practical
Implementation of the existing rules is connected to 6.1. Issuing permits 6.2. Authorization of new plantations and 6.3. Others.


The alternatives considered for the node 5.1. Financing from the Budget, connected top-down, are as follows: A5.1.1. Financing from the budget in the form of a fixed percent out of the services, A5.1.2. Financing from the budget for PNDR consultancy, A5.1.3. Financing from the budget for paperwork regarding periodical payments, A5.1.4. Financing from the budget for collecting and delivering statistical data, A5.1.5. Financing from the budget for other services.

Regarding the other sources of financing than those from the budget, the alternatives considered from the node 5.1. Financing from other sources are the next ones: A5.2.1. Financing from other sources as a percent from land imposts, A5.2.2. Financing from other sources as a percent from selling/buying land, A5.2.4. Financing from other sources as a fee for issuing producer’s certificate, A5.2.5. Financing from other sources as a consultancy fee, A5.2.6. Financing from other sources for certifying biological material and A5.2.7. Financing from other sources by considering other potential revenues.

The hierarchy, as implemented in the SuperDecisions software is shown below, in Figure 1.

**Figure 1.**

![Image of the hierarchy implemented in the SuperDecisions software](image_url)

**Numerical Estimation**

This model was estimated through large consultations and the opinions agreed for every pairwise comparisons and every decision matrices were imputed into the Super Decisions software, freely available. The consistency index for every decision matrix was below 0.1, as recommended in several occasions by the founder of the theory, Thomas Saaty. Finally, the model was synthetized and several of the most representative results are shown in the figures below. In Figure 2. Risk in the good functioning of the Romanian Chambers of Agriculture.
RCA, percent is represented the vector of priorities corresponding to the main risk factors identified by the participants as endangering the good functioning of the Romanian Chambers of Agriculture.

**Figure 2. Risk in the good functioning of the Romanian Chambers of Agriculture (RCA), percent**

The most attention should be devoted to defining the sources of financing for the Romanian Agricultural Chambers. Then, the way in which the associative structure is legislated followed by the way in which the main objectives are set are the next two criterions inducing significant risks if improper defined or if insufficient attention is given, to the good functioning of the RCA’s. Since financing proved to be the most important category to be though and afterwards legislated in the extended paper are detailed the several sources from the budget for financing, with their corresponding priorities.

Since financing proved to be the most important category to be though and afterwards legislated, in Figure 3 above are detailed the several sources from the budget for financing, with their corresponding priorities.

**Figure 3. The relative importance of several sources from the budget of financing RCA’s within the AHP context**

It came out that offering paid consultancy on the National Plan for Regional Development (PNDR) constitute the most important source of financing from the budget, with weight of importance equal to 42.5 percent, followed by the activity of filling the paperwork for periodical payments, with a weight of importance equal to 22.21 and fees from collecting and disseminating statistical data, with a weight of importance equal tp 17.39 percent.
Regarding the sources of financing other than from the budget, the most important seems to be that of the membership fees, of 47.84 percent, followed by the fees for issuing producer’s certificates, with a weight of importance of 21.98 percent. In Figure 4 below is also shown the difference in between estimating the weights of importance within the context of the AHP hierarchy built and out of the context, like the pairwise comparisons for the sources regarding the financing were by themselves alone pairwise compared.

![Figure 4](chart.png)

**Figure 4. The relative importance of several sources apart from the budget of financing RCA’s in and outside the AHP context**

It can be noticed, therefore that although in some categories regarding the financing appear to be no differences or these are insignificant, like is the case of the membership fees, in other cases, like is membership fees or fees from issuing producers’ certificates, these are either under or over estimated.

Finally in the Figure 5.is shown, in the context of the AHP model and outside the context the composition of the RCA’s.

Thus, the most numerous as members should be the agricultural cooperatives, followed by the collecting and processing units. It should be noticed the striking difference in between the number of cooperatives estimated in the AHP context and outside. This comparison is once again emphasizing the importance of judging aspects in the corresponding context. It is an illustration of a social innovative process and also of how the local knowledge can be properly estimated.
Conclusions and further research directions

Recognizing the specifics of the knowledge transfer, latest developments in the literature bring at the forefront the concept of the local knowledge transfer, with its several important illustrations in the agriculture in several countries. In this stream it is emphasized the importance of including this type of knowledge into the plans and actions of restructuring and modernizing agriculture. This paper brings an important example of the way in which this local knowledge can be included in a rigorous multi-criterial decision model. The AHP hierarchical model, constructed through a large consultation with experts all over the country offers concrete insights about the main risk factors which could impede on the good functioning of an associative structure like the Romanian Chamber of Agriculture is. This model is constructed starting from a conceptual design of the desired functions of this institution, in the context of both social and market economy. In this sense, the approach tackled is considered to be a social innovative process. The very concrete percentages of importance associated to the diverse sources of financing, both from the budget and from other sources, the number of the members as well as the estimation of the risk factors constitute a valid support for any project aiming to legislate the constituency of these associative structures.

References


Development and implementation of a sustainable system of management adjusted to the rural economy

Azderski Jovan¹, Tuna Emelj², Popovska Despina³, Pejkovski Zlatko⁴, Bosev Dane⁵

Abstract
Hilly-mountainous areas have been slower in their own economic development and usually are being called as unfavorized areas. To be fully relied only on agriculture is a wrong approach, because it can be only one of the development components. There are several sources for generating income on the village households, such as: building of the infrastructure, complementary management in agriculture and forestry, development of the secondary sector by keeping the environmental balance and mountain landscape, development of the tertiary sector especially of the rural tourism and homemade products. The development and implementation of the sustainable system adjusted to the rural economy and the mountainous areas imposes development of new technologies in rural management and long-term state systematic support of the market production and the need that the hilly-mountainous areas should not be devastated through the accidental migration of the rural population.

Key words: Complementary economy, mountainous areas, application of new methodologies, development of tertiary sector, village economy.

Introduction
The fast industrialization and urbanization, that happened in the 21st century bypassed or just partially touched some areas that usually are considered as hilly-mountainous areas. The historical development legally bypassed those areas within the directions of their economic development. Where is the essence of several phenomena: demographic, social, economic, cultural, that make complex of problems at the hilly-mountainous areas of the Republic of Macedonia, the Balkan and in Europe? Can the bigger differences in the regional development be treated only on the component of the relief, land fertility, climate and meteorological conditions? Is there any specific characteristic of the hilly-mountainous place, isolated history, economic development, special mentality, that outcomes only from the hilly and mountainous character of that area? Does the contemporary development have other laws that are related only to that area?

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Material and method of operation

As a material for preparation of this work we used literature from archives and statistical sources, while for operation methods we used comparisons, induction and deduction methods as well as the method of analysis and synthesis.

Slow development

The financial capital, moving according to the logic of the profit, has been invested in those economic areas that enabled maximum return. It couldn’t be, neither the agriculture in hilly-mountainous areas based on extensive pastures, nor the agriculture based on intensive field production on flatlands. From a historical point of view, after certain capital saturation in industry, traffic, trade, partially in mining and wood exploitation – the capital can be invested in the agriculture, especially those based on intensive production. Hilly-mountainous areas lose their chance for development, and the only minor exceptions are wood exploitation and mining. The isolation of the population in those hilly-mountainous areas is being increased. The roads for caravans are being abandoned. The modern economy has fastened the development flows, but those areas have remained almost to the level from the traditional production from the 20th century. Remaining far away from the main traffic roads, patriarchal village households were trying to survive competing with the flatlands, characterized with agrarian overpopulation, rural debts, where the financial trade and industrial capital introduced new norms and other way of living in the growing city areas. Those and the almost similar factors that contributed to the increase of the income, improvement of the education, culture and health and housing by the river valleys and the flatlands remain the irreplaceable factors for the development of the hilly-mountainous areas.

Still, there are standings that the intensification of the agriculture in hilly-mountainous areas is the only chance for their faster development. The development history clearly states that relying on the primary production is the only way to relatively slower development. Many of the regional differences in the economic development are based on those lawfulnesses.

Social and economic importance

The meaning of the hilly-mountainous areas in the Republic of Macedonia is being recognized mostly because of their widespread all over the country, level of economic development, structure of agricultural capacities and demographic movements.

The mountainous regions are covering around 40% of the total area of the Republic of Macedonia, covering 31% of the available agricultural area of the country. This high percentage of participation in the total area characterizes the scope and the character of the Macedonian agricultural production. The structure of used agricultural areas shows relatively extensive production because almost half (46%) of the natural pastures in the Republic of Macedonia belong to the mountainous regions. The income per resident is almost 50% lower than the Macedonian average, and that is also an indicator for the achieved economic development.

There are evident processes of depopulation, devastation and devitalization in the mountainous regions in the Republic of Macedonia, happening more than 50 years. At the same time, with certain exceptions, those are areas with extremely stepness and unevenness terrains that are without appropriate road and infrastructure and heavily affordable for mechanization usage.

Those are the real assumptions that affect the trends and dynamic of the future development of the Republic of Macedonia. Although, having in mind the development of the country as a whole, one question can be asked, whether the mountainous areas are an inhibited development
factor, or there is an opportunity for faster activation of the resources and the population in
direction of the step-by-step economic transformation according to the natural conditions and
civilization factors. Some of the countries that in their relief have especially mountain
configuration and structure (Switzerland, Austria, Italy, France, Germany and Slovenia) have
given a positive answer.

System of Alpine (mountainous) management

It has been considered that from all mountainous areas in the world, the countries within the
Alps region have achieved relatively the highest and the most stable development. Nevertheless,
the important influence of the historical components, the basic economic and social
development of those European countries (Switzerland, Austria, Italy, France, Germany and
Slovenia), has developed as a specific system of Alpine management. The management system
within the Alpine area is based on the high humidity. Almost all other characteristics of that
system are a result of human effort, somewhere during many generations. Within the boundaries
of this research, the time factor and the achieved social economic development of the Alpine
countries cannot be neglected. Those are real components of the economic development beside
the higher humidity of the region itself.

However, this system hasn’t been developed spontaneously. Based on everyday experience and
the survival fight of an Alpine peasant in harsh conditions is just a part of the explanation. The
other important part of the explanation relies on the scientific and technical achievements that
have been accepted by these regions. As everywhere, the technological and technical
innovations created conditions for higher income of the rural households, beside the fact that
an important part of the family has moved to the valleys and industrial, trade and catering
centers nearby. It can be assumed that some of the business components can be implemented
in the construction and modernization of other mountain areas. That’s why it is useful to know
that contemporary variants of alpine management are suitable as a basis for other mountain
areas. In fact, there is a need for a careful assessment of the technical technological elements
of the Alpine management system, its’ adaptation in the natural and social economical conditions
of our mountain areas and systematic activities in their implementation. The basic technical
elements from the Alpine management system are cultivation of the natural lawns, alternative
usage of the natural lawns, electrical fence, tanks, mechanization for processing of hay, silage
and haylage, mowing hay and prepping silos, halls, fans and fertilizers, displacement of races,
systematic selection and reproduction of the cattle, fellowship dairies, alpine (mountain) pastures, management with forests, homemade products and development of rural tourism.

Within those systems of complementary management in the agriculture and forestry there have
been developed economic units from the secondary and tertiary sector that intent to keep up the
environmental balance and to be a part of the Alpine landscape.

Technical elements of the system

The livestock production in the alpine areas, especially in the pasturage is not based on the
artificial lawns, but on the cultivated natural pastures. Their phyto-cenological structure in basic
is a gift from the nature (humidity and rain schedule), but at the same time is a result of the
human work. The areas do not have stones, they are probably cleaned by lots of generations.
So those areas are completely without stones and bushes. The pastures are constantly treated
with livestock waste, artificial fertilizer, mowing and grazing. It is especially a precondition for
the areas nearby the household yard and in contemporary conditions to those with a bigger
distance, as well.
A very important component of the Alpine management is the interchangeable way of usage of the natural pastures, especially those closer to the household yard. Mowing and grazing interchange, depending on the condition of the grass and the cattle number. This system is based on multiplied care of the grass surface with livestock waste during the year and gains extraordinary good results. This high-quality phyto-cenological composition of the natural pastures is constantly sustained, so the yields are constant without bigger variations.

Those elements like: container for livestock waste, short base with metal greed, electric fence and tractor tank, are inevitable and functionally connected elements of the system for interchangeable usage of the grass areas, nearby and close to the household yard.

The Alpine management on a contemporary basis assumes usage of complex mechanization for processing of hay, silage and haylage. This principle has been at first introduced to the flatlands, in a construction of wide undertaking machines, strong tractors, combines and various mechanization vehicles for loading and transport. During the Second World War, and especially after, this principle has been spreaded fastly in the hilly-mountainous areas. It is based on the construction of the two-axle tractors, rotary cultivators that are characterized with high level of manipulation and adaptation work on sloping terrains. The machines have significantly narrow working procedure. The means of transport with its special construction, are very well suited for use on steep slopes and narrow roads.

The built-in fan on the ceiling of the room for accommodation of the food for the livestock, allows complete drying of the hay with all the plant parts that are no longer exposed to the influence of the atmospheric troubles. Such hay from treated cultivated natural and artificial lawns can successfully replace concentrates not only in the part of the ration, but also in the manufacturing part of the production of 3,000 liters of milk per year per head. The countries of the Alpine region, including significant part of Slovenia, introduced and are still introducing silo-Thorne farms. Silage based on grass, and corn to a certain altitude, as animal component in the winter nutrition, mostly with dry foods, is closest to the natural nutrition of lawns. The green swath of cultivated natural lawns, the artificial meadows with alfalfa, sainfoin and clover, are with large qualitative and nutritional value.

Alpine countries (as well as the Netherlands and part of Denmark) have never based their cattle for massive use on concentrate only. An exception was made for the highly productive heads whose nutrition uses additional doses of concentrate as a condition for highly productive manufacturing. Livestock production in these countries is based on juicy, fresh and groomed lawns, made from high qualitative hay and silage. Of course, the nutrition is based on voluminous food which includes cattle beet and other annual crops. The research indicates the suitability of the low intensity of production based on voluminous food nutrition compared with the nutrition based on concentrates, but it provides a template for a greater degree of efficiency, especially in the hilly and mountainous areas.

The development of one area as a producer of breeding cattle is conditioned by the expressed and long-term activity of the selective centers through a network for control of the milk yield. In that sense, yearlings achieve its price on the market, which is primarily based on the attestation of his ancestry in many generations and the amount of the milk yield. Generally, the breeding cattle are sold as high dairy heifers whose first milk is not practically determined. The attestation is given by the selection center, and besides the appearance of the cattle, the race is also a main feature during the purchase or sale. In addition, the provider of the attestation must enjoy high reputation and solidity.

It was the way of development of the alpine regions from which almost every single one became famous for that breed of cattle known for their dominant quality and numbers. That element (production area) on the breeding market is an additional part of the difference in the price. The service for artificial insemination must be organically linked to the selection centers for cattle
and sheep, also with the herd books of breeding cattle and the milk yield control. Even so coordinated, the meaningful and long-term water activity can give the desirable results.

Alpine pastures for summer grazing are agro-technically regulated spaces, provided with the necessary facilities for livestock and people, organized rationally based on the Alpine register, with fully regulated legal status and established usage. There are no compelling reasons that would prevent the mountain pastures in the Republic Macedonia over the next few decades analogous to be regulated and transformed into a necessary element for economic mountain management. Including the corresponding adaptations, it applies to almost all technical elements of alpine management adapted to the natural conditions, level of development, socio-economic conditions and forcefulness in the introduction of further progress in agricultural and mountainous areas.

**Rural tourism**

The basic approach for the development of the rural tourism is contained in the understanding that the quality of the natural landscapes and communication connections are just starting assumptions. In the period of twenty years (1995/2015), the number of tourists in the Republic Macedonia has increased for three times. This especially refers to the foreign tourists, whose number in the same period grew in the lake areas and the City of Skopje for four times and in mountainous areas for just twice. Yet, the road from premise to economic effects on the family budget of the peasant families in the area of national income from the regions of rural tourism can only be achieved by developing all these components.

These elements are the basic conditions and components of those activities as a specific segment in the system of tourist economy: activity of the area (natural landscape, communication connectivity of the settlements and the population), present and new hotel capacities, developed transport network to the village and weekend settlements, training of the village households, organized tourist alliances and connections with agencies, measures for encouragement and support of the rural tourism.

It is wrong to think that the basic advantage of the rural tourism is the isconic nature and cheap accommodation. Only few people from the urban areas are satisfied only from the natural landscape (hiking, skiing and walking in the nature) as an only motivation to stay in a house of a rural family. After one week staying in this kind of natural ambient, the mood is changed and becomes monotonic, especially for the young urban population. Those rural settlements which are near to the hotels have a real chance for development. Thereby, enjoying this rural tourism, using cheap accommodation in a village family is being combined with attractive activities from the hotel in the late night hours. The criteria how to choose a village household is an integral part from the development programme of the tourist economy.

There are three groups of criteria that determine a rural household as a suitable one for development of those activities. The first group is consisted of: communication connectivity, quality of the natural landscape and the distance from the nearby hotels. The settlements and the households that fulfill those preconditions obviously are favorites. The second group of criteria for selection of a rural household consists of: infrastructure, water supply, basic hygiene at the yard and in the neighborhood. Those households that don’t have a separate building for tourists, which don’t have water supply, sanitation and whose yard is being polluted (garbage, open tanks) are not being considered. The third group of criteria is being consisted from those who are related directly to the family, household owners, their culture and hygienic behavior and the affinity for this activity. Some of those qualities can be reached by education and practice.
The rural tourism can be developed only as an integral part of the touristic activity from the very beginning. Thereby, the area should be considered as a whole, with carefully selected separate locations. Besides, the rural tourism can get a real chance for development if it is involved in the regular annual plans of the big agencies and tour operators. The state should encourage and support the rural tourism at least during the first five years. Some of the measures used for this purpose are: stimulations, loans for building and adaptation of the apartments, organized trainings to the members of the households and release from any contribution from the touristic services.

System of encouragement and support
The system of agrarian protectionism, that encourages introduction of new technologies, and supports the agricultural production and food placement, is a result of wide social interests. The system cannot be focused only to create some special social categories from the rural households and agricultural population. The system is not directed only to the certain balance of the production and life conditions. It can be understood that the equation cannot be achieved, which is obviously seen from the historical experiences. The basic task of the society is to maintain the production and life conditions of rural families in mountainous areas at some level, that still imposes interest for agricultural production and prevent human devastation of those areas. There are several factors which depress the living and working in the mountainous areas. Those are: roads (especially those from IV class), supply of quality electric power, water supply in rural areas, regulation of the natural flows, telecommunication network, medical services, school network, trade network and supplies, further development of social and pension insurance. Local natural energetic and raw material sources are part of the basis for economic and social development of that area. But, the economic development cannot be relied only on that base. Encouragement and support of the agricultural production in those areas are two complementary components of the same process.

There are two groups of framework specification for introduction of new technologies and support of the agricultural production.

The first group consists of: buying reproductive heads from noble race; regresses for selected seed, wheat, corn, forage crops, beans, peas and potato; regresses for machinery in mutual ownership, fence, tanks for collecting the livestock waste, electric fence, installed and moving machinery for milking; building of silos, hay houses, sheepfolds in migration areas of the cattle and buying baskets and beehives. In those group of intensive protection and encouragement, there are involved several buildings that can be of various ownership (dairies, specialized storage and cooling equipment, purchase station equipment), institutional centers (professionals, selection centers, winter schools), initial finance for cooperatives. Using tax release, several activities can be supported: agro-melioration, cultivation of the natural meadows, arrangement of the natural pastures, sowing with forage crops, cereals and potato.

The second group contains measures with lower level of production support, such as: buying fruit seedlings, fertilizers, building of capacities for keeping the cattle, buying equipment for milking cows, building of sheepfolds and poultry folds, premiums for sold milk, cereals and potato seed from the first reproduction.

It should be considered that there is an opportunity to earn income from many sources in the mountainous areas, based on coordination of all the activities and institutions and if necessary some of the activities from the tertiary sector should be dispersed, contributing in that way on the development of the mountainous areas.
Conclusion

Mountainous areas in the Republic of Macedonia are left on the borders of the industrial revolution. The factors for development of the flatland areas are the same for the development of the mountainous areas, regardless of the time frame. The system of Alpine management is a flexible template for complementary development of the primary, secondary and tertiary sector. The qualitative agricultural production, the system for encouragement and support of introduction of new technology in the agricultural production in mountainous areas, can add new valorization of the natural resources, and enable acquiring approximately parity income in conditions of ecological balance with active human involvement.

This transformation can be realized with active state effort and good systematization of the projects for regional and sub-regional development.

References

Agro-eco-management – the case of Bulgaria

Bachev Hrabrin

Abstract
This paper gives an insight on the evolution of system of agro-eco-management in Bulgaria, assesses its efficiency and major challenges, and withdraws lessons for Macedonia. It incorporates an interdisciplinary approach, and analyzes diverse private, market, and public modes of environmental governance during post-communist transition and European Union integration in Bulgaria. After that it assesses the efficiency and major challenges of eco-management, and suggests recommendations from the Bulgarian experiences for Macedonia and other countries with similar development and environmental challenges.

Key words: eco-management, market, private, public, EU integration

Introduction
Issues associated with the effective environmental management in agriculture are among the most topical in public, business and academic debates around the globe (Baba et al.; Bachev; Dobbs and Pretty; Dugos and Dupaz; EC; Hagedorn; MEA; Mitchell; Nikolov et al.; Peerlingsa and Polman; Reed; Scozzari and Mansouri; UN). In Bulgaria there has been a significant modernization of market, private and public modes of eco-governance in the last 25 years. However, research on socio-economic aspects of agri-eco-management is still at the beginning stage and far behind the contemporary needs of society.

This paper gives insight on the evolution of the system of agro-eco-management during the post-communist transition and the EU integration, assesses its efficiency and challenges, and withdraws lessons for Macedonia and other countries with similar development and eco-challenges.

Agri-environmental management is studied as management of eco-preservation and improvement activities of individual agents associated with agricultural production. It requires effective social order (governance) regulating, coordinating, stimulating and controlling behavior and relations of diverse agrarian and non-agrarian agents (Bachev).

Agent’s behavior is governed by a number of distinct modes and mechanisms including: institutions, market, private, collective, public and hybrid forms. Efficiency of dominating modes of eco-management is assessed in terms of their potential to: protect eco-rights and investments, induce eco-friendly behavior, facilitate eco-exchange and cooperation, increase eco-information and innovation, detect eco-problems and risks, reconcile conflicts and coordinate actions, assure socially desirable level of eco-conservation, mitigate eco-risks, and minimize the overall (conservation, recovery, enhancement, third-party, transaction) costs of individual agents and society.

Depending on the objectives, levels, and periods of analysis, and available data different type of indicators are used to assess: comparative potential, complementarities and controversies of

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individual modes; state and dynamics of eco-behavior of agents; extent and dynamics of eco-pressure of agriculture; impact on and/or state of natural environment and its individual components. The overall costs and effects have been taken into account including private, social, direct, indirect, technological, transaction etc.

**Evolution of eco-management in Bulgarian agriculture**

During most of the transition period (1989-2000) the rights on agrarian resources and the diverse eco-rights were not defined or were badly defined and enforced (Table 1). During the prolong process of privatization the management of critical agrarian resources was carried in ineffective and “temporary” structures with no interests in sustainable development. Moreover, outdated and sectoral system of public policing, regulations and control dominated until recently. There was neither modern system for monitoring the state of environment nor awareness of the “concept of sustainability” in public and private agents alike.

**Table 1. Evolution of environmental management in Bulgarian agriculture**

<table>
<thead>
<tr>
<th>Institutions</th>
<th>Private modes</th>
<th>Market modes</th>
<th>Public modes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not well defined eco- and resource rights, bad enforcement; No sustainability concept</td>
<td>Provisional lease in contracts on natural resources; Unregistered farms; Firms; Cooperatives</td>
<td>Trade with informal brands, origins, and ecosystem services; Free (monopoly) agricultural water pricing</td>
<td>State and cooperative farms; Organization under privatization, liquidation and reorganization; Outdated system of eco-regulations, monitoring, information, and enforcement</td>
</tr>
<tr>
<td><strong>Pre-accession to EU (2001-2006)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Better defined and badly enforced rights on agrarian and eco-resources, &amp; contracts</td>
<td>Unregistered farms; Firms; Cooperatives; Water User Associations; Vertically integrated modes</td>
<td>Trade with formal brands, origins, organic products, and ecosystem services; Free (monopoly) agricultural water pricing</td>
<td>Special Accession Program for Agrarian and Rural Development; Cross-compliance; Environmental regulations, standards, and agencies; Regulations for organic farming; Agricultural Advisory Service</td>
</tr>
<tr>
<td><strong>EU membership (since January 1, 2007)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Well-defined rights, and better enforcement; EU Community Acquis; Collective institutions</td>
<td>Unregistered farms; Firms; Cooperatives; Water User Associations; Vertically integrated modes; NGOs; Codes of behavior; Eco-labels</td>
<td>Trade with formal brands, origins, organic products, and ecosystem services; Free (monopoly) agricultural water pricing; Insurance against natural disasters</td>
<td>EU eco-regulations and standards; Operational Programs; Programs for eco-management; Agrarian and Rural Development Plans; Direct payments; Advisory Service; Eco-monitoring and assessment; Protected zones; Compensations for natural disasters; Mandatory eco-training; Garbage taxation; Firms for Natural Parks, Support to trans-border initiatives</td>
</tr>
</tbody>
</table>

**Source:** author

Before the EU accession country’s laws, standards and institutions were harmonized with the Community Acquis introducing modern framework for eco-governance - new rights and restrictions, integrated territory, water and biodiversity management, preservation of traditional varieties and breeds, animal welfare, “polluter pay principle”, and corresponding control,
monitoring, and assessment institutions. The EU accession has introduced and enforced a “new order” - strict regulations and control; tough quality and environmental standards; environmentally friendly zoning; financial support for eco-conservation and market instability, etc.

Outside EU demand, monitoring, pressure, and sanctions lead to a better enforcement. Internal collective actions for good governance also have got momentum leading to some improvement of public management.

However, the new “rules of the game” are not always clearly understood by the public and private organizations. Enforcement of eco-standards is often difficult since the detection and penalizing costs are high. Furthermore, institutional modernization has been associated with new conflicts between diverse private, collective and social interests.

During much of the transition now a good portion of farming activities has been carried in subsistence, small scale, inefficient and unsustainable structures (Table 2, 3). Most livestock holdings have been also miniature “unprofessional” farms breeding the majority of all animals (Table 2, Table 3). Farms adjustments have been associated with a significant decrease in number of unregistered, cooperative and livestock holdings without an adequate transfer of the resources and eco-management to other structures. Dominating modes have had little incentives and capability for long-term investment to enhance productivity and eco-performance with a great informal sector playing a big role even nowadays.

Smaller size, owner operating and extensive nature of the majority of farms let avoid certain problems from the past (e.g. over-intensification, lost natural landscape, biodiversity, nitrate and pesticide contamination, livestock and manure concentration, uncontrolled erosion etc.). It has also revived some traditional and more sustainable technologies, varieties, and products, and averts some livestock epidemics.

The private mode has introduced incentives and possibilities for integral eco-management, investing in eco-system services, origins, labels, and integration with agro-tourism, processing, and marketing. Private management is associated with improved environmental stewardship on owned and marketed resources, but less concern to manure and garbage management, over-exploitation of leased and common resources, and contamination of soils, waters and air. The process of farms adaptation has been also associated with some intensification of production reviving or deepening some of the eco-problems.

However, evolution of various farmers’ and eco-associations has been hampered by the big number and diversified interests of agents, and weak positions of farmers – e.g. newly established Water Users Associations have not led to expected irrigation boom neither overcome existing monopolies. There are few examples for effective agrarian organizations mostly with small-membership and strong common interests (e.g. tobacco, silk-warm, bee-honey etc. producers). Recently eco-organizations have been quite successful in eco-monitoring, campaigns against GM crops and removal of restrictions in protected areas, garbage cleaning, etc.
### Table 2. Number, size and importance of different farms in Bulgaria

<table>
<thead>
<tr>
<th></th>
<th>Public</th>
<th>Unregistered</th>
<th>Cooperatives</th>
<th>Firms</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of farms</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>2101</td>
<td>16000000</td>
<td>na</td>
<td>na</td>
<td>1602101</td>
</tr>
<tr>
<td>1995</td>
<td>1002</td>
<td>1772000</td>
<td>2623</td>
<td>2200</td>
<td>1777000</td>
</tr>
<tr>
<td>2000</td>
<td>232</td>
<td>755300</td>
<td>3125</td>
<td>2275</td>
<td>760700</td>
</tr>
<tr>
<td>2010</td>
<td>35900</td>
<td>900</td>
<td>6100</td>
<td>357900</td>
<td></td>
</tr>
<tr>
<td><strong>Share in number (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>0.13</td>
<td>99.9</td>
<td></td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>1995</td>
<td>99.7</td>
<td>0.1</td>
<td>0.1</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>2000</td>
<td>99.3</td>
<td>0.4</td>
<td>0.3</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>2010</td>
<td>98.0</td>
<td>0.25</td>
<td>1.7</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td><strong>Share in farmland (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>89.9</td>
<td>10.1</td>
<td></td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>1995</td>
<td>7.2</td>
<td>43.1</td>
<td>37.8</td>
<td>11.9</td>
<td>100</td>
</tr>
<tr>
<td>2000</td>
<td>1.7</td>
<td>19.4</td>
<td>60.6</td>
<td>18.4</td>
<td>100</td>
</tr>
<tr>
<td>2010</td>
<td>33.5</td>
<td>23.9</td>
<td>42.5</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td><strong>Average size (ha)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>2423.1</td>
<td>0.4</td>
<td></td>
<td></td>
<td>3.6</td>
</tr>
<tr>
<td>1995</td>
<td>338.3</td>
<td>1.3</td>
<td>800</td>
<td>300</td>
<td>2.8</td>
</tr>
<tr>
<td>2000</td>
<td>357.7</td>
<td>0.9</td>
<td>709.9</td>
<td>296.7</td>
<td>4.7</td>
</tr>
<tr>
<td>2010</td>
<td>2.9</td>
<td>807</td>
<td>211.6</td>
<td></td>
<td>8.5</td>
</tr>
</tbody>
</table>

**Source:** National Statistical Institute

### Table 3. Number and size of livestock holdings in Bulgaria

<table>
<thead>
<tr>
<th>Type of holdings</th>
<th>Share 1-9</th>
<th>Share 20 and &gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy cows</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>87.3</td>
<td>20 and &gt;</td>
</tr>
<tr>
<td>2010</td>
<td>79.6</td>
<td>20 and &gt;</td>
</tr>
<tr>
<td>Buffalo cows</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>85.3</td>
<td>20 and &gt;</td>
</tr>
<tr>
<td>2010</td>
<td>63.5</td>
<td>20 and &gt;</td>
</tr>
<tr>
<td>Ewes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>56.7</td>
<td>20 and &gt;</td>
</tr>
<tr>
<td>2010</td>
<td>29.8</td>
<td>20 and &gt;</td>
</tr>
<tr>
<td>She-goats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>98.2</td>
<td>20 and &gt;</td>
</tr>
<tr>
<td>2010</td>
<td>96.2</td>
<td>20 and &gt;</td>
</tr>
<tr>
<td>Breeding pigs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>87.1</td>
<td>20 and &gt;</td>
</tr>
<tr>
<td>2010</td>
<td>78.8</td>
<td>20 and &gt;</td>
</tr>
</tbody>
</table>

**Source:** Ministry of Agriculture and Food

Market-driven organic farming has emerged in the country and registered a significant growth – the number of organic operators increased 70 folds since 2003 (MAF). There has been
enormous augmentation of organic areas and number of livestock but they are still a tiny portion of the total Utilized Agricultural Area and the livestock population (Table 4).

Table 4. Evolution of organic production in Bulgaria

<table>
<thead>
<tr>
<th>Indicators</th>
<th>2003</th>
<th>2005</th>
<th>2007</th>
<th>2008</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farming area, ha</td>
<td>650</td>
<td>2432</td>
<td>11808</td>
<td>16663</td>
<td>25647</td>
<td>26622</td>
<td>40378</td>
</tr>
<tr>
<td>% in UAA</td>
<td>0.01</td>
<td>0.05</td>
<td>0.23</td>
<td>0.33</td>
<td>0.51</td>
<td>0.52</td>
<td>0.79</td>
</tr>
<tr>
<td>Wild herbs, ha</td>
<td>-</td>
<td>-</td>
<td>397835</td>
<td>489083</td>
<td>546195</td>
<td>543655</td>
<td>472700</td>
</tr>
<tr>
<td>Cattle</td>
<td>na</td>
<td>395</td>
<td>395</td>
<td>470</td>
<td>364</td>
<td>976</td>
<td>1173</td>
</tr>
<tr>
<td>% in all cattle</td>
<td>0.11</td>
<td>0.07</td>
<td>0.14</td>
<td>0.07</td>
<td>0.17</td>
<td>0.22</td>
<td></td>
</tr>
<tr>
<td>Sheep</td>
<td>na</td>
<td>294</td>
<td>1690</td>
<td>2471</td>
<td>6698</td>
<td>6648</td>
<td>9175</td>
</tr>
<tr>
<td>% in all sheep</td>
<td>0.02</td>
<td>0.11</td>
<td>0.21</td>
<td>0.49</td>
<td>0.46</td>
<td>0.67</td>
<td></td>
</tr>
<tr>
<td>Goats</td>
<td>na</td>
<td>32</td>
<td>1058</td>
<td>1624</td>
<td>2773</td>
<td>3397</td>
<td>2831</td>
</tr>
<tr>
<td>% in all goats</td>
<td>0.01</td>
<td>0.28</td>
<td>0.45</td>
<td>0.78</td>
<td>0.99</td>
<td>0.96</td>
<td></td>
</tr>
<tr>
<td>Bees colonies</td>
<td>na</td>
<td>23508</td>
<td>35747</td>
<td>44861</td>
<td>46429</td>
<td>58855</td>
<td>85346</td>
</tr>
</tbody>
</table>

Source: Ministry of Agriculture and Food

Transition to certified organic production is a major form of eco-management in the eco-active farms (Figure 1). Other private and market modes are less used predominately by the Physical Persons. Nevertheless, there are widespread applications of informal forms such as farms with “ecologically pure production”, “built reputation for pure products”, etc.

Additionally, a portion of the surveyed farms has own initiative or participates in another private, collective or state eco-initiatives – e.g. 28,2% of Physical Persons, 18,2% of Sole Traders, and 17,6% of others implement own eco-initiative. Some 9,3% of Physical Persons have “a signed private eco-contract“, while 6,4% of Physical Persons, 5,9% of Companies and Corporations, and 4,5% of Sole Traders have “a signed eco-contact with the state“. A part of the farms participate in eco-initiatives of other farms and organizations - for 8,1% of Physical Persons this is “informal initiative of other farms“; for 17,6% of Companies and Corporations, and 4,5% of Sole Traders, and 3,9% of Physical Persons that is “eco-initiative of the state“;
and for 5.6% of Companies and Corporations, and for 1.5% of Physical Persons this is “eco-initiative of the supplier”.

During the transition period the public (national and international) intervention in eco-management was not significant, comprehensive, sustainable, or in some cases even related. Eco-policies were fragmented and reactive to the urgent problems (e.g. natural disasters) with different agencies responsible for the individual aspects of management.

In the past years a number of programs are developed to deal with the specific eco-challenges such as preservation of biodiversity and environment; limitation of Sulphur Dioxide, VOC, Ammonia emissions; waste management; water sector development; combating climate change; organic agriculture; management of lands and fights against desertification. National monitoring system of environment has been set up, and mandatory eco-assessment of public programs also introduced.

Nevertheless, inefficient priority setting, management and enforcement (bad coordination, gaps, incompetence, ineffective enforcement, corruption, etc.), and administrative capability prevail. Agrarian education and Agricultural Advisory Service are not effectively reorganized and provide modern training on rural development and eco-, climate change, and water-management issues. Integral approach of soil, water and biodiversity management in planning, funding, management, monitoring, controlling and assessment has not been completely applied, and stakeholders involved in the decision-making at all levels, and modern “eco-system services”, “life-cycle”, “water accounts”, “eco-foot-prints” approaches incorporated into the program management. Neither mechanism for effective communication of data to all stakeholders assured. Agrarian and environment research has not been modernized and severely underfunded up to now.

There has been enormous progress in the public support since 2007 EU CAP providing significant funding for the Area-based payments, National top-ups; agro-environmental payments and specific measures like organic farming, management of agricultural lands with high value and handicaps, traditional livestock, protection of soils and water, preservation of landscape; farm modernization and diversification; infrastructural development; training. Increased eco-support including new “green payments” is in place since 2014.

The new rules (e.g. “cross-compliance”) and public subsidies have improved farms income and eco-performance, involved abandoned lands, and brought about amelioration of eco-situation. However, implementation of the public support measures has been slow and far behind targets. Due to the restrictive criteria, lack of titles, complicated and costly procedures, and massive mismanagement, it is not been effectively utilized and benefit unevenly different farms. For instance, less than 7% of the beneficiaries get the lion share (80%) of the Direct Payments while public assistance further enlarges existing disparities between different farms, sub-sectors, and regions of the country.

Efficiency of environmental management in agriculture

A by-product from the new market and private management has been a considerable disintensification of agriculture, ease of eco-pressure and pollution comparing to the pre-reform level (Bachev). The market adjustment has been associated with a sharp decline in all crop (but sunflower) and livestock (but goat) productions, a big portion of the agricultural has been lands left uncultivated, average yields shrunk to 40-80%, livestock, and used machineries, chemicals and waters have decreased significantly (Figure 2). At the same time some traditional crop varieties and livestock breeds have been recovered. All that sharply reduced the eco-pressure of agriculture – e.g. in the last years soils have been in good ecological state in terms of organic content, and heavy metals and metalloids contamination (EEA).
A negative rate of fertilizer compensation of N, P, K intakes dominate and a huge amount of nutrition have been irreversibly removed annually from the soils (EEA). Monoculture or simple rotation has been practiced by large operators, and unbalanced input of nutrient is typical. There has been considerable increase in farmland affected by acidification (Figure 3) as 4.5% of the acidified lands are with level harmful for the crops (EEA). The fraction of salinized land doubled but it is still merely 1.1% of the total. Illegal garbage yards in rural areas have increased reaching 4000 with an actual number far bigger than the officially reported.

Due to the ineffective management 34% of the arable lands have been subjected to wind erosion and 64% to water erosion. There is 21 folds decline in water used in agriculture (Table 5) as merely 2-5% of the network used and primitive techniques employed. That reduced water stress in the country but had a harmful effect on crop yields and structure while irrigation has not been effectively used to correct inappropriate distribution of rainfalls, and mitigate effects of climate change on farming.
**Table 5. Evolution and agricultural use of water resources in Bulgaria**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural water withdrawal (10^9/m^3/year)</td>
<td>3,058</td>
<td>0.141</td>
<td>0.144</td>
<td>0.143</td>
</tr>
<tr>
<td>Share in total water withdrawal (%)</td>
<td>21.78</td>
<td>-</td>
<td>1.66</td>
<td>-</td>
</tr>
<tr>
<td>Share of total actual renewable water resources</td>
<td>14.36</td>
<td>0.66</td>
<td>0.68</td>
<td>0.67</td>
</tr>
<tr>
<td>withdrawn by agriculture (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area equipped for irrigation (1000 ha)</td>
<td>1263</td>
<td>789</td>
<td>622</td>
<td>104.6</td>
</tr>
<tr>
<td>Share of cultivated area equipped for irrigation (%)</td>
<td>29.17</td>
<td>17.55</td>
<td>17.36</td>
<td>3.18</td>
</tr>
<tr>
<td>Area equipped actually irrigated (%)</td>
<td>na</td>
<td>5.42</td>
<td>4.96</td>
<td>51.29</td>
</tr>
</tbody>
</table>

**Source:** FAO, AQUASTAT

There has been amelioration of quality of surface and ground waters - currently only 0.7% of the samples exceed the Ecological Limit Value for nitrate. However, many water eco-systems are at risk caused by the increasing application of chemicals. Monitoring of waters for irrigation also show that in 45% of the samples nitrates concentration exceeds contamination limit 2-20 folds (EEA). Currently, the Nitrate Vulnerable Zones cover 68% of the total Utilized Agricultural Areas.

Only 0.1% of the livestock farms possess safe manure-pile sites, 81% use primitive dunghills, and thousands have no facilities at all (MAF). Serious eco-challenge has been also posed by the inadequate storage and disposal of expired and prohibited pesticides.

The amount of protected areas in the country almost doubled since 1990 (NSI). Nevertheless, the widespread lack of proper eco-management has affected negatively biodiversity in some agro- and related ecosystems - large-scale enterprises paying little attention to biodiversity protection, considerable farmlands uncultivated, some agro-ecosystems lost “agro” character, semi-natural grasslands converted to cultivation, municipal pastures degraded by over- or under-grazing, reckless collection of wild plants and animals destructed all natural habitats, etc. Similarly, the Index of Birds in Agricultural Lands has been negative and variety of bird species decreased by 10% in last years (EEA). In the past decades all 37 typical animal breeds have been endangered, 6 irreversibly extinct, 12 almost extinct, 16 endangered, and 3 potentially endangered (MEW).

There has been enormous (68%) reduction of the overall Green-house Gas emissions from agriculture since 1988 as the sectors decline is higher than the national one (Figure 4). Now agriculture is the second biggest emitter of GHGs contributing between 7-10% of the total.

**Figure 4. Greenhouse gas emissions from Bulgarian agriculture**

**Source:** Executive Environment Agency
Our large-scale survey has found that for a big part of the “eco-active” farms the eco-management is associated with a “high” increase in the long-term investments, production costs, registration, tests, and certification costs, and specialized costs for nature conservation (Figure 5). Also for the majority of farms, the eco-management is associated with “average” growth in specialized costs for protection of natural environment, overall production costs, long-term investments, costs for studying official regulations and standards, overall management costs, costs for acquiring information, training, and consultations, costs for marketing of products and services, costs for participation in programs for public support, costs for private negotiations and contracts, costs for registrations tests, and certifications, costs for cooperation with others, and costs for resolutions of disputes and conflicts.

**Source:** survey with agricultural producers, May 2014

**Figure 5.** Extent of augmentation of costs of agricultural farms associated with environmental protection activity in Bulgaria (percent)

For the predominate portion of farms, natural environment protection activity is associated with the augmentation of farm economic efficiency, as for around one fifth of them that is to a “great” extent, for 37,8% in “average” extent, and for 9,1% of holdings in “insignificant” extent.

For the majority of farms, environment protection activity is associated with the augmentation of ecological efficiency of the farm, (Figure 6). The eco-activity leads to increasing in farm ecological efficiency for a relatively biggest portion of holdings specialized in beekeeping, pigs, poultry and rabbits, mix crops-livestock production, large-scale holdings, and farms located in less-favored mountainous regions, with lands in protected zones and territories, and in North-East and South-West regions.
To the greatest extent the eco-activity of a big part of farms is stimulated by: “personal conviction and satisfaction of farmers from eco-activity”, “participation in public support programs”, “received direct public subsidies”, “professional eco-training of farmer and hired labor”, “market competition”, “access to farm and eco-advises”, “possibilities to increase profit”, “eco-benefits for the farm in longer-term”, and “European Union policies” (Figure 7).
The biggest (“average” or “strong”) impact on eco-active farms have been caused by the Measures 111, 114 и 143 “Professional training and advices”, Measure 214 “Agro-environmental payments”, “Direct Area-based subsidies by the EU”, Measure 112 “Setting up of young farmers”, Measure 141 “Semi-subsistence farming”, Measure 121 “Modernization of agricultural holdings”, “National tops ups for products, livestock, etc.”, and Measure 211 “Natural handicap payments to farmers in mountain areas” (Figure 8).
The impact of the remaining instruments of the CAP on the greatest part of the surveyed beneficiaries is “low” or “none”. What is more, a part of the farms evaluate the impact of the public support instruments on their holdings as “negative”. The later concerns more than 10% of the beneficiaries from the Measure 223 “First afforestation of non-agricultural land”, Measure 226 “Restoring forestry potential and introducing prevention actions”, and Measure 313 “Encouragement of tourism activities”.

Conclusion and lessons for Macedonia

The post-communist transition and the EU integration have brought about significant changes in the environmental management in the Bulgarian agriculture. The newly evolved market, private and public governance has led to a significant improvement of the eco-management and the eco-impacts of agriculture introducing modern eco-standards and public support, enhancing environmental stewardship, disintensifying production, recovering landscape and traditional productions, and diversifying quality, eco-products and services. The agrarian transition and integration has been also associated with some new challenges such as unsustainable exploitation of the natural resources, lost biodiversity, land degradation, water and air contamination etc.

Implementation of the “common” EU policies has been having unlike results in the specific “Bulgarian” conditions. Up to date it enlarges the income, technological, and eco-discrepancy between different types of farms, sub-sectors of agriculture, and regions of the country. In a longer-term the eco-hazard(s) caused by agriculture will likely expand unless effective public and private measures are taken to mitigate the existing eco-problems and risks. Therefore, special measures are to be taken to improve eco-information and assessments; modernize the system of property rights, public regulations and enforcement; perfect the management of public organizations, programs and services; and extend the public support to and partnerships with the dominating farming (including small-scale and subsistence) structures, etc.

The positive and negative Bulgarian and international experiences are to be further studied and popularized, while some lessons could be effectively used to modernize the system of agro-eco-management in Macedonia. The major recommendations could be summarized as following: First, it is to integrate better eco (including neglected water, eco-system services,
climate change etc.) policy in the agrarian and development policies. A long-term public support, stability and certainty in the eco-policy have to be assured in order to induce effective private and collective eco-actions.

Second, it has to be applied an integral approach of soil, water and biodiversity management in planning, funding, management, monitoring, controlling and assessment of public programs at all levels, and real stakeholders’ involvement in decision-making is to be guaranteed. Modern “eco-system services”, “life-cycle”, “eco-accounts”, etc. approaches are to be incorporated in programs design at all level. Third, it is to improve coordination and efficiency of public and private agents involved in the eco-management, and overcome existing division of responsibilities, poor coordination, conflicting interests, and inconsistency, controversies, gaps and inefficiency of actions. Forth, it is to further define, regulate and privatize property, user, management, trading, discharge etc. rights and assets related to eco-resources, eco-system services, renewable energy supply, (N, GHG) emissions, waste discharge, etc. For instance, introduction and enforcement of new agrarian intellectual property rights on protected zones, “Designations of Origin”, “Geographical Indications”, “Traditional Specialty Guaranteed”, eco-labels and innovations, etc. can further enhance the sustainable development of the sector.

Five, it has to be employed a range of adequate instruments including appropriate pricing, quotas, public funding and insurance, taxing, interlinking in order to improve eco-resources use efficiency and risk-sharing, and preventing over-intensification and pressure on natural resources, and supporting farms “multifunctionality” and adaptation to changing environment. Six, the national and international assistance instruments are to be adapted to the specific local conditions and support all type of farms and perspective structures (including joint-ventures), farm modernization and adaptation, eco-innovations, etc. Adapted eco-measures and standards are to be better implemented. Seven, it is to be broadly employed hybrid (public-private, public-collective) modes given coordination, incentives, and control advantages over “pure” public forms. Public enforcement of most eco-standards is difficult (e.g. vast informal sectors, remote areas etc.) and higher support is to be given to voluntary (professional, community, NGOs etc.) initiatives though informing, training, assisting, funding, risk-sharing, assisting agents’ cooperation etc. Real participation of the farmers and stakeholders in priority setting, management, and assessment of public programs at all levels is to be institutionalized. Eight, it is to secure adequate eco-data collection, monitoring, and independent assessment on soil, water and air contamination, waste management, social costs, eco- (water, energy) foot-prints, benefits from farming, effect on eco-conservation, renewable energy production, impacts of climate change, existing eco-risks, etc. Adequate mechanisms for timely and effective communication of eco-information to decision-makers, stakeholders and society are to be assured.

Nine, it is to further improve eco-education and training of farmers, administrators, and public at large. Agricultural education, information and advisory are to reach all agents via effective methods suited to their specific needs, continues training, sharing experiences, including topical eco-management issues. Effective cooperation with other (public, private, international) organizations in all these areas is to be supported. Ten, it is to improve constantly the overall public governance - property rights, laws and contracts enforcement, fight against mismanagement and corruption, etc. as well as remove all restrictions for private and collective initiatives. Eleven, public and international support to multidisciplinary and interdisciplinary research on all aspects of eco-management is to be augmented, including of factors, forms and impacts of eco-governance.
Literature
Standard results of FADN research in Serbia

Bojcevski Mirjana¹, Kovacević Vlado², Ivkova Ivana³, Veselinovic Gligorije⁴

Abstract
Aim of this paper is to analyze importance of FADN standard results in Serbia. Farm Accountancy Data Network (FADN) is one of the most reliable data sources for making economic analysis in the field of agriculture. In the European Union setting up the FADN was initiated in 1965, whereas in Serbia the basis for the development of the FADN was established in late 2011. For the purpose of this paper, the desk research method and method of interview with relevant experts have been used, method of descriptive statistics, comparative method and theoretical analyses as well. Analyzes were conducted form 2012 up to now. In the paper is presented methodology for calculation of the FADN results in the European Union and the Republic of Serbia. Presented is standard definition, the group results and the monitoring on FADN data and conditions to be met for the publication and distribution of FADN results. According to analyses conducted in this paper FADN system is important and useful tool in analyzing the business performance on the farm level as well as the national agricultural policy.

Keywords: FADN, accounting in agriculture, agrarian policy

Introduction
Farm Accountancy Data Network (FADN) system is one of the most trustworthy sources of harmonized and comparable data of the EU Member States for the micro-economic analysis in the field of agriculture, which is regulated by the European Union Regulations and supported with additional instructions contained in the publications of the FADN Community Committee (RI/CC documents).

The FADN methodology applied allows extrapolation of data on standard results from the sample of agricultural holdings selected according to three dimensions: region, economic size and type of farming. Agricultural holdings are selected for the sample in accordance with the selection plan at the regional level in the EU Member States. The sample does not include all EU agricultural holdings, but only those estimated to be commercial.

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In the European Union FADN system was established by the Council Regulation (EEC) No 79/65 of 15 June 1965, while in the Republic of Serbia, this system was officially introduced in late 2011, where at the same time, this period represents the initial phase of its establishment. Establishing a network of accounting data on the family farms based on FADN methodology is a condition for Serbia’s accession to the European Union, which gives a high priority to this activity in the Republic of Serbia” (Vasiljevic et al., 2012).

The first data were collected in 2011 from 41 agricultural holdings. In 2012 the data were collected from 172 agricultural holdings, in 2013 the data were collected from 497 agricultural holdings and in 2014 the data from 989 agricultural holdings were collected.

In the coming period sample of agricultural holdings is expected to continuously increase according to the EU FADN methodology requirements. This will fully ensure the representativeness of the FADN research and meet the EU FADN requirements.

It has been planned that definitive sample for monitoring and recording the accountancy data on the farms in the Republic of Serbia amounts between 1,500 and 2,000 farms” (Vasiljevic et al., 2012).

**Material and methods**

In the preparation of this paper are used empirical and a priori knowledge, method of comparison, as well as methods of deductive and inductive reasoning.

Further, it is used unique replicable European Union (EU) methodology that has been applied and adjusted in accordance with national conditions in the Republic of Serbia. More specifically, in this paper is used FADN methodology described in the following Regulations:

- Council Regulation (EC) No 1217/2009 of 30 November 2009 setting up a network for the collection of accountancy data on the incomes and business operation of agricultural holdings in the European Community,

**Results and discussion**

**FADN organisational structure for data collection**

The European Union requires that all Member States must establish FADN system, which is based on established organizational structure and applied unique FADN methodology for data collection from agricultural holdings.

Basic requirements for the FADN system organization in the EU Member States are set out in the Articles 6, 7 and 9 of Council Regulation (EU) No 1217/2009 and Regulation (EC) No 1318/2013.

The European Commission doesn’t collect data by itself. This is one of the tasks of the Liaison Agency in each Member State. Data collection is undertaken by the Liaison Agency or by bodies nominated by it. Liaison Agency is supervised by a National FADN Committee.

In the Republic of Serbia, Ministry of Agriculture is appointed to be the Liaison Agency–competent authority for the data transmission to the European Commission. Authorised organization by Minister – Institute for Science Application in Agriculture and competent
authority of Autonomous Province of Vojvodina - Provincial Secretariat for Agriculture, Water Management and Forestry are appointed to be bodies under the Liaison Agency responsible for management of data collection. The total number of agricultural extension services which are appointed as Accountancy Offices is 33. These offices have advisers appointed as Data Collectors responsible for collection, processing, and dissemination of data from agricultural holdings (Ivkov et al., 2013).

**Farm Return data**

Farm Return represents specific basis of data collection. It is unique for each Member State and well-defined in the FADN Regulation.

There are 13 main groups of accountancy data to be collected from agricultural holdings participating in the FADN system (Table 1.).

Data required by the European Commission (DG AGRI) have been defined in the Annexes to the Implementing Regulation (EU) No 2015/220 and in its subsequent amendment Commission Implementing Regulation (EU) No 2323/2015. These regulations specify that FADN data should be processed and submitted to the European Commission by the liaison agency, as well as define and explain the different variables.

Beside the requirements of the EU, there are national requirements of each Member State which are based on the needs of the users. In many Member States national economic statistics in the agricultural sector is based on FADN data. Therefore, in order to improve national statistics, it may be necessary to collect additional data from agricultural holdings participating in the FADN system.

Data in the Farm Return concern exclusively the participating agricultural holding. These data refer to the agricultural activities of the holding and to the other gainful activities directly related to the holding. Activities connected with any non-farming activities of the holder or of his family, or with any pension, inheritance, private bank accounts, property external to the agricultural holding, personal taxation, private insurance, etc. Are not taken into consideration in preparing the FADN Farm Returns.

The required data are extracted from the appropriate inventory, cash book, ledger or journal kept by the agricultural holder or field manager. In some Member States, the Liaison Agencies have drawn up special entry books to be completed periodically by the holders.

In line with aforementioned, there have been prepared all necessary documents for Serbian FADN data collection such as Questionnaire for data collection as well as its Guidelines.
Table 1. Main groups of accountancy data in the Farm Return

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>GENERAL INFORMATION: Identification and classification of the farm.</td>
</tr>
<tr>
<td>B</td>
<td>TYPE OF OCCUPATION: Breakdown of the farm area: owned, rented or sharecropped.</td>
</tr>
<tr>
<td>C</td>
<td>LABOUR: All labour, paid and unpaid, which has contributed to work on the farm during the accounting year.</td>
</tr>
<tr>
<td>D</td>
<td>ASSETS: Value of all non-capital inputs used in the production of non-capital products during the accounting year.</td>
</tr>
<tr>
<td>E</td>
<td>QUOTAS AND OTHER RIGHTS: Quotas and other rights included those acquired free if they can be traded separately from linked land.</td>
</tr>
<tr>
<td>F</td>
<td>DEBTS: Outstanding amounts i.e. loans contracted minus the repayments already made.</td>
</tr>
<tr>
<td>G</td>
<td>VALUE ADDED TAX: The VAT system applying and in certain cases VAT payments and receipts.</td>
</tr>
<tr>
<td>H</td>
<td>INPUTS: Costs in cash and in kind, quantities of selected inputs.</td>
</tr>
<tr>
<td>I</td>
<td>CROPS: The area, quantity and value of all crops, animal products and other activities.</td>
</tr>
<tr>
<td>J</td>
<td>LIVESTOCK PRODUCTION: Opening and closing valuations (in number and value) and average number of livestock, value of transactions together with the value of any farmhouse consumption of livestock, purchases and sales.</td>
</tr>
<tr>
<td>K</td>
<td>ANIMAL PRODUCTS AND SERVICES: Per animal category.</td>
</tr>
<tr>
<td>L</td>
<td>OTHER GAINFUL ACTIVITIES DIRECTLY RELATED TO THE FARM: The definition of OGA is the same as used in the Farm Structure Surveys and in the Community typology for agricultural holdings.</td>
</tr>
<tr>
<td>M</td>
<td>SUBSIDIES: Defined as specific payments made directly to the farm business from public funds, excluding those for investment in land, plant, machinery and equipment. Detailed data concerning CAP arable crops area payments and direct payments for beef.</td>
</tr>
</tbody>
</table>

Source: Commission Implementing Regulation (EU) No 220/2015

Data quality assurance and confidentiality
Agricultural policy analysis and decisions should be based only reliable and accurate data. Therefore, the Liaison Agencies and the Commission take great care to ensure a high quality of accounting data and that any errors in FADN data are identified and corrected.
The following table (Table 2.) shows the planning for the data quality checks for the accounting year N. Complete...
Table 2. European Commission timetable for data quality control

<table>
<thead>
<tr>
<th>1 December N+1</th>
<th>First quarter N+2</th>
<th>Second quarter N+2</th>
<th>By 31 July N+2</th>
<th>By 31 September N+2</th>
<th>October N+2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data delivery deadline for most of the Member States</td>
<td>The Commission does basic data checks and exchanges comments, if any, with Member States</td>
<td>Preliminary results are published following the finalisation of the basic data checks</td>
<td>The Commission has sent detailed feedback to all Member States</td>
<td>The Commission has received explanations from all Member States and the data are approved</td>
<td>The Commission presents Standard Results to the FADN Committee and data are made available to users</td>
</tr>
<tr>
<td>Member States should reply within one month with explanations or corrections of the data - more than one round of data verifications may be needed</td>
<td>As soon as the data are final, facts-sheets with main results at Member State level are published</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Estimated time required for data validation process: 10 months

Source: [http://ec.europa.eu/agriculture/rica/collect_en.cfm](http://ec.europa.eu/agriculture/rica/collect_en.cfm)

Submission of Farm Returns data for each EU Member State is mandatory. Data delivery deadline for most of the EU Member States is 1\textsuperscript{st} December of current year for the data coming from previous year. Hence, delivery the Farm Return results for the Commission should take no more than 11 months from the end of an accounting year.

During the pre-accession period, before the full EU integration, Serbia is not included in the regular RICA 1 validation system.

In the Republic of Serbia, there are five levels for data control:

1. Data collector-agricultural holder,
2. Agricultural Extension Service-local level,
3. Regional bodies (Institute for Science Application and Provincial Secretariat of Agriculture, Water Economy and Forestry)-regional level,
4. Ministry of agriculture-national level
5. Unofficial validation by RICA 1 system-EU level.

FADN data are strictly confidential, so these cannot be disclosed or used for tax purposes. Therefore, a minimum number of farms are required for each stratum to assure anonymity (e.g. 5 holdings in Estonia, Hungary and Serbia, 15 farms in EU level). FADN data cannot be used for administrative, legal, taxation or control purposes. The FADN data users shall ensure that the research outcomes in the form of publication, which excludes the possibility of identifying an individual agricultural holding.
In the Republic of Serbia, staff belonging to the institution of FADN organizational structure has to sign a written statement giving the obligations of keeping all information on individual agricultural holdings strictly confidential, and this is in accordance with the Law on Personal Data Protection (Official Gazette of the RS No. 97/2008 and 104/2009, 68/2012 - decision and 107/2012). Summary data can only be provided from an analysis of at least 5 farms.

**FADN data gathering methodology**

According to the new typology of agricultural holdings enforced in the 2010 accounting year the type of farming and economic size of a holding are determined on the basis of the monetary value of total standard output (SO) expressed in euro. Total standard output is determined on the basis of SO coefficients calculated as an average over a period of five years according to the yield and productivity indicators, as well as prices in the years of survey. Agricultural subsidies are not included in standard output coefficients.

Standard output coefficients and the data of the agricultural census or structural survey on land use and the number of livestock are used for determining the value of total standard output in euro i.e. the economic size of every agricultural holding in the field of survey. The type of farming is defined according to the relative contribution of one or the other branch of production of the holding to the holding's total standard output.

The objective of the FADN is to analyse the economic results of the agricultural sector and agricultural holdings; therefore, the threshold of the economic size of the holding in the field of survey has been determined. In Serbia the threshold of the economic size of the field of survey of the FADN is €4000, i.e. the economic size class 3 (Table 3.). It means that the value of total standard output of a returning agricultural holding of the FADN must be higher than €4000 in the accounting year. The threshold of the economic size of a holding is determined according to the principle that the field of survey must cover ca 90% of the agricultural production of the Member State (total output, land use, livestock units).

The threshold of the economic size of the holding is different by EU Member States. In most Member States the threshold is €4,000, however, in Belgium, United Kingdom, France, Luxembourg, Netherlands and Germany it is considerably higher – €25,000, while in Bulgaria and Romania the threshold of the economic size of the holding is €2,000 (Table 4.).
Table 3. Economic size classes

<table>
<thead>
<tr>
<th>Economic size class</th>
<th>Minimum (EUR) &gt;=</th>
<th>Maximum (EUR) &lt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2,000</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4,000</td>
<td>8,000</td>
</tr>
<tr>
<td>3</td>
<td>8,000</td>
<td>15,000</td>
</tr>
<tr>
<td>4</td>
<td>15,000</td>
<td>25,000</td>
</tr>
<tr>
<td>5</td>
<td>25,000</td>
<td>50,000</td>
</tr>
<tr>
<td>6</td>
<td>50,000</td>
<td>100,000</td>
</tr>
<tr>
<td>7</td>
<td>100,000</td>
<td>250,000</td>
</tr>
<tr>
<td>8</td>
<td>250,000</td>
<td>500,000</td>
</tr>
<tr>
<td>9</td>
<td>500,000</td>
<td>750,000</td>
</tr>
<tr>
<td>10</td>
<td>750,000</td>
<td>1,000,000</td>
</tr>
<tr>
<td>11</td>
<td>1,000,000</td>
<td>1,500,000</td>
</tr>
<tr>
<td>12</td>
<td>1,500,000</td>
<td>3,000,000</td>
</tr>
<tr>
<td>13</td>
<td>3,000,000</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Commission Implementing Regulation (EU) No 220/2015

Table 4. Threshold of the economic size in EU member states, 2014

<table>
<thead>
<tr>
<th>EU Member States</th>
<th>Threshold (EUR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria, Romania</td>
<td>4,000</td>
</tr>
<tr>
<td>Estonia, Greece, Spain, Croatia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Portugal, Slovenia</td>
<td>8,000</td>
</tr>
<tr>
<td>Czech Republic, Ireland, Italy, Austria, Finland</td>
<td>15,000</td>
</tr>
<tr>
<td>Denmark, Sweden, Northern Ireland</td>
<td>25,000</td>
</tr>
<tr>
<td>Belgium, Germany, France, Luxembourg, Netherlands, Slovakia, United Kingdom</td>
<td></td>
</tr>
</tbody>
</table>

Source: http://ec.europa.eu/agriculture/rica/collect_en.cfm

Depending on the amount of detail required, the types of farming are divided into general types of farming or principal types of farming. Holdings can be classified by type of farming: general, principal and particular type of farming. Classification of holdings by general and principal type of farming is used most often. There are not enough holdings of particular type of farming to be used for analysis. In terms of general type of farming the most frequently occurring types in the Republic of Serbia are field crops, dairy, grazing livestock and mixed crops and livestock type of farming.

Standard results, definition of variables and standard groupings

The standard results are a set of statistics based on the Farm Return of sample holdings and calculated according to the defined methodology. They describe in considerable detail the economic situation of agricultural holders by different groups.
Standard results are calculated as weighted averages per agricultural holding enabling extrapolation of the data of sample holdings across the field of survey of agricultural holdings. Standard results give a detailed overview of the economic situation of holdings of different economic size groups. As the methodology of data collection and calculation of standard results is common across the EU, it is possible to analyse and compare the respective results of agricultural holdings of different Member States.

FADN information is aggregated into a Standard Results database available for the following dimensions: year, geographic (country, region), type of farming and economic size.

Standard results can be aggregated into eight groups of indicators:

1. Sample and population
2. Structure and yields
3. Production
4. Costs
5. Subsidies
6. Income
7. Balance sheet
8. Financial indicators

The European Commission defines a method for performing the main variables of standard results. All results are given in euros. This enables that the results of each Member State can be given as the total value at EU level, and also enables the comparison of results of two or more Member States results. Rate (national currency - the euro) is calculated for each Member State for each FADN accounting year, and an average of the monthly rates. These monthly exchange rates calculated by Eurostat and made available as part of the CRONOS database.

Detailed definitions of all these variables of standard results are available in a separate publication of the FADN Community Committee (RI/CC 1680).

**Data dissemination at EU level**

Dissemination of the FADN results is based on Standard Results, which are generated on the basis of aggregated FADN Farm Returns that are approved by the European Commission. Organizational unit responsible for FADN in the European Commission each year provides the EU agricultural holdings economics overview based on various economic and financial indicators. It also provides economics overview of agricultural holdings in the European Union and their development by EU Member State and by type of agricultural production. Reports on sector analysis, direct payments and rural development are provided as well.

Analyses based on the FADN research play a key role in the whole process of reforming the Common Agricultural Policy, or in the evaluation of CAP measures as well as in the impact assessment to policy proposals.

**Conclusion**

For the completion of the Serbian FADN system establishment and its sustainable development and functioning, there are still many challenges to overcome (Ivkov et al., 2013). During the coming year, in the Republic of Serbia, the methodology of the FADN research should be further developed and adapted in accordance with the EU requirements, as well as the FADN organizational structure for data collection should be further improved and strengthen.
Furthermore, taking into consideration that the FADN system in the Republic of Serbia is still in the phase of establishing, the current FADN data do not reflect the real economic situation of the agricultural sector due to their logical uncertainty. Therefore, the conclusion concerning the Standard Results of FADN research in Serbia should be made with even more caution.

References
Role and importance of public relations in the state administration - the Ministry of Agriculture and Environmental Protection

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Abstract
The issue and the domain of public relations mean establishing and maintaining good relationships with target audiences, that is establishing of dialogues. In practice, public relations are often utterly simplified and reduced to relations with the media. The media are one of the primary target group, but not the only one. Public relations mean building relationships with other, no less important stakeholders such as employees, communities, public administration institutions.

In this sense, the paper analyzes the role and importance of public relations in the state administration - the Ministry of Agriculture and Environmental Protection of the Republic of Serbia, in order to determine a way to manage public relations in the stated sector.

Thereby several methods are used including: the method of comparative analysis, the method of deduction, descriptive method and interview method.

To create the paper, the data of the Ministry of Agriculture and Environmental Protection of the Republic of Serbia have been used.

Based on the conducted research and analysis of collected data the certain insights have been achieved.

Experts in public relations at the Ministry of Agriculture and Environmental Protection of the Republic of Serbia have to use the right way to represent the changes that will inevitably come, and all the benefits that the end users, as well as the whole country will have of the emerged changes.

Keywords: public relations, public administration, agriculture, environment

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Introduction
From its very beginning, mankind began to communicate using words, and this is the main characteristic that marks it out from the animal world. The beginnings of the oration are mainly known from Indian, Sumerian and Greek epics and texts, which consisted of memorized recitation of religious and legal regulations. The importance of the oral transmission of information is reflected in the numerous texts, which were written much later than they appeared, and that is by virtue of the word of mouth.
Informing has always been of great importance for decision-making of any kind - the everyday level, business or private. "The modern way of life imposes a great need for informing. Informing has become an integral and increasingly common part of human life (Filipović et al., 2003)."
In a world of technological, sociological and market challenges, there is a strong need for systematic communications between an organization and its public. The success of organizations at the present time is very dependent on their public reputation. Also of great importance is that the State Administration of one country, its Government, Ministries and other authorities represent their decisions and actions in the reasonable manner to their citizens.
The emergence of public appearance is linked and dates back to the ancient Greece and Rome, but not in the form in which this discipline occurs today. With the occurrence of the media, i.e. the press, radio, television, and later the Internet, the possibility of addressing the audience indirectly, and therefore public appearance takes on a whole new role in which public speaking skills, persuasion and convincing have different dimensions.
Management of public relations is not possible without some good analyses; experts in public relations call them ESTIMATIONS. Who we are, what our organization is, what we do, what our strengths are, what our services are, what our weaknesses are, what information about us can cause a "crisis" in public - these are just some of the questions that we have to give the answer if we want to build structured relations with the public. This, of course, is not a matter of days, not even the matter of one-off decision, the public relations are the matter of strategy for which the long periods of years are needed, with the proper use of knowledge and techniques that are presented in this paper.
Public relations have very important and significant impact on the general public and the entire society - all the interest groups, the media, the state, as well as the operations of each organization. Bearing in mind all the above, we can conclude that in the present time, behind every successful company, organization, personality and so on, we can say, that there is a team for media relations, which presents these successes in the best way possible to the public and therefore strengthens the position and people's trust in the company for which they work, which is of crucial importance for the contemporary market.

Scope and Purpose of the Research
Each step in the development of the media technology marked a turning point in the life of the human species, and higher aspects of production, storage, transfer and sharing of information material have led to formerly unimaginable social, economic and psychosocial changes.
With the advent of the press, especially with the development of the radio, television and the Internet, that is, with the expansion of the opportunities for addressing the audience indirectly, rhetoric takes on a new role and a new framework in which the skill of rhetoric, persuasion and convincing has different dimensions and hence the rules to some extent, change, complement and are adapted to the new conditions.
In this sense, the aim of this paper is to highlight the importance and the role of public relations in the business and the performance of organizations through the presentation of definitions,
models and strategies that are used in public relations. The aim is embodied in the fact that crisis situations can undermine and jeopardize business organizations that are faced with them and that proper management of public relations can significantly alleviate the crisis and the reputation of the organization can be thus sustained.

Research Results and Discussion
In Serbia, the study of the discipline of public appearance is still in its infancy. Although, in recent years, there is a noticeable trend of growth in this field, it is still not approached seriously enough. It is definitely that politics is exempt from this, as an area of social life, and political actors, who prospered the most in this sense. What definitely makes Serbia to lag behind other countries is the lack of educational institutions to deal with public performance. There are schools where students acquire basic knowledge in the field of public relations, but their curricula are not sufficiently focused on mastering the art of public speaking.

 Plenty of information material on which rests the power and influence of the media has its source in the field of public relations, no matter how it works, that is, whether good or bad, all the same. The media are indispensable creators of opinion, and conductors of various information material to the segment of the public, which are important for any serious organization. Modern managers should therefore recognize and respect the specificity of the certain media, potential benefits and risks of the mass circulation of communication with readers, listeners and viewers, as well as the generic forms that have the greatest influence on the formation of public opinion and the views of the reference target groups. What is necessary to be known is the fact that the one who wants to deal with public performance must master and synchronize three basic elements - speaker, speech and listener.

If we want a successful public appearance, it is important to reconcile these three basic elements. It is known that this rule was established back in ancient rhetoric, although during the course of time there were different opinions about which one of the three was the most important. What is now clear is the fact that only the compliance of all three factors gives a successful result.

One of the key elements, which has a decisive role in whether the public performance will be successful or not, is that, whether the speaker has a certain charisma that speaks strongly enough, or the kind of personality the one who speaks has. Virtues that the speaker must possess and make perfect are assurance, self-confidence and expressiveness.

The speaker is the one who has to adapt to the audience, and not vice versa. On the basis of all the elements that emerged from the analysis of the audience, a good speaker will take account of this in any way to be factored into their public appearance, in order to make it interesting and attractive. It is very important to use examples that listeners are interested in and that can be close and comprehensible. Public speakers often forget that speech is not only mental but also physical activity. Appearances can be varied: lecturing and public speaking, presenting of different contents, conduct of business talks, participation in negotiations, representation in the media and others.

What the audience estimates with the speaker, is not only his words, body language, but also a comprehensive impression of him. From the moment the speakers stands at the lectern, all that he or she does contributes to make the wholesome image. Although not everything is about image, it is nevertheless an important means to achieve the goal, whatever that goal is.

In the process of drawing up the basic concepts of speech and during the presentation, two basic principles should be distinguished:
- what to say - the content and
- how to say - a way of telling - interpretation.
The modern principle of content creation involves three steps which are required to draw up a convincing speech:

- **to think about what is wanted from listeners**
- **to provide listeners with the information needed in order to make them do what is wanted from them**
- **to convince listeners of the necessity of action**

Unlike readers, the listeners of a speech, in addition to paying attention to content, organization of speech and rhetorical style, form their impression of speech on the basis of auditory and visual elements - oratory techniques, modes of presentation, the presentation speech.

When he finally chooses the final version of the text, the speaker can fully concentrate on the interpretation which should show all the subtleties and all the power of speech.

If we try to follow and analyze the public relations in the state administration for example the Ministry of Agriculture and Environmental Protection, we can say that all the stakeholders in the government must take care of agriculture and the environment, as this is our reality. Economic factors, environmental security, sustainable development and issues of agriculture and the environment in the process of approaching the European Union are elements of Euro-Atlantic Integration, part of regional initiatives and the factor of internal stability and economic development.

It is clear that our global environment is under serious threat due to human activities that lead to the overall pollution of water and air pollution, depletion of natural resources such as forests and fish stocks, destruction of plant and animal species and their habitats, as well as the growing threat of global warming. For many years the condition of the environment in Serbia is rather poor, and there is awareness of the problems in this area, as well as the need to overcome that problem. It is very important to establish contact with the public and to present the information that is clear and use examples that listeners are interested in and that can be close and comprehensible.

Bearing the above stated in mind, experts in public relations at the Ministry of Agriculture and Environmental Protection have to find the right way to present to the associations, farmers, and the very media, the changes that inevitably come and all the benefits that users, as well as the whole Republic of Serbia, will get of these changes.

It is very important that the end user - the farmer understands his rights and obligations so that the state may help, so it is of utmost importance that in the media and on the field there are the people who will be not only experts in their fields, but who will also be able to transfer this knowledge to the target group. For this reason it is essential that persons involved in public relations except for their knowledge of the job requirements must also be very familiar with the structure of the cadre in the institution they work at in order to bring about the necessary transfer of knowledge.

Experts in public relations must anticipate changes in the environment of the ministry and help the management to interpret them. Successful professionals in this field are constantly exploring the environment in order to expand the vision and enlarge the image and image details of current and future realities:

- they define possible problems for the public, which is included in them, as well as interaction with other target groups, the media and end users. Journalists and managers in the field of agriculture and the environment, help in defining the impact of agricultural and environmental policies on the management and decision-making.

- they must have adequate means of communication in order to manage to carry out a process of communication in the field of agriculture and the environment in accordance with
the strategic processes related to the objectives of the ministry as well as on the demands of the public.

- to carry out these activities, professionals in the field of public relations must have a high level of professional knowledge on all matters within the ministry that may have something to do with the issues of agriculture and environmental protection, together with the appropriate information from the environment (external public) at all levels of the type of associations, groups, the media and individual users.

Conclusion

It can be concluded that public appearance in Serbia is not satisfactory, because there are no institutions that systematically deal with this segment. It may be that prominent journalists during public appearances make a gesture that is not appropriate, and this is primarily due to the lack of knowledge. In addition, politicians, public figures and PR managers of leading companies make rookie mistakes, either due to scarce skills, or due to the lack of training and experience in general.

Today, there are a number of communication channels, the media, so that the information is easy to be accessed, but the question is what of all that is information, and what is misinformation. Getting to the information in the modern world is not a problem, but coming up with useful information and recognizing them in abundance of other, less important information, requires extensive knowledge, and these days influential people are recognized by that - they have the "right" information.

The obligation of people dealing with public relations is to present the right information in order to get closer to the public and contribute to the image of the organization they represent, but they have to adhere to certain moral principles and codes. However, the practice is a little different, organizations are trying to present to the public only such information that contribute to the image and operations of the organization, while the other pieces of information that do not contribute to it are cleverly hidden.

The evolution of public performance will continue to be moving and evolving but the question is in which direction.

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The significance of healthy-safe food in development of the rural tourism of Serbia

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Abstract
Rural tourism, by its definition, is based on two activities, the tourism and the agriculture, which form together the specific tourist supply. This supply can be organized within an agricultural holding or in the rural area. All of the activities organized in the specific rural area, which attract tourists, should be specific with basic characteristics; quiet, noiseless area, preserved nature, direct communication with natives, the possibility of being informed about field works and domestic food.

Serbia has such rural areas, with primeval purity, where none of preservatives has ever been applied in food production.

Rapid industrialization, inhuman life in urban areas and excessive and/or unprofessional use of plant protection agents in the primary agricultural protection show increasing interest of population, especially of higher classes, to search for healthy-safe food in the rural areas, and they often require to participate in food preparation.

Exactly the healthy-safe food is often an important factor of tourists' orientation to the specific rural tourist destination. The subject of this paper is how and in what way it affects a number of tourists in the specific rural areas.

The research methodology, applied in this paper, is the combination of qualitative and quantitative research. As a research instrument was used a structured questionnaire, which had enclosed a list of mostly open type enquiries. In-depth interviews were organized in several municipalities of Central Serbia with the natives who were engaged in healthy-safe food production and rural tourism.

The expected result is the development and increase of self-sustainable production of healthy-safe food, as an important argument for attracting tourists in the Serbian rural areas, and who want to consume and/or to take part in the production of healthy-safe food.

Key words: healthy-safe food, rural tourism, Serbia.

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Introduction

In past thirty years, the EU countries have realized that rural areas represent a significant factor of sustainable development, on one hand, and a great opportunity to employ the unemployed labour and the possibility to invest free funds in the tourist industry, on the other hand. At the same time, the rural development policy of every area implies taking into consideration the comparative advantages of that area in regard to the others (neighbouring areas) and making new realistic developmental models (Cvijanovic, et.al. 2011).

According to the OECD, of the total number of 165 municipalities, 130 of them belong to the rural areas in Serbia (areas which density of population is less than 150 inhabitants/ km²), i.e. 85% of the Serbian territory with approximately 55% of the total population number. In the rural areas of Serbia, besides still significant number of active population, there is also natural resources, such as high-quality and preserved land, clean forests and water. In these areas are a rich ecosystem and biodiversity, natural rarities and various activities, cultural and historical inheritance. In situation the Republic of Serbia has found itself in, (unplanned migrations rural-urban area, villages devastation, long-term sanctions, bad and unrighteous privatization, destruction of industry and agro-food sector, bombardment and destruction of property and humans, high unemployment, etc.), it is necessary to perceive its real possibilities of economic development.

Tourism, as the most dynamic service activity in last few decades, has been an indicator of the whole economic development, standard and one country's culture development (Stetic etc., 2014). It is especially important for the transitional countries, such as the Republic of Serbia, which unfortunately has a large number of workers in industry and other activities, who had left jobless in the transitional period, and who seek for their chance in the rural areas of Serbia. Therefore these unemployed workers look for their chance in agricultural production, tourism, trade and handicraft trades and other activities, which have the comparative advantage in regard to other environment, but they have to base their activity on modern marketing activities, i.e. to manufacture those products and services requested by the market (Cvijanovic et.al. 2013).

Healthy-safe food production implies the agricultural production without any artificial fertilizers and pesticides, regulators of plant growth and additives in animal feeding, preserves the diversity of plant and animal species, as well as the natural balance in the environment, all in terms of sustainable production. There are significant natural potentials for the healthy-safe production in Serbia, at least 10% of land is unpolluted and it can be utilized for this kind of production, while, for example, this percentage in Italy ranges up to 1.7% (Roljevic et.al. 2009). The potentials for the production of healthy-safe food have not been anywhere near utilized, as for export, as well as for the potential consumption in the tourist supply.

The rural tourism, a significant segment of multi-functional agriculture, due to a multiplicative tourism effect, can initiate the fastest diversification of rural economy, especially through the insistence of the healthy-safe food production in terms of the tourists' holidays in the most beautiful rural areas of the Republic of Serbia. Furthermore, the rural tourism provides significant incomes to rural areas population, not only through the tourists nourishment, but also through the sale of agro-food products in holdings, and the handicrafts products as well (Njegovan et.al. 2015).
Material and methods

For this manuscript were used data published in manuscripts, publications, books and monographs, as well as the data of the Statistical Office of the Republic of Serbia, EU, FAO and others. The research methodology applied in this manuscript was the combination of qualitative and quantitative research. As a research instrument was used a structured questionnaire, which had comprised the list of questions, mostly of open type. In-depth interviews and discussions with hosts who are engaged in the production of healthy-safe food and/or rural tourism were organized on “Ethno-fair” in Belgrade, on 26th and 27th November 2015, and the respondents were from the following municipalities (Vrnjacka Banja, Kraljevo, Aleksandrovac, Cacak, Gornji Milanovac and Mali Zvornik). In the manuscript was applied a comparative-analytical method and a SWOT analysis.

The significance of agriculture in economic development of the Republic of Serbia

Serbia is still the agrarian country, with significant share of agriculture in GDP creation. In the transitional period, the economic structure of the Republic of Serbia has not changed significantly. At the beginning of the XXI Century, the contribution of agriculture to GDP was permanently decreasing thanks to first of all faster growth in non-production sectors (especially trade). In the same period, the share of agriculture in gross value added of economic structure of the Republic of Serbia was extremely high, especially comparing to the EU (27 member-countries). Unfortunately, Serbia has the significant share of GVA of agricultural sector in the total GVA, and much less share of the service sector. This high share of agriculture in the basic macro-economic aggregations (Table 1) in regard to others EU countries are the result of rich natural resources, favourable climatic conditions for this kind of production and slower structural reforming of other economic activities.

Table 1. Macroeconomic indicators of agriculture to economy contribution in the Republic of Serbia

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<tbody>
<tr>
<td>1</td>
<td>GVA of agriculture, forestry, hunting and fishery (mil.RSD)</td>
<td>238,478</td>
<td>231,680</td>
<td>261,510</td>
<td>306,608</td>
<td>269,999</td>
<td>305,520</td>
<td>302,226</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Share of GVA of agriculture in the total GVA (%)</td>
<td>8.7</td>
<td>8.0</td>
<td>8.5</td>
<td>9.0</td>
<td>7.5</td>
<td>7.9</td>
<td>7.7</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Employment in agriculture, forestry, hunting and fishery (000 persons)</td>
<td>706.0</td>
<td>622.7</td>
<td>533.0</td>
<td>478.1</td>
<td>467.1</td>
<td>491.9</td>
<td>507.5</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Share of agriculture in total employment (%)</td>
<td>25.0</td>
<td>23.8</td>
<td>22.2</td>
<td>21.2</td>
<td>21.0</td>
<td>21.3</td>
<td>19.9</td>
<td>-</td>
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<tr>
<td>5</td>
<td>Foreign-trade exchange</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>6</td>
<td>Export of agro-food products (mil.euro)</td>
<td>1.336</td>
<td>1.385</td>
<td>1.688</td>
<td>1.937</td>
<td>2.106</td>
<td>2.104</td>
<td>2.317</td>
<td>2.579</td>
</tr>
<tr>
<td>7</td>
<td>Share of agriculture in total export (%)</td>
<td>18.0</td>
<td>23.2</td>
<td>22.8</td>
<td>22.9</td>
<td>24.1</td>
<td>19.1</td>
<td>20.8</td>
<td>21.4</td>
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<tr>
<td>8</td>
<td>Import of agro-food products (mil.euro)</td>
<td>755</td>
<td>713</td>
<td>903</td>
<td>1.010</td>
<td>1.160</td>
<td>1.229</td>
<td>1.305</td>
<td>1.342</td>
</tr>
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<td>9</td>
<td>Share of agriculture in total import (%)</td>
<td>4.6</td>
<td>6.3</td>
<td>7.3</td>
<td>7.1</td>
<td>7.9</td>
<td>7.9</td>
<td>8.4</td>
<td>8.2</td>
</tr>
<tr>
<td>10</td>
<td>Trade balance of agro-food products (mil.euro)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Coverage of import by export (%)</td>
<td>176.8</td>
<td>194.2</td>
<td>186.9</td>
<td>191.8</td>
<td>181.6</td>
<td>171.2</td>
<td>177.5</td>
<td>192.2</td>
</tr>
</tbody>
</table>

Source: Statistical Office of the Republic of Serbia and recalculated data of the authors

The employment in agriculture of the Republic of Serbia, absolutely observed, records a reduction rate, but the share of agriculture in total employment is further significantly higher, so it is among the highest in Europe for over 20%. It can be explained by a fact that the
agriculture depends on temporary and odd (season) jobs, which are very sensitive to the market fluctuations of labour during the crisis period.

In foreign trade exchange, the agro-food products have a significant role, where the export is higher than the import.

As for import of the agro-food products, Serbia imports less than it exports, and therefore the coverage of import by export is higher than 76.8% in 2008, and up to 94.2% in 2009. There imports between 62-65% of the primary agricultural products, around 30% of processed and around 5-8% of fish and fish products. It is good that the import is less, but it is no good to import the agro-food products which the Republic of Serbia can produce. The share of these products in the total import unfortunately increases and it ranges from the lowest share of 4.6% in 2008 to 8.4% in 2014, when the share was the highest in the total import.

In the observed period (2008-2015), the share of these products in the total export ranges from the lowest 18% in 2008 to the highest of 23.2% in 2009. Unfortunately, the structure of agro-food products export is not satisfying, because there the agricultural products are mostly exported (fresh or frozen raspberry, blackberry, strawberry, plum, sour cherry and mercantile maize) and they make around 75%. Very little or negligible is the export of agricultural products of higher-processing phase (except sugar and oil). The reasons why the Republic of Serbia doesn’t export more agricultural and/or food products, although there has come to the favourable conditions for export in the world market (increase of agro-food products prices, opening certain markets – crisis and sanctions between the EU and the Russian federation, etc.) should be sought in several facts. First of all, there was incautiously done the privatization of food industry, factory-farms and foreign trade enterprises. There is no organized, specialized and interests related agro-food production and the system of cooperative societies has been destroyed.

There was broken up the repro-chains, and a large number of small manufacturers had left aside, who had been in the cooperative sector or in some other form of cooperation with combines (factory-farms) or food industry, and who could provide significant surpluses of these products, as for the domestic, as well as for very demanding foreign market.\(^1\)

A large number of small manufacturers (agricultural holdings) are not capable to comply the “6K”. In other words, there exports the agro-food products which cannot be produced in the EU countries, the Russian Federation or the CEFTA Agreement countries, mostly the primary products. Naturally, those products fulfil the “6K” requirements and every requirement regarding the standards in mentioned importer-countries.

The important production of autochthonous products which produce in small holdings in rural areas of the Republic of Serbia unfortunately does not export. Either they cannot fulfil the 6 “K”, or the standards and different non-tariff barriers represent an obstacle. However, when the tourists from all over the world taste those autochthonous products, they keep seeking information where and when can they buy them, or they simply come again in these rural areas and look for the traditional food and drinks. In other words, they could be a very interesting subject of so called “invisible export” through the supply of rural tourism products.

A special place in the world occupies the development of tourism in rural areas, primarily due to a very stressful life of the people in urban areas (Cvijanovic et.al. 2009). There are different motives why the tourists come to rural areas. Those can be: getting to know and/or participating in agricultural works, enjoying in healthy nature, getting to know with an ethno content of the specific rural area, enjoying the traditional food – especially healthy-safe food, indigenous plants, forest fruits and/or mushrooms, enjoying wine, rakia or other agro-food products and/or

\(^1\) Modern foreign markets require “6K” (in Serbian) or “2Q+4C” (in English): quantity, quality, continuity, control and competitiveness. And for all these is necessary to provide capital.
making them, visiting farmsteads (in Serbian salas) and enjoying the traditional food, participating in manifestations – well-known events (called “ijade” in Serbian), getting to know with the rural area, especially cultural-historical heritage, bring closer children to rural life, a way of its life and work, hunting and fishing in the specific conditions of the specific rural area, etc.

Extremely worthy natural resources of Serbia with an attractive relief, diverse flora and fauna, favourable climatic and hydrological conditions, rich cultural heritage and national tradition provides numerous developmental possibilities, especially in the field of tourism (Katic et.al. 2011). Despite it, the unfavourable migrations continue, the villages are getting old and wither. There are bad infrastructural and other life conditions of the rural population. Development of rural tourism, with the primary agricultural production, with emphasis on preservation and improvement of the environment, is one of the solutions which would reconcile the opposites and along with the appropriate economic, infrastructural, organizational and educational incentives would enable multiple positive effects (Cvijanovic and Vukovic, 2011).

**Agricultural holdings as a carrier of agricultural production and rural tourism**

According to the census of agriculture in 2012, the Republic of Serbia disposes with 631,552 agricultural holdings (AH). An average economic size of an AH amounts 5,939 euro, observed from the organizational-legal form of an AH, this indicator amounts: in a sector of family holdings – 4,990 euro; in a sector of legal entities and entrepreneurs – 204,755 euro. The region of Sumadija and West Serbia has totally 262,940 AHs, i.e. 41.6% of the total number of AHs in the Republic of Serbia (Cvijanovic et.al. 2014).

If an average economic size of an AC in the Republic of Serbia by the regions in 2012 is observed, than the situation is as it follows: the biggest average size of an AC is in the region of Vojvodina (12,032 euro), and the smallest average size of an AC is in the region of South and East Serbia (3,414 euro. The Belgrade region has an average economic size of an AC of 6,038 euro, and the analysed region of Sumadija and West Serbia has an average economic size of 4,309 euro (Cvijanović et.al. 2014).

Besides the agricultural activities, the AHs have also other profitable activities (OPA), related and not related to a holding.

The OPA related to a holding include income from: sale of agro-manufactured products (meat, milk, fruits, vegetables and other agricultural products, rural tourism income, income from fishery sale of wood, sale of products in the field of folk arts and crafts, etc. These activities can be performed in a holding (for example, tourism, folk arts and crafts, processing of agricultural products for sale – except processing of grape due to a wine production in case that a size of manufactured grape is exclusively or mostly from the own production, etc.) or out of a holding (agricultural work and non-agricultural contract work, for example, work with own combine (harvester), etc.).

The OPA not related to a holding are the ones which don’t use a holding's resources, except a holding's labour, and they can be performed in or outside of a holding (in any other economic or non-economic activity).

According to the census of agriculture in 2012, of the total number of AHs in Sumadija and West Serbia, 16.7% of them are the AHs which have the OPA, and in the Republic of Serbia in the same year, the AHs which have the OPA had participated with 12.4%. This region belongs to the regions of Serbia with the highest share of the AHs which have the OPA.
Economic development of rural areas

_In the structure of small family holdings income in Serbia, the most are represented incomes from employment out of agriculture, from sale of agricultural products and income of pension_ (Bogdanov, 2007, p 32). _The structure of employment and income of rural population point out that in Serbia dominates the “afflicted” income diversification, as a consequence of unfavourable economic environment and poverty. Thereby the highest share in the total incomes of rural population of all areas has salaries of employees, and right behind are incomes from agriculture. This data shows a disproportionate relation among employees in agriculture (45%) and its share in the total incomes of households (25%), which ones again shows low realized productivity of agriculture._

Economic development of rural areas implies significantly wider field than agriculture, and the policy goals as well as the measures of rural development do not refer exclusively to farms and manufacturers. According to the clause 12 of the Law on Agriculture and Rural Development “the measures of rural development are a kind of incentives, by which stimulate the competitiveness improvement in agriculture and forestry (investing in agriculture and forestry and introduction of new standards in production and turnover of agricultural products), improvement of the environment protection programs, biodiversity preservation and a program of rural economy diversification and improvement of life quality in rural areas” (Law on Agriculture and Rural Development, “Official Gazette of RS”, no. 41/09). That is to say, the rural development prefers different socio-economic activities, defined by the rural policy and directed to rural areas. They should contribute to the improvement of life quality and economic activities in rural areas, first of all, through the investments in means for agricultural production, construction and reconstruction of rural infrastructure, training and education of the rural population, affirmation of the traditional and cultural values, protection of the environment and natural habitat, development of rural tourism, etc. In regard to the preferential problems of the rural population, there are indicative several conclusions: (Bogdanov, 2007, p 139):

1. Incomparably greater displeasure the households express for communal issues than the available services.
2. Lack or disorganization of economic infrastructure they value relatively lower as a problem, which primarily seems to be the consequence of their ignorance of such services than the lack of need.
3. Regional distinctions are evident and they point out again to a greater displeasure of households in lowland region, but also different nature of problems in the specific areas. The lowland households have the greatest problems in water and health services, but also the problems they called: unemployment, life standard, neglecting villages, lack of cultural events and similar. The households in the region of big economic centres have greater problem regarding services related to agriculture. Except the paved roads, they have more needs for better repurchase prices and cooperative associations, than the households in other parts of Serbia.

Recognizing the characteristics of rural regions in Serbia distinguish as dominant causes of their sluggish development: migration of rural population in urban areas, unfavourable age structure, insufficient investments in rural areas, identification of agriculture with the rural areas development, along with insufficient engagement in non-agricultural activities, etc. The mentioned regional areas have the specific regional characteristics and a different stage of rural development, so it is suitable to respect the situational, i.e. regional approach in defining the supporting measures. Consequently, in according with the specific needs of some rural regions, it is necessary to support the construction of the regional and local institutions for support to the rural areas development, with the improvement of cooperation among the Ministry of Agriculture and the local authorities. It is also inevitable to increase investments in rural
development with simultaneous direction of support towards the activities diversification in Serbian rural areas.

**Organic production and the quality standards**

The organic agriculture is based on application of certain methods of organic production. It is becoming increasingly important, by bringing closer a man to nature he has alienated from, it makes almost complete harmony with the requirements on the environment protection, and finally, it provides the population to feed with products made by the natural processes, using the organic and mineral matters (Katic et.al. 2008, pp. 267-276). Consequentially, the goals of the organic production are: production of sufficient amounts of top-quality food; maintaining and increasing long-term fertility and biological activity of soil by using the biological, mechanical and methods adjusted to the local conditions; protection and maintaining the biodiversity in nature and agriculture, in a farm and its surrounding by using sustainable production systems; maintaining and preserving the genetic diversity by paying attention to the management of genetic resources in a farm, recognizing the significance of domestic knowledge and traditional production systems, their protection and application in education (Mihailovic et.al. 2007, pp. 81-94). Numerous goals stated in Codex Alimentarius can add to these goals: promotion of renewable resources in the locally organized agricultural systems, managing the agricultural products in a way to maintain the organic integrity and a vital quality of products in all levels of processing phases, etc. As these goals cannot be easily measured, the best way was to insure their realization in practice and to make a difference between the organic and conventional production and make procedures, official rules, as on the national, as well as on the international level. The organic production development implies getting to know the IFAOM standards in which are also suggested minimum requirements for the organic production (Mihailovic et.al.2007. pp. 81-94).

The Republic of Serbia has excellent conditions for setting up this kind of production. The environment is preserved, especially in mountain regions, which occupies 71.5% of the central part of the Republic of Serbia, i.e. 51.7% of the whole republic territory (Katic et.al. 2008, pp. 267-276). Most of these areas have high-quality water, clean air and they are remote from highways and other sources of the environment pollution. Accordingly, the organic production carries out by very high criteria and is regulated by the special decisions. These regulations exist in Serbia, too, and are well coordinated with the EU regulations.

In such conditions, the standards give a common language to the production. In that way communication is simpler, and marketing more successful. Standardization helps manufacturers to secure a product that is sought and which can be sold, and it helps buyers to get the quality of a product they desire. Large supermarket associations were introduced the quality standards, which the production had to fulfil. These standards refer to bio-chemical characteristics, appearance (mass, colour, yield diameter) and the presence of harmful matters (nitrates and heavy metals, pesticides residues, phyto-hormones). This is about, first of all, EUREGAP 13 for agricultural production and HACCP in processing industry (Presna et.al. 2006). The standards were made as the consumers’ reaction when unhealthy-unsafe food appeared during the epidemic livestock diseases (mad cow disease, foot-and-mouth disease), as well as due to the fear of introduction of genetically modified food.

The EUREGAP is the standard which covers all main aspects of production, such as managing land, growing crops and harvest. It is also engaged in pollution issues, treatment of labour and the environment protection. It follows the production from sowing (the origin of seed and soil history are analysed), through growing (there follows the use of herbicides, pesticides and fertilizers – quantity, type, quality, place and method of application), irrigation and harvest
(hygiene level and a method of storage) to packaging, transport and placing the product on the shelf in a shop.

The HACCP standard represents a system which identify, considers and controls risks significant for food safety. The risk involves biological, chemical or physical agent in food, with potential to cause unfavourable activities to people’s health. The needs for HACCP were caused by the following factors: increasing number of pollutants, increasing care on health due to hygienic food contamination, increasing risk from diseases caused by the chemical problems in food production, new technologies and life styles and decreasing resistance of people, and also the world trade requires international harmonization. The HACCP enables numerous advantages. The most important are as follows: provides a preventive system for food production, more effective and more efficient supervision by the government with less inspection, responsibility for food safety transfers to industry, helps food manufacturers to be more competitive on the world market. Stimulus for higher organic production in Serbia represents small- and medium-sized enterprises in the field of vegetable processing. The HACCP standard (analysis of risk and control critical points in the production) was introduced by 12 enterprises in Serbia, in the field of fruit and vegetable processing (Malina Produkt, Mondi Food, Sirogojno, Hibrid, Libertas, Flora, Vulić Vulić, Jevremovac ABD, Zadrugar), while the firm Libertas from Sabac, which is engaged in growing fruits and vegetables besides processing, got also the first EUREGAP certificate in Serbia. Although, still a large percentage of Serbian manufacturers and processors of food poorly knows or are not at all familiar with the food safety standards.

Healthy-safe food and rural tourism in some municipalities of Sumadija and West Serbia

Significant decrease of protective means and artificial fertilizers in the primary agricultural production since the beginning of '90s, due to well-known sanctions in the Republic of Serbia, is a good precondition for establishment of organic system of food production. Land, water, climatic conditions and unpolluted environment provide to the Republic of Serbia, in regard to other countries, to increase fast the areas under healthy-safe food, i.e. the organic production. The production of healthy-safe food in the Republic of Serbia can be started on over than 200,000 ha (Roljevic et.al. 2009). Owing to heavy, strictly controlled and specific method of healthy-safe food production, the price is higher in regard to the conventional up to 50%. Due to the production of relatively small amounts, it is hard for manufacturers to deliver these products to the domestic market, and especially to the foreign one. Therefore was organized the research in several municipalities of Central Serbia, i.e. Sumadija and West Serbia, to determine if and whether the production of healthy-safe food affects the rural tourism of these areas. The research was done on agricultural holdings engaged in in the production of healthy-safe food and/or rural tourism. Here are few data which illustrate the best the significance of healthy-safe food for the development of rural tourism and the significance of rural tourism for the development of healthy-safe food.

When they were asked a question if they make a difference between the conventional and organic agricultural production, 87.6% of the total number of respondents was answered positively, i.e. that they make a difference between the conventional and organic production, and 12.4% was answered that they don’t make any difference. They are even well familiar with the regulations on organic production, which is very praiseworthy.

When they were asked a question if they have organized healthy-safe or organic production (OP) on their holding, and/or they use indigenous plants and/or forest fruits in nutrition of tourists, 69.3% of the total number of respondents has answered positively, and 29.2% had answered negatively, and 1.5% had no answer.
When they were asked a question if they have organized OP in their agricultural holding or they use only indigenous plants and/or forest fruits in nutrition of tourists, 59.5% of the total number of respondents has answered that they have the organized OP, 39.3% of them had answered that use only indigenous plants and forest fruits in nutrition of tourists, and 1.2% had no answer.

When they were asked a question which agro-food products they have in OP in their agricultural holdings and which they offer to the tourists, 89.1% of them had answered that they had organized OP of vegetables and/or spice plants, and/or medicinal and aromatic plants, and/or fruits, and 9.2% of them had answered that they had organized OP in livestock breeding, and 1.7% had no answer.

When they were asked a question which indigenous plants and/or forest fruits they gather and make to the tourists, 83.8% had answered they the most often use: indigenous dock, nettle, horseradish, wild garlic, mushrooms, rosehip, wild strawberries, wild blackberries, elder, dogwood, etc. and 10.2% of them used only wild fruits and various herbs for tea, and 6.0% of them had no answer.

When they were asked a question if they accentuate specially the OP products in their tourist supply, 53.9% of the total respondents had answered with “yes”, 44.5% had answered with “no”, and 1.6% of them with “I don’t know”.

When they were asked a question if they offered the OP products for tourist nutrition, 73.8% of them had answered with “yes”, 25.5% of them had answered with “no”, and 0.7% with “I don’t know”.

When they were asked a question if they offer to the tourists the OP products to buy “to go” or the tourists ask for the OP products to buy, 23.9% of the total number of the respondents had answered they offered the tourists to buy the OP products, 75.5% of them had answered the tourists themselves asked to buy the OP products, and 0.6% of them had no answer.

When they were asked a question which OP products were most commonly purchased, the respondents had given a purchase order of the OP products: 1. Rosehip jam, 2. Wild strawberries jam, 3. Sweet cherry, 4. Sweet quince, 5. Blackberry jam, 6. Raspberry juice, 7. Blackberry wine, 8. Elder juice, etc.

When asked a question how users of their services make a reservation for the tourist services in their holdings, 48.9% of the total number of the respondents answered the tourists make reservations directly, by the phone or e-mail, and 51.1% of the respondents answered that their tourist services users make reservations via the local tourist organization (TO).

When they were asked a question if the users of their tourist services, while make the tourist services reservation in their holdings, look for specially the OP products, 58.9% of the respondents had answered positively, and 41.1% of the respondents had answered this wasn’t put as a remark in the reservation.

When they were asked a question if the users of their services visit their holdings for one year or for several years, 89.9% of the total number of respondents had answered they had “regular” guests, i.e. the tourists who visit their holdings each year or every second year, and 10.1% of the respondents had answered they have no “regular” tourists or have a small number of tourists who make a second visit.

According to this research and also made in-depth interviews and discussions with the experts, there can be concluded that Sumadija and West Serbia have a great chance in the OP production (healthy-safe food), not only for own population or those who live in these holdings and areas, but also to be the comparative advantage in the supply of rural tourist products, making affluent exactly the tourist product through these agricultural products.
The awareness on importance on, not only what and how much to eat, but also what food should eat, has been arisen, not only of educated population who live in urban areas of the high-developed countries, but also of Serbian population. The agro-food products manufactured in conventional way, with significant use of artificial fertilizers and protective means (applied often very unprofessionally), result particular threats. At the same time, Sumadija and West Serbia dispose with virgin clear land, in which can immediately organize the integral, and somewhere even the organic (healthy-safe) production. Besides, the Republic of Serbia disposes with numerous indigenous plants, forest fruits, mushrooms, etc., which belong to the healthy-safe food, and can be a very important factor of competitiveness or differentiation of the rural tourist supply of these areas. In other words, the research had shown that the population in Sumadija and West Serbia, who offer the rural tourist products, pay special attention to the OP products, and also the tourists, who visit not only to see natural beauties, cultural and historical heritage of this part of Serbia, but to enjoy in excellent autochthonous food, brilliant natural juices, rakia, wines, jams, salads, sweets without artificial supplements as well.

In order to define the significance of healthy-safe food, i.e. OP for the development of rural tourism in Central Serbia, i.e. some municipalities in Sumadija and West Serbia and their better positioning on the market is necessary to define strengths and weaknesses, as well as chances and threats (Table 2).

<table>
<thead>
<tr>
<th>STRENGTHS</th>
<th>WEAKNESSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ favourable tourist-geographic location of Sumadija and West Serbia,</td>
<td>➢ bad tourist infrastructure and traffic signals in rural areas,</td>
</tr>
<tr>
<td>➢ a large number of preserved and protected natural resources (especially clean soil, water and air),</td>
<td>➢ inadequate legislation for categorization of accommodation facilities,,</td>
</tr>
<tr>
<td>➢ great potential for the tourists accommodation in rural houses,</td>
<td>➢ unfavourable age structure of population in rural areas (old and devastated village),</td>
</tr>
<tr>
<td>➢ hospitality of population,</td>
<td>➢ insufficient marketing presentation of OP and rural tourism potentials,</td>
</tr>
<tr>
<td>➢ diversity of the tourist product of rural tourism,</td>
<td>➢ Insufficient measures of economic and agrarian policy for stimulation of the OP and rural tourism development,</td>
</tr>
<tr>
<td>➢ good supply of authentic food, especially the OP products,</td>
<td>➢ Insufficient support of the government and the local authorities in funding the OP development and the rural tourism development.</td>
</tr>
<tr>
<td>➢ low prices in regard to other countries,</td>
<td>➢ social-economic crisis, war in the Middle East,</td>
</tr>
<tr>
<td>➢ educated staff for production of OP and rural tourism.</td>
<td>refugees and other problems, which affect the readiness of tourists to travel,</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>CHANCES</th>
<th>THREATS</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ changes in habits and values of tourists, who look for the OP products and a new natural experience in rural tourism,</td>
<td>➢ bad or insufficient coordination among institutions in the field of OP, i.e. agriculture and tourism,</td>
</tr>
<tr>
<td>➢ interests relation of the local authorities, scientific and economic institutions, and agricultural holdings for faster development of OP and rural tourism,</td>
<td>➢ tough competition in countries which develop similar or the same tourist products, like Switzerland, Austria, Slovenia, Croatia, etc.</td>
</tr>
<tr>
<td>➢ activate “dead”capital (empty houses, stables, cultural centres, cooperative offices, etc.) in terms of the OP and rural tourism development, i.e. rural areas,</td>
<td>➢ spontaneous, unplanned and unprofessional approach in strategic planning and realization of the organic production and rural tourism in rural areas of central Serbia,</td>
</tr>
<tr>
<td>➢ solving the state problem of unemployment through employment of especially young people, from unskilled workers to top experts in agriculture, i.e. OP, tourism, traffic, catering industry, trade, handicraft trades and other economic and non-economic activities).</td>
<td>➢ potential jeopardy of rural areas, if the principles of sustainable development are not respected, and if the natural wealth of these areas is not preserved,</td>
</tr>
<tr>
<td>➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢</td>
<td>➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢ ➢</td>
</tr>
</tbody>
</table>

Table 2. SWOT analysis of healthy-safe food and rural tourism of the Central Serbia
Conclusion

This was a modest research, based on relatively small sample, but a good “guide mark” of the future research for these areas in much larger samples in the Republic of Serbia. The Republic of Serbia, and especially Sumadija and West Serbia, dispose with clean land, water and air, not only for growing healthy-safe (organic production – OP) food, but also for the rural tourism development. Besides the OP, Serbia disposes with growing wild (indigenous) plants, forest fruits, etc., as they are very interesting in healthy-safe food, not only of the local population, but also the tourists who come to the rural areas.

All of this significantly enriches and differentiates the rural tourist supply of these areas, and it can have more significant impact, as the OP to the tourism, as well as reversely. It would be good to plan strategically the development of the rural tourism in rural areas of the Central Serbia, along with the respect of comparative advantages of these areas, as with its natural beauties, cultural-historical heritage, as well as regarding the OP growing and picking of indigenous plants, forest fruits, etc.

A unique tourist supply of the rural tourism of all rural areas of the Republic of Serbia, strategic planning of the organic agriculture and rural tourism development, would also save the rural areas from destruction of their original beauties, pollution and preservation of flora and fauna these areas dispose with.

A large number of workers, experts and professionals would be employed, not only in the fields of agriculture and tourism, but also every other economic and non-economic activity. Investing in the development of the OP production and rural tourism would reduce a gap in development between the rural areas in regard to the urban ones, and there would stop migrations of working population from rural to urban areas.

Reference

Definition of Women’s Role in Agriculture Markets in Albania

Deci Eda¹, Kapaj Ana², Muca Etleva³

Abstract
Women play also an indispensable role in farming and in improving the quality of life in rural areas. However, their contributions often remain concealed due to some social barriers and gender bias. Why should there be a special focus on Women in agriculture? First of all, the women comprise 51% of the agriculture labor force since farming is usually a family farm activity, consisting of the husband, the Wife and the children (Albanian Women in Agriculture-Case studies, Barrett Nichols.K, December 2008). Secondly, women do farming too. Generally, when reference is made to ‘farmers’ we understand the man as a farmer. But farming is done not only by men; it is also done by women. While women farmers perform so many roles as farmers, wives, and mothers, their work is often undervalued, many times unpaid, some even unrecognized, because of persisting stereotypes about the roles of men and women and because in many small family farms, women labor is unpaid family labor. When they are paid, they are paid less than the men.

The main purpose of this study is to highlights women agriculture producers situation, to analyze how the women are involved in commercial activities, access to land, to credit, to marketing, to participation in organization. We will try to find out the problems that Albanian women cope in their activities to achieve the market as well as they solve these difficulties. This research aims to identify some characteristics of women agriculture producers describing the composition of the family, education, gender division of labor, decision making and underline the variables perceived as constraints.

Key words: Women, market, agriculture, gender division of labor

Problem statement
Women play a significant role in agriculture all over the world. Evidently there are serious constraints which militate against the promotion of an effective role for women in development patriarchal modes and practices motivated by cultures and/or interpretations of religious sanctions and illiteracy hinder women’s freedom to opt for various choices to assert greater mobility in social interactions. Throughout the history and in many societies, inequalities of women and men were part and parcel of an accepted male-dominated culture. It is a complex historical process, which requires detailed study before one can conceive of a viable strategy to improve and sustain the status of women in society. One of the basic factors causing unequal

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share of women in development relates to the division of labor between the sexes. Gender and agriculture is an underexplored topic in Albania. Gender-oriented rural development programs which focus on role of women to guarantee the stability of life provide a sound basis for integrated development of the quality of life. In Albania the distribution of tasks and responsibilities between men and women has mainly restricted women to the domestic sphere. Mass poverty and general backwardness has further aggravated the inequalities. While the women’s childbearing and child-rearing functions are respected in many countries, there has been very little recognition of women’s actual or potential contribution to the economic, social and cultural states. The role of women within the family combined with high level of unemployment and under-employment of the population in general, has led to the unequal state of priority to men in matters of employment.

Objectives of the study
The main purpose of this study is to highlights women agriculture producers situation, to analyze how the women are involved in commercial activities, access to land, to credit, to marketing, to participation in organization. We will try to find out the problems that Albanian women cope in their activities to achieve the market as well as they solve these difficulties. This research aims to identify some characteristics of women agriculture producers describing the composition of the family, education, gender division of labor, decision making and underline the variables perceived as constraints.

Women in Agriculture
Women play also an indispensable role in farming and in improving the quality of life in rural areas. However, their contributions often remain concealed due to some social barriers and gender bias. Even government programs often fail to focus on women in agriculture. Other areas where women’s potential could be effectively harnessed are agricultural extension, farming systems development, land reform and rural welfare. There is a growing recognition of role of women as producers of food, traders, and family caretakers. However, they are not able to unleash their full potentials due to various constraints. Are clearly articulated the following issues and concerns faced by rural women in the areas of rural financing and marketing agricultural research and technology development, agriculture education and extension, rural organization and communication.

Why should there be a special focus on women in agriculture? First of all, the women comprise 51% of the agriculture labor force since farming is usually a family farm activity, consisting of the husband, the wife and the children (Albanian women in Agriculture- Case studies, Barrett Nichols.K, December 2008).

<table>
<thead>
<tr>
<th></th>
<th>% of each sector</th>
<th>% of labor force</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Women</td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td>Agriculture</td>
<td>40</td>
<td>60</td>
<td>54</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>29</td>
<td>71</td>
<td>11</td>
</tr>
<tr>
<td>Services</td>
<td>37</td>
<td>63</td>
<td>35</td>
</tr>
<tr>
<td>Total</td>
<td>38</td>
<td>62</td>
<td>100</td>
</tr>
</tbody>
</table>

Secondly, women do farming too. Generally, when reference is made to ‘farmers’ we understand the man as a farmer. But farming is done not only by men; it is also done by women. Small scale family farms produce as much as 70% of the foods consumed locally. Comparing labor between husbands and wives, wives work more as full-time producers 50% than husbands 44% and husbands work of the farm 14% than their wives (Albanian women in Agriculture- Case studies, Barrett Nichols.K, December 2008). Division of labor in rural Albania is by task and product (Mehmeti, I “Olives Values Chain Assessment USAID Albania Agriculture Competitiveness Program. Development Alternatives, Inc (DAI), Tirana, Albania. October 2007). Also headship does not necessarily determine management in Albania farms. Only 45% of households designated as man headed has farms actually managed by the man head (Lastarria Cornheil, Susan and Wheeler “Gender, Ethnicity and Landed Property in Albania”, Albania Series, Working Paper No 18).

Table 2. Activity Profile

<table>
<thead>
<tr>
<th>Activities</th>
<th>Regular</th>
<th>Joint</th>
<th>Never</th>
<th>Na</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plowing, disking, planting</td>
<td>4</td>
<td>11</td>
<td>5</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Applying fertilizers, pesticides, herbicides</td>
<td>4</td>
<td>9</td>
<td>7</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Irrigation</td>
<td>4</td>
<td>6</td>
<td>5</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Harvesting</td>
<td>7</td>
<td>10</td>
<td>3</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Sorting, grading</td>
<td>10</td>
<td>6</td>
<td>4</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Running farm errands</td>
<td>5</td>
<td>15</td>
<td>0</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Making major farm purchases</td>
<td>5</td>
<td>1</td>
<td>14</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Marketing products dealing with wholesalers or selling</td>
<td>9</td>
<td>5</td>
<td>6</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>directly to the consumers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taking care of farm animals</td>
<td>10</td>
<td>4</td>
<td>0</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>Bookkeeping</td>
<td>10</td>
<td>8</td>
<td>2</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Doing household tasks like preparing meals</td>
<td>10</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Cleaning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Thirdly, women ensure there is food to eat on the table. Before they sleep, they think of what the family will eat the following day, where they will get the money to buy the food or what plant will they harvest.

Fourth, women are primarily care givers. When a family member gets sick, it is the mother who will drop other works to pay attention to the sick. They take care of the health and nutrition of their families and communities.

Fifth, women are the teachers. In most families, also in a farming family, it is the mother who mainly helps the children in their schoolwork, who attends the school meetings, and who impart family values and traditions.

And lastly, women farmers are not “plain housewives who just wait for their husbands to give them the money”. Many women are the ones who market the family’s harvests of crops. Many have engaged in various income-generating activities to augment the incomes of the family.
Barriers and Constraints Women Farmers Face

While women farmers perform so many roles as farmers, wives, and mothers, their work is often undervalued, many times unpaid, some even unrecognized, because of persisting stereotypes about the roles of men and women and because in many small family farms, women labor is unpaid family labor. When they are paid, they are paid less than the men. This inadequate recognition about women’s contributions to agriculture had led to inequalities between men and women farmers in terms of access and control over productive resources, services, and facilities as well as in decision-making. In many developing countries, women still cannot own a very basic asset land. Also, they have poor access to agriculture training and extension. This is mainly because these services have targeted men farmers. Many of the modern agricultural technologies are not friendly or appropriate to women but to men. Agricultural research and development efforts are still inadequate in easing the burdens of women farmers in their household work such as cooking, fetching water, and gathering firewood. With regards to decision-making, women are also poorly represented in leadership positions at all levels of government. Even in the farmers’ organizations where membership is composed of men and women, there are few women leaders.

Research on gender and agriculture often discusses the following factors as determinative of women’s involvement in commercial activities:

- Access to land
- Access to credit and capital
- Access to technical knowledge and skills
- Access to inputs and transport
- Gender division of labor and control of labor
- Income received from the market
- Participation in organizations, unions

In interviews with NGOs and international donors, it was stated that marketing and selling are men’s tasks. The interviews made by revealed a diversity of perspectives (Albanian women in Agriculture - Case studies, Barrett Nichols.K, December 2008). While men, in general, may be more active in marketing and selling activities, the interviews reveal that women are necessarily precluded from these tasks. As such, training that focuses on marketing or market-linkages should not disregard women as potential participants.

Results from the study

Based on the study there has been conducted the main focus was given to women from rural areas which work also with agricultural products and sell in the local markets. We have tried to understand to role that women take in the farming live, in the family decision and also in the market selling process. The survey was conducted in three mail cities of Albania, Tirana, Lushnja and Berati mostly known because of the farming and market activities. In these cities we find agricultural products markets all over the region. These markets might be organized by the local government or they might be spontaneous from the farmers.

In focus have been 84 farming/traders women who have answered face to face interviews. The main type of activity that women are focused on is the fruit and vegetables growing (Figure 1). This is also reflected on the market, most of traded products are fruit and vegetables (Figure 2).
Another important issue that is very present actually in Albania is the ownership of the property, land, farm, etc. according to the information gathered from the survey the ownership division is quite fair in Albania. For most of the farms involved in the survey the ownership is divided between husband and wife (33%) or through all the members of the family (38% of the farms). While there is still a part very conservative where the ownership is totally on husband (23%) (Figure 3).

Interesting is also the decision process which differs quite a lot from farm activity to family expenditures. Even though according to the survey most of the farms base their decision on both wife and husband, when it comes to family expenditures there is a slight increase of the women decision role compared with the farm activity. Based on what the women say, the husband take decision on big expenditures in farm and family, while for everyday decisions it is the women that play the most important role (Figure 4 and Figure 5).
From the study, the most important is how women does fill in comparison with their husbands. Even though there is the filling of inequity between men and women, according to the women involved in this survey they do fill quite equal with their husbands in relation to decision making in family and farm, also in work division (Figure 6). Most of them (69%) does emphasize this fact.

It is important to mention that the women role in Albanian agriculture has been increasing in the last years. This is not only reflected on the work they do but also in the decision process, income earning and independence.
References

The importance, role and application of innovation in agriculture

Dimitrijevic Bojan¹, Zivkovic Jelena², Zivkovic Dragic³, Cvetanovska Marija⁴

Abstract

Rapid changes, uncertainty and risk in modern business, impose the use of a new approach to business, new business orientation and strategy. In such an environment, entrepreneurs and growing companies that foster entrepreneurial management achieve the best results.

An important prerequisite for development of enterprises is innovative entrepreneurship and application of innovation to improve operations and increase productivity and competitiveness.

Nowadays, in developed economies, the largest share in the creation of added value does not stem from the so-called material production, but rather the improvement of productivity and innovation where the use of information technology can be of a great help in a way of efficient and effective implementation of business activities.

In this respect, this paper focus on innovations in agribusiness, in order to analyze their importance, role and application directions in our country.

An important factor that negatively affects the development of entrepreneurship in our country is the lack of presence of the entrepreneurial climate and inventiveness, as a result of decades-long absence of market economy.

With their work potential - knowledge, skills and other characteristics entrepreneurs should contribute to the successful transformation of organization, where they must not be hindered by too much formalized rules and procedures.

In Serbia, especially in its central part, dominate small family farms with a catchall production in basis, and only a small number of these farms have an entrepreneurial character. The development of cooperative relations between small and medium-sized enterprises and farmers will influence the development of the entrepreneurial behavior of farmers.

Serbia has the great potential in agribusiness. If necessary instruments are used in stimulating the application of innovation and thus development of entrepreneurship, Serbia even have the possibility to be the leader in the southeastern part of Europe in the field of agriculture and food industry.

Keywords: development, entrepreneurship, innovation, agriculture, agribusiness.

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Introduction
Living in a time of rapid change, uncertainty and risk, requires a new approach to business, new business orientation and strategy. Under such conditions the greatest impact and best results are achieved by entrepreneurs and growing companies that foster entrepreneurial management.

An important prerequisite for the development of entrepreneurship is innovation in business aiming at improving operations, increasing productivity and competitiveness.

Today, the largest share in the creation of added value in developed economies does not stem from the so-called material production, but rather the improvement of productivity and innovation, largely supported by information technology for the efficient and effective implementation of business activities.

In our country, the awareness of the need for the development of entrepreneurship comes with an evergrowing process of privatisation and restructuring.

One negative factor that significantly affects the development of entrepreneurship in our country is the lack of support for entrepreneurship and inventiveness, which is a direct result of a decades-long absence of market economy.

Entrepreneurship is, by definition, an activity that thrives on uncertainty. Therefore, entrepreneurs must use their knowledge and other skills to contribute to the successful transformation of their organisation. However, this process must not be hindered by overly formalised rules and procedures.

A significant entrepreneurial spirit, which should be put into concrete actions, has taken momentum in the Serbian economy. As Pauli said "It is not new ideas, but their application, that change the world".

The breakdown of big agricultural companies in Serbia has resulted in small and medium enterprises taking the lead in the development of agriculture.

In Serbia, especially in the central region, small family farms with a varied production are dominant, whereas only a small number of these farms have entrepreneurial spirit. The development of co-operatives formed by small and medium enterprises, and farms is bound to shape up entrepreneurship amongst farmers.

Vojvodina is said to have a great potential in agribusiness, and may even become a leader in the field of agriculture and processing industry in Southeastern Europe if adequate means and processes are applied.

In an effort to fully and clearly define the strategy for the future reforms of the agricultural sector, as well as to define the measures and actions for the renewal and activation of the developmental potential of the rural areas, and taking into account the external and internal challenges, the Ministry of Agriculture and Environmental Protection adopted the Agricultural and Rural Development Strategy of the Republic of Serbia for the period of 2014 - 2024 (Official Gazette of the Republic of Serbia, No. 85/2014).

Review of the role of innovation
Manifestation of entrepreneurship is innovation, because it represent novelty in process, product, or product solution.

Innovation is the result of individual or collective knowledge that enables successful development of work that man performs. What is also necessary is technology that represents the organization of knowledge to achieve practical goals. The technology involves skill,
knowledge and ability to make, use and produce useful things. Technology is a generator of changes. Creativity occurs here as a necessary component as well. It includes the ability to create necessary, new and useful ideas, for which a higher level of knowledge is required.

Creativity and innovation promote innovative process that can be viewed through three operations: generating ideas, putting ideas into practice and commercialization. In today’s rapidly changing environment, organizations must be innovative in order to survive, and it means that they have to be creative.

However, concepts of creativity should be distinguished from the concepts of innovation. Creativity is the intellectual ability to make new ideas, regardless of their actual applicability, while innovation is the transformation of new ideas into useful products or services. Not every creative idea will become an innovation. In fact, most of them will not. However, there is no innovation without creativity.

By actively promoting the training of its members and offering a secure job, innovative organizations encourage individuals to be "champions of change", who then actively and enthusiastically support the new ideas and create conditions for their implementation.

They have high level of self-confidence, persistence, energy, willingness to take risks and guidance.

Maybe, innovation does not represent a discovery, as it represents finding something that existed for a long time before, but it is definitely the original act of an individual and is focused on the commercial application of inventions.

Innovations can be classified in different ways:

- according to the impact on productivity: labor-intensive and capital-intensive,
- according to the relative importance of the innovation process: incremental and radical,
- according to the field of innovation: product innovation, process innovation, organizational innovation and marketing innovation,
- according to the extent of changes that they cause in the product: componential and architectural,
- according to the overall impact on the business activity: sustainable and disruptive.

Of course, all those aforementioned innovations types have their own characteristics, which characterize them essentially.

Continual improvement is very important for constant success, ie, successful things to make even more better. The most famous practitioners of continuous improvement are the Japanese.

The only way to make innovation more attractive for managers is the systematic rejection of all that is outmoded, outdated, unproductive, and everything that makes mistakes, failures and misdirected efforts in the work and organization of the company.

**Significance and application of innovation in agribusiness**

Agribusiness includes all activities associated with the production and supply of raw materials in agriculture, as well as the storage, processing and distribution of agricultural and food commodities. It does not include only the basic agricultural production units, but also livestock production systems, production of machinery and equipment, fertilizers, chemical plant protection products, the supply of seed and animal feed, then to an agrarian economy which provides raw materials of plant and animal origin for agricultural industry, as well as the manufacturing industry and sale of finished products through wholesale and retail.

It is often said that the competitiveness of Serbian agriculture depends precisely on innovation and that they are a safe way to increase the competitiveness of small producers in the market.
Innovation influences the improvement of the economic results in agricultural production, but also innovations have impact on the achievement of competitive advantage at the market, and that way, at the same time, innovations are the source of profit for agrarian entrepreneurs.

Innovations have impact on raising labor productivity, reducing production costs and achieving maximum utilization of agricultural resources.

Favorable natural conditions: the geographical position of our country, configuration, size and quality of arable land, pastures, forests, quantity and quality of water for drinking, moderate - continental climate, professional staff, developed university centers and etc., provide an opportunity for agriculture and the food industry to become priority sectors, which makes our country attractive for future investment.

A successful manufacturer is the one who is always a step ahead of the others, who is up to date with the new tendencies, who accepts new innovation, adopts new technologies, conditions, species, varieties, races, etc. This means that innovation is the key to success. Necessity is the "mother of innovation" and innovation is the "father of the profits." Every innovation includes four phases, periods:

- **Invention** (including conception of an idea, an experiment under controlled conditions)
- **Introduction** (where an innovation from the theoretical and experimental phase is transferred into a realistic, market stage, with the risk of introducing new innovations to the market)
- **Speculation** (where innovation, a new product, its success is encouraging and sufficient guarantees, provides the security of investment by other competitors)
- **Stable introduction of innovation** (at this stage innovation has been already transformed into an accepted norm).

According to the Innovation Index of the European Union, Serbia as a country is moderate innovator below average performance.

The relative advantages of Serbia are human resources and research system, while the weakness are reflected in the industry's non-participation in the financing and implementation of research and development, weak institutions and political instability.

An additional problem is that Serbia is in the fourth place in the world and first in Europe in the number of young and educated people leaving the country and that the public perception on corruption is very high. What separates Serbia from other countries in the region is that it is very highly ranked in the list of Global Innovation Index (GII) based on innovation efficiency. Namely, unlike the other countries in the region Serbia more efficiently uses the resources and infrastructure at its disposal to achieve innovative results.

**A brief history of innovation in agriculture**

631,522 farms, spreading over 3,437 million hectares of the total of 5.06 million hectares of farmland (ie almost 70%, with farms covering 4.5 hectares each) are a remarkable potential for the application of innovation.

Even before the agricultural revolution, it was known that killing weed promotes the growth of fruit-bearing crops. It was also observed that the growth of crops was stronger in places where fertilisation and fish waste were used.

However, there was no adequate control of the biological processes which would support the feeding of the crops.

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1 www.globalinnovationindex.org
Nowadays, the same processes are used as the basis for the production of food. However, these processes have been adapted by farmers to that point where far less resources are needed to produce food for a person.

Agricultural revolution contributed to the growth of the population, and the fact that single farms were able to produce more food than it was needed for their survival led to the beginnings of urbanisation.

Some of the most important examples of agricultural innovations that made a strong influence on modern society are listed below.

![Seed drill](http://madeupinbritain.uk/Modern_Farming)

**Image 1. Seed drill**

Parts of a plough: 1) beam; 2) three-point hitch (hake); 3) height regulator; 4) coulter 5) chisel 6) share 7) mouldboard

![Modern plough](http://www.ploughmen.co.uk/about-us/history-of-the-plough)

**Image 2. Modern plough**

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1 Seed drill invented by Jethro Tull (1674 – 21 February 1741, New Style) who was an English agricultural pioneer from Berkshire who helped bring about the British Agricultural Revolution. He perfected a horse-drawn seed drill in 1701 that economically sowed the seeds in neat rows. He later developed a horse-drawn hoe. Tull's methods were adopted by many great land owners and helped to provide the basis for modern agriculture.

2 Joseph Foljambe in Rotherham, England, in 1730 used new shapes as the basis for the Rotherham plough, which also covered the mouldboard with iron.
Cyrus Hall McCormick (February 15, 1809 – May 13, 1884) was an American inventor and founder of the McCormick Harvesting Machine Company, which became part of the International Harvester Company in 1902.
Back in the 1900s steam-powered tractors were busy running around farms and fairgrounds, plowing fields, providing power for other machinery... with many surviving examples still doing the same thing today (if not gathering dust in some museum, of course).

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1 Back in the 1900s steam-powered tractors were busy running around farms and fairgrounds, plowing fields, providing power for other machinery... with many surviving examples still doing the same thing today (if not gathering dust in some museum, of course).
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Plantation age effect on making revenue in cultivation lavender flower

Filipovic Vladimir¹, Trmcic Snezana², Jevdjovic Radosav¹

Abstract
The paper presents the research for the period 2010-2015, of plant species, lavender (Lavandula officinalis Chaix) strain called “Primorska” is cultivated and multiplied at the Institute for Medical Plant Research “Dr Josif Pancic” from Belgrade. The study was conducted during 2010 and 2015 at the parcels, site, at South Banat Region-Pancevo, on a total surface area of 1 ha, depending upon the plantation age and effect on making revenue in the years of optimum agricultural conditions and in the laboratory of the Institute for Seeds in Pancevo (44°52'20"N; 20°42'06"E; at altitude 74 m). According to before mentioned, and from the aspect of profitability this variety of lavender can be recommended production in much larger areas, bearing in mind that these are growing crops.

Key words: lavender (Lavandula officinalis Chaix), variety “Primorska”, plantation age, yield, revenue

Introduction
Plant species lavender (Lavandula officinalis Chaix) variety “Primorska” is grown and multiplied in the Institute for Medical Plant Research ‘Dr Josif Pancic” from Belgrade. Her bush can grow to a height of 0.6 m up to one meter. Although the production of medicinal plants typical of the Mediterranean area, these plants can be successfully grown in continental areas, and therefore in Serbia, at altitudes up to 1,200 meters. Lavender is well tolerated temperatures down to -20 degrees and some hybrids and -30. Planting lavender is done in rows in a north-south direction. The distance between rows is 100 cm and the distance between plants 50-100 cm. For hectare plantations need about 20,000 plants. Is widely used in the pharmaceutical industry. It is particularly important for obtaining high quality essential oil (Jevdjovic et al. 2015, 2010), and is well known as a good honey plant (Vrbnicanin et al. 2012). The aim is to examine the justification-effectiveness of production lavender flower (Lavandula officinalis Chaix) variety “Primorska“ which is cultivated and multiplied at the Institute for Medical Plant Research ‘Dr Josif Pancic” from Belgrade, at an adequate site, at South Banat Region-Pancevo, in depending on the plantation age upon realization of revenue in year with optimal agro-ecological conditions.

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³ Radosav Jevdjovic, (PhD), Senior research associate, (radosavjevdjovic@gmail.com), Institute for Medical Plant Research “Dr Josif Pancic”, Tadeusa Koscuska No 1, 11000 Belgrade, Serbia
Materials and methods

In this study it is used, plant species lavender (*Lavandula officinalis* Chaix) strain “Primorska” is cultivated and multiplied at the Institute for Medical Plant Research ’Dr Josif Pancic’ from Belgrade. The study was conducted during the period starting from 2010 to 2015, on plots and in the seed laboratory of the Institute in Pancevo (44°52’20”N; 20°42’06”E; at altitude 74 m). The land on which the researches were conducted belongs to the type – black humus-gley soil. This land has the following agro-chemical characteristics: pH value = 5.4, humus content = 2.3%, content of P$_2$O$_5$ 3.6 mg/100 g soil and K$_2$O 36,2 mg/100 g soil (Jevdjovic et al.2013.).

The experiment was designed according to as completely randomized block system with the basic plot size of 10,0 m$^2$ (5,0 m x 2,0 m) in four repeatings.

Meteorological data for vegetation period, analyzed in this paper were obtained from the Meteorological station of Institut “Tamis” Pancevo (Table 1).

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Precipitation</td>
<td>736.5</td>
<td>543.7</td>
<td>498.1</td>
<td>560.1</td>
<td>881.6</td>
<td>608.4</td>
<td>678.4</td>
</tr>
<tr>
<td>Temperatures</td>
<td>12.6</td>
<td>12.4</td>
<td>13.4</td>
<td>13.1</td>
<td>13.6</td>
<td>13.5</td>
<td>12.5</td>
</tr>
</tbody>
</table>

Results and discussion

Lavender soils are produced at open seedbeds as summer production and planted by hand in the fall of 2009. Row spacing lavender plantation is 100 x 50 centimeters. During vegetation were used standard measures of care. So where it was necessary was done and filling of empty seats. Weed was destroyed by mechanical means without the use of herbicides. Attacks against plant diseases and pests during vegetation were not registered, so there was no need for extra protection measures. Depending on meteorological conditions of flower harvest (botanical inflorescences) starting in the third decade of Jun till mid of July. When they were picking by hand and sickle, they were cut off from its inflorescence and stick length’ 10 – 15 cm.

The harvest was carried on at the nice and sunny weather, as during drying will be prevented defended weight. Drying of overground mass was conducted by the natural way at the drafty place. After that, the weighted mass of dried aboveground parts per plot and it was calculated the yield per hectare, gained in kilograms.

The indicative cost estimate lavender flower production for the year 2010 in an area of one hectare, is shown in (Table 2), the Profit is -2,325 (€), respectively, and it was not realized. Since the yield of fresh lavender flowers, increases with age now, which is to be expected in optimal agroecological conditions of the site on which it is planted mentioned types of lavender, there is a visible and viable in the amount obtained from 1,450.7 (€). In 2011, is shown in (Table 3). Since 2011, so as of 2015 offering fresh lavender flowers from year to year, considerably magnified, so that in 2012 (Table 4), earnings totaled 1,766.8 (€). In 2013 was 3,521.8 (€) and is shown in (Table 5), in 2014 at (Table 6), the Profit was 5,242.4 (€), and in 2015 (Table 7), 5,496.6 (€).

Bearing in mind that the costs of the five-year period reached 5,627.0 (€). It can be stated that for 2015 yield of lavender (dried flowers), or profit, i.e. cover costs in the multi-year five-year period of production lavender. According to it, and knowing that from the fifth year onwards to ten and even fifteen yields are established so that quite reasonably with additional segments of care now, that is not too demanding, in optimal agroecological conditions, can expect a rise in
yields, and accordingly the price of dried lavender flowers in euros per kilogram. This production is cost-effective, and profitable. Gross profit for the period 2010-2015, amounted to 15,153.3 (€) gained value represents the difference between total revenue of 20,780.3 (€) and cost of production of 5,627.0 (€), the five-year period, the production of lavender, as this is a multi-year so far in the coming years are expected still higher yields, and consequently the profit, assuming optimal production conditions.

Table 2. Indicative production costs for lavender flower in 2010, in an area of 1 ha

<table>
<thead>
<tr>
<th>Costs</th>
<th>(£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Material</td>
<td></td>
</tr>
<tr>
<td>Mineral fertilizers</td>
<td>250</td>
</tr>
<tr>
<td>Plant protection</td>
<td>35</td>
</tr>
<tr>
<td>Seeds</td>
<td>115</td>
</tr>
<tr>
<td>2. Machine operation</td>
<td></td>
</tr>
<tr>
<td>Plow to 30 cm</td>
<td>80</td>
</tr>
<tr>
<td>Harrowing (disking)</td>
<td>40</td>
</tr>
<tr>
<td>Mineral fertilizer dissolution 2x</td>
<td>60</td>
</tr>
<tr>
<td>Sowing preparations</td>
<td>20</td>
</tr>
<tr>
<td>Watering</td>
<td>80</td>
</tr>
<tr>
<td>Inter-row cultivation 2x</td>
<td>32</td>
</tr>
<tr>
<td>Depository entering of mineral fertilizer</td>
<td>20</td>
</tr>
<tr>
<td>Treatment of crop protection agents</td>
<td>23</td>
</tr>
<tr>
<td>3. Seasonal working labor</td>
<td></td>
</tr>
<tr>
<td>Seedling production (2 season workers x 30 days x 10 € daily wage)</td>
<td>600</td>
</tr>
<tr>
<td>Seedling loading and unloading (5 season workers x 10 € daily wage)</td>
<td>50</td>
</tr>
<tr>
<td>Planting seedlings (20 season workers x 10 € daily wage)</td>
<td>200</td>
</tr>
<tr>
<td>Hoening, weeding, watering, fertilizing, filling the empty places,...</td>
<td>720</td>
</tr>
<tr>
<td>Total costs (T)</td>
<td>2,325</td>
</tr>
<tr>
<td>Flower yield (0 kg) x price 0.0 (€) (P)</td>
<td>0</td>
</tr>
<tr>
<td>Profit (P – T)</td>
<td>-2,325</td>
</tr>
</tbody>
</table>

Table 3. Indicative production costs for lavender flower in 2011, in an area of 1 ha

<table>
<thead>
<tr>
<th>Costs</th>
<th>(£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Material</td>
<td></td>
</tr>
<tr>
<td>Mineral fertilizer</td>
<td>220</td>
</tr>
<tr>
<td>2. Machine operation</td>
<td></td>
</tr>
<tr>
<td>Mineral fertilizers dissolution</td>
<td>30</td>
</tr>
<tr>
<td>Inter-row cultivation 2x</td>
<td>32</td>
</tr>
<tr>
<td>Entering of mineral fertilizers</td>
<td>10</td>
</tr>
<tr>
<td>3. Seasonal working labor</td>
<td></td>
</tr>
<tr>
<td>Hoening, weeding, fertilizing,...</td>
<td>220</td>
</tr>
<tr>
<td>Harvesting and collecting inflorescences (20 season workers x 10 € daily wage)</td>
<td>200</td>
</tr>
<tr>
<td>Total costs (T)</td>
<td>712</td>
</tr>
<tr>
<td>Flower yield (890 kg) x price 2,43 (€) (P)</td>
<td>2,162.7</td>
</tr>
<tr>
<td>Profit (P – T)</td>
<td>1,450.7</td>
</tr>
<tr>
<td>Costs</td>
<td>(€)</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----</td>
</tr>
<tr>
<td>1. Material</td>
<td></td>
</tr>
<tr>
<td>Mineral fertilizers</td>
<td>200</td>
</tr>
<tr>
<td>2. Machine operations</td>
<td></td>
</tr>
<tr>
<td>Mineral fertilizator dissolution</td>
<td>30</td>
</tr>
<tr>
<td>Inter-row cultivation 2x</td>
<td>32</td>
</tr>
<tr>
<td>Entering of mineral fertilizer</td>
<td>10</td>
</tr>
<tr>
<td>3. Seasonal working labor</td>
<td></td>
</tr>
<tr>
<td>Hoeing, weeding, fertilizing, ...</td>
<td>220</td>
</tr>
<tr>
<td>Harvesting and collecting inflorescences (25 season worker x 10 € daily wage)</td>
<td>250</td>
</tr>
<tr>
<td><strong>Total costs (T)</strong></td>
<td>742</td>
</tr>
<tr>
<td>Flower yield (1,120 kg) x price 2.24 (€) (P)</td>
<td>2,508.8</td>
</tr>
<tr>
<td>Profit (P – T)</td>
<td>1,766.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Costs</th>
<th>(€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Material</td>
<td></td>
</tr>
<tr>
<td>Mineral fertilizers</td>
<td>150</td>
</tr>
<tr>
<td>2. Machine operation</td>
<td></td>
</tr>
<tr>
<td>Mineral fertilizer dissolution</td>
<td>30</td>
</tr>
<tr>
<td>Inter-row cultivation</td>
<td>16</td>
</tr>
<tr>
<td>Entering mineral fertilizers</td>
<td>10</td>
</tr>
<tr>
<td>3. Seasonal working labor</td>
<td></td>
</tr>
<tr>
<td>Hoeing, weeding, fertilizing, ...</td>
<td>220</td>
</tr>
<tr>
<td>Harvesting and collecting inflorescences (25 season workers x 10 € daily wage)</td>
<td>250</td>
</tr>
<tr>
<td><strong>Total costs (T)</strong></td>
<td>676</td>
</tr>
<tr>
<td>Flower yield (1,390 kg) x cena 3.02 (€) (P)</td>
<td>4,197.8</td>
</tr>
<tr>
<td>Profit (P – T)</td>
<td>3,521.8</td>
</tr>
</tbody>
</table>
Table 6. Indicative production costs for lavender flower in 2014, in an area of 1 ha

<table>
<thead>
<tr>
<th>Costs</th>
<th>(£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Material</td>
<td></td>
</tr>
<tr>
<td>Mineral fertilizers</td>
<td>120</td>
</tr>
<tr>
<td>2. Machine operation</td>
<td></td>
</tr>
<tr>
<td>Mineral fertilizer dissolution</td>
<td>30</td>
</tr>
<tr>
<td>Inter-row cultivation</td>
<td>16</td>
</tr>
<tr>
<td>Entering mineral fertilizers</td>
<td>10</td>
</tr>
<tr>
<td>3. Seasonal working labor</td>
<td></td>
</tr>
<tr>
<td>Hoeing, weeding, fertilizing, ...</td>
<td>120</td>
</tr>
<tr>
<td>Harvesting and collecting inflorescences (20 season workers x 10 € daily wage)</td>
<td>300</td>
</tr>
<tr>
<td>Total costs (T)</td>
<td>596</td>
</tr>
<tr>
<td>Flower yield (1,780 kg) x price 3.28 (£) (P)</td>
<td>5,838.4</td>
</tr>
<tr>
<td>Profit (P – T)</td>
<td>5,242.4</td>
</tr>
</tbody>
</table>

Table 7. Indicative production costs for lavender flower in 2015, in an area of 1 ha

<table>
<thead>
<tr>
<th>Costs</th>
<th>(£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Material</td>
<td></td>
</tr>
<tr>
<td>Mineral fertilizers</td>
<td>100</td>
</tr>
<tr>
<td>2. Machine operation</td>
<td></td>
</tr>
<tr>
<td>Mineral fertilizers dissolution</td>
<td>30</td>
</tr>
<tr>
<td>Inter-row cultivation</td>
<td>16</td>
</tr>
<tr>
<td>Entering mineral fertilizers</td>
<td>10</td>
</tr>
<tr>
<td>3. Seasonal working labor</td>
<td></td>
</tr>
<tr>
<td>Hoeing, weeding, fertilizing, ...</td>
<td>120</td>
</tr>
<tr>
<td>Harvesting and collecting inflorescences (30 season workers x 10 € daily wage)</td>
<td>300</td>
</tr>
<tr>
<td>Total costs (T)</td>
<td>576</td>
</tr>
<tr>
<td>Flower yield (1,740 kg) x price 3.49 (£) (P)</td>
<td>6,072.6</td>
</tr>
<tr>
<td>Profit (P – T)</td>
<td>5,496.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs</td>
<td>2,325</td>
<td>712</td>
<td>742</td>
<td>676</td>
<td>596</td>
<td>576</td>
<td>5,627.0</td>
</tr>
<tr>
<td>Yield</td>
<td>0</td>
<td>2,162.7</td>
<td>2,508.8</td>
<td>4,197.8</td>
<td>5,683.4</td>
<td>6,072.6</td>
<td>20,780.3</td>
</tr>
<tr>
<td>Profit</td>
<td>-2,325</td>
<td>1,450.7</td>
<td>1,766.8</td>
<td>3,521.8</td>
<td>5,242.4</td>
<td>5,496.6</td>
<td>15,153.3</td>
</tr>
</tbody>
</table>

Table 8. Plantation age as a factor to make revenue in the cultivation of lavender flower

<table>
<thead>
<tr>
<th>Years</th>
<th>Yield of fresh inflorescences (kg/ha)</th>
<th>Yield of dry inflorescences (kg/ha)</th>
<th>Price of dry inflorescences (RSD/kg)</th>
<th>Price of dry inflorescences (€/kg)</th>
<th>Revenue (RSD/kg)</th>
<th>Revenue (€/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2011</td>
<td>9,220</td>
<td>890</td>
<td>245</td>
<td>2.43</td>
<td>218,050</td>
<td>2,162.7</td>
</tr>
<tr>
<td>2012</td>
<td>9,460</td>
<td>1,120</td>
<td>260</td>
<td>2.24</td>
<td>291,200</td>
<td>2,508.8</td>
</tr>
<tr>
<td>2013</td>
<td>11,290</td>
<td>1,390</td>
<td>343</td>
<td>3.02</td>
<td>476,770</td>
<td>4,197.8</td>
</tr>
<tr>
<td>2014</td>
<td>19,630</td>
<td>1,780</td>
<td>380</td>
<td>3.28</td>
<td>676,400</td>
<td>5,838.4</td>
</tr>
<tr>
<td>2015</td>
<td>15,940</td>
<td>1,740</td>
<td>420</td>
<td>3.49</td>
<td>730,800</td>
<td>6,072.6</td>
</tr>
<tr>
<td>Total</td>
<td>65,540</td>
<td>6,920</td>
<td></td>
<td></td>
<td>2,393,220</td>
<td>20,780.3</td>
</tr>
</tbody>
</table>

The lavender yield depends on the age of plantations, agro-ecological conditions and cultural practices. In the first year yield is lowest and gradually increased in the fourth or fifth year, and
there are more sedentary, as can be noted in (Table 8.). Yields can be settled until the tenth, and up to fifteen years.

**Conclusion**

In the first year yield is negligible, it is gradually increased in fourth or fifth year of planting. The research period in 2011, yield of dried flowers stood at 890 kg/ha, while the price per kg (kilogram) was 2.43 (€/kg) so that the total revenue for 2011 was 2,162.7 (€/kg/ha). When it comes to offering fresh flowers, the amount of yield was 9,220 kg/ha. Analyzing result in many years of research has shown that the yields from year to year by increasing significantly, and the price of dried flowers, so in 2015. Yield of dry flowers is the biggest and 1,740 kg/ha, while the yield of fresh flowers stood at 15,940 kg/ha. The price of the dried flowers was 3.49 (€/kg), the total revenue was 6,072.6 (€/ha).

In the researching period of time (2010-2015), Total revenue amounted to 20,780.3 (€/kg), and the approximate costs of production amounted to 5,627.0 (€/kg), while net profit in euros per kilogram was 15,153.3 (€/kg).

Plantation age of lavender (*Lavandula officinalis* Chaix), strain "Primorska", at South Banat Region-Pancevo, effects on yield, and the realization of revenue, assuming optimal environmental conditions of the site, as well as applied agro-technical measures, which was concluded after multi year research.

**Acknowledgement**

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**Reference**


Croatian competitiveness in the production of pig meat before joining the EU

Grgic Ivo¹, Levak Vladimir², Zrakic Magdlena³

Abstract
The strong process of economic integration and globalization of national economies encourages strengthening of export competitiveness. The aim was to calculate the international price competitiveness of pig meat production in the period from 2005 to 2012 in Croatia. DRC - Domestic Resource Cost and RCA - Revealed Comparative Advantage and the coverage of imports by exports indices were used for the calculation of competitiveness. Croatia (average 2005/2012) had a negative balance in the pork production - the equivalent of about 385,000 pigs on annual basis with average weight of 100 kg. Croatia has international competitiveness (RCA = 0.089) in the production of pork compared to other exporting countries. The value of DRC indicator (>1) showed that pig meat production until 2010 was not internationally competitive. Currency exchange rate and considerably larger local variable costs in relation to variable costs in Croatian competitive country (Germany) had major impact on the lower level of competitiveness.

In order to increase the international competitiveness of domestic pig meat production, except the correction of the exchange rate, it is also necessary to increase the average number of fattened pigs per producer and per unit of production capacity, which requires a major change of production mode and production technology.

Key words: pig meat, competitiveness, DRC, RCA, Croatia

Introduction
A strong process of economic integration and globalization of national economies requires competitiveness strengthening of particular product export. These processes are an opportunity but also a threat to the relatively small economies in which is big impact of foreign trade on economic growth. Agriculture is specific, multifunctional and one of the "most protected" sectors of Europe.

In the protection system especially stand out systems support, which, according to some analysts, often lead to lack of price competitiveness in the world market. Similar considerations are present in Croatia, a little less since our country became a member of the European Union (EU), and also since part of the funds support comes from the common agricultural fund of the EU.

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Croatia has formally become part of the common production and EU market. However, its integration began much earlier due to foreign trade, with different impact on local production and market. The impact was particularly significant for the agri-food sector. It was also the case in other countries when they join the EU. Competitiveness is especially in focus of many researches and analysis in the period before Croatian integration as was the case with many countries before joining the EU.

Pig production in Croatia, according to the value, is in third place, behind the production value of maize and cow's milk and in total value of agricultural production represents between 10.2% (2008) and 14.6% (2005), but from 2009, the share of pig gross indigenous production (GIP) in the total value of agricultural production decreased.

Croatia is not a significant factor in Europe and EU according to number of pigs and pig produced meat. Although there are good conditions for pig production, especially due to significant production of maize, the Croatian share in the number of pigs and produced meat in Europe and the EU is below 1% and domestic production is also very "sensitive" to changes in the surrounding. This is particularly felt in recent years after export restrictions to the Russian Federation when domestic production was under pressure from the large meat market surplus from other Member States.

**Material and methods**

The aim is to calculate the international price competitiveness of meat production of pigs in Croatia for the period from 2005 to 2012, i.e. for the period prior to full membership in EU\(^1\).

For the calculation of competitiveness there were used indices: DRC - Domestic Resource Cost, RCA - Revealed Comparative Advantage and the coverage of imports by exports.

Domestic Resource Costs (DRC) is the most commonly used indicator when identifying potential opportunities for improving export and areas which need improve the productivity (Gorton and David, 2001).

DRC indicator by Monk and Pearson (1989) is expressed as follows:

\[
DRC = \frac{\sum_{j=k+1}^{n} a_{ij} P^D_j}{P^B_i - \sum_{j=1}^{k} a_{ij} P^B_j}
\]

Where:
- \(a_{ij}\) - quantity of \(j\) market (if \(j < \text{or} \leq k\)) or non-market (if \(j > k\)) input (\(j=1,2,\ldots,n\)) used in production of one output unit \(i\);
- \(P^D_j\) - social non-market price of input \(j\);
- \(P^B_i\) - marginal output price \(i\);
- \(P^B_j\) - marginal market input price \(j\).

If DRC <1 - domestic product is price-competitive, and vice versa, if DRC> 1 - domestic product is not price-competitive.

RCA index is often used to quantify the competitiveness of certain sectors of the economy. Liesner (1958) first introduced RCA and it shows the share of observed sector in total gross exports of the country in relation to the same share of this sector in world exports. If index is greater than 1 it means that the country has expressed a comparative advantage in the sector.

\(^1\) The Republic of Croatia became a full member of the European Union on 1\(^{\text{st}}\) of July, 2013.
RCA indicator is calculated as follows (Balassa, 1965):

\[
RCA_{ij} = \left( \frac{X_{ij}}{X_{ii}} \right) / \left( \frac{X_{wj}}{X_{wt}} \right)
\]

Where:

- \(X_{ij}\) - export value of product \(j\) in country \(i\),
- \(X_{ii}\) - total export value in country \(i\),
- \(X_{wj}\) - world export of product \(j\),
- \(X_{wt}\) - total world export.

Coverage of imports by exports is the ratio of total exports and imports of goods or/and services i.e. proportion of exports and imports of a particular commodity or service sector in the economy:

\[
r_{ij}^t = \frac{X_{ij}^t}{M_{ij}^t} \times 100
\]

Where:

- \(r_{ij}^t\) - coverage of imports by exports in year \(t\),
- \(X_{ij}^t\) - export of sector \(i\) section \(j\) in year \(t\),
- \(M_{ij}^t\) - import of sector \(i\) section \(j\) in year \(t\).

Value less than 100 shows foreign trade deficit and vice versa, more than 100 - foreign trade surplus.

The paper is based on the assumption that Croatian competitive country with which it achieves, according to period average, most of the value of foreign trade of pig meat is Germany.

Data sources are statistical reports and publications of the Central Bureau of Statistics of Croatia, FADN, WTO, Eurostat and FAO reports. Due to lack of official information data has been estimated for some years.

**Results and discussion**

**Pig meat production from 2005 to 2012**

Despite the fact that number of pigs in the world during the analyzed period increased (9.3%), in Europe it decreased by 3.6% and in the EU by 7.5%. The largest number of pigs in the world is located in China (474 million), followed by the USA (66.4 million) and Brazil (38.7 million). In Europe, the largest number of pigs is in Germany and in Spain.

World exports of live pigs have increased significantly by 53.4% i.e. in value by 88.4% in period 2005-2012. At the same time the value of world exports of pig meat increased from 17.9 to 30.3 billion, or 68.6%. A higher value increase was due to faster growth in export prices which is result of significant demand for this type of meat and processed products. The world’s largest exporter of live pigs is Denmark, which in world exports in 2012 accounted for 26.1%, followed by the Netherlands with a share of 25.8%. The world’s largest exporter of pig meat is Germany, followed by the USA and Denmark.

In Germany there was especially significant increase of imports of live pigs, which in the analyzed period increased 2.4 times and its share in total world imports amounted 38.1% in 2012. Italy and Germany are largest importers of meat pigs and their total share in global imports of pig meat was 18.1% in 2012.
Table 1. Number of pigs and pig meat production in the world, Europe, EU and Croatia

<table>
<thead>
<tr>
<th></th>
<th>2005/08</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of animals, 000</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>World</td>
<td>920,975</td>
<td>954,614</td>
<td>964,942</td>
<td>967,976</td>
<td>969,885</td>
<td>942,665</td>
</tr>
<tr>
<td>Europe</td>
<td>193,046</td>
<td>187,669</td>
<td>189,229</td>
<td>187,531</td>
<td>183,974</td>
<td>190,074</td>
</tr>
<tr>
<td>EU</td>
<td>160,645</td>
<td>154,160</td>
<td>153,735</td>
<td>151,713</td>
<td>148,840</td>
<td>156,379</td>
</tr>
<tr>
<td>Croatia</td>
<td>1,286</td>
<td>1,250</td>
<td>1,230</td>
<td>1,233</td>
<td>1,182</td>
<td>1,255</td>
</tr>
<tr>
<td>% Croatia/Europe</td>
<td>0.14</td>
<td>0.67</td>
<td>0.65</td>
<td>0.66</td>
<td>0.64</td>
<td>0.66</td>
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<tr>
<td>% Croatia/EU</td>
<td>0.67</td>
<td>0.81</td>
<td>0.8</td>
<td>0.79</td>
<td>0.79</td>
<td>0.8</td>
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<table>
<thead>
<tr>
<th></th>
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<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pig meat production, 000 tons</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>World</td>
<td>98,507</td>
<td>104,719</td>
<td>107,319</td>
<td>108,055</td>
<td>109,122</td>
<td>102,906</td>
</tr>
<tr>
<td>Europe</td>
<td>25,689</td>
<td>26,026</td>
<td>27,003</td>
<td>27,505</td>
<td>27,226</td>
<td>26,314</td>
</tr>
<tr>
<td>EU</td>
<td>22,211</td>
<td>22,305</td>
<td>22,953</td>
<td>23,246</td>
<td>22,842</td>
<td>22,524</td>
</tr>
<tr>
<td>Croatia</td>
<td>118</td>
<td>131</td>
<td>121</td>
<td>120</td>
<td>104</td>
<td>119</td>
</tr>
<tr>
<td>% Croatia/Europe</td>
<td>0.12</td>
<td>0.5</td>
<td>0.45</td>
<td>0.44</td>
<td>0.38</td>
<td>0.45</td>
</tr>
<tr>
<td>% Croatia/EU</td>
<td>0.46</td>
<td>0.59</td>
<td>0.53</td>
<td>0.52</td>
<td>0.46</td>
<td>0.53</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2005/08</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meat per pig, kg</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>World</td>
<td>107</td>
<td>110</td>
<td>111</td>
<td>112</td>
<td>113</td>
<td>104</td>
</tr>
<tr>
<td>Europe</td>
<td>133</td>
<td>139</td>
<td>143</td>
<td>147</td>
<td>148</td>
<td>131</td>
</tr>
<tr>
<td>EU</td>
<td>138</td>
<td>145</td>
<td>149</td>
<td>153</td>
<td>153</td>
<td>136</td>
</tr>
<tr>
<td>Croatia</td>
<td>92</td>
<td>105</td>
<td>98</td>
<td>97</td>
<td>88</td>
<td>93</td>
</tr>
<tr>
<td>% Croatia/Europe</td>
<td>69</td>
<td>76</td>
<td>69</td>
<td>66</td>
<td>59</td>
<td>60</td>
</tr>
<tr>
<td>% Croatia/EU</td>
<td>67</td>
<td>72</td>
<td>66</td>
<td>64</td>
<td>57</td>
<td>57</td>
</tr>
</tbody>
</table>


Although there are good conditions for pig production, especially due to the production of maize, the Croatian share in the number of pigs Europe is 0.60% and in the EU to 0.80%. Even lower is the share of domestic produced meat and it accounts 0.45% in Europe and 0.53% in the EU. This was due to lower production of meat per pig and the index in relation to Europe was 60, and in relation to the EU it was 57 (Table 1).

The average number of pigs during the analyzed period was 1.26 million head. The largest number of pigs was recorded in 2006 followed by constantly reducing the number, whereby from 2006 to 2012, the number decreased by 307 thousand head or 20.6%. In the same period, the number of fattened pigs increased by 287,000 where from the domestic production was 56% of animals and 44% from imports.

In the analyzed period, the pigs’ number had significant fluctuations (Table 2). The greatest impact on the average annual growth of pigs’ number has had the import of live pigs for slaughtering.

Export of pig meat increased from 155 tons in 2005 to 1,180 tons in 2009, followed by a significant decline in exports. Over 75.00% of pig meat export was in Bosnia and Herzegovina, and the rest was mostly exported to Austria, Denmark, Germany and Angola.
Table 2. Imports and exports of pig meat from 2005 to 2012, tons

<table>
<thead>
<tr>
<th></th>
<th>2005-2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>(\cdot)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Import</td>
<td>35,377</td>
<td>43,018</td>
<td>39,752</td>
<td>41,692</td>
<td>46,904</td>
<td>39,109</td>
</tr>
<tr>
<td>Export</td>
<td>428</td>
<td>1,180</td>
<td>911</td>
<td>217</td>
<td>137</td>
<td>520</td>
</tr>
<tr>
<td>Balance</td>
<td>-34,949</td>
<td>-41,838</td>
<td>-38,841</td>
<td>-41,475</td>
<td>-46,767</td>
<td>-38,589</td>
</tr>
</tbody>
</table>

Source: Internal data of the Croatian Chamber of Economy, Croatia

Croatia imported annually 39,109 tons of pig meat in average or 8.7 kg per capita, which amounts to about 55.00% of the pig meat consumption per capita. Pig meat was mostly imported from Germany and the Netherlands where this share increases from 32.50% (2005) to 56.05% (2012). There was a negative balance in the period 2005-2012 - converted approximately 385,000 pigs annually with average weight of 100 kg. The link between reduced number of pigs and export growth has been determined also by Margeta et al. (2013). According to them it shows the possibilities for further development of pig production in Croatia. This is especially possible with a production technology change because in Croatia there are all natural conditions for successful pig breeding in an environmentally friendly way, where should be respected certain law requirements.

It is assumed that in the future more farmers will be engaged with organic pig breeding, primarily the farms, which are engaged in breeding to produce traditional and protected food products of animal origin (kulin, Slavonian ham) with the aim to increase the competitiveness of production (Radović and Pavićić, 2006). Mahnet (2010) warned at certain obstacles for Croatian pig production under conditions of EU-CAP. He emphasizes as advantage that Croatian by joining the Union will have at its disposal all the advantages of large common market. But it requires a change in the size of farms, the structure of production and application of new technological processes on farms. For farms that already have established technological procedures that are at EU level, the required adjustment to modern pig meat production will be more successful. However, part of small producers will abandon production as it happened in some other EU countries. It happened because labor productivity and technological efficiency are important factors that affecting the competitiveness of pig production (Martel, Dourmad and Dedieu, 2008).

Some methodological considerations in competitiveness calculation

The domestic resources cost include amortization and maintenance, labour and capital (annuities and interest rates) costs. Operating costs are market inputs in Croatian competitive country (Germany) i.e. variable cost. The calculations that are required to calculate the DRC coefficient do not include any support. There is no generally accepted methodology for calculating the labour cost on family farms and the labour value was equal to the average annual wage of workers in agriculture on the basis of 1,800 hours per year. The annual number of fattened pigs by the supplier is calculated so the total annual number of breeding pigs is divided by the total number of physical persons who are recipient of subsidies for fattening pigs\(^1\). The calculation of required labour was made using the coefficient of conditional head of pigs, 0.15. Labour consumption for the production of animal feed is estimated at 15 hours/ha\(^2\), and "in barn" at three hours per day.

The capital cost is calculated according to the annual amortization value per kilogram of live weight. For the average production of 227 fattened pigs per year, the breeding station of approximately 120 m\(^2\) with a turnover of 2.5 cycles per year, which means that in one round

\(^1\) Find more in: http://www.hpa.hr/wp-content/uploads/2015/05/3%20Svinjogojstvo_2014.pdf

\(^2\) Expert evaluation based on users interviews.
there are grown 91 fattened pig. The cost of construction of such a building is 3,000.00 kuna/m² or a total of 360,000.00 kuna. Assumed time of amortization is 20 years and the annual value of amortization is 18,000.00 kuna. For the import price of pig meat was used conversion factor of 1.24.

The competitiveness in the production of pig meat

In analyzed period there is a cost volatility during pigs fattening from 11.7 €/kg in 2007 to 15.2 €/kg in 2012.

Source: Statistical documentation of the Central Bureau of Statistics and authors' calculations

Graph 1. The production costs of pig meat in the Republic of Croatia 2005-2012

The largest part of total costs are variable costs (about 71%) in which, on average, half are the animal feed costs, and the input of piglets is about 40%. Similar results were also found in Finland case (Niemi et al., 2010). Domestic fixed costs include labour (72%) and capital (18%) costs, with a tendency to increase by 22.8% for the analyzed period (Graph 1). The labour value amounts in average 88% of the average wage of workers in agriculture.

Production cycles i.e. significant fluctuations are especially present in domestic pig production. Decreasing of breeders’ number has not led to a considerable increase in supplied animals and that number went from 203 in 2009 to 272 in 2007. The pigs are fattened to average weight of 100 kg of live weight so the pig gross indigenous production (GIP) has the same tendencies as well as number of animals supplied.

DRC is calculated according to Germany, as the reference country. In period 2005-2012 Germany total imported 73,908 tons of pig meat valued at 227 million USD. Average domestic variable costs were only 0.66 €/kg higher than Germany's costs, and its growth in both countries for the whole period was approximately 21%, indicating a significant cost equivalence in the production.

1 Germany was the world's largest exporter of pork in the amount of about 1.5 million tons per year during 2009 and 2010. At the same time, Germany was the world's largest importer of live pigs with realized import of 12 million animals in 2010.
Table 3. Calculation of the competitiveness of pig meat production from 2005 to 2012

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>delivered fattened pigs per farm</td>
<td>239</td>
<td>203</td>
<td>227</td>
<td>227</td>
<td>218</td>
<td>229</td>
</tr>
<tr>
<td>output weight, kg/farm</td>
<td>23,934</td>
<td>20,340</td>
<td>22,657</td>
<td>22,700</td>
<td>21,800</td>
<td>22,904</td>
</tr>
<tr>
<td>total working hours in the farm with the supplied pigs</td>
<td>1,608</td>
<td>1,531</td>
<td>1,580</td>
<td>1,581</td>
<td>1,562</td>
<td>1,586</td>
</tr>
<tr>
<td>annual human labour hours/farm</td>
<td>45,373</td>
<td>48,090</td>
<td>49,438</td>
<td>51,217</td>
<td>52,280</td>
<td>47,814</td>
</tr>
<tr>
<td>gross indigenous production ²</td>
<td>17,951</td>
<td>15,255</td>
<td>16,992</td>
<td>17,025</td>
<td>16,350</td>
<td>17,178</td>
</tr>
<tr>
<td>the labour value, kn/kg</td>
<td>2.54</td>
<td>3.15</td>
<td>2.91</td>
<td>3.01</td>
<td>3.2</td>
<td>2.78</td>
</tr>
<tr>
<td>amortization³, kn/kg</td>
<td>1.02</td>
<td>1.18</td>
<td>1.06</td>
<td>1.06</td>
<td>1.1</td>
<td>1.05</td>
</tr>
<tr>
<td>domestic resource cost, kn/kg</td>
<td>3.56</td>
<td>4.33</td>
<td>3.97</td>
<td>4.07</td>
<td>4.3</td>
<td>3.83</td>
</tr>
</tbody>
</table>

Germany

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>general production costs, kn/kg</td>
<td>8.47</td>
<td>8.02</td>
<td>8.58</td>
<td>9.38</td>
<td>9.56</td>
<td>8.68</td>
</tr>
<tr>
<td>import live weight price, kn/kg</td>
<td>12.35</td>
<td>11.90</td>
<td>11.89</td>
<td>14.16</td>
<td>13.92</td>
<td>12.66</td>
</tr>
<tr>
<td>DRC</td>
<td>1.01</td>
<td>1.11</td>
<td>1.2</td>
<td>0.85</td>
<td>0.99</td>
<td>0.97</td>
</tr>
<tr>
<td>DRC – assumption: number of fattened pigs higher for 20%</td>
<td>0.88</td>
<td>0.97</td>
<td>1.05</td>
<td>0.74</td>
<td>0.86</td>
<td>0.84</td>
</tr>
<tr>
<td>DRC – assumption: number of fattened pigs same as in Germany</td>
<td>0.72</td>
<td>0.70</td>
<td>0.82</td>
<td>0.58</td>
<td>0.64</td>
<td>0.67</td>
</tr>
</tbody>
</table>

¹ The average weight of delivered fattened pigs is 100 kg of live weight; ² Input weights of piglets is from 25 kg and gross indigenous production is 75 kg per pig; ³ Annual amortization of the facility is 18,000 kuna.

Source: Same as for Graph 1 and Production costs and margins of pig fattening farms 2012 REPORT, pages 34 and 52

DRC coefficient value indicates that the production of pigs up to 2010 was not competitive. It was mostly due to low exchange rate of US dollar. However, some authors such as Đikić and Jurić (2000) when determining non-competitiveness said that the quality of fattened pigs halves produced on family farms compared to the developed pig-breeding state that in Croatia about 80% of pig production and over 50% of the pigs slaughtered in slaughterhouses are produced on family farms what is considered as the main cause of the lack of competitiveness as a result of the lack of competitiveness across family farms.

Simulation of DRC calculation coefficient with increasing number of fattened pigs for 20% and by number of fattened pigs in Germany, DRC coefficient takes for the entire period in both scenarios value less than one (DRC<1). In case when number of fattened pigs per farm would increase for 20% also the competitiveness would increase for 13 index points, but if the number of breeding pigs stays like in Germany, then the Croatian competitiveness in pig production would be higher for 21 index points (Table 3).
Conclusions
The Republic of Croatia, including its agriculture in the last thirty years, has experienced several significant changes. The most important changes were changes in the economic and political system, the collapse of a large manufacturing-market area, wartime suffering and EU accession. All that has had a significant impact on Croatian agriculture whereby studying "exposure" to EU market competition usually highlights the problem of the competitiveness of domestic agricultural production in aggregate and at the individual product level.

The international competitiveness of individual agricultural product measured by DRC method (Domestic Resource Cost) is affected by three main factors: the fixed labour and capital costs invested in the production, import or export product price and operating or variable production costs of the product in the destination country in which export or import the product from it. Therefore, there are present annual changes in the competitiveness of certain products and as a result we presented average period 2005-2012.

Pig production in Croatia from 2005 to 2010 was not competitive, mostly due to the low exchange rate of US dollar. Simulation of DRC calculation coefficient with increased number of fattened pigs for 20% by producer shows increased competitiveness for 13 index points, and if the number of fattened pigs was like in Germany then the competition has increased for 21 index points.

References
Optimization of dairy farm in function of rural development of South-eastern part of Serbia

Jandric Mersida¹, Rajic Zoran², Milovanovic Zoran³

Abstract
The production program is of strategic significance for managing business activity, survival and development of business-production systems. Among other things, management wants their expected (desirable) status to be optimal (operationally and in the long term). However, their wishes are always challenged by limitations that need to be taken into consideration when applying methods and technics of optimization.

This paper presents the results of optimization of dairy farm from South-West Serbia. The goal of the paper is to anticipate optimal production structure at dairy farm, using contemporary methods, which would put resources on hand at maximum usage, consequently achieving maximal business results. The significance of optimization of its production program is even bigger considering it is located in the area with mainly rural population.

To obtain the most objective information, the detailed financial-economic analysis of dairy farm’s business activity was carried out. In order to achieve that, it was necessary to gain insight into this farm’s internal possibilities and market presence (the farm deals in buying, processing and placing milk and dairy products). Accordingly, the methods of work that were used in the research were adjusted. Other than mathematical and statistical methods, some of humanistic methods were used in data processing, especially descriptive method, analytical method and deduction.

The optimal structure of product was determined by simplex method for linear programming. The linear programming is a mathematical methodology for modeling and solving the problem of finding the path to the best outcome. The initial simplex tableau and definition of the optimal structure of production process (including vectors of limitations and matrix for technical coefficients) were assembled on the base of previously determined information and assumptions. The connection between limitations and activities through technical coefficients was elaborated in initial simplex tableau, the mathematical expression of that connection was explained by system of non-linear equations – economic function. The problem that arose from such model was solved with Excel worksheet, i.e. its add-on - “Solver”.

After the “Solver” calculated the numbers, the generic report for the results of three models was programmed. The financial result after optimization suggests that the Model 1 is the most profitable one, while the results for Model 2 and 3 were almost the same.

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According to Rajić (2002), the optimal solution achieved by solving the problem of linear programming has quantitative character, while the post-optimal analysis gives the insight into its qualitative character. One way to establish the quality of optimal solution and justify the investment is the analysis of economical effectiveness for milk and dairy production using dynamic methods, which will be the subject of another paper.

**Key words:** milk, optimization, linear programming, models.

**Introduction**

The organizational problem is one of the largest obstacles in developing milk production. One of the basic determinants that show efficient and effective business activity in a company, regardless of its size, is appropriate organizational form aligned with conditions and the environment of a market.

Many problems we see in economy, especially those concerned with organisations’ business activity, usually contain a request for optimal use or allocation of funds that are available in limited amount. It would mean that the problem of production program has strategic role in business activity, survival and development of business-production systems.

The manager naturally strives to have optimal desired/wanted state, operatively and in the long run. However, desires are always challenged by limitations that need to be taken into account when applying optimisation methods and techniques. In business market conditions, the production program represents the resultant for optimal use of production potential, in accordance with realistic market restrictions. To achieve continuous function of production system, its production potential needs to be aligned with market needs, with regard to objective input-output relationships (Krstić et al, 2003:123).

By using linear programming, all practical problems that can be expressed mathematically by linear programming can be solved.

**Material and working methods**

This study used contemporary methods of optimisation for linear programming and for projecting optimal structure for dairy production that would put available resources into maximum usage, thus achieving maximal business result expressed by gross margin.

By analysing existing conditions of dairy’s business activity, the mathematical model for optimisation was defined. Also, simulated and optimization process were applied that would bring the production system closer to optimal, desired production state.

To define coefficients in the mathematical model, the following determinants were made: total amount of time that is needed for job turnaround at product level, production potential of available human resources in accordance with relation, market absorption capacity, production capacity for each line of production and assumed contractual obligations.

Using Microsoft Excel software, the modelling for dairy farm in south-western Serbia was done. The ultimate goal for optimization of structure of production items is reaching maximum net profit.

**Results and discussion**

The business model of this specific dairy farm is based on collecting and buying-out milk coming from a wider area, processing it, distributing and selling it to customers. The whole
production program comes to a few items: raw milk, yogurt, white cheese, butter, paprika in sour cream and kajmak (a type of cream typical for this area).

The general issue when it comes to problems with linear programming is maximisation or minimisation of goal function with limitations expressed as linear equations or inequalities as well as the added set of natural limitations which is that variable values cannot be negative.

**Defying limitations and optimal criteria**

The projection of production items’ structure was made by combining available production capacity, storage and demand for dairy products on the market, followed by the selection of production activity and limitations for this dairy farm.

The activity in its business model encompass six products: \( X_1 = \text{Yogurt (0,19 l)} \), \( X_2 = \text{Cave's Cheese (1 kg)} \), \( X_3 = \text{Pasteurised milk (1 l)} \), \( X_4 = \text{Yogurt (1 l)} \), \( X_5 = \text{Kajmak (1 kg)} \) and \( X_6 = \text{Raw milk (1 l)} \). The limitations for this model are conditions that need to be satisfied with optimal solution for the model. In this case the limitations include available capacity of special lines for milk and dairy products, market conditions, availability of raw material, working hours, etc.

Accordingly, when formulating limitations for choosing optimal structure of production activity, the demand for milk and dairy products was taken into account. That is why it was predicted that the optimal structure of activities should include following activities that would satisfy market needs:

- Maximum capacity of ramp for unloading the goods: \( X_1 \times 0,18 + X_2 \times 5 + X_3 \times 1,01 + X_4 \times 1,05 + X_5 \times 11,55 \leq 20,000 \)
- Total amount of collected milk: \( X_1 \times 0,19 + X_2 \times 5 + X_3 \times 1,01 + X_4 \times 1,05 + X_5 \times 11,55 + X_6 \leq 30,000 \)
- Maximum amount of produced yogurt: \( X_1 \leq 30,000 \)
- Maximum amount of cave's cheese: \( X_2 \leq 1,500 \)
- Maximum amount pasteurized milk: \( X_3 \leq 5,000 \)
- Maximum amount of yogurt (1 l): \( X_4 \leq 2,000 \)
- Maximum amount kajmak (1 kg): \( X_5 \leq 500 \)
- Available working hours (s): \( X_1 \times 0,78 + X_2 \times 27 + X_3 \times 3,84 + X_4 \times 3,96 + X_5 \times 47 + X_6 \times 1,3 \leq 100,000 \ s \)
- Minimum amount of yogurt in a cup: \( X_1 \geq 12,000 \)

The profit per production unit that would be used as a criterium for goal function was determined by calculating the costs.

Accordingly, the goal function that would lead to maximum profit looks like this:

\[
F_{\text{max}} = X_1 \times 2,68 + X_2 \times 62,16 + X_3 \times 4,85 + X_4 \times 9,50 + X_5 \times 123,23 + X_6 \times 2,42
\]

Maximum capacity of the ramp for delivering the goods is 20,000 l milk and the total amount of milk that can be collected is 30,000 l. This extra 10,000 l could be sold to strategic partner because the milk would go directly to designed place of exchange. Available working hours are considered as limiting factor (100,000 s). The quota for raw materials use for all products was established using the report from technologic department of the dairy farm.

The profit per unit of the product was calculated in compliance with all mentioned activities. It was based on the quota for raw materials use, time consumption, transportation costs, production costs and distribution costs, thus becoming a starting point for development of economic function.
The initial simplex tableau was arranged by determining the optimal structure of production activities with limiting vectors, matrix of technical coefficients and abovementioned data and premises. The connection between restrictions and activities using technical coefficients was established in initial simplex tableau. Mathematical expression of that connection was presented by system of nonlinear equation – economic function. This tableau template was custom made for data processing on computer.

### Table 1. Initial – Basic Model

<table>
<thead>
<tr>
<th></th>
<th>Profit per unit</th>
<th>Max capacity of unloading ramp</th>
<th>Max amount of available milk</th>
<th>Max amount of yogurt (cup)</th>
<th>Max amount of cave’s cheese</th>
<th>Max amount of pasteurized milk</th>
<th>Max amount of yogurt (litre)</th>
<th>Max amount of kajmak (kg)</th>
<th>Available working hours (s)</th>
<th>Min amount of yogurt (cup)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yogurt, cup 0.181</td>
<td>2.68</td>
<td>0.19</td>
<td>0.19</td>
<td>1.00</td>
<td>1.00</td>
<td>1,00</td>
<td>1.00</td>
<td>1.00</td>
<td>0.78</td>
<td>1.00</td>
</tr>
<tr>
<td>Cave’s cheese, 1 kg</td>
<td>62.16</td>
<td>5.00</td>
<td>1.01</td>
<td>0.90</td>
<td>1.05</td>
<td>11.55</td>
<td>11.55</td>
<td>1.00</td>
<td>27.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Pasteurized milk, 1 l</td>
<td>4.85</td>
<td>1.01</td>
<td>1.05</td>
<td>1.05</td>
<td>11.55</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>3.84</td>
<td>1.00</td>
</tr>
<tr>
<td>Yogurt, 1 l</td>
<td>9.50</td>
<td>1.05</td>
<td>1.05</td>
<td>1.05</td>
<td>11.55</td>
<td>1.00</td>
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<td>Kajmak, 1 kg</td>
<td>123.23</td>
<td>11.55</td>
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<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>47.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Raw milk, 1 l</td>
<td>2.42</td>
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<td>0.00</td>
<td>0.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
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<tr>
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</table>

The lack of initial model and thus lack of important information regarding manager can be mitigated by simulating different changes within the model along with analysing the consequences of those changes. After processing the initial model, three models emerged.
Every one of them has logical results which imply the model was properly set up and that optimisation was successfully achieved.

From the first model it is obvious that the pasteurized milk isn’t competitive because it needs to use limiting minimum (which was done with Model 2) to reach optimal solution. Therefore, pasteurized milk appears only in Model 2 where it reaches optimal solution and not in Model 1 and 3.

What can be clearly stated is that pasteurized milk has minimum profit margin and is part only of Model 2 when it is “pushed” to reach optimal solution. Kajmak is part of all three models with production of 500 kg in total. Optimal amount of yogurt (1 l) is in Model 1. Optimal amount of unloaded raw milk to strategic partner is 6,718 l.

Table 2. Model 1

<table>
<thead>
<tr>
<th>Product</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yogurt, cup 0.18 l</td>
<td>30,000</td>
<td>2,68</td>
<td>0,00</td>
</tr>
<tr>
<td>Cave’s cheese, 1 kg</td>
<td>1,500</td>
<td>62,16</td>
<td>4,85</td>
</tr>
<tr>
<td>Pasteurized milk, 1 l</td>
<td>0,00</td>
<td>9,50</td>
<td>2,42</td>
</tr>
<tr>
<td>Yogurt, 1 l</td>
<td>976</td>
<td>123,23</td>
<td>20,000</td>
</tr>
<tr>
<td>Kajmak, 1 kg</td>
<td>500</td>
<td>&lt;= 500</td>
<td></td>
</tr>
<tr>
<td>Raw milk, 1 l</td>
<td>6,718</td>
<td>&lt;= 30,000</td>
<td></td>
</tr>
<tr>
<td>Limitation usage</td>
<td>260,788</td>
<td>&lt;= 20,000</td>
<td></td>
</tr>
<tr>
<td>Sign</td>
<td>&lt;=</td>
<td>&lt;=</td>
<td></td>
</tr>
<tr>
<td>Limitation</td>
<td>20,000</td>
<td>30,000</td>
<td></td>
</tr>
<tr>
<td>Max capacity of unloading ramp</td>
<td>0,19</td>
<td>5,00</td>
<td>1,01</td>
</tr>
<tr>
<td>Max amount of available milk</td>
<td>0,19</td>
<td>5,00</td>
<td>1,01</td>
</tr>
<tr>
<td>Max amount of yogurt (cup)</td>
<td>1,00</td>
<td>30,000</td>
<td>&lt;= 30,000</td>
</tr>
<tr>
<td>Max amount of cave’s cheese</td>
<td>1,00</td>
<td>1,500</td>
<td>&lt;= 1,500</td>
</tr>
<tr>
<td>Max amount of pasteurized milk</td>
<td>1,00</td>
<td>0</td>
<td>&lt;= 5,000</td>
</tr>
<tr>
<td>Max amount of yogurt (litre)</td>
<td>1,00</td>
<td>976</td>
<td>&lt;= 2,000</td>
</tr>
<tr>
<td>Max amount of kajmak (kg)</td>
<td>1,00</td>
<td>500</td>
<td>&lt;= 500</td>
</tr>
<tr>
<td>Available working hours (s)</td>
<td>0,78</td>
<td>27,00</td>
<td>3,84</td>
</tr>
<tr>
<td>Min amount of yogurt (0.18 l)</td>
<td>1,00</td>
<td>30,000</td>
<td>&gt;= 12,000</td>
</tr>
</tbody>
</table>

The representation of products in first model is: yogurt in a cup = 30,000 units, cave’s cheese = 1,500 kg, pasteurized milk = 0 l, yogurt (1 l) = 976 units, kajmak = 500 kg and raw milk = 6,718 l. The realised profit with production structure in first model is 260,788, which is 2,173
more than what would be achieved financially with second model and 9.839 more than with third model.
The representation of products in second model is: yogurt in a cup = 30,000 units, cave’s cheese = 1,500 kg, pasteurized milk = 500 l, yogurt (1 l) = 495 units, kajmak = 500 kg and raw milk = 6,706 l. The realised profit with production structure in second model is 258,615 RSD, which is 2,173 RSD less than financial result in first model. This is also the lowest financial result between models 1 and 3.

**Table 3. Model 2**

<table>
<thead>
<tr>
<th>Yogurt, cup 0.19 l</th>
<th>Cave’s cheese, 1 kg</th>
<th>Pasteurized milk, 1 l</th>
<th>Yogurt, 1 l</th>
<th>Kajmak, 1 kg</th>
<th>Raw milk, 1 l</th>
<th>Limitation usage</th>
<th>Sign</th>
<th>Limitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>30,000</td>
<td>1,500</td>
<td>500</td>
<td>495</td>
<td>500</td>
<td>6,706</td>
<td>2,68</td>
<td>62,16</td>
<td>2,42</td>
</tr>
<tr>
<td>0.19</td>
<td>5.00</td>
<td>1.01</td>
<td>1.05</td>
<td>11.55</td>
<td>20,000</td>
<td>&lt;= 20,000</td>
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<td></td>
</tr>
<tr>
<td>Max capacity</td>
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<td></td>
<td>Max capacity</td>
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<tr>
<td>of unloading ramp</td>
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<td></td>
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<td>of unloading</td>
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<tr>
<td>0.19</td>
<td>5.00</td>
<td>1.01</td>
<td>1.05</td>
<td>11.55</td>
<td>26,706</td>
<td>&lt;= 30,000</td>
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<tr>
<td>Max amount of</td>
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<td></td>
<td></td>
<td></td>
<td>Max amount of</td>
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<tr>
<td>available milk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>cave’s cheese</td>
<td></td>
<td></td>
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<tr>
<td>1.00</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td>1,500</td>
<td>&lt;= 1,500</td>
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<tr>
<td>Max amount of</td>
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<td></td>
<td></td>
<td></td>
<td>Max amount of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>yogurt (cup)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>pasteurized</td>
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<td></td>
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<tr>
<td>1.00</td>
<td>1.00</td>
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<td></td>
<td>500</td>
<td>&lt;= 5,000</td>
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<tr>
<td>Max amount of</td>
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<td></td>
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<td></td>
<td>Max amount of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cave’s cheese</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>yogurt (litre)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.00</td>
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<td></td>
<td></td>
<td></td>
<td>495</td>
<td>&lt;= 2,000</td>
<td></td>
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<tr>
<td>Max amount of</td>
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<td></td>
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<td></td>
<td>Max amount of</td>
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<tr>
<td>kajmak (kg)</td>
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<td></td>
<td></td>
<td>kajmak (kg)</td>
<td></td>
<td></td>
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<tr>
<td>1.00</td>
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<td></td>
<td></td>
<td></td>
<td>500</td>
<td>&lt;= 500</td>
<td></td>
<td></td>
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<tr>
<td>Available</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>working hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.78</td>
<td>27.00</td>
<td>3.84</td>
<td>3.96</td>
<td>47.00</td>
<td>130</td>
<td>&lt;= 100,000</td>
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</tr>
<tr>
<td>Min amount of</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Min amount of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>yogurt (cup)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>yogurt (cup)</td>
<td></td>
<td></td>
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<tr>
<td>1.00</td>
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<td></td>
<td></td>
<td></td>
<td>30,000</td>
<td>&gt;= 12,000</td>
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<tr>
<td>Min amount of</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Min amount of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pasteurized milk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>pasteurized</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>500</td>
<td>&gt;= 500</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Third model presumes that total amount of 30,000 l of milk should be collected (this wouldn’t interfere with assumed contractual obligations to primary producers). This was used in optimal solution which can be seen in second limitation of third model (30,000) – in first model there was 26,718 l and in second model 27,706 l.
The representation of products in third model is: yogurt in a cup = 30,000 units, cave’s cheese = 1,162 kg, pasteurized milk = 0 l, yogurt (1 l) = 2,000 units, kajmak = 500 kg and raw milk =10,613 l.
Table 4. Model 3

<table>
<thead>
<tr>
<th></th>
<th>Yogurt, cup 0.19l</th>
<th>Cave’s cheese, 1 kg</th>
<th>Pasteurized milk, 1 l</th>
<th>Yogurt, 1 l</th>
<th>Kajmak, 1 kg</th>
<th>Raw milk, 1 l</th>
<th>Limitation usage</th>
<th>Sign</th>
<th>Limitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limitation usage</td>
<td>30.000</td>
<td>1.162</td>
<td>0.00</td>
<td>2.000</td>
<td>500</td>
<td>10.613</td>
<td>258.949</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max capacity of unloading ramp</td>
<td>2.68</td>
<td>62.16</td>
<td>4.85</td>
<td>9.50</td>
<td>123.23</td>
<td>2.42</td>
<td></td>
<td></td>
<td>&lt;= 20.000</td>
</tr>
<tr>
<td>Max amount of available milk</td>
<td>0.19</td>
<td>5.00</td>
<td>1.01</td>
<td>1.05</td>
<td>11.55</td>
<td>19.386</td>
<td></td>
<td>&lt;=</td>
<td>30.000</td>
</tr>
<tr>
<td>Max amount of yogurt (cup)</td>
<td>1.00</td>
<td></td>
<td></td>
<td>30.000</td>
<td></td>
<td>30.000</td>
<td></td>
<td>&lt;=</td>
<td>30.000</td>
</tr>
<tr>
<td>Max amount of cave’s cheese</td>
<td>1.00</td>
<td></td>
<td></td>
<td>1.162</td>
<td></td>
<td>1.500</td>
<td></td>
<td>&lt;=</td>
<td>1.500</td>
</tr>
<tr>
<td>Max amount of pasteurized milk</td>
<td>1.00</td>
<td></td>
<td></td>
<td>0</td>
<td></td>
<td>5.000</td>
<td></td>
<td>&lt;=</td>
<td>5.000</td>
</tr>
<tr>
<td>Max amount of yogurt (litre)</td>
<td></td>
<td>1.00</td>
<td></td>
<td>2.000</td>
<td></td>
<td>2.000</td>
<td></td>
<td>&lt;=</td>
<td>2.000</td>
</tr>
<tr>
<td>Max amount of kajmak (kg)</td>
<td></td>
<td></td>
<td></td>
<td>1.00</td>
<td>500</td>
<td>500</td>
<td></td>
<td>&lt;=</td>
<td>500</td>
</tr>
<tr>
<td>Available working hours (s)</td>
<td>0.78</td>
<td>27.00</td>
<td>3.84</td>
<td>3.96</td>
<td>47.00</td>
<td>1.30</td>
<td>100.000</td>
<td>&lt;=</td>
<td>100.000</td>
</tr>
<tr>
<td>Min amount of yogurt (cup)</td>
<td>1.00</td>
<td></td>
<td></td>
<td>30.000</td>
<td></td>
<td>12.000</td>
<td></td>
<td>&gt;=</td>
<td>12.000</td>
</tr>
</tbody>
</table>

The realised financial result with production structure based on third model is 258.949 which is less than what could be achieved financially by model 1.

Table 5. Results of optimisation based on models 1, 2 and 3

<table>
<thead>
<tr>
<th></th>
<th>MODEL_1</th>
<th>MODEL_2</th>
<th>MODEL_3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yogurt (cup 0.19l)</td>
<td>30.000</td>
<td>30.000</td>
<td>30.000</td>
</tr>
<tr>
<td>Cave’s cheese (1 kg)</td>
<td>1.500</td>
<td>1.500</td>
<td>1.162</td>
</tr>
<tr>
<td>Pasteurized milk (1 l)</td>
<td>0</td>
<td>500</td>
<td>0</td>
</tr>
<tr>
<td>Yogurt (1 l)</td>
<td>976</td>
<td>495</td>
<td>2.000</td>
</tr>
<tr>
<td>Kajmak (1 kg)</td>
<td>500</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>Raw milk (1 l)</td>
<td>6.718</td>
<td>6.706</td>
<td>1.0613</td>
</tr>
</tbody>
</table>

After Solver calculated the solution, the program was used to generate report about all three model’s results. The table 5 clearly shows that the product – yogurt in a cup – is part of all three models with maximum amount which is logical considering the gross margin for this product is the highest, i. e. it is the most profitable product.

Financial result after optimisation shows that the Model 1 is the most profitable one because it reaches result of 260.788, while the results for model 2 and 3 are relatively similar.
Table 6. Financial result for each model

<table>
<thead>
<tr>
<th>Overall financial result</th>
<th>Financial result (dinar)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODEL_1</td>
<td>260.788</td>
</tr>
<tr>
<td>MODEL_2</td>
<td>258.615</td>
</tr>
<tr>
<td>MODEL_3</td>
<td>258.949</td>
</tr>
</tbody>
</table>

The results from Table 6 are interpreted as follows:

- Maximum profit that is achievable with regards to limited available resources (production capacity, market demand, work force and raw material) is 260,788 RSD.
- To reach that profit following production is needed: 30,000 units of yogurt in cup, 1,500 kg cave’s cheese, 976 l of yogurt (1 l), 500 kg kajmak and 6,718 l of raw milk needs to be sold to strategic partner.
- The model doesn’t guarantee that this production will definitely reach the profit of 260,788 RSD (due to the unforeseen situations) but it guarantees that it is maximum profit that can be achieved given the conditioned available resources.

Conclusion

The goal function or criteria was set and limitations were identified. The results were established with help of Solver, the most optimal result was chosen and based on that solution the optimal structure of product in production was projected.

The results of the chosen optimal model – MODEL 1 are as follows:

- Maximum profit that is achievable with regards to limited available resources (production capacity, market demand, work force and raw material) is 260,788 RSD.
- To reach that profit following production is needed: 30,000 units of yogurt in cup, 1,500 kg cave’s cheese, 976 l of yogurt (1 l), 500 kg kajmak and 6,718 l of raw milk needs to be sold to strategic partner.
- The model doesn’t guarantee that this production will definitely reach the profit of 260,788 RSD (due to the unforeseen situations) but it guarantees that it is maximum profit that can be achieved given the conditioned available resources.

With optimisation of dairy production, the significantly higher financial results can be achieved. According to Rajić (2002), the optimal solution established by solving linear programming problem has quantitative character, while the post-optimal analysis helps gain insight in the quality of optimal solution.

The post-optimal analysis is very important source of qualitative information that manager has as a tool and can be significant contributor to improving quality of decision making. Using this methodology, the manager can have information about what will happen when some of the parameters within model change. Looking into results of analysing the sensitivity of some limitations, it is possible to get reliable information about future production orientation and the course of future investment.
One of the ways to determine the quality of optimal solution and justified investment is analysing the economic effectiveness of milk and dairy production using dynamic methods such as: method of net current value, method of internal interest rate, sensitivity analysis, method for critical point of rental, etc. what will be the subject of some future study.

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Application of the agricultural policy measures (APM) tool: Evidence from Macedonia

Kotevska Ana¹, Janeska Stamenkovska Ivana², Dimitrievski Dragi³

Abstract

The differences in the budgetary support of agriculture among countries, but also among years, hinder the process of evaluation of the harmonization with the Common Agricultural Policy (CAP). Agricultural Policy Measures (APM) tool enables uniform classification of the agriculture policy measures combining the pillar concept of the CAP and the OECD classification. This paper presents the application of the APM for the Macedonian agricultural policy for the period 2008-2014. The findings confirm the commitment for gradual harmonization with the CAP, but also identify the needs for further adjustments of the policy and the applicability of this database for conducting policy analysis and impact evaluation.

Key words: agricultural policy measures, Macedonia, policy analysis

Introduction

The agricultural policies in Western Balkan countries are under continuous reforms in the process of market liberalization and harmonization with the Common Agricultural Policy (CAP) of the European Union (EU). The reforms require continuous evaluation of this process, supplemented with an application of international standards in terms of level and type of support.

The versatility in number and type of agricultural policy measures among countries impede the process of impact evaluation, policy analysis and its comparison with other countries. Therefore, different methodologies for classification of the policy measures are developed. The most widely used are the methodology according the EU program support and the methodology developed by OECD.

Agricultural Policy Measures (APM) tool, developed by the Rednak and Volk (2010), combines both the pillar concept of the CAP and the OECD classification. The CAP concept allows

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³ Dragi Dimitrievski (PhD), Full Professor, Faculty of Agricultural Sciences and Food, University of „Ss Cyril & Methodius” in Skopje, Blvd. Aleksandar Makedonski bb, Skopje, Macedonia
evaluation of the level of policy harmonization, whereas the OECD classification allows estimation of the OECD indicators for measuring the level of budgetary support. This tool has already been successfully applied in the comparative study of the agricultural policies in the Western Balkan countries (Volk 2010; Volk, Erjavec and Mortensen 2014), describing the overall similarities and differences among them. The aim of this paper is to present the application of APM tool for classification and evaluation of the Macedonian agricultural policy, covering the agricultural policy measures and budgetary transfers for the period 2008-2014.

Following the introduction, the paper gives brief description of the tool, its application and the outputs. The main outputs and benefits are presented and illustrated as part of the results and discussion, whereas the conclusions are given at the end.

**Method and data**

The Agricultural Policy Measures (APM) tool enables building a database on the budgetary payments in the country per year of realization. The APM classification combines the EU classification by pillars and axis for the higher levels of aggregation, whereas the OECD criteria are used for the groups and subgroups at the lowest level of classification (Volk, Rednak and Erjavec, 2014). According to the APM classification, all agricultural measures are grouped into three main pillars: (1) market and direct producers measures; (2) structural and rural development measures; and (3) general measures to agriculture. Additional section ‘miscellaneous transfers to agriculture’ is added to those three pillars, but also a subgroup in each of them, to grasp the items for which there are not available information for classification (ibid). The groups and subgroups are based on information about the beneficiary, programmed continuity of the payment and the specificities in terms of commodity or services. For the second pillar, the structure is as the structure of the EU rural development policy 2007-2013. The classification up to the forth level of hierarchy is presented in Table 1.

The Macedonian APM database classifies the national agricultural policy measures according to this common (uniform) template, enabling comparative analysis of the agricultural policy with the other EU or EU candidate countries. In addition, due to the continuous changes of the Macedonian agricultural policy, it allows comparability of the national agricultural policy along the years. Since the very first systematic and structural changes for adjusting national agricultural policy towards CAP are established with the Law of agriculture and rural development in 2007, the Macedonian APM database covers the period since 2008.

Data used for building the APM database are obtained from the Agency for financial support of the agriculture and the rural development. Data are provided per year of realization of the payment for the programs for direct payments and rural development (2008-2014), aquaculture (2012-2014), organic production and tobacco production (2008). The national currency is converted in Euros to enable comparability among countries.
Table 1: APM classification of the budgetary support in agriculture

<table>
<thead>
<tr>
<th>PILLAR</th>
<th>Axe</th>
<th>Group (Sub-groups)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MARKET AND DIRECT PRODUCER SUPPORT MEASURES</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Market support measures</strong> (Export subsidies; Market intervention (intervention buying-in; private storage aid; food aid to third countries); Operational costs for public stockholding; Consumers support; Other and miscellaneous market support measures)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Direct producer support measures</strong></td>
<td></td>
<td></td>
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<tr>
<td>Direct payments and variable input subsidies (Direct payments to producers (based on output (price aids); based on current area/animal; based on fixed criteria (decoupled); Other); Variable input subsidies (for seeds and seedlings; for breeding animals; for fuel; fuel tax rebates; for fertilizer and pesticides; interests concessions for short run loans; insurance subsidies; other variable input subsidies; subsidies for on-farm services))</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disaster payments and other compensations to producers (based on output; based on area/animal; based on resource retirement; for input purchase; other)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Improving the competitiveness of the agricultural sector</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On farm restructuring support (On farm investment support (modernization of agricultural holdings; restructuring of permanent crops plantations; land improvement; irrigation; land consolidation; restoring agricultural production potential damaged by disasters); Other on farm restructuring support (setting up of young farmers; adapting to demanding standards; participating of farmers in food quality schemes; other on farm support))</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agri-food restructuring support (General support to agricultural sector (improving infrastructure related to agriculture; early retirement; other support to agriculture); Food processing support, marketing and promotion (investments in food processing; marketing and promotion; supporting producer groups; other support to agri-food industry))</td>
<td></td>
<td></td>
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<tr>
<td>Forestry support</td>
<td></td>
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<tr>
<td>Miscellaneous (competitiveness)</td>
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<tr>
<td><strong>Improving the environment and the countryside</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environment and landscape targeted payments to producers (Payments to farmers in LFA (based on output; based on area; based on animal numbers; other); Payments to farmers in protected areas (based on output; based on area/animal; other); Agri-environmental and animal welfare payments to farmers (based on output; based on area/animal; other; based on non commodity criteria; first afforestation of agricultural land))</td>
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</tr>
<tr>
<td>Environmental payments not directly linked to agriculture (environmental payments to forestry; other payments with environmental objectives)</td>
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</tr>
<tr>
<td><strong>Supporting rural economy and population</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support to rural population directly linked to farms (Support to on farm diversification into non-agricultural activities; Other on farm support to rural population)</td>
<td></td>
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<tr>
<td>General support to rural economy and population (Business creation and development; Rural infrastructure and village development (basic infrastructure and services for rural population; village renewal and development); Other measures to support rural areas)</td>
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<td></td>
</tr>
<tr>
<td>Building local capacity (LEADER)</td>
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<tr>
<td>Miscellaneous rural development measures</td>
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<tr>
<td><strong>GENERAL MEASURES RELATED TO AGRICULTURE</strong></td>
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<tr>
<td>Research, development, advisory and expert services (research and development projects; extension and advisory service; infrastructure related to vocational training; expert services)</td>
<td></td>
<td></td>
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<tr>
<td>Food safety and quality control (veterinary control; plant health control; quality control)</td>
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<tr>
<td><strong>Other general support measures</strong> (farmer’s and other non-governmental organizations support; information systems; technical assistance; other)</td>
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<tr>
<td>MISCELLANEOUS AGRICULTURAL POLICY MEASURES</td>
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</tr>
<tr>
<td>OTHER TRANSFERS (not to agriculture) (Social transfers to agricultural sector; Budgetary transfers to other sectors (forestry, fishery); Administrative and other costs (ministry; paying agency; inspectorate; veterinary and phyto-sanitary administration); Unspecified non agricultural budgetary transfers)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Adopted from Volk, Rednak and Erjavec (2014)
Results and discussion

Planning vs. realization. Planning is not always equal with the realization. The deviations from the planned budgetary support and paid transfers are due to many factors. Some of them come from the long procedures, so the payments occur in the next calendar year or, as in the case of the rural development program, in few successive years, depending on the scale of the investment or the type of measure. The number of protocols and approval criteria set by the paying agency, and the frequent amendments and adjustments on the regulation made by the Ministry, additionally complicate the process. Other crucial factors refer to the farmers’ experience, education, and skills to manage the administrative labyrinth to collect and prepare all necessary documentation. The APM current database presents the payments in the year of realization, as a function of all these factors. By producing data on injected funds per sectors into the economy, it allows an impact evaluation of specific measures. The APM database cannot be used to assess the utilization of the planned budget, but may serve as an illustration of the set priorities in supporting agriculture and the rural development.

Harmonization with the CAP. The EU integration process has brought positive changes in the legislation and the institutional capacities, with a systemic establishment of policy through set of laws, strategies, programs and long-term plans, with an increased budget for agriculture to achieve the goals set in line with the CAP objectives. APM output confirms the Macedonian commitment for adjustment of its agricultural policy towards the CAP, by showing the increased budget and harmonized structure of the applied agricultural policy, but also detects the needs for further adjustments of some policy measures.

The process of allocation of budgetary transfers in the APM tool reveals that in the first years of the implementation of the CAP-like agricultural policy some of the measures were included in the Program committed to an improper pillar. For instance, the establishment of new orchards and vineyards and support of the agro-food processing industry, which are investments in its nature, as well as additional payments related to agro-environmental and LFA conditions, have been supported through the Program for financial support of the agriculture. This has been overcome, thus increasing the level of harmonization of the Macedonian agricultural policy towards CAP.

Budgetary transfers to agriculture. The first obvious notice is the significantly increased available budget since 2008 (Figure 1). Although the total budget is increased, there is not considerable change in its general structure. Direct payments are the main instruments of the agricultural policy, whereas rural development measures and general support to agriculture take only smaller share of the agricultural budget. A small increase in the rural development budget occurs after 2010, although the increased budget for direct producer support compensates this increase and results with only a small shift in the budget structure.

Direct payments are distributed per unit of agricultural product and per area of agricultural land or head of livestock, conditioned with cross-compliance measures to ensure safe and healthy food production and environmental protection. During the last years, the share of direct payments per capacity is increased on behalf of the support per output (Figure 2). Main supported sectors per output are tobacco and milk, whereas cereals and grape as per area support and sheep and cattle production per head support (Figure 3). Input subsidies are almost negligible in size (with less than 1% of direct production support budget), and market measures have not been applied in the whole period.
**Figure 1.** Budgetary support to agriculture and rural areas (mil. EUR and %, 2008-2014)

**Figure 2.** Direct payments to producers (mil. EUR and %, 2008-2014)

**Figure 3.** Budgetary transfers to producers (Top 10 commodities in 2014, mil. EUR)
From the point of rural development, the increase of the competitiveness, either as on-farm investments or agro-food restructuring support, has been the major focus of the support (Figure 4). A significant increase in the support of basic infrastructure, services and village renewal is noted in the last year. The agro-environmental and the LFA support measures are less represented, accounting only 5% of the rural development budget.

Rural development is additionally supported by IPARD funds; however due to the unavailability of detailed input data, the current APM database includes only aggregate values for the measures 101 (under the heading ‘modernization of agricultural holdings’) and 103 (under the heading ‘investments in food processing’) for the years 2011 and 2012, without detailed allocation per commodity. Although the EU funds take only 1% of the total budget transferred to agriculture, detailed allocation of these funds will produce clearer picture of the support per commodity.

**Figure 4. Structural ad rural development measures (mil. EUR and %, 2008-2014)**

The budget related with the general support in agriculture is incomplete, since it does not include the budget of some administrative bodies of MAFWE (Phyto-sanitary body and laboratory, or Inspectorate for agriculture), the budget from other institutions (such as the Ministry of Environment and Physical Planning, the Bureau for Regional Development, as a body within the Ministry of Local Self-Government, Ministry of Economy, etc.), neither the budget for agricultural education. The database could be further improved with the budgets of the activities and projects financed by other national institutions or foreign donors.

The current APM database includes the budget for veterinary and food quality control that takes the largest share, and the budget for extension service that is less represented (Figure 5). This budget is stable but low during the whole period, not following the increase of the total agricultural budget. Beside the low budget for extension, previous study and report reveals the positive opinion farmers have on the role of the national extension agency in delivering information and helping them about the supporting programs and measures (Kotevska and Martinovska Stojceska, 2015; Pringle, Burlini, and Schiessl, 2014). Due to lack of information on the general support to agriculture, the fourth indication for improvement of the Macedonian agricultural policy is the need for a higher budget for extension.
The main aspects for improvement and adjustment of the Macedonian policy towards the CAP have been also identified in National Strategy for Agriculture and Rural Development 2014-2020 (MAFWE 2014). They refer to the increasing the rural development support, gradual ‘decoupling’ of the direct payments, increasing the agro-environmental measures, as presented previously, but also supporting young farmers and the establishment of cooperatives and vertical integration, introducing market boards and minimum quality standards, mitigating the impact of climate change, and improving waste management and energy efficiency. The adjustment of the national agricultural policy with the CAP would continue up to their full compliance and full EU membership, but the dynamics and scope of this process depends on progress in the accession process and the beginning of accession negotiations (ibid).

The use of APM tool. Besides the already presented outputs and benefits, APM enable estimation of the level of support in the countries by calculating PSE, CSE, TSE, and GSSE indicators, and calculation of input data for many econometric and mathematical models for policy analysis (for instance, AGMEMOD and IFM-CAP).

Such comprehensive quantitative description of the agricultural policy with exact allocation of the budget transfers per measures and commodities is needed for conducting impact analysis of particular measures or conducting sector analysis as a basis for designing development strategies. These analyses are important tools supporting the process of policy cycle, especially the phases of problem identification and policy evaluation. In addition, such detailed allocation of the budgetary transfers enables application of the principles of democracy, transparency and accountability in the agricultural policy and budgetary transfers.

Conclusions

The application of the APM tool for the Macedonian agriculture shows gradual harmonization towards CAP. It also points out some aspects that need to be further adjusted, as increasing the budget for rural development and its utilization. A special focus should be put on the measures for improving the rural economy and the environment protection, as well as on the share of the coupled measures. Not having a clear picture of the funds spent in agriculture confirms the lack of transparency among the institutions and the need for one umbrella institution to cover all aspects of the agriculture. So far, the outputs have been used to analyse the policy development along the years and to compare it with the other Western Balkan countries. The next step is the use of this database for more advanced policy and impact analyses.
References
Prerogatives and importance of derivative securities development for agribusiness sector in Serbia

Kovačević Vlado¹, Vasiljevic Zorica², Rajić Zoran³, Zakić Vladimir⁴,

Abstract
The aim of the paper is to determine the prerogatives and effects of developed derivative exchanges and OTC markets on agribusiness sector in Serbia.

Derivative securities are financial innovation that occurs in the last forty years in the financial and commodity markets. They were introduced primarily due to an increase in the general business risk rate.

Despite the possibility to establish derivative securities market based on the Law on capital market, this market is not yet established in Serbia. The study shows that the established derivative exchanges and OTC market will have beneficial and pronounced positive impact on the segment of risk management in the financial sector as well as in the commodity sector. The main prerogative for establishment of this kind of markets is establishment of clearing system.

Keywords: swaps, futures, options, business risk, hedging strategies.

Introduction
Derivative securities are financial innovation that occurs in the last forty years in the financial and commodity markets. They were introduced primarily due to an increase in the general business risk rate. The volume of trades with these securities surpassed the volume of many traditional financial instruments. Today derivative securities are considered the most successful and the estimates are that the volume of trade in the future will increase (Zakić and Vasiljevic, 2013).

In the basis of derivatives is another kind of assets: commodities, foreign exchange, interest rates, other securities, commodities, weather indicators, indices etc. Change in the price of the underlying asset will affect the price of derivative securities. Derivative securities are divided into financial and commodity. Financial derivatives are created on: currencies, interest rates, other securities, market indices etc. Commodity derivatives have underlying asset in metals, agricultural products, electricity, industrial raw materials, oil and natural gas, minerals, rubber, commodity indices etc. All derivatives securities are in EU classified as financial instruments and regulated in the same way.

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The essence of futures trade is a predictor of future price/value movements. On one hand, seller expects a decline in price/value, while buyer relies on the reliability of forecasts of rising prices.

Methodology
For the purpose of this paper, the desk research method and method of interview with relevant experts have been used. This research covers the 7 years’ period of time (between 2009 and 2015).

To provide objective results, the following methods were also used:
- method of descriptive statistics,
- comparative method and
- theoretical analyses.

Hedging strategies with commodity derivative contracts
Derivative securities can be divided according to the degree of standardization to:
1. Non-standardized
   - swap contracts and
   - option contracts traded on the OTC market.
2. Standardized derivative securities
   - futures contracts and
   - option contract traded on a regulated market.

OTC market is regulated to a lesser extent. Name of the OTC market derives from the abbreviation of words Over The Counter. This market is regulated to some extent by the rules of International Swaps and Derivative association (ISDA). The OTC market provides greater flexibility but also a higher risk of default for traders, so the knowledge of the creditworthiness of the opposite side is necessary (Taušer and Čajka, 2014).

The total value of contracts traded on the OTC market in December 2013 amounted to 710 billion US dollars.

Source: (Acworth, W., 2014)

Figure 1. Volume of trade on the organized market (at 84 exchanges), according to the number of contracts traded on the different types of assets in 2013
The Asian futures and options market based on Figure 2 had a positive trend and takes precedence in the trade over the United States.

In order to trade derivatives efficiently, a necessary precondition is the existence of clearing house. The task of clearing houses is to ensure the execution of the financial part of the transaction. Clearing houses act as a third counterparty in derivative securities trade by providing a guarantee for the execution of all derivative contracts. For this reason, buyers and sellers can enter into mutually valid contracts on the exchange only through clearing houses. For example, the trader gives the order to broker to buy or sell a particular derivative instrument. If the broker is not a member of the clearing house, it forwards the trading order to the member of the clearing house, at the same time depositing the indicated deposit on the margin accounts. The clearing house checks the credit worthiness and financial balance of traders and gives consent for the execution (Kovacevic V., 2002).

Clearing house is positioned as a seller of derivative contracts to a buyer, and takes position as a buyer to a seller, thanks to which direct knowledge of the buyer and the seller is not required, personally trust becomes institutionally.

Guaranteeing the execution of futures contracts is done through the obligation of traders to deposit a sum of money - margin as a deposit guaranteeing that the party is at a loss on the futures contract will not cancel the execution of the contract. In the futures buyer and seller of the contract have an obligation of deposit and maintain margins, while with option contracts only option seller deposits and maintain margin.

**Swap contracts** are agreements between two parties to exchange different cash flows on a certain date in the future. Swaps are traded on the OTC market. These contracts are not standardized and not traded secondary. It is usually that one of the parties on the swap contract is the bank. The advantage of swaps is absence of standardization and flexibility to the needs of participants in trading.

*Assumption is that agricultural company will sell its agricultural products at the same price at which the swap payment will be calculated, so the swap transactions after the actual sales of agricultural products remain a net amount of swap broker pays the agricultural company. In this way agricultural company provides a fixed price for its agricultural product in advance.*
After the global economic crisis in 2008 the global trend is the regulation of swap markets i.e. mandatory use of clearing houses thus achieving security in the execution of these contracts or some other contract guarantees. Another change in the regulators of swaps is the obligation of the reporting of swap trade to market regulator.

Swap contracts are usually prepared according to the methodology prescribed by the International Swaps and Derivatives Association (ISDA).

The types of swap contracts are the following:

- Equity swaps,
- Interest rate swaps,
- Interest rate swaps in different currencies,
- Swaps on credit risk,
- Exchange rate swaps,
- Inflation rate swaps,
- Commodity swaps.

Agricultural sector may use all kind of swaps for hedging strategies as any other sector. Commodity swaps are most common for agricultural sector giving the possibility of risk price management for agricultural products/inputs.

**Example for hedging strategies with swaps:** Agricultural enterprise enter in commodity swap contract in which agricultural enterprise from their broker receives a fixed amount of money per ton of agricultural product for the contracted quantity for a certain period of time, simultaneous agricultural company for the same amount of agricultural produce pays the market value at the contract maturity to the swap broker.

![Scheme 1](image)

**Scheme 1. Hedging strategies model with commodity swap**

*Assumption is that agricultural company will sell their agricultural products at the same price at which the swap payment will be calculated, so the swap transactions after the actual sales of agricultural products remain a net amount of swap broker pays the agricultural company. In this way agricultural company provides a fixed price for their agricultural produce in advance.*

**Future contracts** are highly standardized contracts on the purchase and sale of certain assets in the future. They have many similarities but also differences in relation to the forward contracts.

The most commonly traded futures are on:

- currency;
- shares;
- financial and other indices;
- commodity;
- weather conditions (rainfall, temperature forests, etc.).
Thanks to the high standardization, the futures contracts can be secondary traded as opposed to forwards and swaps. Another difference between futures and forwards is that the physical delivery of goods occurs in about 2% of cases in commodity futures and most contract ends in a cash transaction (Zakić and Kovacević, 2010).

**Example for hedging strategies with futures:** Agricultural company in April opens a short (future contract is sold) hedging position for November contract at a price of 325 dollars per ton, while in November after harvest closing position on the future at a price of 320 dollars per ton. At the same time in November it sales corn at the spot market for $ 300 per ton.

In this example the spot price fell more than futures, and this has caused a weakening of the basis, and the agricultural company achieved a worse result than anticipated. From Table 1 it can be seen that entering into transactions on the futures market gave overall positive result.

**Table 1. Short hedging positions (weakening of the basis)**

<table>
<thead>
<tr>
<th>Spot corn price</th>
<th>Futures corn price</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planned price: 325 $/ton</td>
<td>Opens short position on November contract (sales) for 325 $/ton</td>
<td>/</td>
</tr>
<tr>
<td>October – sales corn at spot market for 300 $/ton</td>
<td>Closes position on November contract (sales) for 320 $/ton</td>
<td>/</td>
</tr>
<tr>
<td>Results on the spot market: 325-300 $/ton = 25 $/ton less than the planned</td>
<td>The results in futures market: 325-320 $/ton = 0.5 $/ton profit</td>
<td>Basis change: -2 $/ton</td>
</tr>
</tbody>
</table>

The end result:
- planned price of 325 dollars $/ton
- selling price on the spot market 300 $/ton
- profit on futures market 5 $/ton

**Total realized price of 305 $/ton**

**Source:** Authors’ calculation

The essence of the short hedging strategies lies in the fact that if there is a fall in the price on the spot market as is the case in the above example, the planned price ($ 325 per ton) is protected by a gain on the futures contract and opposite gain on the spot market by increased price will be offset by loss on the future market. If basis is zero, planed price will always be achieved.

**Option contracts** can be defined as derivative securities, which carry a certain right. Relations between the parties shall be regulated by an option contract. Optional agreement in legal term is an incomplete contract, which gives an option contract buyer the right to buy or sell a particular type of asset at an agreed price, but that is not obligatory for the buyer. The reason for option seller obedience to the option buyer wishes is the option premium, which represents the option price (Kolb and Overdahl 2007).

**Example for hedging strategies with options:** Agricultural company engaged in livestock production expects increase of maize price and have dilemma of whether to buy corn in July and to store it until May when it will be needed. Another solution would be through the purchase of call options on corn attempting to obtain more favorable prices. For these reasons, the
producer buys a call option with maturity in May next year with a strike price of 300 $/ton, pays a premium 30 $/ton for the contract size of 100 tons. Depending on the prices of maize there are the following situation shown in the Table 2.

Table 2. Hedging strategies with purchase of call option

<table>
<thead>
<tr>
<th>Spot corn price $/ton</th>
<th>Option value $/ton</th>
<th>Profit/Los $/ton</th>
<th>Total Profit/Los $/ton</th>
</tr>
</thead>
<tbody>
<tr>
<td>272</td>
<td>0</td>
<td>-30</td>
<td>-3.000</td>
</tr>
<tr>
<td>296</td>
<td>0</td>
<td>-30</td>
<td>-3.000</td>
</tr>
<tr>
<td>300</td>
<td>0</td>
<td>-30</td>
<td>-3.000</td>
</tr>
<tr>
<td>305</td>
<td>5</td>
<td>-25</td>
<td>-2.500</td>
</tr>
<tr>
<td>330</td>
<td>30</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>348</td>
<td>48</td>
<td>18</td>
<td>1.800</td>
</tr>
</tbody>
</table>

Source: Authors’ calculation

From the Table 2 can be concluded that breaking point is the price of 330 $/ton. Furthermore, the earnings of the option buyer are growing in parallel with the growth of the corn price. However, the buyer of the option will activate option in the price range 300 to 330 $/ton to reduce the loss on premiums. Activating option at a price of corn under 300 $/ton has no sense because it would produce additional loss.

Prerequisites and importance of the development of commodity derivatives in Serbia

There is no active derivative market in Serbia, largely due to the lack of an appropriate legal framework.

The Law on Capital Market regulates issues related to the establishment of standardized derivatives, while spot trading in agricultural products is left to the Law on commodity exchanges, which is in the draft stage. Although the legal framework for trading derivative securities exists (the Law on capital market), this market has not been established in the practice. The main reason is not established clearing houses (there are two types of clearinghouses: in-the-clearing house or independent clearing house).

By the Law on Capital Market the Central Depository of Securities of the R. Serbia is only institution which can serve as a clearing house in Serbia (Kovačević, 2002).

According to EU regulations, there must be freedom in clearing houses licensing and house established in one Member State can operate in all member states without additional registration.

Non-EU country can apply for permission to operate national clearing houses in EU. The request shall be sent to the European Commission, which assesses whether the legal framework of the country of the applicant complies with the EU, while ESMA assesses the technical compatibility of the system with the EU. After receiving the approval of both institutions, EU investors have opportunity to invest through clearing houses in a third country, clearing houses after approval are given the option of operating in the EU.

Harmonization of the candidate countries with EU related to derivative markets is also the harmonization with world commodity and financial markets since the present globalization in the regulation of derivative markets.
Of the particular importance was the G-20 summit in St. Petersburg on 5 and 6 September 2008, at which there have been outlined directions for the development of commodity and financial organized markets in 20 developed countries that have adopted the following most important principles for the development of derivative trading (G-20 Leaders’ Declaration, 2008):

- Establishment of common criteria for the functioning of the exchange and OTC markets;
- Regulation of swaps market, through licensing swap dealers, trading registration and clearing obligations for swaps trading. Strict swap trading reporting requirements;
- Introduction of the general criteria common for regulatory authorities, as well as better coordination of cooperation between regulatory bodies.

The Republic of Serbia has an obligation within the EU accession process to harmonize its legislation in the field of derivatives with the EU.

In the EU came into force in 2012 a law known as the EMIR with similar provisions as the Dodd-Frank Act in the US. Basic provisions EMIR’s are: (1) mandatory clearing for most of trading instruments on OTC market, (2) the application of specific techniques of risk management for instruments that are not subject to clearing (3) reporting of trading, (4) specific requirements for the establishment and operation of clearing houses and trading platforms.

With the aim of establishing and developing the derivative’ OTC and exchange markets in Serbia it is necessary to implement the following activities:

- Establishment of the legal framework for independent clearing houses and in-the-house exchange clearing house. The current situation is that the Central Registry of Securities in addition to the role of central securities depository (which is the typical activity of Central registers) is the only institution that can carry out clearing and settlement of derivatives in Serbia, which is not the practice in the EU and other countries where the clearing is considered as a market service. There are few examples where clearing houses with majority state ownership perform clearing as a KELER in Hungary, but this house is licensed and controlled like any other clearing houses. Furthermore, according to the provisions of the EMIR regulation function clearing houses can perform only an independent legal entity.

- An introduction of the clearing houses’ licensing system and controlling system. It is necessary to specify procedures for the licensing of clearing houses where special barrier is EU requirements of a minimum capital of 7,500,000 euros. It is necessary to prescribe and control system for clearing houses, according to the EMIR regulation the obligation for licensing and controlling the clearing house is on one or more control authorities, but does not specify those bodies. In practice, almost all European countries are to control the operation of clearing houses by the commission for securities and the central banks with a clear division of authority.

- Harmonization of national legislation with EU in the part which defines the obligations of clearing the swap market or the obligation to provide guarantee for the performance of swap agreements for contracts that are not subject to the clearing and reporting obligations and control of the swap market.

- Adoption of the Law on commodity exchanges (regulates spot market) would have a positive impact on the development of derivatives, since the spot price can be used for determining the daily settlement prices of futures contracts on commodities. Unlike derivative securities, which are all under the regulations of MiFID regardless of whether the underlaying assets for derivatives are interest rates, currencies, commodities etc. are all classified as a financial instruments and regulated by common EU legislation, spot commodity markets are not regulated by common EU legislation and each Member State can regulate this area with
national legislation (in some EU countries the ministry of industry, agriculture, trade are in charge of spot market).

Derivative market has a positive impact on the overall economy because it largely eliminates the possibility of creating a monopoly position (especially in the case of commodity trading).

The positive effect of derivative developed derivative market on overall economy is throughout:

- direct influence and
- indirect influence.

Direct influence includes the positive effect that is manifested through the options:

- Possibility to manage business risk through the use of hedging strategies with derivatives;
- Opportunity to purchase inputs for production in the future and mitigating the risk of shortages of raw materials.

On the side of the indirect effect which futures markets have are the following:

- Public disclosure of prices and other information related to prices/rates in future is of importance for different business functions of economic entities. Industrial and agricultural complex uses market data to create the production plan through the price monitoring reports from previous years. Processors uses data on price movements in the preceding period for plan procurement of raw materials and the like.
- Developed derivative security market has a pronounced positive effect on the stability of asset prices traded in the underlying futures contract.
- Increase in the volume of banks loans. Exchange and OTC derivatives trade in this regard have impact in three ways: (1) the disclosure of the prices of products for the banks are significant in the case of utilization the agricultural commodity as collateral, allowing the determination of the value of the collateral, (2) in the case of using the goods as collateral, banks have the ability to hedge the price of agricultural commodity and thus insure themselves against adverse price movements and loss of value of collateral, allowing banks a higher assessment of the value of collateral and issuing larger loans.

All of the above positive effects depend on the degree of development of derivatives’ markets, and it is expected that developed markets attract more domestic and foreign participants and therefore have a pronounced positive effect on total economy, derivative market with a low commission, organized settlement and clearing systems, extrajudicial protection of participants, an efficient electronic trading platform and optimal derivative contracts in terms of size, quality standards in the case of trade with goods and the like.

In addition to the positive impact of trading derivative securities they may have a negative impact, which is primarily caused by manipulation on the futures market.

**Conclusion**

Developed derivative securities’ market has a positive effect by providing opportunities for agribusiness sector to manage business risk. In addition to the direct effect on the economy, the derivative market in Serbia would have the indirect effect on macroeconomic stability, especially by influencing: stable relationship between supply and demand, lower inflationary pressure, lower price fluctuations, favorable situation in the market etc.

In Serbia the financial and commodity derivatives market is not established in practice, besides the pronounced needs for this kind risk management instruments.

The basic requirement for derivative trading is development of the legal framework that regulates this area and its harmonization with the EU and global regulations. System of
licensing and controlling of the clearing house, which would allow the establishment of independent and in-the-house clearing houses is the priority. Furthermore one of the important preconditions for development of this market is harmonization of the OTC swap markets with EU regulation which would allow further development of this segment of the market, increasing security and transparency of trading.

Development of derivative market and the inclusion of this market in the global market would have an indirect positive effect on the increase in the volume of trading on the capital market and spot commodity market.

Serbian derivatives' market can serve as a regional market for business risk management of agribusiness sector in former Yugoslav republics, since the spot price of agricultural products within the region is highly correlated.

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The contribution of ICT sector in the national economy

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Abstract
The main objective of this study is to perform a detailed analysis of the contribution ICT sector has in the national economy, with the special focus to identify his potential in decent job creation that provide equal access and opportunities to all. A particular focus will be on employment and self-employment opportunities ICT sector offers for the young generation.

Data from different sources like INSTAT, World Bank and different studies are explored and analyzed to create an overview of the contribution of ICT sector in economy, its business structure, ICT sector labor market characteristics and its relation with VET system. Different reports conducted in Albania in this context was studied and analyzed.

Key informant interviews were conducted in December 2015. The data gathered from these interviews are analyzed to complete the picture. The target groups for interviews were ICT manufacturing companies, computers wholesale, computer peripheral equipment and software companies, ICT services companies and repair of computers, peripheral and communication equipment companies. Furthermore, companies in Financial and Insurance Activities Sector, Professional, scientific and technical Activities sector, and Education sector answered to the questionnaire.

Main finding of this study is that IT services have a long-term development potential. IT services subsector has growth potential in both domestic and foreign markets and offers long-term employment potential for young graduates. Intervention need to be done to reach this potential. It is needed ensure the availability of a skilled workforce.

Key words: ICT sector, labor market, VET system, employment, business structure.

Introduction
Evaluating the contribution of ICT sector is a challenging task. Mainly the official statistics from INSTAT are for the whole economic activity and are not detailed for subsectors. The subsectors of ICT manufacturing industries (6 classes: 6 subsectors with 4 digit classification) are part of manufacturing economic activity (which has in total 230 classes: 230 subsectors with 4 digit classification). The subsectors of ICT trade industries (2 classes: 2 subsectors with 4 digit classification) are part of wholesale and retail trade; repair of motor vehicles and motorcycles economic activity (which has in total 102 classes: 102 subsectors with 4 digit classification).

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The subsectors of ICT services industries are part of Information and Communication economic activity. The subsectors of ICT services industries are almost half of the subsectors (12 classes: 12 subsectors with 4 digit classification) on the Information and Communication economic activity (which has in total 25 classes: 25 subsectors with 4 digit classification). Subsectors of repairing the computers (2 classes: 2 subsectors with 4 digit classification) are part of Other Services activities (which has in total 15 classes: 15 subsectors with 4 digit classification). We will use official data when it is appropriate mainly for Information and Communication economic activity.

Methodology

Data from different sources like INSTAT, World Bank and different studies are explored and analyzed to create an overview of the contribution of ICT sector in economy, its business structure, ICT sector labor market characteristics and its relation with VET system.

Different reports conducted in Albania was studied and analyzed:

The most important outcomes of the report Building an Albanian Qualification Framework: Demand-Side Analysis and List of Occupations (Gishti & Shkreli, 2015) were

1. A draft national list of most demanded occupations.
2. An overview over occupations/ qualifications needed in each Albanian region.

The main purpose of the study Gender-Sensitive Research on ICT Sector in Albania (CBTL, 2015) was the analysis of ICT value chains, ICT sector performance and competitive position. The report “Sector selection report: Comparative assessment of the Information and Communications Technology (ICT) and Garment and Footwear (G&F) sectors in Albania” (Stefanillari et al, 2014) summarizes the findings of the process of re-assessment of ICT and G&F, their current economic trends, their growth potential and their youth employment potential.

The Skill Needs Analyses 2014 (ILO, 2014) objective was to identify the skills and employee profile shortages’ in the labor market, occupations for which current employees lack necessary skill or profile, occupations for which recruitment of new employees are found to be difficult, the nature of training needs by occupation, as well as the extent of proper relations between enterprises and the relevant state institutions.

The report “Gender Sensitivity Report on Skills Gap in the Agro-processing, ICT and Tourism Sectors in Albania” (IPSED, 2014) aim to identify in details what are most needed required professions; how companies fill these positions; the mismatch between what market needs and skill providers offer; the quality of their curricula and practical experience offered; internship programs and how are students benefit from them; etc.

The research “Baseline Survey of Public VET Providers in Albania” (GIZ/ETF, 2014) presents the findings of a baseline survey of all public VET providers. The baseline study was implemented between December 2013 and March 2014 across all the 12 regions of Albania. Key informant interviews were conducted in December 2015. The data gathered from these interviews are analyzed to complete the picture.

The target groups for interviews were ICT manufacturing companies, Wholesale of computers, computer peripheral equipment and software companies, ICT services companies and Repair of computers, peripheral and communication equipment companies.

Furthermore, companies in Financial and insurance Activities sector, Professional, scientific and technical Activities sector, and Education sector answered to the questionnaire.

Importance To The Economy

It is not possible from official data to estimate the contribution of ICT sector to GDP, the contribution of ICT sector to economic growth and sector growth & sustainability.
Secondary data analysis was conducted to have a clearer picture. According to (CBTL, 2015) the IT sector in Albania is small accounting less than 1 percent of the GDP. Its software development segment is quite insignificant. ICT is considered worldwide as a key factor for economic growth. The IT sector Albania even developing at good pace is still considered at early stages. Socio-economic impact of this sector is still weak in Albania. The usage of technology in ICT sector isn’t yet sufficient.

Information and Communication sector has experienced a big decrease in 2009 due to the global financial crisis 2008–09 which affect also Albania. The GDP of Information and Communication sector is decreasing since 2009 also due to the drop of communication and internet tariffs and as a result the revenues of electronic communications operators. According to (Stefanllari et al, 2014) which was referred to (Zitnik, 2012) until 2011, the Albania IT market increased 5.5% year per year reaching $190.43 million in U.S. dollar terms. Measured in local currency, the market grew 1.9% from the previous year. International Data Corporation (Zitnik, 2012) expected the IT market in Albania to expand by 2.5% in 2012 and to grow at a compound annual growth rate of 2.1% across a five-year forecast period. IT spending is expected to total $211.76 million in 2016. According to (CBTL, 2015), although there are no accurate statistics on the size of the sector and its subsectors, their rough estimations indicate that the entire software market in Albania does not surpass 20 million Euros a year. Exports are much more concentrated on top 10 exported products that represent 83% of total ICT exports. There are no ICT services exported. 92% of ICT exports are concentrated in 8 countries where Italy is the main destination for ICT products that Albania exports. In 2014 ICT exports to Italy increased with 4% comparing to 2013 (40% in 2014 of total exports of this category comparing to 36% in 2013).

**Business Structure & Characteristics**

It is difficult to explore the business structure and characteristics of the ICT sector due to the distribution of its subsectors as part of 4 sectors according to NACE rev.2 classification. Secondary data analysis is conducted to have more detailed information. 57% of IT companies are companies with 1-10 employees; 38% are companies with 11-50 employees; and 6% are companies with more than 50 employees. Companies with one or two owners dominate the market: 41% of all surveyed companies have a single owner and 31% of them 2 partners. More than 55% of the companies have hired from 2 to 9 employees since the start of their operation. A larger number of individuals provide services in the field of software development as well, operating as physical persons. Their activity is very small and their involvement is limited to small-scale projects or assignments. A number of IT firms operating mainly in the hardware sector, also offer software services in specific cases.

There are about 1800 registered companies, which include provision of IT services as one of the business purposes in the articles of incorporation. This number represents 1.9 percent of the total number of registered companies in the country (at about 101 thousand). However, it is estimated that only about 200 of the registered companies are actively involved in the field of IT at a significant level. Almost all of them are based in Tirana. Telecommunications subsector is comprised by 4 mobile operators (Telecom Albania, Eagle Mobile, Plus Communication, Vodafone Albania) offering mobile telephone and internet services, 96 fixed-line telecommunications operators (dominated by one single company, Albtelecom and 95 alternative operators (local or regional)), 167 Internet Service Providers (ISPs) providing double- and triple-play bandwidth-intensive services where each of them delivers voice, Internet, and cable TV, 119 providers that enable the transmission of audiovisual programs.
The structure of the IT market in Albania in 2011 is as following:

![Structure of the IT Market in Albania, 2011](image)

**Source:** Zitnik, 2012

**Figure 1. IT market in Albania**

Analyzing the information about the distribution in the sector of the businesses according to their ownership, it results that most of the foreign owned businesses operate in the wholesale and retail trade (27.2%), in information and communication (14.1%). Albanian own companies operating in information and communication are 1.7% and joint venture companies operating in information and communication are 3.4%. (ILO, 2014)

The average share of revenue by type of service in IT subsector as per 2012 is as following:

![Average share of revenue by type of service](image)

**Source:** AITA 2012

**Figure 2. Average share of revenue by type of service in IT subsector**

There is a lack of effective cooperation between stakeholders in the field, including business, academia, and public institutions and also IT infrastructure remains relatively weak in the country. Despite increased public and private investments during the past decade, Albania lags behind in the development of a modern and accessible IT infrastructure. In particular, the broadband infrastructure is still limited – the country does not have a broadband backbone and fiber-optic networks are limited to a few main cities. Such weak infrastructure and the limited broadband access, as well as the relatively high costs of access remain significant constraints for having broad access to IT/ICT. The short-term plans from the Government are to use ICT to i) modernize government services – e-services – for citizens and businesses, ii) introduce en masse ICT services in its education programs to overcome the digital gap in young people’s skills and iii) consolidate infrastructure in the whole territory of Albania, especially with the completion of broadband infrastructure.

The major constraint to business growth and upgrading in the field of IT and software development, in particular, is the weak domestic demand for IT services. Although there are no
accurate figures, there are many indicators that confirm that demand for IT services, including software solutions, is very low. Another constraint according to (CBTL, 2015) is that the IT sector faces shortage of specialized skills, both technical and management skills. However there is a different finding about this in (ILO, 2014). According to this study, it is very positive that the information and communication sectors which are specific and require relative higher professional and technical skills, are the sectors where very few businesses have declared to have staff lacking relevant skills to perform the assigned job. According to (ACIT, 2014) it appears that Albania has reached good records in terms of skills and affordability of the ICT sector.

ICT firms are not specialized in specific products or fields. With the exception of accounting software and enterprise solution companies there is little specialization elsewhere. Weak and undiversified demand is a major factor that undermines the incentives of firms to specialize in specific products or fields. Another factor is the fact that usually clients do not require and contract maintenance or As domestic market demand for IT services is still growing, in general companies do not specialize on certain services, but instead they have opted for a broad diversification of services. On average sales and distribution account for 36% of company turnover, followed by software development and maintenance at 14% and the IT solutions and consulting at 11%. Software development is a main service for 10% of the companies. All the companies answered to our questionnaire are Albanian owned companies. According to (ILO, 2014), the sectors which have the highest percentages of companies that plan to introduce new products and new technologies are those in the field of information and communication.

**Labor Market Characteristics**

ICT provides the youth with well-paid, attractive opportunities. ICT is a substantial employer in Albania. According to INSTAT the number of employees in Information and Communication sector is decreased in 2013.

![Figure 3. Employees index 2010=100](Source: INSTAT)

This is mainly due to the decrease of number of employees in telecommunication subsector of Information and Communication economic activity.
Even the number of employees in telecommunication subsector is decreasing whereas the number of employees in Information and Communication economic activity is increasing since fourth quarter of 2013.

There are some assumptions that a great number of the young people also work informally as employed or self-employed IT service providers working on jobs like repairs, software installation, computer formatting or web design. These assumptions are based on the fact that there are around 4,000 IT graduates entering the labor market each year. The absolute majority of employment inside the sector of Information and communication is concentrated in the businesses operating in the Central Region. These sectors are almost nonexistent in North and South region.

ICT companies have yet to benefit from any support schemes as most government initiatives have focused on basic IT skills and on the infrastructure – initially on internet expansion and now on the implementation of a nationwide broadband network. This means that conditions are there for future business development initiatives which can benefit from investments in infrastructure, low operation costs and a wide pool of skilled youth.

There is no official data for companies that employ specialists with ICT skills and the same for companies that employ Working Persons with Skills of an ICT specialist (broad mass) (MIAP, 2015)

IT services subsector has growth potential in both domestic and foreign markets and offers long-term employment potential for young graduates. However, the IT companies should find their specialization in the global markets and build up their offer to be able to compete not only on price. Telecommunication market does not offer high employment potential as the companies can use their current capacities. Instead, these large Telecom corporations will serve as anchor businesses needing mobile applications and support IT services as they increase mobile services to Albanian consumers. According to this study, hardware market it’s not foreseen to have any significant growth in the coming years.

According to interviewed people in their study (IPSED, 2014), the main positions for medium level technicians are required for web design, network maintenance technicians and help desks operators. And according to interviews, the above positions are mostly filled by technical secondary-school graduates or general-secondary school graduates that are passionate in computer science and information technology. While other positions, such as system engineer, web programming, database programming, application development, network manager, banking IT and Finance etc., are mostly filled by university graduates, followed up by an intense training financially covered ICT companies.

The ICT sector is gender balanced and it offers women good opportunities to advance in their career.

According to (IPSED, 2014) appears as if labor supply and labor demand is disconnected with intermediaries. Career offices at Universities (not such structure exist in VE Schools) give sporadic and not much orientation towards the labor market.
“Announcements in newspaper, Job portals, Company’s website etc.” is used as the method for recruitment in the 46% of “Information and communication” Companies and 44% of them used Acquaintances, relatives and friends as the method. Maybe the high percentage of using the channel Acquaintances, relatives and friends as a method to recruit new employees is the reason of experiencing some skill shortages in this economic sector. The other 10% used the method “Promoting other existing workers in the enterprise.”

“Information and communication” is one of the most staff training’ economic activity with 37.5% of their staff trained from September 2013 until September 2014. This might be related to the nature of the qualified jobs existing in the sector: jobs that require skills to be up to date with the technology which is in continuous development in this economic activity. According to table In (ILO, 2014): Top-20 Professions, grouped by ISCO code, sorted by the estimated number of firms, where specific training is mainly needed in the near future are ICT operations and user support technicians & Software and applications developers and analysts:

<table>
<thead>
<tr>
<th>Rank</th>
<th>ISCO 3 digit</th>
<th>Professions group</th>
<th>All firms</th>
<th>Micro &amp; Small</th>
<th>Medium &amp; Large</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>351</td>
<td>ICT operations and user support technicians</td>
<td>183</td>
<td>177</td>
<td>7</td>
</tr>
<tr>
<td>20</td>
<td>251</td>
<td>Software and applications developers and analysts</td>
<td>115</td>
<td>49</td>
<td>65</td>
</tr>
</tbody>
</table>

Source: ILO 2014

Maybe this need for specific training is due to the nature of ICT technologies which are continuously in development.

Many firms provide intensive in-house training for graduates, in some cases lasting six to twelve months, in order to enable them to undertake concrete tasks in the firm, which imposes additional costs. Maybe this is due to the specialization on certain ICT technologies these firms have. Results from interviews show that one of the most used training’ approach is on job training.

**Sector Vocational Skills Development Analyses**

Public VE schools with ICT profile exists in every region of Albania, but only two of these VE schools are only for ICT. Korca, Gjirokastra, Vlora, Shkodra, Elbasan, Berat, Lezha, Kukes and Diber have ICT VE Direction in Secondary Education but do not have ICT as Priority or potential economic sector. Vocational Training Centers that offers ICT courses are in Korca, Gjirokastra, Vlora, Fier, Durres, Shkodra, Elbasan and Tirana regions.

Contracting vocational schools or centers for trainings is very rarely considered by businesses. Mainly businesses do not have information in VET system. There are cases where businesses are participating in VET system by being part of VET provider supervisory body. Rarely businesses are involved in curricula design of a VET provider and involved also in dual learning jointly with VET providers. This the case with of the newly opened ICT school in Tirana “Hermann Gmeiner”.

According to (IPSED, 2014) the interviewed people in their study stated that the main positions for medium level technicians are required for web design, network maintenance technicians and help desks operators. And according to interviews, the above positions are mostly filled by technical secondary-school graduates or general-secondary school graduates that are passionate in computer science and information technology.
There are a lot of Information and Communication Technology (ICT) VSS, newly introduced in 2009 in 17 VSSs out of 44. There are 17 public VE schools the offer ICT profile. The performance of the newly opened ICT school “Hermann Gmeiner” could not be evaluated. The performance of VE ICT schools has been evaluated for other schools (16 in total). Only one of the VE schools offering ICT profile is high performer, 43.75% of them are medium performers, 37.5% of them are low performers and 12.5% are poor performers.

ICT teachers are lacking basic education (there are cases of ICT teachers graduated in English or nursery). Another problem VS offering ICT are facing is with the workshops and laboratories. There are labs in all ICT schools but in several cases outdated and not able to support the software for ICT programming classes. In more than 50% of schools, technical subjects of electronics are difficult to be run due to the missing workshops in VE schools. (Dibra, 2015)

Some practice modules which are part of the curricula are meant for specific industry sectors with particularly sophisticated technologies, products, production lines etc., which are non-existent in the VET providers’ region and thus it is impossible to deliver the practical training. This is the case in ICT curricula too.

Roughly one out of three students is being trained in ICT with the primary goal to follow university and not to enter the labor market. Another factor lowering the external effectiveness is the low percentage of ICT students’ employment after graduation. Almost 1 in 3 full time students of graduated in ICT VE schools is in “Unemployable” Profiles.

Different studies from Informatics department of FNS found that the level of knowledge gained by the students on the Information and communication technology course in the high school (professional or not) were significantly low compared with the program of this course. Different studies conducted to discover the reasons found that Informatics Teachers of secondary schools who give this subject have not graduated in computing or computing teacher subjects. To address this situation was suggested the creation of a master for teachers in ICT. Currently in collaboration with the center of excellence of the FNS Informatics Department is working to establish a platform that provides continuous training for high school teachers.

The provision of “supply-driven” VET programs does not adequately prepare learners for today’s Albanian and European labor market. To address this, the private sector has to be brought closer to the planning and delivery of VET programmes, as part of the process of making VET delivery demand-driven and more responsive to change and progress. To date, involvement of employers and industry in VET is rather limited and their influence on the training of young Albanians is therefore modest.

With regard to the work readiness and employability of graduates, results from the assessment clearly demonstrate that the current VET system does not equip VET graduates with the necessary skills to enter the labor market. Roughly one out of three students attends VET programmes for which no adequate occupational activity (ICT is one of them) is available in the Albanian labor market. Additionally, the over-emphasis on Matura-driven academic VET does not enhance the employability and work readiness of VET graduates. It rather paves the way to higher education. VET works as an easy entrance track into university education for at least 50% of VET graduates – and is perceived as such by the society.

The number of students enrolled in ICT profile is approximately 12% of VE students. ICT profile is becoming one of the most attractive profile in VE. Only 6.3% of the students are enrolled in the high performance school, 55.1% of them are enrolled in medium performers’ schools, 35.3% of them are enrolled in low performers’ schools and 3.3% of them are enrolled in poor performers’ schools.

The current enrolment of girls/women into VE is limited. The number of girls in ICT profile is almost 17% of all students in ICT VE, a high percentage compare to the percentage of girls in
other VE profiles. The situation at VTCs with regard to gender bias looks slightly better. There, the share of male trainees is 61%, while the share of female trainees is 39%. Regarding access of people with disabilities, 50% of the VTCs reported to have special procedures for their admission. In the past, this included the exemption from paying tuition fees. Selected VTCs also stated that they cooperate with associations and/or develop specific programmes for this target group. In contrast, VSSs seem to be less open for handicapped students (10% of VSSs with special procedures for disabled persons).

![Figure 5. Enrolled students in VE ICT profile by gender and academic year](image)

Disability and poverty are closely interrelated, with disability accentuating poverty and poverty increasing the likelihood of disability. Currently more needs to be done to break this cycle by integrating persons with disabilities into VET mainstream, thereby opening up pathways to decent employment and quality of life. Foremost the VET teachers/instructors need to be sensitized, the teaching, training and learning materials need to become gender-balanced and cultural gender stereotyping should be proactively addressed. (GIZ/ETF, 2014)

A fundamental change is needed to break away from the stereotype position of girls in VET in particular. To this effect an integrated communication strategy has to be developed to reach out to parents and (future) learners. Such communication will inform female learners about the availability of flexible short and foremost relevant VET programmes and persuade them to opt for VET. As career choices are highly influenced by parents, special sensitization campaigns for parents/guardians should be included. The VET providers will have to review their offer with regard to gender and actively promote VET for girls and women. Furthermore VET providers need to ensure adequate dormitories with sanitary facilities for girls and women. Almost all of the ICT companies answered the questionnaire reported that don’t have VET graduates in their companies and don’t plan to hire from VET system for new vacations opened in their companies.

**Conclusions and recommendations**

In the light of global demand for IT services, maturing domestic market demand and a large local workforce supply, IT services have a long-term development potential. IT services subsector has growth potential in both domestic and foreign markets and offers long-term employment potential for young graduates. However, the IT companies should find their specialization in the global markets and build up their offer to be able to compete not only on price. With regards to the banking sector, ICT is not seen as particularly risky sectors and is seen with interest as a sector carrying a diversity of firms and potential for growth. Economic development experts perceive ICT as a sector that still has to be structured and underline the need for studies and research to identify the best growth strategies. There is a clear lack of ICT-specific studies and sectorial economic analyses. Nonetheless, it is likely that interventions in this sector will create jobs that are not only decent but also attractive to youth. Many experts seem to agree that ICT is indeed a medium to long – term goal for Albania,
Growth of ICT sectors depends on the development of links to new international clients, the capacity of firms to develop new products and the availability of a skilled workforce. In some cases graduates need six to twelve months to be ready to undertake concrete tasks in firm. Maybe this is due to the specialization on certain ICT technologies these firms have. A long internship (one year for example) during ICT studies maybe will reduce the time graduates need to be ready to work. During internship they will gain the skills in special ICT technologies the ICT firms are specialized and as result will need less time to be ready to work after they graduates.

One of the intervention options is to ensure the availability of a skilled workforce. The intervention could be made in some directions:

- Curricula development of VET ICT programmes and participation of ICT companies in development of the curricula or by being part of VET provider supervisory body.
- Lifelong Training of the VET ICT teachers.
- Dual forms of vocational education and training.
- Allow VET teachers to work part time in the ICT sector in order to be closer to the most updated ICT technology.

ICT teachers are lacking basic education (there are cases of ICT teachers graduated in English or nursery). It is recommended to oblige current teachers to gain ICT basic skills buy attending bachelor or master programs in ICT and to motivate ICT graduates to work as ICT teachers. Department of Informatics of Faculty of Natural Sciences, Tirana University can cooperate with VET in Lifelong training of teachers of VET. The Department collaborates with the center of excellence, an inter-departmental center that is already a licensed center and gives its contribution in building packages in support of continuing education for teachers. Currently, all teachers have the opportunity to attend Albanian language program offered by the center and take advantage of credits necessary for their professional development.

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Determinants of rural development support use in Macedonia, Serbia, and Bosnia and Herzegovina

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Abstract
The aim of this paper is to identify the internal and external factors that form the farmers’ intentions in relation to the use of the rural development support and explain their behaviour, in order to design an appropriate assistance plan to increase the effectiveness and efficiency of the rural development policy. The analysis is based on the theory of planned behaviour and multivariate statistics applied on data gathered in a survey of about 900 farmers that took place in November-December 2014 in Macedonia, Serbia and Bosnia and Herzegovina. The findings confirm that farmers’ intentions are influenced by the past behaviour (application), their attitudes towards the use of rural development support and the possibilities for co-financing. The social norms are mostly important in Serbia, followed by Bosnia and Herzegovina. Other socioeconomic factors, such as education, market orientation, farm size and the share of household’s income from agriculture, have different impact among the countries.

Key words: rural development support, Macedonia, Serbia and Bosnia and Herzegovina

Introduction
In the process of EU integration and policy harmonization, Macedonia, Serbia, and Bosnia and Herzegovina need to adopt a new conceptual and administrative model of agricultural policy. A particular challenge for the policy makers and the beneficiaries is the rural development (RD) policy, which requires adjusted rules and procedures (for instance, co-financing, compliance with minimum legal standards, preparing business plans) in which neither of the countries has enough experience.

The progress that these countries have made in adjusting their agricultural policy to the Common Agricultural Policy (CAP) of the EU is visible, but still insufficient. In recent years, the countries have adopted (Macedonia and Serbia) or are in the process of adopting (Bosnia and Herzegovina) a long-term strategic and programming documents and setting their objectives and priorities for agriculture and rural development. Yet, the broader social objectives, such as food safety standards, environmental issues, and social problems of rural areas (e.g., poverty rates, depopulation, gender and youth issues, and marginalised rural areas)

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are relatively low positioned. Furthermore, the structure of the total budgetary support to
agriculture is mainly unfavourable for the rural development, because market and direct
producer support measures prevails and the total budgetary expenditures are considerably lower
than in EU countries (see Figure 1). The total amount of funds dedicated to rural development
support (RDS) is low and unstable, and it varies from below EUR 10 per hectare of UAA in
Serbia to about EUR 25 per hectare in Macedonia (Bogdanov et al., 2015). This instability in
terms of availability and budgetary transfers reflects the low priority that national governments
give to rural problems.

![Figure 1. Budgetary expenditure for agri-food sector and rural areas, by pillars, 2012 (million EUR and %)](source)

The low level of support for rural development is just one of the problems farmers face. A large
number of farmers are not familiar with the measures and mechanisms of support for rural
development, and a significant number cannot meet the administrative requirements (for
example, the necessary evidence proving property rights, and the collateral requirement).
Having this in mind, the aim of this paper is to identify the internal and external factors that
form the farmers’ intentions in relation to the use of the RDS and explain their behaviour, in
order to facilitate future assistance plan designs to increase the effectiveness and efficiency of
the rural development policy.

Social psychology provides suitable conceptual frameworks and methodological tools to
understand farmer behaviour and to design interventions for supporting a behavioural change.
According to the theory of planned behaviour (TPB) (Ajzen 1985, 1991, 2012), the individual
intention to perform a given behaviour determines the performance, whereas the individual
intention is influenced by the direction and intensity of the attitude towards the behaviour, the
subjective norm, and the degree of the perceived behavioural control. Although TPB is not a
theory of behaviour change (Ajzen, 1991), according to a meta-analysis of Webb and Sheeran
(2006), it is among the most frequently used theories for changing behavioural intentions.
Positive attitudes towards the behaviour, strong approvals by the respected others, and high
confidence in the perceived behavioural control ultimately result in stronger intentions to
engage in certain behaviours. Once an intention is formed, the second stage is to close the
intention-behaviour gap by helping individuals to overcome obstacles to perform the behaviour.

This paper is based and extended from the research conducted in the framework of the regional
project titled as “The impact of socio-economic structure of rural population on success of rural
development policy” (Kotevska and Martinovska Stojcheska, 2015). Following the
introduction, the materials and methods are presented, then the results and discussion and the
concluding remarks in the end.
Material and methods

A survey took place in November-December 2014 with face-to-face interviews in Macedonia, Serbia and Bosnia and Herzegovina, gathering 895 filled questionnaires out of which 884 were included in the analysis. The questionnaire was designed to obtain measures of the TPB constructs. Eliciting accessible beliefs was done first by using open-ended questions to agricultural experts, supplemented with modal accessible beliefs from the literature review, which were additionally simplified after testing the questionnaire with farmers. The statements are assessed in most cases on a 5-point scale, or a Likert-scale given in semantic differentiate format, ranging from 1 as worst evaluation to 5 as best evaluation.

Multivariate statistics are used to analyze the sample and farmer’s intention to apply for RDS. Principal component analysis (PCA) is used to identify the latent underlying structure among the statements regarding the RDS. The difference between countries is determined with non-parametric tests (Kruskal-Wallis test and Mann-Whitney test). The correlation between intentions and the statements expressing attitudes, norms, and controls, as well as the past behaviour and the socio-economic characteristics is calculated using Spearman’s and Pearson’s correlation.

In our study, we delimit the analysis to explaining the behavioral intention to apply for RDS, because of the time constraint in conducting the research, but also because there was no information on the next RDS calls in the three countries. Anyway, we do not find this as a shortcoming, since strong intention to engage in certain behavior is generally a strong indicator of its ultimate performance (Sheeran, 2002).

Results and discussion

Intentions to apply for RDS

Most of the surveyed farmers intend to apply and use RDS for their own household in the short-term (one of the next calls), and in the mid-term (next 3–5 years) (see Table 1). Macedonian farmers have equally strong intentions to apply for RDS both in short-term and mid-term perspectives (mean 3.4 and 3.5, respectively). Serbian farmers have stronger intentions to apply in immediate calls (mean 3.8 compared to 3.3, respectively), while farmers in Bosnia and Herzegovina have stronger intentions to apply in mid-term (mean 3.6) rather than in a short-term prospect (mean 3.2).

Given the current RD policy, farmers cannot individually initiate and participate in RD projects of common interest. Therefore, their willingness to contribute in that sense is measured at a mid-term prospect (3–5 years). The farmer’s intention to participate in such projects is accentuated in Serbia and Bosnia and Herzegovina (mean 3.4 in both cases), but not relevant in the case of Macedonia (mean 3.0).

<table>
<thead>
<tr>
<th></th>
<th>MK</th>
<th>RS</th>
<th>BA</th>
<th>Correlation with PA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intends to apply for RDS</td>
<td>3.4</td>
<td>3.8</td>
<td>3.3</td>
<td>.424** .264** .316**</td>
</tr>
<tr>
<td>Intends to apply for RDS</td>
<td>3.5</td>
<td>3.3</td>
<td>3.6</td>
<td>.353** .226** .185**</td>
</tr>
<tr>
<td>Intends to participate in</td>
<td>3.0</td>
<td>3.4</td>
<td>3.4</td>
<td>.087 .156** .010</td>
</tr>
</tbody>
</table>

*Note: Dependent variable PA (past application): “In the last 3 years farmer have applied for the RDS” (1=Yes; 0=No); Statements scale (1=Very weak; 2=Weak; 3=Neutral; 4=Strong; 5=Very strong).

**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).

Farmers’ intentions are influenced by the past behaviour (application) (Table 1). There is a strong and highly significant relationship between the intentions to use RDS for own benefit,
in all three countries, especially pronounced at immediate calls application (from 0.264 in Serbia to 0.424 in Macedonia), hence implying the positive effect of previous experience upon the disposition for participation in RD programs. The relationship between the intentions to declaratively participate in common RD projects is expectedly not significant in the case of Macedonia and Bosnia and Herzegovina (since there is no direct experience with such project), and significant but with low intensity in the case of Serbia (with a coefficient of 0.156).

**Factors influencing farmers’ intentions to apply for RDS**

The PCA provided the underlying structure of the farmers’ opinions regarding RDS and yielded into four components in Serbia and Bosnia and Herzegovina and five components in Macedonia. The total variance explained is 71.15% in Macedonia, 65.42% in Serbia, and 70.31% in Bosnia and Herzegovina. The internal consistency of the components is examined using Cronbach’s Alpha. The alpha values indicate reliable grouping into single constructs (all over 0.7), except for perceived behavioural control in Serbia (0.6). The factors were grouped into three logical sets, in line with the applied TPB conceptual framework: farmers’ attitudes, subjective norms, and perceived behavioural control (see Table 2). There are significant differences on the RD opinion statements among the countries (p<0.05), as proven by the Kruskal-Wallis test. The Mann-Whitney test confirmed that the Macedonian sample statistically differs from the other two country samples for most statements. This can be explained by the fact that Macedonia has a specific RD policy with EU harmonized institutional organisation (programming and implementation structure). The farmers’ attitudes towards RDS are more comparable in Serbia and Bosnia and Herzegovina, with some statistically significant differences in the subjective norms and perceived behavioural controls.

**Attitudes towards RDS**

The general attitude towards RDS is positive. This overall encouraging stance is additionally confirmed as over 90% of farmers included in the survey in all countries declare that it is good to have RDS (assessment ranging from 4.2 to 4.5, respectively). Farmers from all three countries positively assess the use of RDS to develop farms and villages, showing greater enthusiasm when it comes to improving their own farms. This finding should be used when planning RD measures for common projects to be preceded with awareness campaigns and complementary training programs.

The majority of farmers identify the significant role of RDS to the survival of family farms and to improve the income of the farm (mean 4.0 in MK, 3.9 in BA, and 3.6 in RS). The benefits of RD policy in terms of stronger development of rural areas (protection of environment, closer networking, improvement of infrastructure, implementation of EU standards and development of rural tourism) are more emphasized by farmers from Serbia and Bosnia and Herzegovina (the assessment ranging from 3.6 to 3.8, as comparatively in the interval 3.1 to 3.4 in MK). In the past years, there have been a number of programs in Serbia that promoted the importance of rural tourism for the development of the rural areas. This might be the reason why farmers recognize the significance of this specific aspect. The co-financing requirement in RD projects is evaluated as a good motivator (with means ranging from 3.5 in RS and BA to 3.7 in MK).

**Correlations between attitudes and behavioural intention.** The intention to apply, as a composite score, correlates positively and with significantly at 0.01 level to almost all statements reflecting the attitudes towards the use of RDS. These relationships are almost equally strong through all the attitudinal statements in Serbia. In Bosnia and Herzegovina, the influence of attitudes on the intention is positive, but weaker in intensity. The relationship between attitudes of personal benefits (such as survival of small family farms, and increased
farm income), and the intentions to use RDP for their own farms, is more accentuated among the Macedonian sample.

**Subjective norms towards RDS**
Farmers especially value the approval of their immediate family (answers ranging from 4.0 in RS to 4.3 in BA). Farmers also acknowledge the opinion of others from their environment, namely people they respect. The influence of other people to pursue them to apply for RDS is rather neutral.

An interesting aspect is whether the farmer decides independently to apply for RDS. In Serbia and Bosnia and Herzegovina, it is mostly the farm manager that makes independent decisions on whether to apply for RDS (mean 4.1 and 4.4, respectively). The respondents in Macedonia usually make such decisions in consultation with the family and with other people they respect (mean 3.1). Farmers in all three countries assess that people they respect provide greater support for the use of RDS for personal benefit, rather than for public benefit. This shows that in rural areas, social norms have an impact on decision-making, and therefore can have an effect on RD policy success.

**Correlations between subjective norms and behavioural intention.** The impact of social norms on intentions to use RDS is most evident in Serbia (with moderate to weak correlation), followed by Bosnia and Herzegovina. In Macedonia, the intention is mostly affected by the family support.

**Perceived behavioural control towards RDS**
The personal ability of the farmer (perceived control over information, knowledge and experience to independently prepare the RD application and ability to finance RD investments) is generally assessed as an obstacle. The access and cost of the RDS application (i.e., information, procedure, and documents) are perceived as an additional external barrier. Applications in Macedonia are evaluated as accessible and relatively affordable (mean 3.2), which in practice are supported by the extension services and free of charge. In Serbia and Bosnia and Herzegovina these statements were evaluated less favourably (means from 2.5 in BA to 2.9 in RS). Regarding personal abilities, the Macedonian farmers are the least self-confident (mean 2.1), whereas Bosnian and Serbian are more neutral (means from 2.8 in RS to 3.1 in BA). Macedonian farmers have less own means to co-finance such investments (mean 2.6 compared to 2.9 in RS and 3.1 in BA), but slightly better access to finances (3.2 compared to 3.1 in BA and 3.0 in RS). These findings clearly indicate that the application process must be made simpler and that access to information and credits should be further improved.

**Correlations between perceived controls and behavioural intention.** The perception of the farmer, whether he has enough information and knowledge to independently prepare an application, is not in significant relation with the intentions in Macedonia and Serbia (mainly due to the mid-term intentions), but is significantly encouraging the intentions in Bosnia and Herzegovina. Otherwise, the intention is in positive correlation with the possibilities for co-financing in all three countries. In Macedonia and Bosnia and Herzegovina, the intention is significantly affected by the costs and preparation of documents, as well as by the possibilities for getting the necessary information.
Table 2. Attitudes, subjective norms, and perceived behavioural control towards RDS and correlation with the intention to apply for RDS

<table>
<thead>
<tr>
<th>Attitudes</th>
<th>Mean score</th>
<th>Correlation with BI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MK</td>
<td>RS</td>
</tr>
<tr>
<td>RDS leads to improvement of the infrastructure in rural areas.</td>
<td>3.4</td>
<td>3.7</td>
</tr>
<tr>
<td>RDS leads to protection of environment and biodiversity.</td>
<td>3.3</td>
<td>3.7</td>
</tr>
<tr>
<td>RDS leads to higher implementation of EU standards.</td>
<td>3.3</td>
<td>3.7</td>
</tr>
<tr>
<td>RDS leads to higher networking of rural population.</td>
<td>3.4</td>
<td>3.6</td>
</tr>
<tr>
<td>RDS leads to stronger development of rural tourism.</td>
<td>3.1</td>
<td>3.8</td>
</tr>
<tr>
<td>RDS supports the survival of small family farms.</td>
<td>4.0</td>
<td>3.6</td>
</tr>
<tr>
<td>RDS increases the income of the farms and rural households.</td>
<td>4.0</td>
<td>3.6</td>
</tr>
<tr>
<td>The co-financing principle is good motivator for farmers.</td>
<td>3.7</td>
<td>3.5</td>
</tr>
<tr>
<td>In general, it is good that the state has a RD.</td>
<td>4.5</td>
<td>4.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subjective norms</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The decision whether to apply for RDP is totally up to me.</td>
<td>3.1</td>
<td>4.1</td>
<td>4.4</td>
<td>.160**</td>
<td>.328**</td>
<td>.337**</td>
</tr>
<tr>
<td>My family approves the application for the RDP.</td>
<td>4.1</td>
<td>4.0</td>
<td>4.3</td>
<td>.532**</td>
<td>.509**</td>
<td>.377**</td>
</tr>
<tr>
<td>Other people I respect approve the application for the RDP.</td>
<td>3.6</td>
<td>3.7</td>
<td>3.8</td>
<td>.190**</td>
<td>.548**</td>
<td>.290**</td>
</tr>
<tr>
<td>Many people I know pursues me to apply for the RDP call.</td>
<td>3.2</td>
<td>2.7</td>
<td>3.1</td>
<td>.086</td>
<td>.253**</td>
<td>.267**</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Perceived behavioural control</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I have enough information to independently apply.</td>
<td>2.2</td>
<td>2.8</td>
<td>3.1</td>
<td>.106</td>
<td>.005</td>
<td>.410**</td>
</tr>
<tr>
<td>My knowledge and experience is enough to independently prepare the application (procedure and documents).</td>
<td>2.1</td>
<td>2.9</td>
<td>3.1</td>
<td>.080</td>
<td>.071</td>
<td>.387**</td>
</tr>
<tr>
<td>I have enough own means to co-finance an RDP investment.</td>
<td>2.6</td>
<td>2.9</td>
<td>3.1</td>
<td>.301**</td>
<td>.173**</td>
<td>.344**</td>
</tr>
<tr>
<td>I am able to get bank credit to co-finance the investment.</td>
<td>3.2</td>
<td>3.1</td>
<td>3.0</td>
<td>.331**</td>
<td>.250**</td>
<td>.375**</td>
</tr>
<tr>
<td>I can easily get credit.</td>
<td>3.5</td>
<td>2.6</td>
<td>2.7</td>
<td>.310**</td>
<td>.129**</td>
<td>.352**</td>
</tr>
<tr>
<td>The RDS application (procedure and documents) is easy.</td>
<td>3.2</td>
<td>2.6</td>
<td>2.5</td>
<td>.343**</td>
<td>.045**</td>
<td>.244**</td>
</tr>
<tr>
<td>The preparation of the RDS application is not expensive.</td>
<td>3.2</td>
<td>2.9</td>
<td>2.6</td>
<td>.259**</td>
<td>.074**</td>
<td>.173**</td>
</tr>
<tr>
<td>The information regarding the RD program is easy to get.</td>
<td>3.3</td>
<td>2.9</td>
<td>2.8</td>
<td>.261**</td>
<td>.086</td>
<td>.315**</td>
</tr>
</tbody>
</table>

Note: Dependent variable BI (behavioural intention) as a composite mean score of “I intend to apply for RDS in one of the next calls”; “I intend to apply for individual RDS (next 3-5 yrs)” and “I intend to participate in joint RD project (next 3-5 yrs)”; Statements scale (1=Strongly disagree; 2=Disagree; 3=Neutral; 4= Agree; 5=Strongly agree).

**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).

The relationship between socioeconomic characteristics and previous RDS experience

The relationship between the socio-economic status and the past application for RDS is analysed, in order to recognize the different interaction of factors influencing the RDS utilization. The analysis shows a significant correlation between some variables. Education is an important factor that influenced Macedonian and Serbian farmers’ decision to apply for rural development grants, meaning that farmers with higher education levels have more intensively applied for RDS. In addition, in Serbia, the farmers who applied for the RDS are those that sell a higher share of their farm production on the market, who have higher share of the household income generated from farming activities. In Bosnia and Herzegovina, the farmers’ decision to apply for RDS in the past was influenced by several factors: the primary occupation of the head of the household, the size of the household, the level of farm commercialization, and the proportion of household’s income from agricultural activities.
In all three countries, farmers who are more likely to stay in agriculture have already mostly applied for RDS which shows their entrepreneurial orientation and commitment. It suggests that the farmers see perspective in agriculture and that they are ready to take steps in this direction, including investments. In Macedonia, all analysed factors linked to the farm perspective and perceived profitability positively and significantly relate to the farmers’ decisions. In Serbia, in addition to the likelihood to stay farming in the near future, other factors of importance are farm profitability and the plan to invest on the farm, whereas Bosnian farms that identified a successor have somewhat more intensively applied for RDS.

Conclusions

In this paper, we attempted to explain the importance and correlation of certain factors that shape farmers’ motivation to apply for RDS. The farmers in all countries generally intend to apply and use RDS, but farmers with positive attitudes in terms of personal and public RD policy benefits are more inclined to participate in RDS schemes. Subjective norms, especially manifested through the support of the immediate family, are particularly important when it comes to the willingness to use the funds. The perceived controls are also stimulating in terms of enhanced use, especially those related to co-financing and access to information. Generally, the factors that are related with farmer and household characteristics seem to be less pronounced; education, farm profitability, likelihood to continue farming, and the willingness to invest positively correlate with the past application for RDS in Macedonia and Serbia. In Bosnia and Herzegovina, the characteristics that are linked to past applications are the likelihood to continue farming, household size, primary education of farm holder, and household income from farming.

All these findings confirm the importance and the need of RDS for farmers. What is even more important is the recognition of their readiness to use these funds once the obstacles are mitigated. This should encourage further development of the agricultural and rural development policy and informative campaigns. These results are important to reference future policy developments in defining targets and more efficient information campaigns as critical success factors of any RDS.

### Table 3. Farmers’ socio-economic characteristics and correlation with past application

<table>
<thead>
<tr>
<th></th>
<th>Mean score</th>
<th>Correlation with PA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MK</td>
<td>RS</td>
</tr>
<tr>
<td>Education A)</td>
<td>10.1</td>
<td>10.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of household members</td>
<td>4.9</td>
<td>5.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary occupation (agricultural in %) B)</td>
<td>98.3</td>
<td>76.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural production sold on market (%)</td>
<td>96.4</td>
<td>59.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household income from farming (%)</td>
<td>90.2</td>
<td>58.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Likelihood to farm in the next 3-5 years C)</td>
<td>4.6</td>
<td>4.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plan to invest on the farm in the next 3-5 years C)</td>
<td>3.5</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identified successor of the farm C)</td>
<td>2.9</td>
<td>3.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farm profitability in the last 3 years D)</td>
<td>3.3</td>
<td>3.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dependency on subsidies to break-even E)</td>
<td>2.0</td>
<td>2.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Dependent variable PA (past application): “In the last 3 years farmer have applied for the RDS” (1=Yes; 0=No); A: 1=Primary school (4 years); 2=Primary school (8 years); 3=High school (3-4 years); 4=College (2 years); 5=University (4 years); B: 1=Agriculture; 2=Other; C: 1=Definitely not; 2=Unlikely; 3=Not sure; 4=Very likely; 5=Definitely yes; D: 1=Very unprofitable; 2=Moderately unprofitable; 3=Break-even; 4=Moderately profitable; 5=Very profitable; E: 1=Not dependant; 2=Slightly dependant; 3=Very dependant.

C, D, E non-parametric correlation, all other Pearson correlation.

**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).**
Acknowledgement

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References

Carp production profitability: A comparative analysis in Macedonia and Serbia

Martinovska Stojcheska Aleksandra1, Janeska Stamenkovska Ivana1, Markovic Todor2, Kokot Zeljko2

Abstract
Macedonia and Serbia are countries with long tradition in freshwater carp production. In this comparative study, the aim is to assess the carp fish production economics, with particular focus on profitability. The findings revealed that carp production is profitable in both cases, though with better returns in the Macedonian case with the rate of profitability being 17.18%, in comparison to 18.71% at the Serbian farm. The full cost of production per kg is €2.56 and €2.25 in Macedonia and Serbia, respectively. The current profitability levels are highly sensitive to market price fluctuations, and there is considerable room for yield improvement and costs reductions.

Key words: carp production, profitability, Macedonia, Serbia

Introduction
Carp culture is the most widely practiced fish production system in Central and Eastern Europe (Woynarovich et al., 2010). More concretely, in Macedonia and Serbia, fish culture is mainly practiced in cold waters on trout farms and in warm waters on carp farms, with rainbow trout (*Oncorhynchus mykiss*) and common carp (*Cyprinus carpio*) being the dominant species (Spirkovski, 2007; Z. Marković and Poleksić, 2008).

The role of fish as source of protein for human nutrition is indisputable. Despite that, the consumption of fish in Macedonia and Serbia is very low, i.e. only 4.6 and 5 kg per capita on annual basis, respectively (Milijašević et al., 2012; SSORM, 2016). Other types of animal meat are more present in the regular diet patterns in both countries (pork, poultry and beef). This situation can be attributed to eating habits, low purchasing power of the population, relatively high price and limited and inadequate offer on the market (Kokot et al., 2015; Kostov, 2014).

The development of any type of economic activity, including fish culture, needs to be supported with relevant economic analysis. Depending on the needs and scope, such analysis can be carried out from different perspectives and with varying precision. In this study, our aim is to investigate the profitability of carp culture production on Macedonian and Serbian carp enterprises. We use farm level data and derive relevant comparative production and economic

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2 Todor Marković, PhD, Assistant Professor (todor@polj.uns.ac.rs), Željko Kokot, MSc, PhD student, (zeljko.kokot5@gmail.com), University of Novi Sad, Faculty of Agriculture, Trg Dositeja Obradovića 8, Novi Sad, Serbia
indices. Although there is a long tradition of warm-water fish ponds culture in both countries, as well as a large number of proven experts in practice, there is not enough research on the economics of fisheries in Serbia (Čanak, 2012) and this situation is even more pronounced in Macedonia, where no specific fish economics research has been conducted so far. This paper aims to fill part of this gap and to contribute to the freshwater fisheries economics literature in these two countries.

Material and methods
The general trends in fish culture with focus on carp production are based on available data from Macedonian and Serbian state statistical offices (SSORM, 2016; SSORS, 2016), FAO database (FAO, 2016), as well as some national reports (Kostov, 2014; MAFWE, 2014; Čanak, 2015).

This research additionally uses primary data collected from two case farms, in Macedonia (cage system, with 30 cages totalling 750 m² or 3,750 m³) and in Serbia (pond system, with 215 ha of production area). A basis for calculation of the carp production enterprise performance is the analytical enterprise budget. An emphasis is put on the proper identification, measurement and allocation of costs as essential in determining the profit of a specific enterprise. For this purpose, the costs are allocated based on the relationship with the specific production line (enterprise) and therefore are further classified into direct costs and indirect costs.

In order to ensure comparability in measuring the carp enterprise performance between the two case farms, our analysis focuses on per unit derived indices, coefficients and ratios (Milanov and Martinovska Stojcheska, 2002; T. Marković et al., 2014): gross and net profitability rate (as share of gross and net profit in the total income); income-to-cost ratio (total value of production as potential income in direct i.e. total costs); cost of production per kg of output (direct and total costs per quantity produced); as well as labour productivity ratio in value terms (total production value and net profit per labour costs). The feed conversion ratio is also an important indicator of the efficiency of feeding referring to the quantity of feed necessary to produce one kilogram of fish.

Lastly, a sensitivity analysis is performed examining the change in profitability and costs of production on hypothetical shifts in yield, market price and costs. Potential increases or decreases on yield are set at a range from 1,000 to 2,500 kg per cage or hectare in the Macedonian and Serbian case, respectively. The market price and costs sensitivities are tested with 10 to 20 percent assumed variation.

Results and discussion
Fish and carp systems and production in Macedonia and Serbia
Different production systems are used worldwide for carp production; the major ones include semi-intensive and intensive ponds, as well as pens and cages in open waters (Weimin, 2004). Leopold (1981) summarizes extensive literature dealing with the definitions of intensity, suggesting that with regard to the economic and production levels, carp production can be in extensive systems (associated with relatively low input costs and generally low fish production and benefits) and intensive systems (with relatively high costs of applied means and measures, and generally high yields of fish production and high economic effects). He suggests that the best available criteria of fish production intensity could be based upon the cost of input calculated per unit of production output or per unit of production area, with emphasis of the structure of cost in terms of materials, labour, energy and land requirements. Carp fish culture practices can also be identified as related to the level of management and feed sources (Rahman
et al., 1992): (i) extensive production (solely natural feed sources, low cost, low output); (ii) semi-intensive production (manure based, supplementary feeding is limited, moderate production cost an output); (iii) intensive production (pellet feed, high stocking density, high cost and high output).

Most of the carp production both in Serbia and Macedonia is characterized as semi-intensive. More concretely, in Macedonia carp production is carried out in classical and cage systems (Kostov, 2015). The classical warm-water system is present in larger water areas, and functions without major costs and relatively low yields (900 to 1,500 kg ha\(^{-1}\)). The most intensive type of carp production in the country is in cages; the cages are set in some of the larger artificial lakes – accumulations and most of these are located in Lake Tikveš. In Serbia, two main intensity levels of carp production are identified (Čanak et al., 2015): (i) lower level, or classical semi-intensive production, where supplementary cereals, fertilization and liming are used; and (ii) higher level, or partly intensive production that was introduced since 2004, where instead of cereals, concentrated or pelleted feed is the main source of nutrition. The typical yield in the higher semi-intensive production system ranges from 1,500 to 2,000 kg ha\(^{-1}\).

Macedonia is characterised with installed capacities for fish production of around 3,000 tons of fish; 1,756 tons of trout and 1,320 tons of carp and other fish (MAFWE, 2014). However, the analysis of the total Macedonian fish production reveals that about 50% of the installed capacities for fish production are not fully utilised. During the period 2005-2014, both Macedonian and Serbian fish productions show an increasing trend (Table 1). When compared with Serbia, Macedonia with maximum catch of 1,664 tons in 2010 is quite behind; during the last decade the Serbian average fish production is about 6,500 tonnes of fish.

<table>
<thead>
<tr>
<th>Year</th>
<th>Trout</th>
<th>Carp</th>
<th>Other fish</th>
<th>Total MK</th>
<th>Trout</th>
<th>Carp</th>
<th>Other fish</th>
<th>Total RS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>472</td>
<td>335</td>
<td>61</td>
<td>868</td>
<td>544</td>
<td>3,259</td>
<td>391</td>
<td>4,194</td>
</tr>
<tr>
<td>2006</td>
<td>378</td>
<td>167</td>
<td>268</td>
<td>813</td>
<td>539</td>
<td>3,911</td>
<td>402</td>
<td>4,852</td>
</tr>
<tr>
<td>2007</td>
<td>758</td>
<td>206</td>
<td>145</td>
<td>1,109</td>
<td>579</td>
<td>4,859</td>
<td>1037</td>
<td>6,475</td>
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<td>2008</td>
<td>910</td>
<td>247</td>
<td>174</td>
<td>1,331</td>
<td>929</td>
<td>5,165</td>
<td>977</td>
<td>7,071</td>
</tr>
<tr>
<td>2009</td>
<td>1,147</td>
<td>340</td>
<td>171</td>
<td>1,658</td>
<td>880</td>
<td>5,428</td>
<td>1005</td>
<td>7,313</td>
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<tr>
<td>2010</td>
<td>1,238</td>
<td>197</td>
<td>229</td>
<td>1,664</td>
<td>873</td>
<td>6,156</td>
<td>137</td>
<td>7,166</td>
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<td>2011</td>
<td>1,114</td>
<td>202</td>
<td>207</td>
<td>1,523</td>
<td>796</td>
<td>6,071</td>
<td>597</td>
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<td>2012</td>
<td>1,080</td>
<td>194</td>
<td>187</td>
<td>1,461</td>
<td>808</td>
<td>5,959</td>
<td>746</td>
<td>7,513</td>
</tr>
<tr>
<td>2013</td>
<td>1,080</td>
<td>194</td>
<td>187</td>
<td>1,461</td>
<td>856</td>
<td>4,435</td>
<td>555</td>
<td>5,846</td>
</tr>
<tr>
<td>2014</td>
<td>1,068</td>
<td>193</td>
<td>235</td>
<td>1,496</td>
<td>736</td>
<td>5,525</td>
<td>677</td>
<td>6,938</td>
</tr>
<tr>
<td>Average</td>
<td>925</td>
<td>228</td>
<td>186</td>
<td>1,338</td>
<td>754</td>
<td>5,077</td>
<td>652</td>
<td>6,483</td>
</tr>
</tbody>
</table>

Trout production dominates with 67% of the total fish production in Macedonia (Figure 1). In Serbia, carp production captures 78% of the total fish production (Figure 2).

The area under carp ponds has significantly increased in Serbia during the last decade. The carp production was organized on a total area of 8,724 ha in 2014, which is almost doubled compared to the utilized area for carp production in 2005 (4,374 ha). The average area under carp fish ponds in Serbia is 8,079 ha (Table 2). On the other side, during the analysed period the total area for fish production in Macedonia in the official statistics remains unchanged i.e. registered as being on 1,000 ha, including ponds, reed beds and fish ponds for all fish species.
Carp production in Serbia is more stable compared with the Macedonian carp production, with a coefficient of variation of around 19%, and an average yield of 0.75 t ha⁻¹. The negative change rate per unit utilized area (-1.82%) indicates that there is still need for improvement of the production technologies in Serbia. The carp production in Macedonia shows higher fluctuations (with a coefficient of variation of around 27%), reaching its maximum value of 340 tons in 2009. The average yield for carp produced in Macedonian fish ponds is 0.23 t ha⁻¹.

Although fish production quantities have increased in Macedonia, domestic supply covers only around 16% of the total fish consumption in 2014 (SSO, 2016), thus making Macedonia to be a net importer of fish, including carp. During the period 2007-2014, there are evident fluctuations in the imported quantities of carp, with a coefficient of variation of around 83%. Highest quantity of 60 tones are imported in 2007, while in 2014 only 4.5 tones of carp are imported, with an average import price for the analysed period of around 2 Euros kg⁻¹. On the other side, the import of other fish is relatively stable, in an average amount of 4,161 tones for the analysed period (Table 3).

The fish production in Serbia covers less than 30% of the domestic demand for fish, so therefore more than 70% is imported. However, fish import in Serbia is characterized by a negative growth rate, -17.52% of carp, and -12.55% for other types of fish, respectively.

Both countries are characterised with relatively low level of export of fish (Table 3). Most of the Macedonian export comprise export of other fish; carp has been exported only in 2010 (1.1 tons) and in 2013 (0.17 tons). The export of other fish concerns domestically produced trout, from which only around 1.35 tons are annually exported. In Serbia the total export is more significant with about 126 tones per year, with carp accounting for the major part of the export quantities. An encouraging fact for Serbia is that carp export indicates growth rate of 15.56% per year, while the export of other types of fish shows a modest growth of 1.20%.
Table 3. Import and export of fish in Macedonia (2007-2014) and Serbia (2005-2014)

<table>
<thead>
<tr>
<th></th>
<th>Import</th>
<th></th>
<th></th>
<th>Export</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average</td>
<td>CV (%)</td>
<td>Min</td>
<td>Max</td>
<td>Average</td>
<td>CV (%)</td>
</tr>
<tr>
<td><strong>Macedonia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carp (t)</td>
<td>24</td>
<td>83.33</td>
<td>5</td>
<td>61</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Other fish (t)</td>
<td>4,161*</td>
<td>6.93</td>
<td>3,745</td>
<td>4,551</td>
<td>1.35</td>
<td>33.43</td>
</tr>
<tr>
<td><strong>Serbia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carp (t)</td>
<td>628</td>
<td>66.00</td>
<td>168</td>
<td>1,517</td>
<td>90</td>
<td>67.16</td>
</tr>
<tr>
<td>Other fish (t)</td>
<td>392</td>
<td>54.98</td>
<td>62</td>
<td>697</td>
<td>36</td>
<td>44.07</td>
</tr>
</tbody>
</table>

Note: *Fresh, chilled and frozen fish. - Carp exports originating from Macedonia are negligible.

Comparative profitability analysis of carp production

In intensive culture systems such as cages, carp is usually bred as monoculture or dominant species. The analytical budget of carp enterprise in Macedonia is based on a farm that practices cage monoculture (Table 4). The budget is calculated on one cage basis (surface of 5mx5m i.e. 25 m², with a depth of 5 m), and the results are also presented per hectare basis and in percentages.

The production value, given the yield of 1,500 kg per cage and the market price of €3.09 kg⁻¹, is estimated at €4,635 ha⁻¹. There are factual possibilities to increase the volume of production up to 2,500 kg per cage, which will result in increased value of production, as it is later projected in the sensitivity analysis (Table 7).

The costs per cage amount to €3,838, confirming the high intensity of this production. The cage carp is fed exclusively by pelleted or extruded feed which represents the highest cost item and takes up almost two-thirds of the total costs structure. The farmer uses 2 kg of feed to produce 1 kg of carp, which leaves room for improvement. The producer breeds own fry and that is reflected in the low cost attributed to that segment (only €309 per cage, or 8% of the costs), which in other conditions could be rather significant. Packaging is insignificant direct cost. In terms of other costs, labour is actually in its minimal range, with only 10% share in the total cost, as the producer uses approximately a ratio of €0.24 per kg of output, and €0.16 per kg of output is attributable to transport. Other direct costs, such as veterinary services, are minor. Indirect costs are mainly derived from the depreciation of fixed assets (cages and nets). The producer pays concession fee in order to use the accumulation, but this amount is rather symbolic around €150 annually for all cages, or €4.88 per cage. The calculation of the interest on working capital is based on the assumption, in both Macedonian and Serbian carp budget, that one fourth of the variable investment is financed from borrowed sources of financing.

The cage production is profitable, leaving a €796 net result per cage. In addition to that, fish producers are entitled to use subsidy support, which in 2015 amounted to €0.16 kg⁻¹ (OG, 2013), meaning potentially extra €244 per cage, which is substantial and stimulating amount.
Table 4. Analytical budget calculation of carp production, Macedonia (case capacity 25 m²)

1. Production value

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Price (€)</th>
<th>Total (€)</th>
<th>Total (€ ha⁻¹)</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carp fish (kg)</td>
<td>1,500</td>
<td>3.09</td>
<td>4,635</td>
<td>1,853,921</td>
</tr>
<tr>
<td>Production value</td>
<td>4,635</td>
<td>1,853,921</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>

2. Direct costs

<table>
<thead>
<tr>
<th>Material costs</th>
<th>Quantity</th>
<th>Price (€)</th>
<th>Total (€)</th>
<th>Total (€ ha⁻¹)</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish fry (fingerlings, kg)</td>
<td>58</td>
<td>5.37</td>
<td>309</td>
<td>123,432</td>
<td>8%</td>
</tr>
<tr>
<td>Pellet feed (kg)</td>
<td>3,000</td>
<td>0.81</td>
<td>2,439</td>
<td>975,748</td>
<td>64%</td>
</tr>
<tr>
<td>Packaging (30 kg bags)</td>
<td>50</td>
<td>0.08</td>
<td>4</td>
<td>1,626</td>
<td>0%</td>
</tr>
<tr>
<td>Total material costs</td>
<td></td>
<td></td>
<td>2,752</td>
<td>1,100,806</td>
<td>72%</td>
</tr>
<tr>
<td>Labour (ratio per kg)</td>
<td>1,500</td>
<td>0.24</td>
<td>366</td>
<td>146,362</td>
<td>10%</td>
</tr>
<tr>
<td>Transport (ratio per kg)</td>
<td>1,500</td>
<td>0.16</td>
<td>244</td>
<td>97,575</td>
<td>6%</td>
</tr>
<tr>
<td>Veterinary services (visits)</td>
<td>3</td>
<td>10.84</td>
<td>33</td>
<td>13,010</td>
<td>1%</td>
</tr>
<tr>
<td>Total direct costs</td>
<td></td>
<td></td>
<td>3,394</td>
<td>1,357,753</td>
<td>88%</td>
</tr>
<tr>
<td>Contribution margin (1-2)</td>
<td></td>
<td></td>
<td>1,240</td>
<td>496,168</td>
<td>2.26</td>
</tr>
<tr>
<td>Cost of production at direct costs (€/kg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Indirect costs

| Concession for accumulation | | | 4.88 | 1,951 | 0% |
| Fixed assets depreciation | | | 362.42 | 144,968 | 9% |
| Interest on working capital | | | 34.40 | 13,760 | 1% |
| Other costs | | | 42.28 | 16,913 | 1% |
| Total indirect costs | | | 444 | 177,593 | 12% |
| Total costs (2+3) | | | 3,838 | 1,535,346 | 100% |
| Profit (1-2-3) | | | 796 | 318,575 | 2.56 |
| Cost of production at total costs (€/kg) | | | | |

For poly-culture in ponds, carp can be the major species or a secondary species. In the Serbian case farm (Table 5), common carp is the major species with dominant share (94%). The total production value in the analyzed pond is €4,767 ha⁻¹. The value of production is mostly contingent to the yield level of certain fish categories. Yields in the fisheries sector in Serbia are modest in comparison with the yields which are realized in the world (T. Marković et al., 2014). This is one of the key causes of low profitability.

The total costs per unit area are very high (€4,381 ha⁻¹). Such high costs, place aquaculture in rank of highly intensive productions. The direct costs of this complex production include: the material costs (yearlings and fry, pellets, hydrant lime, fuel and lubricants, other materials), labour costs and direct services. Within the direct costs, pelleted feed has the largest share (€1,662 ha⁻¹, or 38%). Also, spawn represents significant cost, which takes more than third of the total production costs, hence coupled with the feed costs, amounting to 73% of total costs. The remaining material costs (hydrant lime, fuel and lubricants, other materials) have no significant participation, with a share of less than 4%. Labour costs in the analyzed semi-intensive pond amount to €501 ha⁻¹, or 11% of total costs. In intensive production systems, labour costs are much lower, so their reduction in the analyzed pond, can significantly affect the level of the production economy. Direct services include pond maintenance and do not represent a significant element of the costs. The general or indirect costs are covered by the corresponding part of the depreciation of buildings and equipment, various overhead expenses, and interest on current assets.

Looking at the absolute performance indicators (contribution margin and profit), the achieved results are relatively modest. The realized contribution margin (€892 ha⁻¹) and profit (€386 ha⁻¹)
1) cannot be considered as satisfactory for production with such intensity, which is characterized by high investments per unit of capacity.

Table 5. Analytical budget calculation of carp production, Serbia (case capacity 215 ha)

<table>
<thead>
<tr>
<th>1. Production value</th>
<th>Quantity</th>
<th>Price (€)</th>
<th>Total (€)</th>
<th>Total (€ ha⁻¹)</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carp 1 (kg)</td>
<td>22,498</td>
<td>2.73</td>
<td>61,420</td>
<td>286</td>
<td>6%</td>
</tr>
<tr>
<td>Carp 2 (kg)</td>
<td>74,594</td>
<td>2.73</td>
<td>203,642</td>
<td>947</td>
<td>20%</td>
</tr>
<tr>
<td>Carp 3 (kg)</td>
<td>296,260</td>
<td>2.38</td>
<td>705,099</td>
<td>3,280</td>
<td>69%</td>
</tr>
<tr>
<td>Grass carp (kg)</td>
<td>8,351</td>
<td>1.88</td>
<td>15,700</td>
<td>73</td>
<td>2%</td>
</tr>
<tr>
<td>Silver carp (kg)</td>
<td>11,503</td>
<td>1.53</td>
<td>17,600</td>
<td>82</td>
<td>2%</td>
</tr>
<tr>
<td>Catfish (kg)</td>
<td>6,312</td>
<td>3.41</td>
<td>21,524</td>
<td>100</td>
<td>2%</td>
</tr>
<tr>
<td><strong>Production value</strong></td>
<td></td>
<td></td>
<td><strong>1,024,983</strong></td>
<td><strong>4,767</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Direct costs</th>
<th>Quantity</th>
<th>Price (€)</th>
<th>Total (€)</th>
<th>Total (€ ha⁻¹)</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carp yearlings (units)</td>
<td>12,794</td>
<td>2.73</td>
<td>34,928</td>
<td>162</td>
<td>4%</td>
</tr>
<tr>
<td>A two-year carp fry (units)</td>
<td>99,112</td>
<td>2.73</td>
<td>270,576</td>
<td>1,258</td>
<td>29%</td>
</tr>
<tr>
<td>A two-year grass carp fry (units)</td>
<td>2,910</td>
<td>2.05</td>
<td>5,966</td>
<td>28</td>
<td>1%</td>
</tr>
<tr>
<td>A two-year silver carp fry (units)</td>
<td>4,172</td>
<td>1.64</td>
<td>6,842</td>
<td>32</td>
<td>1%</td>
</tr>
<tr>
<td>A two-year catfish fry (units)</td>
<td>2,690</td>
<td>4.09</td>
<td>11,002</td>
<td>51</td>
<td>1%</td>
</tr>
<tr>
<td>Pelleted food 25/7 (kg)</td>
<td>533,562</td>
<td>0.47</td>
<td>250,774</td>
<td>1,166</td>
<td>27%</td>
</tr>
<tr>
<td>Pelleted food 30/7 (kg)</td>
<td>208,841</td>
<td>0.51</td>
<td>106,509</td>
<td>495</td>
<td>11%</td>
</tr>
<tr>
<td>Hydrant lime (kg)</td>
<td>131,729</td>
<td>0.07</td>
<td>9,221</td>
<td>43</td>
<td>1%</td>
</tr>
<tr>
<td>Fuel and lubricants (total)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other materials (total)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total material costs</strong></td>
<td></td>
<td></td>
<td><strong>723,925</strong></td>
<td><strong>3,367</strong></td>
<td><strong>77%</strong></td>
</tr>
<tr>
<td>Labour (total)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other direct costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total direct costs</strong></td>
<td></td>
<td></td>
<td><strong>833,170</strong></td>
<td><strong>3,875</strong></td>
<td><strong>88%</strong></td>
</tr>
<tr>
<td>Contribution margin (1-2)</td>
<td></td>
<td></td>
<td><strong>191,813</strong></td>
<td><strong>892</strong></td>
<td></td>
</tr>
<tr>
<td>Cost of production at direct costs (€/kg)</td>
<td></td>
<td></td>
<td>1.99</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Indirect costs</th>
<th>Total (€)</th>
<th>Total (€ ha⁻¹)</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed assets depreciation</td>
<td>101,226</td>
<td>471</td>
<td>11%</td>
</tr>
<tr>
<td>Interest on working capital</td>
<td>7,601</td>
<td>35</td>
<td>1%</td>
</tr>
<tr>
<td><strong>Total indirect costs</strong></td>
<td></td>
<td><strong>108,828</strong></td>
<td><strong>506</strong></td>
</tr>
<tr>
<td><strong>Total costs (2+3)</strong></td>
<td><strong>941,998</strong></td>
<td><strong>4,381</strong></td>
<td><strong>100%</strong></td>
</tr>
<tr>
<td><strong>Profit (1-2-3)</strong></td>
<td><strong>82,986</strong></td>
<td><strong>386</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Cost of production at total costs (€/kg)</strong></td>
<td></td>
<td><strong>2.25</strong></td>
<td></td>
</tr>
</tbody>
</table>

The comparative carp production analysis is done using analogous performance indices in the two cases (Table 6). Carp production is profitable in both cases, though with better returns in the Macedonian case (26.76% contribution margin and 17.18% rate of profitability at the Macedonian farm, in comparison to 18.71% and 8.10% on the Serbian farm, respectively). This is also reflected in the income-to-cost ratio, whereas there is €1.21 of return on €1 of related total costs in the Macedonian case, i.e. in the Serbian case only €1.09 of production value is achieved on €1 of the total costs.

Nevertheless, the cost of carp production calculated at unit of output is more elevated in Macedonia; the cost of production per kg calculated at direct costs is €2.26 and €1.99, and the full cost of production per kg €2.56 and €2.25, in Macedonia and Serbia, respectively. This
indicates that the higher profitability previously discussed on the Macedonian farm is linked to higher production value, as function of the achieved yield and market price of the product. The overall structure of costs is very similar between the comparative budgets on the level of total direct and indirect costs shares (see Figure 3). Namely, in both cases, total direct costs account for 88% and indirect costs for 12% in the total costs, which is an expected proportion. However, looking in more details into the direct costs structure, major constituent is feed, the respective share in total costs being 64% in the Macedonian case and 38% in the Serbian case. The costs of carp production vary according to the culture practice and usually feed costs comprise the largest portion of production costs (Weimin, 2004). The major feed in both cases are commercial feeds – pellets which ensure stable feeding patterns and higher intensity of production. Nutrition with pelleted complete feed allows higher yield in all the categories of analyzed cyprinid fish (Ljubojević et al., 2012). However, many fish farms both in Macedonia and Serbia, still use maize, wheat and barley as feed, which impacts the yield levels negatively, and therefore the quality of produced fish. Feed costs’ share in the Serbian case is comparable with the literature whereas feed costs in carp production typically range from 30 to 50% in total costs (Leopold, 1981). In the Macedonian case, this segment is higher, which results from the higher cost of feed, and also to the small contribution of other direct material costs such as fry. The share of other direct costs, apart from labour, is higher in the Macedonian case, mainly due to the depreciation cost of cages. The labour share in total costs and the indicators of labour productivity indicate more effective use of this resource in the Macedonian case. This is related mainly to the fact that breeding and collecting fish in cage culture usually requires less labour input (Weimin, 2004), but also may point to the actual case operative environment and management practices.

Feed intake and relative efficiency can be analysed through the feed conversion ratio. This ratio in carp production usually ranges from 1.5 to 2.5, depending on the type and quality of feed and feeding system (Woynarovich et al., 2010). In our analysis, the Serbian case farm is more successful converting 1.77 kg feed to 1 kg of output, in line with the usual feed conversion ratio for such production in Serbia from 1.4 to 1.8 (Z. Marković, 2010). In the Macedonian case, 2 kg of feed are needed in order to produce 1 kg of output.

Table 6. Comparative carp production performance indices

<table>
<thead>
<tr>
<th>Profitability and effectiveness</th>
<th>Macedonian case</th>
<th>Serbian case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contribution margin rate (%)</td>
<td>26.76</td>
<td>18.71</td>
</tr>
<tr>
<td>Profitability rate (%)</td>
<td>17.18</td>
<td>8.10</td>
</tr>
<tr>
<td>Profit (€ per kg)</td>
<td>0.53</td>
<td>0.20</td>
</tr>
<tr>
<td>Income-to-cost ratio (at direct costs)</td>
<td>1.37</td>
<td>1.23</td>
</tr>
<tr>
<td>Income-to-cost ratio (at total costs)</td>
<td>1.21</td>
<td>1.09</td>
</tr>
<tr>
<td>Cost of production at direct costs (€ per kg)</td>
<td>2.26</td>
<td>1.99</td>
</tr>
<tr>
<td>Cost of production at total costs (€ per kg)</td>
<td>2.56</td>
<td>2.25</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Labour productivity</th>
<th>Macedonian case</th>
<th>Serbian case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour gross productivity ratio</td>
<td>12.67</td>
<td>9.52</td>
</tr>
<tr>
<td>Labour net productivity ratio</td>
<td>2.18</td>
<td>0.77</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Feed conversion</th>
<th>Macedonian case</th>
<th>Serbian case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed conversion ratio</td>
<td>2.00</td>
<td>1.77</td>
</tr>
</tbody>
</table>
Yield, market price and costs impact on profitability

The impact of hypothetical changes in yields, market price and cost levels upon the performance of the carp enterprise is presented in Table 7.

The sensitivity analysis of yield shifts takes into account the variable nature of most of the direct costs. Decreased outputs result into lower profitability or even potential loss in the Serbian case. We further calculated the threshold break-even yield levels at 536 kg in the Macedonian and 1,110 kg in the Serbian case, respectively, meaning that production volume beneath those levels would be unprofitable, i.e. the costs will out-weight the income. Expectedly, the cost of production lowers as the level of output increases.

Profitability levels are highly sensitive to market price reductions and total costs increases. The cost of production at full costs in this sense can be interpreted as a break-even threshold; hence product sales below that price would result into negative financial result and unprofitability. It is interesting to note that if the market price for the Macedonian farmer is assumed to be at the Serbian market level, than the costs will rise above the value of production and the farm will have negative result. In the case of the Serbian farm, even slightest 10% reduction in sales price would result in loss.

The Serbian producer is more sensitive to cost changes; a 10% increase in cost, given the same production value, would already turn the net result under the break-even level; in the Macedonian case, a 20% increase in cost, would diminish the profits.
terms of more efficient use of the volumes enable finding optimal operating levels, gains in productivity, and specialization in per unit of output, triggers a decrease in the overall cost of production. Also, larger output volume of production, mainly attributable to the indirect/fixed costs segment, when allocated on per unit of output, triggers a decrease in the overall cost of production. Also, larger output volumes enable finding optimal operating levels, gains in productivity, and specialization in terms of more efficient use of the available production factors. Other reasons for enhancing intensification of production in some of the fish ponds, building of new production capacities, and improved evidence of the fish production. The Macedonian fish sector is small and underdeveloped, though recent increase in fish production figures is notable. The production is not cost-effective enough, relative to the volume of invested assets, as evidenced by the example of the analyzed fish pond. The Macedonian fish sector is small and underdeveloped, considering that most of the production takes place at semi-intensive ponds, with outdated supporting infrastructure, while there is a small number of modern fish farms. Based on the analysis, it can be concluded that the fish production in Serbia is still underdeveloped, considering that most of the production takes place at semi-intensive ponds, with outdated supporting infrastructure, while there is a small number of modern fish farms. The production is not cost-effective enough, relative to the volume of invested assets, as evidenced by the example of the analyzed fish pond. The Macedonian fish sector is small and underdeveloped, though recent increase in fish production figures is notable. There are several reasons for this (Kostov, 2014): increased production in some of the installed capacities, intensified production in some of the fish ponds, building of new production capacities, and improved evidence of the fish production. Carp cage production is becoming more widespread and is more profitable, but cost effectiveness can still be improved. The applicability of economies of scale is evident through the sensitivity analysis. This concept applies primarily to the potential to decrease the average cost per unit; the increase of the volume of production, mainly attributable to the indirect/fixed costs segment, when allocated on per unit of output, triggers a decrease in the overall cost of production. Also, larger output volumes enable finding optimal operating levels, gains in productivity, and specialization in terms of more efficient use of the available production factors. Other reasons for enhancing

Table 7. Sensitivity analysis on yield, sales price and costs changes, Macedonia (on 25 m² cage basis) and Serbia (on 1 ha basis)

<table>
<thead>
<tr>
<th>Yield level (kg)</th>
<th>1,000</th>
<th>1,500*</th>
<th>2,000</th>
<th>2,500</th>
<th>1,000</th>
<th>1,500</th>
<th>1,951*</th>
<th>2,500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total costs (€)</td>
<td>2,706</td>
<td>3,838</td>
<td>4,970</td>
<td>6,103</td>
<td>2,494</td>
<td>3,486</td>
<td>4,381</td>
<td>5,470</td>
</tr>
<tr>
<td>Production value (€)</td>
<td>3,090</td>
<td>4,635</td>
<td>6,180</td>
<td>7,725</td>
<td>2,443</td>
<td>3,665</td>
<td>4,767</td>
<td>6,108</td>
</tr>
<tr>
<td>Profit (€)</td>
<td>384</td>
<td>796</td>
<td>1,209</td>
<td>1,622</td>
<td>-51</td>
<td>179</td>
<td>386</td>
<td>638</td>
</tr>
<tr>
<td>Profitability rate (%)</td>
<td>12.41</td>
<td>17.18</td>
<td>19.57</td>
<td>21.00</td>
<td>-2.08</td>
<td>4.88</td>
<td>8.10</td>
<td>10.44</td>
</tr>
<tr>
<td>Income-to-cost ratio</td>
<td>1.14</td>
<td>1.21</td>
<td>1.24</td>
<td>1.27</td>
<td>0.98</td>
<td>1.05</td>
<td>1.09</td>
<td>1.12</td>
</tr>
<tr>
<td>Labour net productivity ratio</td>
<td>1.57</td>
<td>2.18</td>
<td>2.48</td>
<td>2.66</td>
<td>-0.20</td>
<td>0.46</td>
<td>0.77</td>
<td>0.99</td>
</tr>
<tr>
<td>Cost of production (€ per kg)</td>
<td>2.71</td>
<td>2.56</td>
<td>2.49</td>
<td>2.44</td>
<td>2.49</td>
<td>2.32</td>
<td>2.25</td>
<td>2.19</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sales price (€/kg)</th>
<th>2.47</th>
<th>2.78</th>
<th>3.09*</th>
<th>3.40</th>
<th>1.95</th>
<th>2.20</th>
<th>2.44*</th>
<th>2.69</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total costs (€)</td>
<td>3,838</td>
<td>3,838</td>
<td>3,838</td>
<td>3,838</td>
<td>4,381</td>
<td>4,381</td>
<td>4,381</td>
<td>4,381</td>
</tr>
<tr>
<td>Production value (€)</td>
<td>3,708</td>
<td>4,171</td>
<td>4,635</td>
<td>5,098</td>
<td>3,814</td>
<td>4,291</td>
<td>4,767</td>
<td>5,244</td>
</tr>
<tr>
<td>Profit (€)</td>
<td>-131</td>
<td>333</td>
<td>796</td>
<td>1,260</td>
<td>-567</td>
<td>-91</td>
<td>386</td>
<td>863</td>
</tr>
<tr>
<td>Profitability rate (%)</td>
<td>-3.52</td>
<td>7.98</td>
<td>17.18</td>
<td>24.71</td>
<td>-14.88</td>
<td>-2.12</td>
<td>8.10</td>
<td>16.45</td>
</tr>
<tr>
<td>Income-to-cost ratio</td>
<td>0.97</td>
<td>1.09</td>
<td>1.21</td>
<td>1.33</td>
<td>0.87</td>
<td>0.98</td>
<td>1.09</td>
<td>1.20</td>
</tr>
<tr>
<td>Labour net productivity ratio</td>
<td>-0.36</td>
<td>0.91</td>
<td>2.18</td>
<td>3.44</td>
<td>-1.13</td>
<td>-0.18</td>
<td>0.77</td>
<td>1.72</td>
</tr>
<tr>
<td>Profit (€ per kg)</td>
<td>-0.09</td>
<td>0.22</td>
<td>0.53</td>
<td>0.84</td>
<td>-0.29</td>
<td>-0.05</td>
<td>0.20</td>
<td>0.44</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total costs (€)</th>
<th>4,606</th>
<th>4,222</th>
<th>3,838*</th>
<th>3,455</th>
<th>5,258</th>
<th>4,820</th>
<th>4,381*</th>
<th>3,943</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production value (€)</td>
<td>4,635</td>
<td>4,635</td>
<td>4,635</td>
<td>4,635</td>
<td>4,767</td>
<td>4,767</td>
<td>4,767</td>
<td>4,767</td>
</tr>
<tr>
<td>Profit (€)</td>
<td>29</td>
<td>413</td>
<td>796</td>
<td>1,180</td>
<td>-490</td>
<td>-52</td>
<td>386</td>
<td>824</td>
</tr>
<tr>
<td>Profitability rate (%)</td>
<td>0.62</td>
<td>8.90</td>
<td>17.18</td>
<td>25.47</td>
<td>-10.28</td>
<td>-1.09</td>
<td>8.10</td>
<td>17.29</td>
</tr>
<tr>
<td>Income-to-cost ratio</td>
<td>1.01</td>
<td>1.10</td>
<td>1.21</td>
<td>1.34</td>
<td>0.91</td>
<td>0.99</td>
<td>1.09</td>
<td>1.21</td>
</tr>
<tr>
<td>Cost of production (€ per kg)</td>
<td>3.07</td>
<td>2.81</td>
<td>2.56</td>
<td>2.30</td>
<td>2.69</td>
<td>2.47</td>
<td>2.25</td>
<td>2.02</td>
</tr>
<tr>
<td>Profit (€ per kg)</td>
<td>0.02</td>
<td>0.28</td>
<td>0.53</td>
<td>0.79</td>
<td>-0.25</td>
<td>-0.03</td>
<td>0.20</td>
<td>0.42</td>
</tr>
</tbody>
</table>

Note: *Actual levels.

Conclusions

The current performance of both Macedonian and Serbian farms reveals considerable room for interventions in yield improvement and costs reductions, and accordingly increasing the profitability of carp production. Based on the analysis, it can be concluded that the fish production in Serbia is still underdeveloped, considering that most of the production takes place at semi-intensive ponds, with outdated supporting infrastructure, while there is a small number of modern fish farms. The production is not cost-effective enough, relative to the volume of invested assets, as evidenced by the example of the analyzed fish pond. The Macedonian fish sector is small and underdeveloped, though recent increase in fish production figures is notable. There are several reasons for this (Kostov, 2014): increased production in some of the installed capacities, intensified production in some of the fish ponds, building of new production capacities, and improved evidence of the fish production. Carp cage production is becoming more widespread and is more profitable, but cost effectiveness can still be improved. The applicability of economies of scale is evident through the sensitivity analysis. This concept applies primarily to the potential to decrease the average cost per unit; the increase of the volume of production, mainly attributable to the indirect/fixed costs segment, when allocated on per unit of output, triggers a decrease in the overall cost of production. Also, larger output volumes enable finding optimal operating levels, gains in productivity, and specialization in terms of more efficient use of the available production factors. Other reasons for enhancing
economies of scale can be related to increased benefits for large-scale producers in discounts when procuring inputs i.e. getting lower input prices when purchasing higher quantities of input. Finally, producing larger volumes of output can boost the negotiating powers and market positioning of the producer.

Both Macedonia and Serbia have very favourable climatic and soil conditions for freshwater fish production, but the producers are faced with subordinate position compared to other branches of agriculture. As the consumption levels are low in both countries, there is realistic growth potential for changing consumer food patterns and increasing fish consumption on the domestic market. Increased production can additionally lead to intensified export in the case of Serbia (to the European Union and to Russia), and import substitution in the case of Macedonia. Nevertheless, in order to achieve that, it is necessary to emphasize the need for fisheries’ development strategy and stimulating support from the state i.e. adequate policy for production, processing and marketing of fish.

Acknowledgement

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References


The significance of constant organizational learning in agro industrial management in the era of knowledge

Mićić Ivan¹, Rajić Zoran¹ Zivkovic Dragic¹, Nikolic Sanja², Micic Ivana³, Micic Marija³

Abstract
We witness that global economy have changed trough the time, due to which, the conditions in the environment of the organization have changed too. Generally, in the industrial history, four stages of the global economy are indentified: era of manufacturing production, era of mass production, era of information, and finally era of knowledge. Since, the era of knowledge have brought new challenges that are seen trough the rapid and advance development of science and technology, organizations have to respond to the new created “rules” and conditions on the market.

Thus, the organization turned their focus on the most valuable resource nowadays – the knowledge. Developing the appropriate knowledge within the organization became the primary priority to every modern, knowledge orientated organization, which imposes the necessity of constant organizational learning – improvement of the employees knowledge and skills.

In this context, the research was conveyed in the organizations in agro industries in the Republic of Macedonia, with main objective to examine the significance and the usage of the constant organizational learning. By using Spearman Correlation, it was examine whether the age of the employees have influence on their opinions concerning the actual need for constant learning and knowledge improvement.

The results show the awareness of the employees for the need of the constant improvement of their knowledge. Also, it was find out that the age of the employees has influence on their opinions and attitudes considering constant learning.

Key words: science and technology development; the era of knowledge; constant organizational learning; the age of employees; agro industrial management

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Introduction
The global economy has changed passing trough different phases. Every phase have its own characteristics which shape the conditions in the environment in every industry, not excluding agro cultural industry. In the industrial history, four stages of the global economy are indentified:

era of manufacturing production, era of mass production, era of information, and finally era of knowledge. (Slavković, 2006).

The era of knowledge brings new changes that are seen in rapid and advance development of science, engineering and technology, which in turn entails changes in society, as well as on the market, creating new “rules of the game” in every industry. These changes are especially visible in the last ten years, and the following can be distinguished in brief: knowledge becomes a crucial issue for the success of the organization; the time for decision making is significantly shortened; relations among employees are becoming very complex; the information and communication technologies are increasingly being incorporated into the interactions among people, as well as into business transactions. (Slavković, 2006).

In every industry, including agro cultural, managers turned their focus on the most valuable resource nowadays – knowledge. In this era the traditional factors of production - capital, land, labor and materials lose importance comparing to the importance that acquire knowledge and became a crucial strategic resource.

The pressure that these conditions have made imposed a need for attaining specific knowledge, skills and abilities considering agro industrial management and employees in the agro industrial organizations. The managers and the employees are facing a changing environment, and they have to change in order to be competitive. This means that they have to be permanently updated with the innovations in their filed which can be done with constant enhancing employees’ knowledge and skills.

Trainings as an effective tool for constant organizational learning
Training represents a process of acquiring the new knowledge and skills desired to perform certain tasks. It can be conducted in order to achieve various goals and needs of the organization: (Mathis and Jackson, 2011)

- Regular training is necessary to inform employees with ongoing legislative changes related to the work
- Technical training allows employees to efficiently perform their tasks
- Training on interpersonal relationships and solving problems is improving labor relations in the organization
- Training for professional development provides long-term orientation towards increasing the ability of individuals in the organization

The training represents the cost of the organization. Yet studies have shown that it is necessary in a dynamic environment and that organizations began to increase the budget for the trainings. (Tyler, 2005)

Training should be seen as an effective tool for “continuous improvement” of employee performance, in other words - constant organizational learning. Employees must keep up with technological innovations that are experiencing enormous growth in recent decades, as well as other changes taking place in agro industries if they want to remain competitive.

The crucial role of agro management is to identify where the need for training is existing. The need for training is perceived through analysis of the organization and its current situation and future requirements and developments. Assessing the need for training, agro industrial
Managers should analyze the following sources of information available to them: (Mathis and Jackson, 2011)

- Sources within the organization: complaints, accidents, spending, monitoring, insults, exit interviews, usage of the equipment etc.
- Sources of jobs/tasks: knowledge, skills and abilities of employees, specifications of the jobs.
- Sources of individual employees: tests, records, centers for assessment, questionnaires, surveys, knowledge for operations and technological processes, ranking etc.

After establishing the need for training, the next step is defining the purpose of training, which will be achieved through informal education of employees. Once the training objectives are determined, creating, organizing and execution of the training can begin. There are several ways to implement the training: (Mathis and Jackson, 2011)

- Internal training directly face to face
- External training
- Third party/consultant performs training
- Conference online
- Mentoring Training
- Training via e-mail
- Training via a telephone conference call
- Series of digital (audio and video) files

Having in mind that the budget for trainings is often limited, the organization should determine priorities in setting goals so that the trainings would be effective. Preference will be given to trainings related to the highest priorities of the organization.

The objective of the research

The study will examine the age of employees consider it as a factor that influences the constant organizational learning. It will be examined whether the age has influence on attitudes of the employees concerning key elements of constant organizational learning: sharpen the competition; importance of the human resources management; the need of constant learning; the need of attending trainings in the domain of the profession; the need of attending trainings outside of the domain of the profession; contribution of the acquired knowledge from the trainings in everyday decision making; rewarding system motivates them to enhance their knowledge.

Material and methods

Participants:
The research was conducted in 10 agro industrial companies in the Republic of Macedonia, to a sample of 100 respondents – employees in these companies.

Data collection method:
The questionnaire that was given to respondents was formed with multiple choice questions, using the Likert scale. The respondents had to choose one from five offered alternatives which expressed their level of agreement or disagreement for a series of statements.

The analysis of the results was made using $\chi^2$ test in purpose to examine the correlation between the age of the respondents and their attitudes. Also, Spearman's coefficient is been used to
illustrate whether the influence of the age of the respondents on their answers is directly or inversely proportional. Only statistical significance obtained results are considerate in the analysis. The collected data was proceeding in SPSS program.

**Hypothesis**

The study intends to test the following hypotheses:

**H01**: Age don’t influence on the opinion of the employees about the era of knowledge which sharpen the competition.

**H02**: Age don’t influence on the opinion of the employees about the importance of the human resources management in the era of knowledge

**H03**: Age don’t influence on the opinion of the employees that the era of knowledge impose the need of constant learning (improvement of knowledge and skills)

**H04**: Age don’t influence on the opinion of the employees about the need of attending trainings in the domain of their profession

**H05**: Age don’t influence on the opinion of the employees about the need of attending trainings outside of the domain of their profession

**H06**: Age don’t influence on the opinion of the employees that acquired knowledge from the trainings contribute in every day decision making.

**H07**: Age don’t influence on the opinion of the employees that the rewarding system motivates them to enhance their knowledge

**Results and Discussion**

**Table 1.** *Age don’t influence on the opinion of the employees about the era of knowledge which sharpen the competition*

<table>
<thead>
<tr>
<th>Symmetric Measures</th>
<th>Value</th>
<th>Asymp. Errora</th>
<th>Std. Errorb</th>
<th>Approx. Tb</th>
<th>Approx. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interval by Pearson’s R</td>
<td>.356</td>
<td>.114</td>
<td>3.771</td>
<td>.000c</td>
<td></td>
</tr>
<tr>
<td>Ordinal by Spearman Correlation</td>
<td>.286</td>
<td>.114</td>
<td>2.951</td>
<td>.004c</td>
<td></td>
</tr>
</tbody>
</table>

N of Valid Cases 100

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.
c. Based on normal approximation.

Considering the result, H01 is rejecting and it is concluding that there is strong proportional influence of the age of employees on their opinion about the era of knowledge and the opening of the markets in Republic of Macedonia which sharpen the competition. This means that the older employees think that the competition on the market is sharpened.
Table 2. Age don’t influence on the opinion of the employees about the importance of the human resources management in the era of knowledge

<table>
<thead>
<tr>
<th>Symmetric Measures</th>
<th>dimension 1</th>
<th>Value</th>
<th>Asymp. Std. Error</th>
<th>Approx. T</th>
<th>Approx. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Interval by</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dimension 0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ordinal by</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ordinal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N of Valid Cases</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>.301</td>
<td>.072</td>
<td>3.120</td>
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<tr>
<td></td>
<td></td>
<td>.378</td>
<td>.076</td>
<td>4.042</td>
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<tr>
<td></td>
<td></td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.
c. Based on normal approximation.

Analyzing the results it can be concluded that H02 is rejecting and there is weak proportional influence of the age on the opinion of the employees about the importance of the human resources management in the era of knowledge. The employees recognize the role of the human resource management as significant factor in the era of knowledge.

Table 3. Age don’t influence on the opinion of the employees that the era of knowledge impose the need of constant learning (improvement of knowledge and skills)

<table>
<thead>
<tr>
<th>Symmetric Measures</th>
<th>dimension 1</th>
<th>Value</th>
<th>Asymp. Std. Error</th>
<th>Approx. T</th>
<th>Approx. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Interval by</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dimension 0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ordinal by</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ordinal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N of Valid Cases</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>.296</td>
<td>.075</td>
<td>3.064</td>
<td>.003c</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.281</td>
<td>.090</td>
<td>2.895</td>
<td>.005c</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.
c. Based on normal approximation.

According to the results, H03 is rejecting and it is concluding that there is weak proportional influence of the age on the opinion of the employees that the sharpen competition on the market impose the need of constant learning (improvement of knowledge and skills). The results illustrate that the employees recognize the importance and the need of the constant learning (improvement of knowledge and skills) imposed by the market conditions.
Table 4. *Age don’t influence on the opinion of the employees about the need of attending trainings in the domain of their profession*

<table>
<thead>
<tr>
<th>Symmetric Measures</th>
<th>dimension1 Value</th>
<th>Asymp. Std. Error&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Approx. T&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Approx. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>dimension 0 Interval by Pearson’s R</td>
<td>-.354)</td>
<td>.089</td>
<td>-3.748)</td>
<td>.000&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Ordinal by Spearman Correlation</td>
<td>-.364)</td>
<td>.087</td>
<td>-3.863)</td>
<td>.000&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.
c. Based on normal approximation.

Considering the results, hypothesis H04 is rejecting and it’s concluding that there is weak inverse influence of the age of employees in their opinion about the need of attending trainings in the domain of their profession. Namely, the need of attending trainings in the domain of the profession is more recognized by older employees.

Table 5. *Age don’t influence on the opinion of the employees about the need of attending trainings outside of the domain of their profession*

<table>
<thead>
<tr>
<th>Symmetric Measures</th>
<th>dimension1 Value</th>
<th>Asymp. Std. Error&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Approx. T&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Approx. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>dimension 0 Interval by Pearson’s R</td>
<td>-.287)</td>
<td>.110</td>
<td>-2.969)</td>
<td>.004&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Ordinal by Spearman Correlation</td>
<td>-.297)</td>
<td>.106</td>
<td>-3.075)</td>
<td>.003&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.
c. Based on normal approximation.

Results show that H05 is rejecting and it is concluding that there is weak inverse is weak inverse influence of the age of employees in their opinion about the need of attending trainings outside of the domain of their profession. Matched with the previous hypothesis, the need of attending trainings outside of the domain of the profession is more recognized by older employees.
Table 6. Age don’t influence on the opinion of the employees that acquired knowledge from the trainings contribute in every day decision making

<table>
<thead>
<tr>
<th>Symmetric Measures</th>
<th>Value</th>
<th>Asymp. Std. Error</th>
<th>Approx. T</th>
<th>Approx. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>dimension0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interval by</td>
<td>.372</td>
<td>.068</td>
<td>3.973</td>
<td>.000c</td>
</tr>
<tr>
<td>Ordinal by</td>
<td>.414</td>
<td>.072</td>
<td>4.508</td>
<td>.000c</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Not assuming the null hypothesis.  
b. Using the asymptotic standard error assuming the null hypothesis.  
c. Based on normal approximation.

Considering the indicators, H06 hypothesis is rejecting because there is weak proportional influence of the age on the opinion of the employees that acquired knowledge from the trainings contribute in every day decision making. This means that older employees recognize the importance of the knowledge that they gain on the trainings, in the decision making processes.

Table 7. Age don’t influence on the opinion of the employees that the rewarding system motivates them to enhance their knowledge

<table>
<thead>
<tr>
<th>Symmetric Measures</th>
<th>Value</th>
<th>Asymp. Std. Error</th>
<th>Approx. T</th>
<th>Approx. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>dimension0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interval by</td>
<td>.238</td>
<td>.093</td>
<td>2.431</td>
<td>.017c</td>
</tr>
<tr>
<td>Ordinal by</td>
<td>.260</td>
<td>.100</td>
<td>2.669</td>
<td>.009c</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Not assuming the null hypothesis.  
b. Using the asymptotic standard error assuming the null hypothesis.  
c. Based on normal approximation.

Results show that H07 is rejecting, and it is concluding that the age influence on the opinion of the employees that the rewarding system motivates them to enhance their knowledge. Because there is weak proportional influence, the older the employees are, they are more convinced that the rewarding system motivates them to enhance their knowledge.

Conclusion

It is difficult to separate a certain industry or activity where there is no need for continuous organizational learning. Due to modern trends of rapid development of science and technology, knowledge becomes more important, especially for industries which are directly related to technology such as agro industries.

Generally speaking, the ultimate result of well-created process of constant learning in the organizations is that every employee in the company fulfills its mission, which reaches the corporate objectives and strategies, and identifies the most valuable knowledge from the “sea of information”. It is not an easy task because it involves the management structure at the highest levels of management.
Implementing a concept of constant organizational learning takes effort, time and money, but it results can be impressive and risks can be minimized. Organizations that have made this kind of investment in constant learning realize tangible results quickly. They add to their top and bottom lines through faster cycle times, enhanced efficiency, better decision making and greater use of tested solutions across the enterprise. Regarding the results, it can be concluded that the older employees recognize the sharpened competition on the labor market. This emphasizes the role of the human resource management as significant factor in the era of knowledge. Also, the employees themselves recognize the importance and the need of the constant learning (improvement of knowledge and skills) imposed by these market conditions. They find the trainings, in the domain of their profession as well as out of the domain of their profession, as a useful method to improve their knowledge and skills because they confirm that knowledge gained on trainings help them in the decision making processes. It is interesting to point out that the need of attending trainings (in and out of the domain of the profession) is especially acknowledge among the older employees. Having in mind the obtained results, managers in agro industries should focus on enhancing and upgrading the knowledge of the employees using training as an effective tool for constant organizational learning. Furthermore, agro managers should be aware that employees are individuals with different age that influence on their opinion considering key elements of constant organizational learning (sharpen the competition; importance of the human resources management; the need of constant learning; the need of attending trainings in the domain of the profession; the need of attending trainings outside of the domain of the profession; contribution of the acquired knowledge from the trainings in every day decision making; rewarding system motivates them to enhance their knowledge) and indicate their different needs. Hereby, agro managers should have individual approach to each employee in purpose to explore the maximum of the human capital in the organization. Finally, today world economy is facing a new challenge. The production and the technological revolution are already in the past. The stage is entered by the managerial revolution – the era of knowledge. In knowledge economy, organizations are competing at which one owns better organizational knowledge and at finding a better way to develop the human resources in the organization. Implementing systematic and continuous learning in the entire organization becomes one of the most important forms of human resources development.

References
Development strategy of economically justified pig meat production from farm to fork: agricultural economic analysis

Micić Ivan¹, Rajić Zoran¹ Zivkovic Dragic¹, Nikolic Sanja², Micić Ivana³, Micić Marija³

Abstract
The study deals with situational analysis and the basic problems development on pig meat production in Serbia, as well as an economical analysis of fattening pigs at farm production conditions. The research included small private farm “Gracanica” farm, in central Kosovo and Metohija, and a large co-operative farm first December “Žitorađa” farm at Toplica District Coastal Region Serbia. During the period in 2012, have been monitored the volume and application production technology of fattening pigs on both farms, and analyzed the resulting economic results. During the observing period, it was found that at private farm, their breeding pigs were 40 head, for the co-operative farm, their breeding pigs were 30,000 heads. The produced fattened pig in private farm costs 87 Euro’s, the pork meat carcasses 1.16 Euro’s / kg, and for the farm, cost of fattened pigs is 142 Euro’s, while, the pork meat carcasses 1.94 Euro’s / kg. The average weight of carcass sides is uniform in both at 78.5 kg, whereas the share of pork sides varied from 79% to private farms and 78% cooperative farm.

Keywords: production development, fattening pigs, quality pork meat, cost, economic parameters

Introduction
It takes practice to meet long-term and strategic planning process, in developing pig meat production, in creating the material basis for intensifying of agricultural processes and faster revival of pig production. Production of pig meat is one of few operations within the area of agriculture, which ensures daily source of income to all participants in the chain of production, processing and transport. Pig or hog production occurs in several technological, mutually organizationally dependent - phase (of care, breeding and feeding sows and gilts farrowing, rearing piglets and fattening, through diet, etc.).

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Maintaining good health condition of pigs is possible only if, in facilities, provide favorable hygienic conditions on the farm. That is why the contemporary building objects necessary requirement for the application of modern technologies and organization of production of pigs and pork. Regardless of the natural indicators for intensive, market-oriented production of pigs, it is very difficult to secure detailed insights into production costs of fattening pigs, which represents the basis of research work. In contrast to the farms which the pigs produced for their own needs and eventual sale of the surplus of products, agricultural holdings or farms, which been permanently oriented towards commodity production, should devote great attention to production costs. The requirement for survival in the market is a competitive and as possible a cheaper production, with the resulting product has to satisfy quality standards. Family-owned farms in Western Europe are a main stream agricultural production.

If Serbia is developing a similar path, it can be expected that in our agricultural farms represent the backbone of agricultural production. The State should measure agricultural policy stimulates this process in both directions at the expense of small and large farms, as stated in: farm / Bojana Jovanovic in Gracanica in Kosovo and Metohija (farm A), and farm / "1. Decembar "specialized agricultural livestock cooperative enterprise for the production of pig meat and Zitoradja (farm B). This paper benefits both presentations of the obtained results of research, during the research, as in the analysis procedures. The demonstration and research primarily used the scientific method, the application of which makes it possible to explain and predict the relationship between the individual relevant input, and the results of achieved effects in pig meat production. In line with the development strategy pig meat production, the aim the research is that with as many of analyzed and achieved economic parameters, improve the quality and efficiency of pork production, derived from precious pure breeds, which are raised in Serbia: A farm / and farms B /, as well as an analysis of the current situation, and the presentation of the results of crop production, the farm A / and pig production, at both farms. The research included specific case studies of small private farm “Gracanica” (farm A), in central Kosovo and Metohija, and a large cooperative farm first December “Žitorada” (farm B) at Toplica District Coastal Region Serbia.

In preparing this work used data from multiple sources. The first group can be classified sources that relate to information on the characteristics of cereals in livestock feeding pigs of all categories. The second group includes statistical data related to pig meat in Serbia, the EU and the world. With the aid of the data obtained from the Republic Institute for Statistics, analysis was performed of the existing situation pork meat in Serbia. These are the data related to the amount of meat and pigs produced, consumed nutrients, the number and structure of the labor force in the studied farms A / B /, facilities, and technical resources, etc. A third group of data includes data field research for both analyzed farms. These are the volumes of production, analysis and production of pigs meat in Serbia in the long run. The mere analysis of such data would not be possible that it is not approved by both farms, and the data are further processed mathematical statistical methods. This source of information is particularly important in determining the averages, volumes, losses, and conversion of food etc. The fourth group consists of data taken from national and international literature, which is related to the area of meat in general. These data are related to the research, and a variety of technical parameters and problems of technology production of pig meat, etc. This includes information relating to the cost of pig farming and other types of meat, taken from the literature.
The physical volume of pork production in Serbia

Quantities of pig meat, to be realized in the market, should produce high quality meat that will meet the needs of existing and new demands from consumers, that is obtaining the highest possible amount of meat of better class or first class, loin, thigh, and others. Pig production follows the unfavorable economic situation for many years. Pork meat and meat products are controlled by consumer protection and constant presence of disparities between product prices in comparison to other products. Due to a relatively high prices and declining of consumer purchasing power and competition from other types of meat, created the retroactive effect of the market, was reduced the consumption of other meat. The decrease in total production, directly or indirectly influenced, above all, the collapse of the previous Yugoslavia, or the loss of a significant part of the market. First, for the production of pork meat must bring protective prices and regularly coordinate with the market and in parity with the prices of other products.

- the number and quality of breeding animals,
- the degree of stimulation of the production of pigs, because subsidies to producers, the "RS Official Gazette", number 85/2012, 60 - 65/2013, 13/2016, of 1,000.00 dinars per head sold fattening pigs registered slaughter industry, can have a positive impact on the increase of this production, favorable price relationships between the inputs and the price of pigs for slaughter.

The main objectives of the pig should be:

- reliable growth in production,
- increasing the number of farmers, the farm,
- improve the racial composition and others.

In order to create preconditions for development of pork production in the Republic of Serbia in the forthcoming period it is necessary to use modern methods of selection in this branch of animal husbandry, alternatively as two breed and three breed cross-breed, parent component crosses F1 generation (AB) - terminal race (C.).

- Papers in the field of economic justification in the development of pig production. Serbia appears as an importer of meat, and in 2012 it imported 8,859 t of meat and 54,645 fattening pigs. In the coming years it is necessary to increase the production of piglets per sow, which is reflected in better earliness and sexual ripening, increased fertility and rearing of piglets (0.2-0.6 animals per litter) and improved pace reproduction of heifers in production and achieve results are obtained in countries with highly developed pig breeding, (Stankovic, et al., 1989). In order to produce larger quantities of pork, it is necessary to increase production per breeding animal. Since the beginning of 2012 there were no significant price fluctuations in the market pigs.

The average annual price of fattening pigs in 2012 amounted to approximately 170 din / kg, an increase of about 40 din / kg compared to 2011, while the lowest price was in early 2012 - 145 din / kg, in order its reached a climax in late autumn, when it amounted to 200 dinars / kg. According to the Serbian Bureau of Statistics in 2012 are slaughtered 5,453,062 heads that number of slaughtered animals decreased to 342 thousand head, compared to 2011. The reason for this was reduction in the number of pollinated throat, as illustrated in the following Tab. 1.

From Table 1 shows that the approximate balance of pigs from 2010 to 2012 decreased by 350,230 throat, export of 10,162 throats, throat slaughter of 275,164, the total available quantity of 730,708 heads while imports rose to 44,586 throat.

On the basis of the incentives in agriculture were adopted several ordinances related to the production of pig production.

These are the Rulebook on the manner of exercising the right for incentives in livestock for quality breeding animals and Regulation on the manner of exercising the rights for incentives in livestock fattening pigs.

Pork production was reduced in 2012 to slightly less than the 14.5 thousand compared to 2011 and amounted to 252,207 t, as shown in orientation balance of pork from 2010 to 2012, Tab. 2.


From Table 2 it can be seen that pork ranks first in terms of total quantity available according to the Republic Bureau of Statistics and the Customs Administration in 2012, the total domestic production of pork has decreased by 2011, to 7.45%, the total energy 6%, meat imports increased by 93.64%, and exports by 71%. In Serbia, the pigs on the dominant, or deviating from sizes of EU standards. The impacts on the sector have quantities of products which, in addition to production sold directly to the farm or an irregular way, Table 3.

### Table 1. The approximate balance of pigs from 2010-2012 and Forecast for 2013

<table>
<thead>
<tr>
<th>Category</th>
<th>Eq. measures</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of head at the beginning</td>
<td>head</td>
<td>3.631.013</td>
<td>3.488.738</td>
<td>3.286.900</td>
<td>3.138.508 of the year</td>
</tr>
<tr>
<td>The initial number of sows</td>
<td>head</td>
<td>520.756</td>
<td>519.119</td>
<td>485.271</td>
<td>447.843</td>
</tr>
<tr>
<td>breeding animals</td>
<td>head</td>
<td>6.236.605</td>
<td>6.161.916</td>
<td>5.805.424</td>
<td>5.642.822</td>
</tr>
<tr>
<td>import</td>
<td>head</td>
<td>10.059</td>
<td>22.846</td>
<td>54.645</td>
<td>100.000</td>
</tr>
<tr>
<td>Consumption</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>export</td>
<td>head</td>
<td>41.890</td>
<td>35.650</td>
<td>31.728</td>
<td>33.000</td>
</tr>
<tr>
<td>slaughter</td>
<td>head</td>
<td>5.728.226</td>
<td>5.795.122</td>
<td>5.453.062</td>
<td>5.400.000</td>
</tr>
<tr>
<td>Loss</td>
<td>head</td>
<td>618.823</td>
<td>555.828</td>
<td>523.671</td>
<td>500.000</td>
</tr>
<tr>
<td>Number of heads at the end of year</td>
<td>head</td>
<td>3.488.738</td>
<td>3.286.900</td>
<td>3.138.508</td>
<td>2.948.330</td>
</tr>
</tbody>
</table>

**Source:** Republic Bureau of Statistics and the Customs Administration

### Table 2. The approximate balance of pork from 2010 to 2012 with forecasts to 2013

<table>
<thead>
<tr>
<th>Category</th>
<th>Eq. measures</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local production</td>
<td>tons</td>
<td>269.273</td>
<td>271.000</td>
<td>252.207</td>
<td>250.000</td>
</tr>
<tr>
<td>Import</td>
<td>tons</td>
<td>2.535</td>
<td>4.575</td>
<td>8.859</td>
<td>8.000</td>
</tr>
<tr>
<td>Total Available Quantities</td>
<td>tons</td>
<td>271.808</td>
<td>275.575</td>
<td>261.066</td>
<td>258.000</td>
</tr>
<tr>
<td>Consumption</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Export</td>
<td>tons</td>
<td>708</td>
<td>1.405</td>
<td>2.403</td>
<td>300</td>
</tr>
<tr>
<td>Total domestic consumption</td>
<td>tons</td>
<td>271.100</td>
<td>274.170</td>
<td>258.000</td>
<td>257.700</td>
</tr>
<tr>
<td>Ukupno potrošnja</td>
<td>tons</td>
<td>271.808</td>
<td>275.575</td>
<td>261.066</td>
<td>258.000</td>
</tr>
</tbody>
</table>

**Source:** Republic Bureau of Statistics and the Customs Administration

### Table 3. Number of slaughtered pigs ('000)

<table>
<thead>
<tr>
<th></th>
<th>Number of slaughtered pig</th>
<th>Number of slaughtered animals in slaughterhouses</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>5.795</td>
<td>1.819</td>
</tr>
<tr>
<td>2012</td>
<td>5.453</td>
<td>1.714</td>
</tr>
<tr>
<td>2013</td>
<td>5.684</td>
<td>1.483</td>
</tr>
</tbody>
</table>

From Table 3 it can be seen that in 2011 the number of pigs slaughtered outside the slaughterhouse higher by 319% in 2012 to 318% in 2013 for 383% of the total number of slaughtered livestock in slaughterhouses (legal flows).

**Pork production in Serbia**

The production of pork it results from the number of slaughtered animals and the structure of the slaughter, and the average weight of slaughtered animals. The conditioned and the stability of agricultural and industrial production as a whole, depends on the production and price movements of cattle feed, but the resultant of the following factors:

- the number of infertile sows in the herd,
- the number of niskosuprasnih pigs,
- the number viskosuprasnih pigs and sows with suckling piglets,
- pigs for fattening,
- the number of slaughtered animals of all categories,
- mass and yield throat and FIG.

Maximum capacity utilization is economically justified, because the less costs per unit of product. In today's pork production is considered to participate sows and castrated NERESTA 30 days prior to slaughter should be moving at a level above a third of the total stock of pigs, (Vidovic et al., 2012).

On production affects the level of consumer demand, and the amount of imported throat. However, pork production is highly variable due to the effect of a number of factors; primarily, race, age categories, quality, processing method etc.

The quality pork meat, mainly depends on the following elements: conformation (meatiness), followed by the presence of fat, amount, distribution of, and the profusion of meat fatty tissues. In addition, the quality affects the chemical composition, physical properties, sensory properties and microbiological safety.

Pork on the market comes in halves as well as primary parts (the so-called. "Dressed"), can be cooled and deep-frozen.

**Material and methods**

The results of production from farm A / B frame and / are related to the one-year period (2012). For the adoption of conclusions, the parameters of production: feed consumption per 1 kg weight, the total gain of the cost of feed at both farms.

\[
\text{food consumption per pound of gain} = \frac{\text{total food consumption}}{\text{total gain}}
\]

\[
\text{total gain} = \text{number of feeding days} \times \text{increment by feeding day}
\]

\[
\text{production efficiency} = \frac{\text{total revenues}}{\text{total costs}}
\]

\[
\text{profitability of production} = \frac{\text{profit}}{\text{investment}} \times 100
\]

\[
\text{profit rate(profitability of revenues)} = \frac{\text{profit}}{\text{total revenues}} \times 100
\]

The resulting economic indicators are arranged and processed appropriate biostatistical methods - by analysis of variance.

The significance of the results in the production of fattening pigs and pork meat in 2012 were monitored independently on each farm during a year of research.

It was also used the method of comparative analysis, whereby the Serbian usually been compared with other countries, groups of countries and the like.
Results and discussion

Starting from the previously scheduled facts and characteristics of the Serbian strategies in pig meat production during year 2012, as part of the case studies, was analyzed:

- Agricultural and food-processing ability in development of the whole economy,
- The tendency in current pork production, as well as the changes that occurred in the scope and structure of our country and the world production.
- The quality characteristics of meat and meat products.

The paper outlines:

1. pork production, with special emphasis on swine production: the area of the province of Kosovo and Metohija in Gracanica on a small private registered pig farms A / Bojana Jovanovic, ul. Kosovke Girls no. 417 and in the Toplica districts, municipalities Žitorađa on a large pig farm B / "1. December "Žitorađa, its place and importance in the economic development;

   In addition to theoretical explanations and examples of application in general, has shown efficacy and optimal nutrition in the case of mixtures for feeding fattening pigs on farm A and Bfarm.

   On the tested farms A / B / production costs of fattening pigs on both farms based on established commodity indices.

   On both farms was made the calculation of variable costs in accordance with the processes of production.

   Costs related to the feed consumptions and medicines, which are used in the production process, as well as depreciation throat, current facilities and equipment was performed on the basis of norms.

   In this way, the estimated investment in production on farms A / B /, according to which they make calculations of production costs and farms income is determined annually.

Agro-economic analysis of fattening pigs

For agro-economic research analyzes in pigs were taken two farms in Serbia and Kosovo and Metohija who would qualify for this production. We investigated the farm A / which has 40 fattening pigs, and farm B / which has 30,000 head.

The average entry weight of piglets for fattening was 25 kg, and the output achieved mass of 100 kg. In farms B / average pig fattening cycle lasted 98 days with a daily gain of 0.76 kg / head / day, while the farms A / 87 days, with an average daily gain of 0.86 kg / head / day.

Our results are in agreement with those obtained by (Vidovic et al., 2012) in performance test of pure breed, Landrace and Yorkshire.

The calculation of income includes only the income from the sale of pigs and the potential revenues from pork meat were not taken into account. Data are presented in Table 4.
Table 4. Economic indicators in pig meat production of carcass sides on both farms in 2012

<table>
<thead>
<tr>
<th>I</th>
<th>Indicator</th>
<th>Unit of Measure</th>
<th>Farm A/</th>
<th>Farm B/</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Fresh pork meat in sides</td>
<td>Head</td>
<td>40.00</td>
<td>30.000.00</td>
</tr>
<tr>
<td>B</td>
<td>Weight throats of live weight pigs</td>
<td>kg</td>
<td>100.00</td>
<td>100.00</td>
</tr>
<tr>
<td>1</td>
<td>Total weight of pigs (A x B)</td>
<td>kg</td>
<td>4,000,00.00</td>
<td>5,000,000.00</td>
</tr>
<tr>
<td>2</td>
<td>Pork meat in sides / head</td>
<td>%</td>
<td>79.00</td>
<td>78.00</td>
</tr>
<tr>
<td>3</td>
<td>The price of pork in halves</td>
<td>€/kg</td>
<td>3,160.00</td>
<td>2,340,000.00</td>
</tr>
<tr>
<td>4</td>
<td>The price of pork in halves</td>
<td>€</td>
<td>2.82</td>
<td>2.82</td>
</tr>
<tr>
<td>V</td>
<td>Total revenues (3 x 4)</td>
<td>€</td>
<td>8,911.20</td>
<td>6,598.800.00</td>
</tr>
<tr>
<td>II</td>
<td>COSTS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>The price of slaughter pigs services</td>
<td>€/head</td>
<td>8.70</td>
<td>8.70</td>
</tr>
<tr>
<td>6</td>
<td>Direct costs of live weight pigs</td>
<td>€</td>
<td>3,480.00</td>
<td>4,281,531.00</td>
</tr>
<tr>
<td>7</td>
<td>Total slaughter pigs services (A * 5)</td>
<td>€</td>
<td>348.00</td>
<td>261,000.00</td>
</tr>
<tr>
<td>G</td>
<td>Total costs (6 + 7)</td>
<td>€</td>
<td>3,828.00</td>
<td>4,542,531.00</td>
</tr>
<tr>
<td>III</td>
<td>PROFIT / LOSS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Pork in carcasses from the farm (C - G)</td>
<td>€</td>
<td>5,083.20</td>
<td>2,056,269.00</td>
</tr>
<tr>
<td>9</td>
<td>Pork hemisphere throat / € (8 : A)</td>
<td>€</td>
<td>127.08</td>
<td>68.54</td>
</tr>
<tr>
<td>10</td>
<td>The price of pork hemisphere kg (G : 3)</td>
<td>€</td>
<td>1.21</td>
<td>1.94</td>
</tr>
<tr>
<td>11</td>
<td>Cost of production of meat (V: G)</td>
<td>€</td>
<td>2.33</td>
<td>1.45</td>
</tr>
<tr>
<td>12</td>
<td>Return on revenue (8 : V) x 100</td>
<td></td>
<td>57.04%</td>
<td>31.16%</td>
</tr>
</tbody>
</table>

Source: Research author

From the data it is evident that the farm A / price of pork in halves costing € 1.21 / kg, and this production has an efficiency of 2.33 and profitability of revenues from 57.04%, also on farm B / price pork meat in carcasses costs 1.94 euros / kg, and this production has the economy of 1.45 and profitability of revenues from 31.16%.

Conclusion

The analysis of the agri-food production, particularly pork meat were brought the conclusions when it comes to access to this type of production. Another argument in the request for setting the price of fattening pigs to slaughter line quality is obtained according to the share of the meat, which was shown in research on farm A /, it is best to to close the entire production cycle from farm to fork.

This refers to the market in pig and porcine meat in Serbia in the period from 2002 to 2012. After research, the work was an answer on a number of very important questions, namely:

The Republic of Serbia in the last decade has the decline in the number of pigs and piglets at an annual rate of 1-2%.

The production of pork it results from the number of slaughtered animals and their weight.

The average domestic pork production in 2012 amounted to 252 207 t, import 8,859 and export 2,403 t, with a tendency to decrease.

It can be seen that on both farms costing calculation total in pig meat production (halves) is performed for the calculation of the costs of slaughtering, cooling and processing of carcasses that amount to € 8.70 per pig.

The calculation is made in accordance with the actual yield of slaughtered pigs, the value of fattened pigs weighing 100 kg at a price of € 87.0 + € 8.70 cost of the slaughter, which amounts to 95.70 euros, on a farm A /.

Slaughtering pigs was obtained chilled carcass weight of 79 kg x 2.82 price hemisphere is obtained full value = € 222.78, when deducting the price pork meat (midfielder) € 95.70, we get the profit per head of € 127.08 / kg.

It can be easy to conclude that the price of chilled hemisphere 132.79% higher than the price of fattening pigs, which is not customary relationship in the market. There has been a profit of € 5,083.2 at farm A /.
Also on the farm B / derived calculation in accordance with realized dressing percentage of slaughtered pigs and value of fattened pigs weighing 100 kg is 142 EUR + overhead slaughter 8.7 euros, which amounts to € 150.70, and since the chilled carcass weight of 78 kg h price of 2.82 euros, provided the values of the throat (halves) of € 219.96. Slaughtering pigs obtained hemispheres are quite uniform weight, an average of 78 kg per head and realized a profit of € 2,056,407 Farm B /

It can be easy to conclude that the price of chilled hemisphere 45.96% higher than the price of hogs. It can be said that both farms have economically justified production fattening pigs and pork meat (halves). Farm production pork meat is happening to a significant change in the development of pig so in quantity and quality of fattening pigs.

Occurred is work to new scientific knowledge about the practical application of quality nutrition in fattening pigs. Investigated are the advantages of this method of education and give a scientific contribution to furthering the development of the production of quality pork meat, for which Serbia with pig tradition, has excellent geographical and ecological potential, especially in its crop and livestock production.

As a final conclusion of these investigations can be recommended pig farms to organize into production groups, cooperatives, clusters or franchisees, to jointly open easier favorable hog-repro-center and perfected their products and quickly placed the meat on the market.

References
Raspberry production as a development engine of family holdings

Milic Dusan¹, Elenov Riste², Dimitrijevic Bojan³, Milovancevic Zoran⁴

Abstract
Raspberries in Serbia are predominantly produced in small family plantations, whose size usually ranges from 10 to 30 acres. The surface of these raspberries is generally defined by the number of household members of a family, with possible involvement of several workers in the harvest season. The average yield of raspberries in Serbia in recent years ranged from 5 to 8 tons per hectare, that is 0.7 - 0.8 kg / m². There, 40 to 50,000 households are engaged in production of raspberries on the surface of 14th - 16.000 ha. Only 3 - 5% of the area of planted raspberries are irrigated, which is negligible. The production of raspberry is the most common in the hilly - mountainous areas of the Republic of Serbia. It is estimated that in the Serbian raspberry industry around 200,000 people are engaged of all ages, along with the seasonal workers. Therefore, it is fair to say that raspberry, especially where it is grown provides village survival.

The work encompasses analysis, natural, organizational and economic conditions of production, as well as yields, technology and economic results of raspberries on family farm from Central Serbia. Analysis of the organizational and economic conditions, as well as the production results involves the use of a specific process that objectively assess the results achieved and deduced on the needs, possibilities and ways to improve them.

The goal of the analysis is to show the impact of natural and organizational-economic conditions of the achieved results, to detect and determine negative factors in order to eliminate their influence in the coming period, but also to point out the factors that have a positive effect on results of operations in order to devote attention in the future and to emphasize their influence.

Based on the analytical accounting calculations the cost of raspberries is calculated, which is 116.26 dinars. The difference between the average market price upon which the 2014 products were put on the market and cost price, which represents the earnings per unit of product is 43.74 (160 to 116.26) pounds. Based on the calculated economic efficiency of operations, the profit of raspberry production was 1.38, a 27.34% rate of return. A ratio between the actual results of production and volume of investment of human labor, calculate the level of labor productivity is 3.17 kg per random hour.

Key words: family farm, raspberry, production conditions, the results of production

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Introduction

Unfavourable agrarian structure is one of the most difficult problems of the Serbian agriculture, because the small holdings have irrational and unprofitable production (Jelíc and Jovanovic, 2009). From the aspect of ownership structure the importance of family farms is tremendous. The economic importance of these farms is in discrepancy with the bottom of their potential possibilities. These farms are small and are based on the work of the family labor force. Today there is an expressed desire to establish a new structure of these farms, which will be able to respond to the challenges of the modern market economy. In order these structural changes to be achieved a change must me made in the manufacture itself.

Materials and Methods

In preparing this study used a larger number of methods, taking into account their selective application, which means that for each occurrence of the benefits of the method that suits her character. The methods used were: observation, interviews, surveys, tabular methods and calculative methods.

All the necessary empirical data for the preparation of this work are mainly provided from direct communication with the members of the household. In preparation of this work were used written materials related to the production of raspberries.

To monitor the data by domestic and foreign professional literature of recent date were used, in both written and electronic forms (literature from the Internet), available statistical data on raspberries, as well as publications related to the production and cultivation of raspberries.

Results and discussion

Raspberries in Serbia are predominantly produced on small family orchards, whose size usually ranges from 10 to 30 acres. The surface of these raspberries is generally defined by the number of household members of a family, with possible involvement of several workers in the harvest season (Dimitrijevic, 2009). The average yield of raspberries in Serbia in recent years ranged from 5 to 8 tons per hectare, that is 0.7 - 0.8 kg / m². In Serbia, 40 to 50,000 households are engaged in production of raspberries on the surface of 14th - 16.000 ha. Only 3 - 5% of the area of planted raspberries is irrigated, which is negligible. The production of raspberry is the most common in the hilly - mountainous areas of the Republic of Serbia (Milić et al., 2009). It is estimated that in the Serbian raspberry industry along with seasonal workers, about 200,000 people of all ages are engaged. Therefore, it is fair to say that raspberry, where it is grown, is seen as survival of the village. For years, 15 to 20% of world production comes from the Serbian raspberries.

In this way, the balance of payments that our country provides is about 100 million euros (Dimitrijevic and Kalanović - Bulatović, 2011). In the structure of total fruit production in the Republic of Serbia, in the period from 1988 to 2012, the share of the quantity of produced raspberries ranged from 4 to 6% (Dimitrijevic et al., 2013).

The agricultural farm "Maric" is located in the village of Boturići, in the municipality of Aleksandrovac which belongs to Rasina District. This place is known as the Zupa. Boturići Village is located on an altitude of 550-600 m. Through the village flows the river Rasina, which is of special importance because of the possibility for irrigation.
The population traditionally engages mainly in agriculture. Until twenty years ago agricultural production in this area was predominantly extensive, however, the expansion for production of berries, increasingly gets the characteristics of intensive production. An increasing number of households, through education and increased investment material begin to apply modern farming methods, which is motivated, above all, by the possibility of solid earnings that are currently allowed by this branch of horticulture.

Agricultural Farm "Maric" covers an area of 8 ha, out of which 4 hectares is forest. Fruit production is successfully implemented on about 4 ha of arable land, of which 0.5 ha of raspberry and blackberry under 0.5 ha, and on the other areas plums, apples and pears are grown.

Agricultural Farm "Maric" produces about 80 tons of fresh agricultural products in total annually. A smaller part of the fruit is processed, with the purpose its future development to be based on the manufacturing activity increase.

The produced quantity of fresh raspberries is realized in the market. The expansion of production of berries in the area followed the "emergence" of a large number of cold storage and processing of fruits, so that in this area within a radius of about 15 km there are ten refrigerators engaged in fresh fruit buing.

Natural conditions are very important factor that affects agricultural production, primarily on plant production, because they contribute to the growth and development of the plant itself. The main natural conditions that affect crop production include soil and climatic conditions. Environmental factors do not act alone, but rather in a complex and integrated way. The best results are achieved when these factors (water, heat, light and land) are acting in the optimal range. If environmental factors act outside the limits of the optimum, they may be characterized as harmful (excessive soil moisture, drought and etc). For a successful and rational production of raspberries the organizational and economic conditions of production are higly significant, including the distinguished geographic location, transport links, markets, equipment buildings, equipment, means of mechanization labor, as well as the level of organization of labor in the production itself.

Even in conditions of fierce competition, the producers of raspberries have no problem in marketing their highly demanded products. The stakeholders in the refrigerator business fight for "every kilogram" of produced berries in the area, so some of them offer special privileges to their potential subcontractors, such as advance payment, interest-free loans for production materials, and even bonuses (each purchased 1000 kg of raspberries, give bonus of 100 kg of mineral fertilizers).

For regular flow of agricultural production, it is necessary to provide sufficient funding machinery as well as their continued safety, availability and functionality. The performance of certain operations in optimal agro-technical terms depends on the number and regularity of the mechanization itself. Meeting the agro-technical deadlines depends on the yield that is planned and thus the financial result.

The "Maric" estate is equipped with solid mechanization that is reflected in the sufficient supply of connecting the drive machinery as well as different equipment and devices, which are necessary for carrying out the manufacturing process, which should be done well and on time in order good results to be achieved.

Land processing should be paid a significant attention not only in terms of runtime, but also in terms of bringing the land in a condition that is most favorable for the growth of raspberries. Deep plowing is done at the end of October, immediately after the dispersion of manure and mineral (NPK) fertilizers and the cultivation after the spring fertilizer nitrogen fertilizers and another in May for weeds control.
Of all the small berries fruits in the class of raspberries takes the greatest amount of nutrients. For good growth of raspberries it is necessary to have large amounts of organic matter in the soil. This high requirement for nutrients is due to the fact that raspberries each year develop a large number of new shoots, and the shoots are an abundance of old generation, which after maturing begin to dry, so every year for the reconstruction of the bush and high yield large amounts of nutritive elements are required.

Table 1 displays the total consumption of human and machine work in raspberry production. Consumption of labor of workers is 95.32% of the total expenditure regarding labor, and consumption of machine labor force amounts to only 4.68%. This means that for an hour of time expenditure of labor mechanization, over 20 hours of human labor are spent, namely, the ratio of used machine labor and human workforce is 1: 20.37.

<table>
<thead>
<tr>
<th>Work operation</th>
<th>Need work days in total</th>
<th>Spent work days</th>
<th>Machine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Workers</td>
<td>%</td>
<td>Machine</td>
</tr>
<tr>
<td>Days</td>
<td>197,42</td>
<td>95,32</td>
<td>9,7</td>
</tr>
</tbody>
</table>

Source: Autor

Table 2 shows the expenditure of human and machine work in groups of operations. The largest consumption of workers working day is realized during the harvest (85.35%) of the total consumption of the workers working day, and the most power of the labor force during the performance of the operations of tillage and fertilization, only 4.85% of the total expenditure of labor workers.

<table>
<thead>
<tr>
<th>Work operation</th>
<th>Need work days in total</th>
<th>Spent work days</th>
<th>Machine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Workers</td>
<td>%</td>
<td>Machine</td>
</tr>
<tr>
<td>Land processing</td>
<td>9,58</td>
<td>4,85</td>
<td>1,98</td>
</tr>
<tr>
<td>Care and protection</td>
<td>19,34</td>
<td>9,8</td>
<td>7,12</td>
</tr>
<tr>
<td>Harvest</td>
<td>168,5</td>
<td>85,35</td>
<td>0,6</td>
</tr>
<tr>
<td>Total</td>
<td>197,42</td>
<td>100</td>
<td>9,7</td>
</tr>
</tbody>
</table>

Source: Autor

Consumption of machine is the largest during working tasks of care and protection, where it is spent 73.4% of the total engagement of machinery, and the lowest consumption is during the harvest, where there are spent only 6.18% of the total commitment of funds mechanization.

Consumption of the workforce, by group operations is shown in Figure 1, and the expenditure of funds by groups or all the operations on the second chart.
The success of the business holdings can be measured on the basis of realized market value of production (the amount of cash income generated from the sale of the product) and amount of costs. If the higher positive difference between the market value of production and costs, more favorable economic results are achieved. Production value is measured by the market value of the product itself. The market value of raspberry production depends on the quantity produced and the price per unit. The volume of production depends on the natural and organizational-economic conditions of production, as well as the price of market conditions. Analysis of the market value of raspberry production was done on the basis of the data presented in Table 3.

**Table 3. Amount and value of raspberry production on “Marić” estate**

<table>
<thead>
<tr>
<th>Number</th>
<th>Elements</th>
<th>Achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Raspberry land area (ha)</td>
<td>0,5</td>
</tr>
<tr>
<td>2</td>
<td>Average yield (t/ha)</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>Amount of production (t)</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Market price (din/kg)</td>
<td>160</td>
</tr>
<tr>
<td>5</td>
<td>Market production value (000 din)</td>
<td>800</td>
</tr>
</tbody>
</table>

*Source: Autor*
The accomplished yield in raspberry production on a family farm, "Maric" in 2014 amounted 5,000 kg, and it was realized in the market at an average price of 160 dinars / kg. Actual market value of raspberry production in that year amounted 800,000 dinars.

Actual production costs of raspberries are given in Chart 4.

Chart 4. Made costs during raspberry production on “Maric” estate in 2014 on an area of 0,5 ha

<table>
<thead>
<tr>
<th>Number</th>
<th>Type of costs</th>
<th>Amount (rsd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Land preparation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Deep harvest (workers, equipment)</td>
<td>1,125</td>
</tr>
<tr>
<td></td>
<td>• Cultivation (workers, equipment)</td>
<td>625</td>
</tr>
<tr>
<td></td>
<td>Fertilization</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Manure (workers, equipment)</td>
<td>63,300</td>
</tr>
<tr>
<td></td>
<td>• 15 t manure x 2200 din/t market price</td>
<td>8,375</td>
</tr>
<tr>
<td></td>
<td>• Mineral fertilizers (workers, equipment)</td>
<td>33,000</td>
</tr>
<tr>
<td></td>
<td>• 0,35 t NPK (10:12:24) x 54000  din/t</td>
<td>1,225</td>
</tr>
<tr>
<td></td>
<td>• 0,05 t KAN x 36000  din/t</td>
<td>18,900</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,800</td>
</tr>
<tr>
<td>2.</td>
<td>Measurement of care and protection</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Pruning (workers)</td>
<td>94,110,25</td>
</tr>
<tr>
<td></td>
<td>• Cut branches collecting (workers, machines)</td>
<td>17,850</td>
</tr>
<tr>
<td></td>
<td>• Tieing raspberries on wire (workers)</td>
<td>7,500</td>
</tr>
<tr>
<td></td>
<td>• Hilling around bushes (workers)</td>
<td>10,000</td>
</tr>
<tr>
<td></td>
<td>• Spraying x 6 (workers, machine)</td>
<td>12,500</td>
</tr>
<tr>
<td></td>
<td>• Kuprozin</td>
<td>30,770,25</td>
</tr>
<tr>
<td></td>
<td>• Cipkord</td>
<td>990</td>
</tr>
<tr>
<td></td>
<td>• Galmin</td>
<td>390</td>
</tr>
<tr>
<td></td>
<td>• Akord</td>
<td>480</td>
</tr>
<tr>
<td></td>
<td>• Mankogal</td>
<td>900</td>
</tr>
<tr>
<td></td>
<td>• Fobos</td>
<td>640</td>
</tr>
<tr>
<td></td>
<td>• Ridomil</td>
<td>1,260</td>
</tr>
<tr>
<td></td>
<td>• Pehar</td>
<td>2,900</td>
</tr>
<tr>
<td></td>
<td>• Kozak</td>
<td>1,600</td>
</tr>
<tr>
<td></td>
<td>• Signum</td>
<td>2,900</td>
</tr>
<tr>
<td></td>
<td>• Abastate</td>
<td>390</td>
</tr>
<tr>
<td></td>
<td>• Copper oxychloride</td>
<td>790</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,150</td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Harvest</td>
<td>422,750</td>
</tr>
<tr>
<td></td>
<td>• Loading, transport and unloading of package material</td>
<td>4,000</td>
</tr>
<tr>
<td></td>
<td>• Harvest (workers)</td>
<td>416,750</td>
</tr>
<tr>
<td></td>
<td>• Fruits loading, transport and unloading</td>
<td>2,000</td>
</tr>
<tr>
<td></td>
<td>Total costs</td>
<td>581,285,25</td>
</tr>
</tbody>
</table>

**Source:** Autor

Economic analysis of raspberry production in the observed family farm was done on the basis of analytical accounting calculations for 2014 (Chart 5 and Chart 6).
Chart 5. Calculation of raspberry production on “Maric” estate in 2014

<table>
<thead>
<tr>
<th>Calculation elements</th>
<th>Amounts (rsd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Production value</td>
<td></td>
</tr>
<tr>
<td>Raspberries 5.000 kg x average price 160 din/kg</td>
<td>800.000</td>
</tr>
<tr>
<td>B. Production costs</td>
<td></td>
</tr>
<tr>
<td>• Land preparation</td>
<td>1.125</td>
</tr>
<tr>
<td>• Fertilization</td>
<td>63.300</td>
</tr>
<tr>
<td>• Level of care and protection</td>
<td>94.110</td>
</tr>
<tr>
<td>• Harvest</td>
<td>422.750</td>
</tr>
<tr>
<td>C. Financial result</td>
<td>218.715</td>
</tr>
<tr>
<td>D. Pricing</td>
<td>116,26</td>
</tr>
</tbody>
</table>

Source: According to the “Maric” estate, the raspberry producer for 2014

It should be noted that the cost for manufacturers is the starting point for a commercially acceptable lowest purchase price. Manufacturers’ interest is surely the cost to be as low as possible.

After financial results determination, it is necessary to determine whether the farm business was, and to what extent, effective. The basic indicators of economic business efficiency are: production economy, profitability and productivity.

Production economy (Pe) is commonly reported ratio of total revenue and total expenditure, ie, ratio of the value of production and production costs. It is expressed through the coefficient of economy:

\[ PV = \frac{\text{Production value}}{\text{Total Costs}} \]

Ako je ovako utvrđeni koeficijent ekonomičnosti veći od 1, proizvodnja je ekonomična i obrnuto. Ako je on jednak jedinici, proizvodnja je na granici ekonomičnosti. If such a fortified economy coefficient is more than 1, the output is economical and vice versa. If it is equal to one, the output is on the border line of economy.

\[ PV = \frac{800,000}{581.285} \]
\[ PV = 1,38 \]

Production of raspberries on the family farm, "Maric" is considered to be cost-effective because of the economy coefficient is more than 1.

Profitability is an expression of the final financial effects of investments in a particular economic activity. It expresses the relationship of the financial results (profits) of production value (Gogić 2005).
The rate of return (Rp) is determined as follows:

\[ Rp = \frac{\text{Net profit}}{\text{Production value}} \times 100 \]

\[ Rp = 27.34\% \]

In 2014, the raspberry production is was economical, because the market value of 100 dinars achieved the net profit of 27.34 pounds. Indicators of labor productivity are obtained from the relationship of achieved results and volume production and investment of human labor. The level of labor productivity, therefore, expresses the amount of product obtained per unit of human labor. The level of labor productivity is expressed naturally:

\[ Pr = \frac{\text{Amount of achieved products}}{\text{Work spent}} \]

or

\[ Pr = \frac{\text{Work spent}}{\text{Amount of achieved products}} \]

\[ Pr = 10.000 \text{ kg/ha} / 3.158.72 \text{ hour/ha} = 3.17 \text{ kg/hour} \]
\[ Pr = 3.158.72 \text{ hour/ha} / 10.000 \text{ kg/ha} = 0.32 \text{ hour/kg} \]

On the basis of the data, it is shown that labor productivity was achieved at the farm in 2014 in raspberry production amounted 3.17 kilograms per hour of work, or 0.32 working time needed to be spent to produce one kilogram of fresh raspberries.

**Conclusion**

The paper analysis covered general information on raspberry production, organizational and economic conditions of production, analysis of grain yields and economic analysis of production on the family farm, "Maric".

Based on the analytical accounting calculations and calculated cost of raspberries amounts 116.26 dinars. The difference between the average market price at which the products in 2014 were put on the market and the cost price represents the profit per unit of product raspberry 43.74 (160 to 116.26) pounds.

In order not to bring score based only on the absolute value of this work, a considerable extent of attention was given to the relative economic indicators. Economical raspberry production was 1.38. In 2014, production of raspberries was of great importance, since the rate of return was 27.34%. A ratio between the actual results of production and volume of investment of human labor, calculated that the level of labor productivity in the production of raspberries is 3.17 kg per hour.

Population of Rasina region is traditionally engaged in agricultural production. Twenty years ago agricultural production in this area was predominantly extensive, however, the expansion of production of small fruit farming increasingly gets the characteristics of intensive production. An increasing number of households, through education and increased investment material begin to apply modern farming methods, motivated above all, by good earning possibilities that this branch of horticulture currently allows.
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Local producer’s possibilities to sell in Tirana Market

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Abstract
Agricultural production is the main source of revenues for rural families in our country. Actually farmers need to be competitive not only to the local markets but also to the national ones. At these conditions is important to begin establishing new forms of cooperation such as marketing cooperatives.

The main objective of the paper is to identify the market possibilities for rural produces in the Tirana region. Tirana region is the most appropriate one for several reasons: (a) it is the main center in Albania in terms of population, (b) the rural area around the city of Tirana can’t fulfill the demand of the urban area either for quantity or quality (c) the main fruit and vegetable importers in Albania are located in Tirana. Taking into consideration all these elements, the organization of the fruit and vegetable market in Tirana is crucial not only for vendors but also for producers.

The survey was conducted respectively with different categories of selling points and seller’s groups for fruits and vegetables. The instrument used for the survey was closed questionnaire. Also we made 200 face to face interviews with different categories of vendors in Tirana markets.

Data has been processed by Microsoft Access. Uni-factorial and multi-factorial analysis has been conducted in order to determine trends in the organization structure of the Tirana wholesale and retail market of fruit and vegetables and its main characteristics performed.

As a conclusion we observed that vendors of all categories look the same characteristics for their products such as: low price, good quality (freshness and good external look), origin of produces, autochthones varieties. Local producers should sell to the small vendors with low capacities to provide marketing services. As a result, it should use short commercialization circuits, selling directly to the small vendors and in the same time providing some marketing services (e.x. standardisation). Also they should assure continuity with regard to the quality and quantity of its production.

Key words: Local producer, markets, autochthones varieties, marketing

Introduction
Rural population in Albanian is seriously engaged in agricultural production. The country is characterized by small and fragmented farms (1.20 ha average farm size (INSTAT 2012)). The limited farm surfaces and the high level of fragmentation (Civici A. 2003) (average 5 plots for

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each farm (INSTAT 2012)) hamper farmers to produce in big quantities, especially in hilly and mountain areas. But, agriculture still remain the main source of employment and income – especially in the country’s rural areas – and represents around 21% of GDP while accounting for about 43.3% of the work force (World Bank, 2016). It is worth mentioning that till now the farmers are encouraged to make direct investments in their farms like the implementation of simple or central heating green houses orchard, and other improvements with regard to the production technology (measure 2, Inter-sectoral Strategy 2014-2020). Recently, farmers in Albania have established marketing cooperatives which are operating as non-profit organizations.

Actually local farmers’ are facing with several problems in commercializing their products such as: (i) improving their know-how to produce good quality and standardized products, (ii) improving farmers agronomic skills, (iii) encouraging the use of new cultivars and cultivation’s methods, with the objective to produce products which can be labeled as regional or biological ones, (iv) improving marketing activities in order to penetrate in regional, national or international markets.

Taking into consideration all these elements, farmer products are not valorized at the market level. Producers are currently unable to change the situation and are simply “price takers”, but in fact, they could increase their incomes through increasing their participation in the marketing channel. This is not as simple as it sounds, because producers would like to provide some services which are actually being provided by the same wholesalers such as, post harvesting services, transportation, etc.

Understanding the transactions taking place in the regional fruit and vegetable market of Tirana and the behavior of the entire actors in this market, helped to identify the potential clients of the local producers and to outline the steps that need to be taken in order to comply with their requirements in the future.

**Material and methods**

The principal aim of the study is to give a detailed picture on the way the market of fruit and vegetables in Tirana city is organized and functioning. In order to reach the objectives of the study, during the elaboration process there have been used primary and secondary data.

Primary data consisted in the information gathered by the observation and a survey conducted respectively with different categories of selling points and seller’s groups for fruits and vegetables. The instrument used for the survey was closed questionnaire. At this point it is worth mentioning that we take into consideration, also the opinions expressed from vendors, meanwhile they were filling the questionnaire.

The secondary data consisted in information gathered from the related studies undertaken by several authors as well as by other institutions such as MARDWA, INSTAT, etc. These data served to a better implementation of the survey and questionnaire and helped in creating a general idea about the fresh fruit and vegetable market organization and functioning.

Analysis of the secondary data, indicated that fresh fruits and vegetable are mainly commercialized at the following:
1. “Whole sale” market in Tirana– this is actually the most important market functioning as wholesale and retail one.
2. 12 neighborhood fruits and vegetables markets (retail ones), which commercialize more or less the same quantity.
3. Small shops located in different areas of Tirana city, which sold among other grocery products, fresh fruits and vegetables also. There are a lot of shops of this kind in populated areas of Tirana where people used to buy in very small quantity and variety and in emergency cases (in the afternoon when the retail markets are closed or even for lack of time to spend in shopping).

In order to get the necessary information with regard to the commercialization of fruit and vegetables in Tirana, we made the identification of the main characteristics of each vendor group regarding to the turnover level, the variety of products they sell and the specific weight of fruits and vegetables on their total sales.

The questionnaire involved 23 questions related to the product characteristics. In order to have a more representative questionnaire, a pilot survey was carried out. Five interviews were conducted with representatives of different seller’s groups and some minor changes were adopted into the final questionnaire. Finally, there have been conducted 200 interviews. The table below gives the distribution of interviews conducted with different groups of fruit and vegetables sellers.

<table>
<thead>
<tr>
<th>No.</th>
<th>Target group</th>
<th>No. Questionnaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Retail not specialized vendors</td>
<td>65</td>
</tr>
<tr>
<td>2</td>
<td>Retail specialized fruits and vegetables vendors</td>
<td>95</td>
</tr>
<tr>
<td>3</td>
<td>Whole sale fruits and vegetables market vendors</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>Hyper market managers</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>TOTAL</td>
<td>200</td>
</tr>
</tbody>
</table>

Source: Authors elaboration

The questionnaires included qualitative and quantitative data. Data has been processed by Microsoft Access. Uni-factorial and multi-factorial analysis has been conducted in order to determine trends in the organization structure of the Tirana wholesale and retail market of fruit and vegetables and its main characteristics performed.

Results and discussion

Structural change continues to transform the global fresh fruit and vegetable (fresh produce) marketing system. For this reason we decided to prepare this market survey in Tirana Area.

Since traders are a very important part of the marketing and distribution channel of fruit and vegetables, their opinion as future suppliers of Tirana Market, is very important for local farmers. They guarantee the passage of the products from the farmers to the consumers assuring an added value for producing products.

While selecting the products to sell to the consumers, vendors of all categories look for some characteristics such as: low price, good quality (freshness and good external look), origin of
produces, autochthones varieties\(^1\) etc. Data processing indicated that among the most appreciated characteristics, were:

- Freshness
- Quality
- External look
- Domestic products
- Low price

Other produce attributes seemed to be less important but anyway among the interviewees about 50% of them preferred autochthones varieties and good packing quality. The table below shows a ranking list of characteristics according to the importance level given by the all vendors.

**Table 2. The product characteristics according to the importance**

<table>
<thead>
<tr>
<th>No</th>
<th>Characteristics</th>
<th>Very important and important</th>
<th>Not so important</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Freshness</td>
<td>100.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>2</td>
<td>Quality</td>
<td>99.2%</td>
<td>0.8%</td>
</tr>
<tr>
<td>3</td>
<td>Good external look</td>
<td>95.2%</td>
<td>4.8%</td>
</tr>
<tr>
<td>4</td>
<td>Domestic products</td>
<td>86.5%</td>
<td>13.5%</td>
</tr>
<tr>
<td>5</td>
<td>Low price</td>
<td>79.4%</td>
<td>20.6%</td>
</tr>
<tr>
<td>6</td>
<td>Autochthones varieties</td>
<td>55.5%</td>
<td>44.5%</td>
</tr>
<tr>
<td>7</td>
<td>Packing Quality</td>
<td>49.2%</td>
<td>50.8%</td>
</tr>
<tr>
<td>8</td>
<td>Imported products</td>
<td>47.6%</td>
<td>52.4%</td>
</tr>
<tr>
<td>9</td>
<td>Bio products</td>
<td>31.0%</td>
<td>69.0%</td>
</tr>
<tr>
<td>10</td>
<td>Label Information</td>
<td>30.9%</td>
<td>69.1%</td>
</tr>
</tbody>
</table>

**Source: Our inquires**

If we consider quality to comprise freshness and good external look then the quality is undoubtfully the very most preferred attribute while selecting the product to sell. Low price is not so important as long as it is not accompanied by good quality.

Despite the limitations there exist while supplying with domestic products, the latter seemed to be much more preferred than the imported ones. Such a result shows that Albanian farms may easily find markets for their products. Good product quality facilitates the market penetration process.

On the other hand, Albanian vendors are not so much interested in bio products. Thus, it will be better for Albanian bio products to be directed to foreign markets where efforts for producing such products are better repaid.

The label information is not considered as an important attribute for the vendors. The fruit and vegetable products in Albania are generally commercialized without any written information on the origin, quality attributes and traceability. Since such attributes seems to be important, the label information can add value to the product and as a result increase sold quantities.

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\(^1\) Autochthones varieties in our point of view are those traditionally consumed by the Albanian consumers but not necessarily domestic products. For example the tomato “cuore di bue”, is an Italian variety but is traditionally consumed in Albania, and so considered as an autochthon one.
Data processing also indicated that the vast majority of vendors preferred good quality products and low price. On the other hand, according to the interviewees’ opinion, consumers were attracted mostly by the quality of produce rather than prices.

Indeed, quality seemed to be important for all the parties involved in the process, suppliers, vendors and consumers. In fact, the best option for all of them would be quality produce at the lowest price possible. On the other hand domestic producers are not interesting any more to sell their products with low prices, because the agriculture income is the main source of incomes in the households (Guri et al 2014). But at this point the quality of domestic products is seriously compromised because of standards and traceability lack. Only 23084 farmers have formalized their activity during 2015 (MARDWA 2015). Also the Albanian standardized product is orientated for export and the low quality product is part of Albanian market. For this reason vendors (both retailers and wholesalers) preferred not to invest in strong market structures and distribution. Usually they ask to the local producers to bring the product in Tirana market, because they don’t prefer to spend money in low quality products. At the same time they do not want long term commitment since trust and a ceiling market price do not exist.

Conclusions

1. Local producers should sell to the small vendors with low capacities to provide marketing services. As a result, it should use short commercialisation circuits, selling directly to the small vendors and in the same time providing some marketing services (e.x. standardisation).
2. They should assure continuity with regard to the quality and quantity of its production.
3. It’s difficult for them to have written contracts with the vendors in the immediate time, the contractually process depends with a high and lasting quality level.
4. Local producers can create farmer markets, because they represent a good alternative for effectively reaching low-income communities (Project for Public Spaces (2009)).

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Corporate Social Responsibility in Macedonian Food Industries: Promoting Responsible Leadership in Practice through a Stakeholder and Legitimacy Theory

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Abstract
The article describes how companies create incentives for promoting responsible leadership through a stakeholder and legitimacy theory in practice. Three Macedonian companies from the food industry were analyzed. These companies are among the few showing willingness to share the perceived experiences and relevant documents regarding their CSR activities. In order to acquire appropriate data for the purpose of this research, data triangulation was applied. The findings substantiate the CSR benefits and challenges for the companies that apply these activities providing incentives for other companies to pursue CSR practices in their future decisions and business strategies. The results revealed that applying CSR in the agri-food companies in R. Macedonia contributes in gaining consumers’ loyalty, strengthens the internal and external stakeholders relations, attracts foreign direct investments, as well as eases the adaptation process of the EU legislation.

Key words: agribusinesses, Corporate Social Responsibility, R. Macedonia, sustainability

Introduction
Integrating environmental, social and economic issues into business practices, as a challenge recognized by scholars, businesses and politicians, leads to reactions and corporate concerns of a social character (Herbert and Rorarius, 2009). Most of the Corporate Social Responsibility (CSR) activities are undertaken by companies in response to the outside pressures and mostly depends on the management to decide how and to which pressure to address effectively (Boatright, 2009). When designing proper CSR strategies and programmes, the companies should also consider the stakeholders aspirations (Welford et al., 2007). In this context, the CSR activities raise the dilemma, should the companies without CSR agenda be excused and left to continue their economic activities, or should they be alerted for the necessary changes that need to be undertaken in order to become appropriately adapted and incorporated in the society they are embedded in. It can be argued that regardless the companies recognize their responsibility bearing towards the societies they function in, it is hard for them to find the effective balance between gaining profit and employing the social responsibility. Companies implementing proper CSR practices provide safe working conditions for their employees, ensure environmental stewardship, and stipulate contributions and charities to different types

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of community groups. The implementation of the CSR concept is on a voluntary basis, dependent on the company economic perspective (Heyder and Theuvsen, 2008).

Key factors for performing businesses in responsible way are the accountability and the transparency of the actions (www, DTIUK, 2011). Hence, the companies should communicate their CSR activities transparently, in order to build trust and legitimacy between the stakeholders. The use of legitimacy and the stakeholder relationships within enterprises eases the process of implementation the CSR concept (Heyder and Theuvsen, 2008). Mitchell et al. (1997) identify the key stakeholders on the basis of the following attributes: the stakeholder’s power of influencing the company, the legitimacy of the stakeholder’s relationship with the company and the urgency of the stakeholder’s claim on the company. By having participation interests in a company, the stakeholders also want to attain the benefits (Donaldson & Preston, 1995). On the other side, the concept of legitimacy refers to the conformity of an organization with social norms, values and expectations (Oliver, 1996). Suchman (1995) argues that this theory addresses how companies’ values are in consistency with the stakeholders’ values and norms. Therefore, the legitimacy is considered as an assessment by the stakeholder, rather than as a general concept. This mostly applies to the external legitimacy; however the internal legitimacy is driven by the employees who believe in good leadership within the company.

The general problem of misconception and the under-implementation of this concept it is also noticed within the Macedonian food sector. The awareness and the willingness to pursue CSR activities are still on a low level, although Macedonia has become a third European country, after Denmark and Lithuania, in adopting a national CSR Agenda (Rumpt, 2011). The implementation and the promotion of the CSR activities are facilitated by a CSR National Coordinative Body, bringing this concept closer to the Macedonian business community. This is considered as a support in the preparation process of the Macedonian companies towards the accession to the EU common market (Petkovski and Nikolov, 2007). Nevertheless, the only path for gaining accountability, legitimacy and sustainability are the imperative norms set by the country. Pursuing sustainable CSR activities is also voluntary and therefore not a challenging form for avoiding various industrial defamation and gaining legitimacy. The lack of understanding of the CSR concept and a shortage of indicators also decrease the motivation for the CSR engagement within a corporate strategy in the Macedonian food sector. In this context, Werther and Chandler (2006) argue that by ignoring this concept, companies could lose their societal legitimacy, which in the end affects their operational and financial performances. Another problem the Macedonian food industries are faced with is the trade-off between the profits and the sustainability of their products on one side and the balance between economic, environmental and social goals on the other side (Petkovski and Nikolov, 2008).

This paper aims to describe how companies create incentives for promoting responsible leadership by implementing CSR activities. Additionally, the research will focus on the benefits from pursuing CSR activities by Macedonian food companies.

**Material and methods**

The research focuses on analysing three Macedonian companies with highly developed awareness for the social responsibility. The companies are from the same industry but with different sizes (e.g. small, medium and large). The analyses are based on triangulation of primary and secondary data. Combination of different data types can be highly synergic and can contribute to higher validation of the research (Eisenhardt, 1989). Primary data are obtained from interviews supplemented with secondary data obtained through analysing articles, journals, internet and other relevant documented sources. The telephone interviews were done with representatives from the Human Resources Department responsible for the
implementation of the CSR strategy. In order to analyse the different aspects of the CSR activities, the stakeholder theory was applied (Hartman et al., 2007).

The qualitative research method was chosen in order to give deeper understanding of the related factors (internal and external) influencing the incentives for implementing the CSR practices in the chosen companies. The data analysis was conducted in two stages: within-case analysis and cross-case analysis. In the first stage, each of the case studied company was analysed with the obtained qualitative data. Cross-case analysis was applied to assess the similarities and differences between the analysed cases.

Each method and technique used in this research has its own particular strengths and weaknesses. The case study method is “an in-depth investigation of a problem in one or more real-life settings (case sites) over an extended period of time” (Bhattacherjee, 2012). It is a methodological approach which gives the opportunity to capture the reality in details by the current situation, and to develop a subtle understanding of the link between social, cultural, and political factors that might have influenced the phenomenon of interest (ibid). The case study methods also have some weaknesses. First, as this method is used for hypothesis testing (positivist) or theory building (interpretive) and involves no experimental treatment, thus the findings remain weak and are more likely to be criticised as subjective. Additionally, the quality of findings obtained from the study depends on the integrative powers of the researcher, where, an experienced researcher can easily recognise the concepts and patterns in the respective case findings whilst the novice researcher may omit (ibid). Due to the fact that the findings are heavily contextualised it is difficult to generalise the case findings from one industry research to other industries. It is worth noting that by using a combination of data sources (primary and secondary) for the respective case study, some insufficiencies from the secondary data source (published documents) were supplemented with the primary data source (conducted interviews), for example, the lack of information regarding the behaviour of the employees during the implementation processes of CSR was supplemented with the answers obtained directly from the interviewee through the conducted interview. The combination of data sources helps to validate and confirm the case findings by using the triangulation technique.

The strength of the use of a cross-case analysis is that the researcher can look for similar patterns and concepts between different cases while ignoring the contextual differences which can lead to idiosyncratic conclusions (Bhattacherjee, 2012). This means that individualisation of the characteristics or quality of the conclusions can be avoided.

**Results and discussion**

Several companies from the Macedonian food and beverage industry established the first non-profit company for packaging and packaging waste management with their own capital (www, Pakomak, 2012), showing that Macedonian companies are becoming aware of the need for integrating CSR practices. However, according to the UNDP baseline study (2007) still prevails the general belief that CSR activities are an obligation only for profitable companies representing the smaller part of business structure in Macedonia, especially in the agri-food sector.

**Within-case findings for CSR activities - large company**

The company is mainly focused on satisfying the clients’ needs. Additionally, creating good working conditions for the employees such as developing programs for life-long learning and creating a reward system is highly prioritized. This company makes good efforts for community development through various activities, as scholarships for students and supporting sports and cultural manifestations. One of the important aspects is that it addresses the shareholders and investors by regular and transparent publishing of its reports on the company website. As part
of CSR, gaining legitimacy is also one of the crucial aspects for this company. The continuity of these activities provides good reputation among the internal and external stakeholders for the company, thus the company fulfils the suggested four principles of the legitimacy theory which contributes to the company’s credibility.

A special focus is put on the environmental protection as one of the long-term corporate principles of this company. The environment management system is part of the integrated system for quality management and good production practices. For this purpose the company has established an Institute for Development and Quality Control. All employees are engaged in implementing this concept in ensuring a sustainable environmental and social development. Not only the employees, other stakeholders also influence the decision-making process, thus confirming good established relationships with the company. In this way, the company gain legitimacy and trustworthiness among their stakeholders.

Within-case findings for CSR – medium company

The CSR concept in its structure includes the stakeholders, targeted by the company in their daily business operations. The motivation for enacting CSR explains the concern of the management team for the external impact of its activities. In this context, the outcome of the conducted activities is assessed by gaining trust not only from the employees but also from various customers confirming a good stakeholder relationship. There from the stakeholders influence the company’s decisions, especially in reference to the CSR implementation. This is explained with the fact that the consumers influence the decisions, and therefore the company addresses the CSR activities to them. Legitimacy is also part of the CSR concept, and it is gained through various kinds of activities such as sponsorships and donations. Another focus is the production of high quality products, leading to good reputation and legitimacy from each stakeholder group of the company.

The research results also revealed that the implementation of CSR is driven by the environmental and social impacts, having the philanthropy as one of the main CSR activities.

Within-case findings for CSR – small company

It is a rare example where a small Macedonian food company implements the CSR approach in its business development strategy (UNDP, 2007). The stakeholder analysis indicates that the customers and the employees are the main focus for the company development and its sustainability. Not only the management of the company, but the employees are fully engaged in the company development and building its reputation. Legitimacy is also considered in the implementation of the CSR approach. Considering that it is a small company, gaining legitimacy is one of the company’s priorities.

The company participates in social programs and provides donations to families and churches. The managerial attitudes toward CSR practices were also examine; the results show an increased awareness about the benefits of implementing the CSR concept. The main concern for the company is developing a professional image and unique products, as mid-term results, as well as gaining loyal consumers on a long-term basis. The company does not provide official reports for their activities regarding the CSR issues; however it has a proactive CSR approach contributing to its development during the time period.

Cross-case analysis of secondary data

The companies, subject of the case studies have generally developed and maintained strong relationships with various groups of primary stakeholders, such as employees, suppliers, customers and the society in general. Other group of stakeholders, considered as secondary
according to the companies’ approach depend on its organisational structure and size classification. In this context, the large company as a joint stock company has created strong stakeholder relationship with its shareholders. As such this company is listed on the Macedonian stock exchange. The medium size company has developed a good stakeholder relationship with its collaborators and trade associations, since they are involved in the processing industry. The small company is focused on developing a stakeholder relationship with the media as a secondary group of stakeholders.

Cross-case analysis of the interview findings
The results from the cross-case analysis reveal that all three companies have similar approaches towards CSR activities. The CSR approach for all of them is considered as a concept which has an impact on external factors such as the society and the environment. However, the motivation for implementation of the CSR concept differs among the companies. The large and the medium size company implement the CSR concept influenced by the company’s business activities impact on the society and the environment; the small company implement it in order to build a professional image, to create unique products and to get more loyal consumers. The different motivation drivers are due to the fact that the large company has been present on the market for 75 years, the medium sized company is active for 50 years, while the small sized company only 17 years.

All three companies share the argument that the stakeholders influence their decision in the implementation of the CSR approach. The key influence comes from the direct external stakeholders and the consumers. However, the influence by the media, NGO’s, collaborators, business associations, etc is also noteworthy.

Conclusions
In order to describe how companies create incentives for promoting responsible leadership through stakeholder and legitimacy theories in practice, the results provided information for implementing and communicating the CSR activities among the companies. They showed that the profit is no longer the only important thing, but nowadays conducting social, economic and environmental sustainable practices is of high importance for the businesses in order to perceive benefits from various groups of stakeholders that have specific interests and distinct expectations from the company. Significant factor recognized by the companies is retaining ethical perspective while running daily activities. This will contribute to the maintenance of the internal and external stakeholders’ relationship and will have positive impact on the companies for promoting an image of a responsible leadership and competitive advantage.

The findings can also contribute for increasing the manager’s awareness in the food production and processing industries who have not implemented the CSR activities yet. It acts as a motivation for engaging in this type of activities as a part of their business strategy. This concept provides legitimacy and builds the company’s image; it also eases the adaptation of the EU legislative within companies, in order to gain loyal consumers as well as to increase the possibility of attracting the FDIs.

The CSR concept can be researched in a broader area of the food and beverage industry in RM, such as communicating the CSR activities, CSR concept as a sustainable development and as a most challenging future research is to investigate whether companies pursue CSR strategy from the heart, or the only reason is just building the company’s image.
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Wine Market Integration – Possibilities from ICT application

Nacka Marina¹, Georgiev Nenad²

Abstract

We aim to establish a Wine Market Integration Model as a data driven business model which will be consisted of all the relevant stakeholders: wine producers, represented by the wine association and the individual wineries, governmental institutions as policy decision makers, scientific community for sharing research experiences and novelties, and the consumers as the most important segment in valorization of this marketing approach. By using bottom-up approaches, the model would be developed as unique database, web-based resource and mobile application, which bring market intelligence to the participants in the integration model and wine industry in general. The results are presented through explanation of the Wine Market Integration Model in forms of blueprint idea and ICT tools. The development of the model is at initiated level as integrated and direct marketing approach. An integrated approach will eliminate information asymmetries by creating sustainable data business model which will contribute to the raising of the consumers awareness, improving of the wine education, promoting of the Macedonian wine as well as increasing of the wine culture in general.

Key words: Wine market integration, ICT tools, information asymmetry.

Introduction

Wine production in the Republic of Macedonia is one of the most important segments of the agri-food industry. Although the country has tradition in production of high-quality wines, recent scientific findings reveal that there is still lack of market organization that integrates all stakeholders in the wine market chain (Nacka, 2015). The homogeneity of the domestic market impact the insufficient commitment of domestic wineries to the domestic consumers, thus the wineries are direct to tracking the consumers’ insights mostly on the export markets (USAID, AgBiz, 2012). However, the intentions of the actors in the wine industry and the policy decision makers are aimed to invest in intensive development and to reach a market competitive position. In this regard, the strategy would focus on increased perception of domestic consumers for quality wines and brands, promotion of domestic wines and education of the consumers (National Strategy for Viticulture and Wine production (NSVW), 2014-2020).

In recent studies, we had research the consumers’ preferences of domestic wines and the level of awareness and perception about the domestic wine supply on the market, brands and product characteristics. Even though consumers mostly asses the quality of the domestic wines as very

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good and excellent (from 1-poor to 5-excellent, 43% graded with 5, and 41% graded with 4, 14% graded with 3 and 2% graded with 2) there is no proportional relationship between quality perception and general knowledge about the wineries, wine brands and product characteristics (Nacka, 2015). Besides, consumer stressed the promotion of domestic wine is insufficient but necessary for further increase of the consumption of wine.

Taking in to account the low market integration and the lack of consumers’ knowledge for domestic wine industry, we consider the possibility of introducing a concept of Wine Market Integration Model, so to improve coordination, communication, information flow and knowledge transfer among all participant in the market integration. We take in to account the ability of information driven technology to acquire, manage, and process information and allow closer integration between participants in the value chain. So, this concept should provide sustainability of the communication model and continuous information flow among parities. The basis of the concept of the communicational model rely on maximizing the informational symmetry, thus, minimizing the informational asymmetry within the information transfer in different levels of the participants integration.

In order to avoid information asymmetry, we consider a development of an ICT supported tool (platform) that will integrate participants in friendly application form. Such an application will be primarily developed as web platform and available free download application for smart phones. The ICT as new technological concept of communication and information have significant importance in the easy information access of the users, giving timely and thrust worthy information that could decrease the information asymmetry on one hand and the transaction and search costs, on the other hand. Besides, the use of ICTs enables new forms of knowledge brokering, important for the raising the consumer knowledge and market communication and dialogue with consumers.

Accordingly, the aim of this project is to establish Wine Market Integration Model as a data driven business model which will be consisted of all the relevant stakeholders: wine producers, represented by the wine association and the individual wineries, governmental institutions as policy decision makers, scientific community for sharing research experiences and novelties, and the consumers (represented by the agency for consumers’ rights protection) as the most important segment in valorization of this marketing approach. The members of this Model are direct beneficiaries of its outcomes, however the indirect entities in the wine supply chain (distributers, exporters, grape producers, etc.) will all benefit from the Council’s activities. The Council will also act as a facilitator of the specific information and interest among the stakeholders in front of the relevant institutions in the sector.

In the following section, the theoretical framework overview the concept if ICT in agriculture and the concept of information asymmetry. The results are presented through explanation of the Wine Market integration Model in form of blueprint idea, ICT platform and mobile application. Finally, by emphasizing the importance of ICT in the marketing approach, the main conclusions are drawn.

**Theoretical framework**

**ICT concept**

ICT is simply an electronic means of capturing, processing, storing and disseminating information or ICT are meeting information, communication, and knowledge needs of farmers, agribusinesses, governments, and society (Duncombe & Heeks, 2002, Maumbe, 2012). This concept provides e-collaboration, interactive, distance neutral, mobility and market transparency (Maumbe, 2012).
However, key elements, pointed by Maumbe (2012), that should be considered in the use of ICT in agriculture are following:

<table>
<thead>
<tr>
<th>Source: Maumbe, 2012</th>
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<tr>
<td><strong>Picture 1. Key components in developing ICT in agriculture</strong></td>
</tr>
</tbody>
</table>

In the recent studies, the use of ICT in agriculture has different approaches. The concept is mostly related to impact on ICT of food security, mapping of the distribution, food market integration, adoption of crops technology, ICT policy for agriculture based on transaction costs approach (De Silva, 2010) and access to market information (Maumbe, 2012). However, following these key components, we have defined our concept as market integration, relying on the conceptual idea of avoiding information asymmetry and transaction costs.

**Information asymmetry**

One of the aspects that influence on developing an integration approach is based on communication model that should provide constant information flow among the users. This aspect is very important in the process of adaption of knowledge and new technologies, data exchange and creation of trust and relationship among participants.

Stiglitz (2001) defined information asymmetry as “fact that different people know different things and it is a condition in which at least some information is known to some but not to all parties involved”. Accordingly, asymmetry of information occurs when one party in a transaction has more or better information than the other (Wankhade & Dabade, 2010). Information asymmetry can be broadly considered in two types, as product information asymmetry and general information asymmetry, determinate by users’ position due to location or socioeconomics conditions.

In this regard, the asymmetric information is easily to be derived in terms when the domestic market integration approach is characterized as less functional with low information flow among the parties: Producers-Traders-Experts-Scientific community-Governmental institutions-Consumers. Thus, when asymmetry prevails, the participants in the chain are unable to perceive the needed and quality information.
Considering the issue of information asymmetry, the communication model in the sustainable ICT system should follow the concept of minimizing this occurrence. Thus, it is important to know why there might be information asymmetry that refers to lack of information with a party, having in mind the following questions (Wankhade & Dabade, 2010):

- What makes the lack of information?
- Is it that participant (user) is not exposed to the necessary information?
- Is it that participant (user) has not shown interest to acquire the required information?
- Is it because the desirable information is not available?
- Is it due to the fact that participant (user) has been socialized on such a way that he never cares for such information?
- Is that the participant (user) have not time to gather the information?

Each question has relevance to information asymmetry. Besides, the communication model and information flow take into account the two subsets of causal factors, such as: a) Socioeconomics and cultural conditions (education, cultural milieu, national economy, national Enactments) and b) Enablers (Efforts for quality, word –of-mouth, supply chain management, advertising, guarantee/warrantee).

In order improve or develop the communication model for Wine Market Integration, the concept of minimizing information asymmetry will be considered in each phase.

The purpose of this approach is to maximize the information symmetry, mostly assumed on the basis of enablers as factor. The concept should provide sustainability of the communication model and continuous information flow among parities.

**Material and methods**

We compared three ICT solutions for data collection, communication and information sharing. The first case is established as integrated Agricultural market information system for agricultural enterprises and agri-food companies (Stamatoska Janevska, 2015). The main purpose is to collect prices of agricultural commodities thus providing further policy analysis.

The second case is ICT solution is aimed for automation and control of the entire process of grape production (Vlahovic, 2015).

The third case is the most similar to our idea representing a direct marketing approach (Cho&Tobias, 2010). This model connects the producers, processors, farmers markets, distributors, restaurants, and consumers. Based on this idea, we have also linked the governmental institutions, scientific community and wine experts, following the key components of ICT use in agriculture (Maumbe, 2012). However, using bottom-up approaches, we focused on marketing approach of ICT integration concept for forming partnership that will link Producers-Traders-Experts-Scientific community-Governmental institutions-Consumers. The development of the model is at initiated level as unique database, web-based resource and mobile applications that brings market intelligence to the participants in the integration model and wine industry in general. The idea would also include mapping system that locates wineries and promotes their products, providing an important link between producers and consumers. Basically, we have followed the framework for ICT presented by Maumbe (2012):
Conceptually, we propose the Wine Market Integration Model as following:

**Picture 3. Conceptual model of Wine Market Integration**

Source: Maumbe (2012)
Results and discussion

Wine Market Integration Model is the marketing approach that brings benefits for the wineries that could use for direct marketing strategies and e-promotions and the consumers who would gain knowledge from free access to different source of information. In general, it will provide a strengthening of the wine market integrations, which is still less organized.

The proposed model considers two types of users:

- Data providers – Subscribers (wineries, scientific experts, governmental institutions)
- Data users – Consumers, tourist agencies, sommeliers, export traders

All these data for the suggested database should be provided by the Council members, which at the same time will act as primary end users of the Council outcomes. An added value to this concept will be the development of an ICT supported tool (platform) that will integrate all above in a user friendly application form. Such an application will be primarily developed as web platform, also available as free download application for mobile phones.

For this purpose, the primary activity of this Council will be to develop a sustainable database which will aggregate data for: wine history and tradition, wineries (location, contact information, wine assortment with product characteristics, prices, and procurement practices), wine recommendations (wine type, variety, origin, year of vinification, etc.), wine events (manifestations, fairs, etc.), wine tours (tourist information), promotional packets and discounts, educational activities (workshops, seminars, tasting), dissemination of latest research findings in the topic of wine marketing etc.

Picture 4. Blueprint of the Wine Market Integration Model
ICT as web platform for integrated coloration platform

The web platform should enable develop of information and communication tool that would provide and trust worthy information, thus by reducing transactions costs between consumers and wineries by adding „market intelligence“ into the educational arena.

Additionally, we would develop ICT tool in function of consumers’ education, as mobile application, that could increase the consumer’ knowledge, market communication and dialogue between wineries and consumers.

Conclusions

Developing Wine Market Integration Model could improve coordination, communication, information flow and knowledge transfer among all participants in the market integration. The ICT as new technological concept of communication and information have significant importance in data aggregation and distribution, thus providing timely and trust worthy information. The benefits of the integrated model would address the wineries, the consumers and other participants in general, thus providing their integration on one hand, and individual promotion on the other hand. In this regard, the overall benefits for all users could be described in three categories: 1) Wineries (useful marketing strategy, especially when information symmetry is more important than the product diffusion; internet marketing; mobile marketing segmentation strategies; e-marketing; e-promotions; reduced transaction costs etc.), 2) Consumers (education and awareness; easy access to information; helps to find the wine they preferred; reduced search costs etc.) and 3) General (market integration; users coordination; improved wine culture; web-based service; promotional tool for wineries, sommeliers, exporter
traders, diplomatic, tourist agencies; wine tourism; sharing of scientific research; mobile marketing; media-promotion and marketing etc.).

An integrated approach will eliminate information asymmetries by creating sustainable data business model which will contribute to improving of the wine education, promoting of the Macedonian wine and the wine tourism as well as increasing of the wine culture in general.

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Impact of the Restriction for Neonicotinoids’ Use on the Development of Soil Pests for the Sunflower and Maize Production

Nikolov Dimitre¹, Minka Chopeva²

Abstract
The use of neonicotinoid pesticides for the treatment of seeds is temporally interrupted from the European Commission with Regulation 485/2013 from 1.12.2013. According some researches (in Romania) the application of the Regulation is related to lots of negative results on farmers’ production. In Bulgaria as a full EU member this regulation was also enforced. At the end of 2015 has been led a research for the impact of European prohibition on farmers. The research was realized from an IAE team in collaboration with Syngenta Bulgaria Ltd and is a part of the new-created trade unit – Syngenta Balkans, including also Serbia, Macedonia and Montenegro.

The paper presents the economic impact of the prohibition in force for the neonocotinoids use on Bulgarian producers of sunflower and maize. The main methodological approach of the analysis is a survey among a part of farmers producing sunflower and/or maize. The total number of farmers counts 173, included in 20 regions of the country. The research is sufficiently representative for the sunflower producers. The obtained result and conclusions for the sunflower production could be generalized with guaranteed probability equal approximately to 90 %. The research has lower representativeness for the maize production. The obtained results and conclusions have medium degree of guaranteed probability.

The questionnaire contains questions about the size of the arable land cultivated with sunflower and maize, including the land treated with neonicotinoid pesticides, the collapsed areas, the density of soils pests, the average yields etc. in the period 2013-2015. The range of areas planted with sunflower in 2015 is 6,5 % of all area in the country, with maize - 8,3 %.

For determine the negative impact of the different soil pests, the farmers have the possibility to assess the degree of importance of pests causing the biggest problems at the cultivation of maize and sunflower. The options for answer are three: High, assessed at 3 points; Medium – at 2 points and Low – 1 point. On the basis of obtained results has been evaluated a general indicator of significance degree.

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For the data processing were used different statistic methods, as the following: method of statistical groupings; method of variation; method of weighted average value, graphical method and others.

The analysis of obtained results shows that almost the half of areas planted with sunflower and maize in 2013 have been treated (respectively 53,2 % for the maize and 50,8 % for the sunflower). In 2015 the relative share of treated areas diminishes sharply – to 23 % for the maize and to 19,5 % for the sunflower. The average yield for both crops decreases in 2015, compared to 2013. For the sunflower this decrease is 17,2%, for the maize it is almost of one third (31,1%).

The maize weevil and wire worm are the two most frequent soil pests. The density of all pests increases from 2013 to 2015. For the maize weevil the average number on 1 km² has increased from 5,9 in 2013 to 7,6 in 2015; for the wire worms this increase is from 5,5 to 6,8; for the western corn worm – from 3,8 to 3,9 and for the earth fleas - from 3,8 to 5,6. The increase pace for the maize weevil is bigger than for other pests. Comparing the changes of the size of treated with nicotinoid pesticides areas and the changes of soil pests density we can affirm that the imposed prohibition has impacted mostly on the risk of appearance of the grey maize weevil and the wire worm. In the biggest cereal-producing region – Dobrich, the invasion of soil pests is bigger than the average for the country. The situation is similar for other regions with traditional production of maize and sunflower.

The obtained results prove the direct relation between the occurred cases of pests’ attacks and the formed attitude of farmers to their significance level. The farmers put almost on the same level the grey maize weevil and the wire worm with values 2,53 and 2,61 respectively, i.e. in the limits between the average and the high significance level. The west maize worm and the earth fleas are slightly below the average level.

There are also other pests invading the areas of surveyed farmers. These are crickets (black and field), aphids, grasshoppers, moths and slugs They are mentioned by farmers from almost all grain-producing regions: Dobrich, Rousse, Razgrad, Targovishte, Burgaz and Stara Zagora. The listed pests have appeared in different local places.

The mass answer of farmers, related to the consequences by the appearance of soil pests, is about the strong crops diminution after the pests’ attacks – 36,6 % of all respondents gave this answer. Follow answers about collapsed areas, low yields etc.

The imposed restriction for the neonicotinoid pesticides application for fighting the soil pests had negative impact in the following directions: diminution of average yields of sunflower and maize; increase of the number and the density of different kinds of soil pests; strong crops diminution and increase of collapsed areas. The density of all pests’ types, excluding the west maize worm, has increased in 2015, compared to 2013. The highest density level has been observed for the grey maize weevil. The earth fleas increase their density with accelerated pace.

The achieved results from the led survey and the made generalizations give reason to conclude that the negative impacts on producers of maize and sunflower could be discouraging for their further work as agricultural producers.

Key words: Neonicotinoid, soil pest, sunflower, maize, Singenta.
Introduction
The use of neonicotinoid pesticides for the treatment of seeds is temporally interrupted from the European Commission with Regulation 485/2013 from 1.12.2013. According some researches (2) the application of the Regulation is related to lots of negative results on farmers’ production. In Bulgaria as a full EU member this regulation was also enforced. At the end of 2015 has been led a research for the impact of European prohibition on farmers. The research was realized from an IAE team in collaboration with Syngenta Bulgaria Ltd and is a part of the new-created trade unit – Syngenta Balkans, including also Serbia, Macedonia and Montenegro. The report target is to present the impact of the prohibition in force for the neonocotinoids use on Bulgarian producers of sunflower and maize.

Research methodology
The main methodological approach of the analysis is a survey among a part of farmers producing sunflower and/or maize. For the definition of the representativeness of the sample has been applied a relatively easy technique – the comparison of the following two criteria:
The first criterion is related to the approximation degree of the average yield for the sunflower (respectively for the maize) in the sample to the average yield of sunflower (maize) for all the country. The quantifying expression of this indicator is the following ratio:

1) \( P_1 = \frac{n \text{ average of the sample}}{n \text{ national average}} \)

The second criterion measures the approximation degree of the average yield variance for both crops separately between all areas in the sample to the total average yield variance between all areas in the country. The formula for the variance scope is the following:

2) \( P_2 = \frac{\text{VAR sample}}{\text{VAR national variance}} \)

For both criteria is valid the following rule: if the values of \( P_1 \) and \( P_2 \) are sufficiently close to 1 (which means up to 0,9 or up to 1,1), it is assumed that the sample is enough representative.
The questionnaire contains questions about the size of the arable land cultivated with sunflower and maize, including the land treated with neonicotinoid pesticides, the collapsed areas, the density of soils pests, the average yields etc. in the period 2013-2015. The range of areas planted with sunflower in 2015 is 6,5 % of all area in the country, with maize - 8,3 %.
To define the negative impact of different soil pests, an opportunity was given to the farmers to assess the degree of importance of pests, which create the biggest problems for the maize and sunflower production. The options for answer are three: High, assessed at 3 points; Medium – at 2 points and Low – 1 point. On the basis of obtained results has been evaluated a general indicator of significance degree.
For the data processing were used different statistic methods, as the following: method of statistical groupings; method of variation; method of weighted average value, graphical method and others.
Results and conclusions

Sample description

The total number of farmers counts 173, included in 20 regions of the country. The interviewed farmers’ distribution is conforming to the different number of sunflower and maize producers in different areas. Thus, their distribution per areas is irregular.

The obtained results of the methodology for definition of the sample representativeness are: for the sunflower $P_1 = 1.1$ and $P_2 = 1.02$; for the maize $P_1 = 1.2$ и $P_2 = 1.16$. Therefore, the research is sufficiently representative for the sunflower producers. The obtained result and conclusions for the sunflower production could be generalized with guaranteed probability equal approximately to 90 %. The research has lower representativeness for the maize production. The obtained results and conclusions for the maize producers have medium degree of guaranteed probability.

The distribution of interviewed farmers per regions could be seen on Fig. 1.

Source: Information from empiric research

Figure 1. Respondents’ number in the sample

The highest numbers of farmers in the sample are from the regions of Plovdiv, Burgas and Vratza, respectively of 20, 17 and 16 farmers. Almost the same is the number of respondents from the regions of Pleven (13), Russe and Silistra – by 11 farmers each, Razgrad and Dobrich – by 10 producers each. In fact, the dominant part of surveyed farms in the research is from the biggest cereal-producing regions of the country.

Analysis of areas with sunflower and maize, including treated with neonicotinoid pesticides, and of average yields

The total size of UAA of farms in the sample is 2601121 decars, which is 5.23% of all UAA in the country in 2015. The range of areas planted with sunflower is 6.5%, with maize - 8.3%.

Data about the trends of changes of farms areas with sunflower and maize, of the treated area with neonicotinoid pesticides and of average yields are in Table 1.
Table 1. Total area with sunflower and maize in the sample, including the treated areas by nicotinoid pesticides (decars), relative share of treated areas (%) and average yields for the period 2013-2015 (kg/decars)

<table>
<thead>
<tr>
<th>Crops</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total area, decars</td>
<td>Including treated by nicotinoids, decars</td>
<td>Relative share (%)</td>
</tr>
<tr>
<td>Maize</td>
<td>3117153</td>
<td>168831</td>
<td>53.25</td>
</tr>
<tr>
<td>Sunflower</td>
<td>493483</td>
<td>250745</td>
<td>50.82</td>
</tr>
</tbody>
</table>

Source: Information of empiric research and own calculations

The analysis of information from the table above shows the sharp decrease of nicotinoids use against the soil pests, after 2013. Almost half of areas in 2013 have been treated by the indicated pesticide (respectively 53,2% for the maize and 50,8% for the sunflower). In 2015 the relative share of treated areas of maize is 23%, of sunflower - 19,5%. Conclusion could be made that despite the inadmissibility of mentioned pesticides’ use, the farmers still use their possibilities to fight with the soil pests.

Visually the data from the Table 1 and the resultant trends could be followed on Fig. 2.

As it is seen on the figure above, the average yield of both crops in 2015 decreases in comparison to 2013, for the sunflower - of 10,1%, for the maize - of 15,2%.

Source: Information of empiric research and own calculations

Figure 2. Changes of the relative share of treated area to the total share (%) and average yield (kg./decar) of sunflower and maize for the period 2013-2015
Analysis of soils pests: number, density, determination by the size of treated areas

Particular attention in the survey has been paid to the number of cases in the three successive years, when the crops have been attacked in the phase of germination by the following soil pests: grey maize weevil, wire worm, western maize worm and earth fleas. There is also information about their density, expressed by the number of individuals per 1 square kilometer. The biggest number of farms from the entire sample is these attacked by wire worms. (Fig. 3).

Source: Information from empiric research and own calculations

(Figure 3. Total number of farms attacked by different kinds of pests in the period 2013-2015)

From the analysis in the last Figure we can make the following generalizations. The grey maize weevil and the wire worm are the most frequent pests in the group of analyzed soil pests. The number of farms, damaged by these kinds of pests, in the examined period has decreased considerably. But this fact does not mean that the harming impact of these pests diminishes in the time period. The observed decrease can be explained by the presence of a big number of farmers, which have not answered the question: “Which pests have been observed in the germination phase of the crops?”

The farms’ number, non-answered to the posed question about the grey maize weevil is almost twice bigger than the number of these answered positively. There is a fact, which is more important and alarming: the density of all pests increase from 2013 to 2015, which is shown on Figure 4. For this reason the analysis of the change of the number of observed pests per 1 square kilometer in the period 2013-2015 has bigger cognitive value, compared to the analysis of the number of farms, which indicated that they have suffered from pests.
The analysis of obtained results shows an ascending trend of density development for almost all kinds of soil pests. Only the density of the western maize worm remains on the same level, which is the lowest, compared to other pests. The average number on 1 km\(^2\) for the maize weevil has increased from 5.9 in 2013 to 7.6 in 2015; for the wire worms this increase is from 5.5 to 6.8; for the western maize worm - from 3.8 to 3.9 and for the earth fleas - from 3.8 to 5.6. The conclusion is that for the maize weevil the density is the highest in comparison to others, in every year of the period. The increase pace for this pest is bigger compared to the increase of wire worm and the western maize worm. This is the main reason for the increase of difference between the density of the maize weevil and the other two pests. Apart this, the increase pace for this pest is bigger, compared to the wire worm and the western maize worm. This is the main reason for the increasing difference between the densities of before-mentioned pests. For example, if in 2013 the difference in relation to the pests number per 1 km\(^2\), between the weevil and the wire worm was barely 0.5; in 2015 this difference has increased twice.

Despite the lower density of earth fleas, compared to the weevil and wire worm densities, in 2015 we can observe a sharp jump of their average number per 1 km\(^2\) (1.5 times). The main conclusions are the following: the pests having the biggest density for all the period are the grey weevil and the wire worm; the lowest density level for the three years is of the western maize worm; despite the increase of pests’ density, for the different kinds the increase is not the same; the fastest increase is for the number of the earth fleas, but independently of this fact, the grey weevil remains the pest with the biggest density. Comparing the change of the size of treated areas with the changes of pests’ density, we can conclude that the introduced restriction has reflected mostly on the risk of appearance of grey maize weevil and wire worm.

The differences of density for the grey weevil between the different regions are shown on Fig. 5.
From the indicated data it is seen that in regions of Dobrich, Pleven and Burgas the density of the weevil is the biggest; its value in 2015 is respectively 17.8 per km² in Dobrich; 13.1 per km² in Pleven and 12.3 per km² for Burgas. Under the average value for the country is the number of the weevil for the crops of farmers in the regions of Vidin, Montana, Silistra, Pernik and Plovdiv. In the regions Stara Zagora, Kyustendil and Sliven there are not received answers of the question for the average number of the grey maize weevil.

In order to establish the supposed results on the density of the soil pest from the non-use of nicotinoid pesticides (or their partial application) were presented two figures more (Fig. 6 and Fig. 7). The information on these figures is related to the relative share of the treated agricultural land in the total land size planted with maize or sunflower.
The comparative analysis between data on Fig. 5, 6 and 7 shows that only in the region of Pleven the share of the treated area, both with maize and with sunflower, is bigger than the average for the country, at the same time the density of the grey maize weevil is over the average. In the predominant part of other regions we can assert that there is inverse correlation between the number of weevils and the part of treated area. For example, in the regions of Vidin, Montana, Lovech, Razgrad, Plovdiv and Kyustendil in 2013 the treated area share is higher, compared to the average for the country and respectively, the density of the grey weevil is under the average for the country.

In 2015 for the both crops, only in Lovech region, the relative share of the treated area is bigger than the average for the country. In this region the weevil density is under the average level for the country. In the regions Russe and Targovishte the share of the treated areas decreases sharply, both for sunflower and maize. In this area, the density of the maize weevil is below the national average level. In 2015 there is a higher average number of the maize weevil per 1 km\(^2\), than for the country, so the lack or the insufficient use of neonicotinoids realized negative impact on the crops state.

In the biggest cereal-producing region, Dobrich, there is an inverse correlation between the treated area size and the number of maize weevils per 1 km\(^2\). Unlike the previously examined regions, in 2013 the share of treated area for the sunflower is barely 21.3% and for the maize - 36.4%. In 2015 this share decreases respectively to 12.3% for the sunflower and to 4.5% for the maize. This could be the main reason for the mentioned biggest invasion of the weevil in Dobrich region, compared to the average for the country in both years. Similar is the situation in the region of Burgas - less treated areas and higher values of density of the maize weevil.

**Assessment from the farmers of the significance degree for the different soil pests**

To define the negative impact of different pests, farmers were questioned the following: “Assess the pests, creating the biggest problems for the sunflower and the maize, per their significance
degree”. There are three options of answer: High, assessed by 3 points; Middle – by 2 points and Low – by 1 point. On the base of obtained results has been assessed a general indicator of significance degree, by the use of the formula for the average-weighed value.

The obtained values of the general coefficient, measuring the significance level for different pests, are presented on Fig. 8.

Data analysis from the Figure above confirms the presence of the presumable direct relation between the occurred cases of pests’ attacks and the formed farmers’ attitude to their importance level. Farmers place the grey weevil and the wire worm on the almost same significance level; with values of the general coefficient, respectively of 2.53 and 2.61, i.e. the level is between the middle and the high level. The pests: western maize worm and earth fleas have been placed slightly under the average level.

The interviewed farmers have noticed that their crops have been attacked also by other pests – crickets (black and field). Apart the cricket the crops have suffered from aphids, grasshoppers, moths and slugs. We can conclude that the mentioned pests have appeared in different places, locally.

The obtained results, regarding the consequences caused by different soil pests, show particular interest. The mass response of farmers is related to the strong rarefaction of crops after the pests attack. This answer give more than 1/3 of all surveyed persons – 35.6% (Fig. 9)
On second place is the negative result, related to the obtainment of lower yields in comparison to the yields from years without pests’ attacks. This consequence has been mentioned by 20% of interviewed farmers. On third place is the answer about the necessity of crop reseeding, because of the rarefaction or collapsed areas. The collapsed areas are on the next place of the negative results. Practically, every 10 of surveyed farmers indicate this result (11.18%). The listed negative consequences by the farmers are often tightly related. For example, the necessity of reseeding is related to the crops rarefaction and the collapse of areas, due to different pests attacks.

The made analysis of results about the consequences from the prohibition for neonicotinoids use on sunflower and maize producers clarifies the negative impacts in some directions. In 2015 the average yields of sunflower and maize have diminished: the number and the density of different kinds of soil pests have increased; as a result of the last-mentioned, the size of collapsed areas also has increased. The density of all kinds of pests, excluding the western maize worm has increase in 2015 against 2013. The highest density level for the three years has been observed for the grey maize weevil. The density of earth fleas has increased with accelerated pace, due to the non-use or the reduced use of neonicotinoid pesticides, which in this case has the most negative impact. The regions with the most expressed relation between the pests’ density and the non-use of neonicotinoid pesticides are Dobrich, Russe, Targovishte, Vratza, Burgas and Plovdiv.

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Analysis and forecasting of bean prices in Serbia

Novkovic Nebojsa¹, Mutavdzic Beba²

Abstract
Bean is an important crop in Serbia. In last 20 years (1991-2010) bean has been produced on 23,767 hectares and the average annual production was about 40,000 tons with average yield of about 1.5 tons per hectares.

The topic of this research paper is the analysis of the changes and the future tendencies of the price parameters of bean in Serbia, with the aim to forecast the real, absolute and relative (the parity with wheat) bean prices, i.e. to forecast the economic conditions for the production of this crop.

The analysis of the time series (1994-2014) has been done by means of descriptive statistics, and the suitable ARIMA models were used for the forecast in the period 2015-20.

The real growth of bean price and the increase of parity with wheat have been predicted for the forecast period as well. It means that both absolute and relative price conditions in bean production are being improved.

Key words: bean price, bean/wheat price parity, Serbia, forecasting.

Introduction
Bean is one of the most important vegetables in Serbia. The average agricultural land under bean in the period 1991-2010 was nearly 23,800 hectares (Ivanišević, 2015). The area under bean showed relative stability (the coefficient of variation 7.08%). It fluctuated between 20,268 and 26.379 hectares and displayed the tendency towards a slight decrease of the average annual rate of -1.36%. The average annual bean production was around 40,000 tons and it varied from 15 to 70 thousand tons a year. Bean production showed high unstability (the coefficient of variation 37.03%) and tendency of decreasing (average year change rate -2.48). Average bean yield in Serbia was 1.5 tons per hectare and it varied between 0.58 and 2.65 tons/ha.

The topic of this research is the analysis of the changes and the future tendencies of the price parameters of bean in Serbia. Considering the importance of bean production, the existence of the possibility to apply the methods of the scientific forecasting, and the tendency of the future development of bean

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production, the aim of this research is hereby defined: The forecasting of the change of the absolute and relative (parity) price parameters of bean in Serbia.

The forecasting is based on time series data. Autoregressive–moving-average (ARMA) models or a class of ARIMA models are often applied to this end. ARIMA models are widely used in the area of forecasting and there are quite a number of publications where the implementation of this model and its validity check were examined. The works of Box, Jenkins, Pen and other authors are significant on account of their methodological input. In their works, by examining these models, they have given their contribution to the development of the models. For instance, (Fasen, 2015) assesses multivariate autoregressive–moving-average (ARMA) models in the continuous-time and their dependence estimation (MCARMA model).

As a separate case, a CARMA (one-dimensional MCARMA) process is considered. For a CARMA process, Bartlett's formula for the sample autocorrelation function is proven. (Yining, 2015) Describes semi parametric time series models with innovations for a log-concave distribution. He proposes a general maximum likelihood framework which allows a simultaneous estimation of the parameters of the model and density of the innovations. This framework can be easily adapted to many well-known models, including the class of autoregressive–moving-average (ARMA) models, the class of GARCH models and the class of ARMA-GARCH models.

A fair number of authors have dealt with the forecast in agriculture. Analyse the time series of the production and the price of pigs and maize and ascertain that there are seasonal, cyclical and random oscillations present in the series. They predict the parity price trend for pig-maize using a proper ARIMA model (Nikolić-Dorić et al., 1993).

In their research, (García-Martínez et al., 2008) state that the crop production in Spanish Mediterranean region is under a strong influence of market liberalization which drives the farms to become more competitive as producers, and also to meet consumers’ expectations in terms of the quality and price of a product. The authors’ objective is to assess the economic climate for the production of tomato and pepper in greenhouses. By applying ARIMA models in the forecasting of price trends of these products, they estimate the expected development of purchasing power, which leads to decisions about the choice of cultivars, product scheduling, heating etc. In other words, forecasting is used for production planning and commercial activities in the production of tomato and pepper in greenhouses.

Analyse tomato production in greenhouses. In the study, the authors propose the automatic tomato yield predictor modelas a possibility for anticipating weekly fluctuations in the yield, which could avert problems of both reduced yield and overproduction. The prediction parameters used by the authors consist of variables inside the greenhouse, temperature, CO2, vapour pressure deficit (VPD) and radiation, as well as past yield data. The model for the tomato yield forecasting was constructed by the analysis of the collected data using an intelligent system named “Evolving Fuzzy Neural Network” (EFuNN). The given results demonstrate that the model predicted weekly fluctuations of the yield with an average accuracy of 90% (Qaddoum et al., 2013).

The prediction of tomato price trend is the topic (Zhang et al., 2014). The authors believe that an accurate price prediction of agricultural products is a useful method for making a proper record of the turnover of agricultural products and agricultural production, and for creating the balance between supply and demand of the agricultural products. For the application of Wavelet neural network, as a method of forecasting, they chose retail tomato prices. The result of the applied process is a prediction model with an error less than 0.01, and the correlation between the predicted value and real value is 0.908, which indicates that the model will predict tomato price trend accurately.
Forecasting tomato prices can provide critical and useful information to tomato growers making production and marketing decisions. The authors have analysed the seasonal price variation of tomato crop and have developed a Seasonal ARIMA (SARIMA) model to forecast the monthly tomato prices at wholesale level in Antalya, Turkey, on the basis of reported prices from 2000 to 2010. (Adanacioglu and Yercan, 2012).

Authors (Novković et al., 1994) examine how parity prices for fattening pigs/maize depend on the turnover of the fattening pigs and maize, and, based on the analysis, they forecast the trend until the end of the 20th century.

Perform an analysis on the time series of the parity prices for wheat/mineral fertilizer, and, with the use of a certain ARIMA model, they predict the parity trend in the following five-year period (Novković et al., 2005/6).

Analyse animal husbandry in Vojvodina and determine the directional movement of certain livestock species and the production characteristics of the animal husbandry at the beginning of the 21st century (Novković et al. 2006).

By means of quantitative model based on time series, encompassed the prediction of the total land under vegetables, and also the land, yield and total output of potato, beans and tomato in Vojvodina, in the period 2005-10. In her forecast, she also used ARIMA models, based on the time series of the statistical data from the period 1950-2005. In the analyzed period, the land under vegetables in Vojvodina is characterized by the low presence of the arable land and the slight downward trend. The predicted figures and the charts presenting the original and predicted figures of the land under vegetables confirm the previously ascertained downward trend. After taking the whole examined period under consideration, it can be concluded that the shrinking of the land is followed by the increase of the intensity of vegetable production, i.e. a considerable increase in the yield of all vegetable crops (Mutavdžić, 2009).

While analyzing the tendencies in the agriculture development in Serbia in the period 2001-2010, reached the conclusion that vegetable production in Serbia had the following characteristics:

- The harvested areas under tomato, peas, cabbage and kale, pepper, carrot and cucumber increased, whereas those under potato, onion, melon, watermelon and garlic became smaller, when compared to the previous decade (1991-2000);
- The average yield of all the observed vegetable crops went higher (except beans);
- Total vegetable production in Serbia has increased significantly, primarily as a consequence of an increase in the production intensity i.e. the higher yield. The average annual rise in the production is as follows: peas 56%, pepper 26%, carrot 20%, potato 18%, cucumber 17%, cabbage and kale 13%, watermelon 12%, tomato and onion 5% and garlic 2%;
- The following vegetables display rising production tendency: tomato, peas, onion, pepper, beans, carrot and cucumber. However, potato, watermelon and garlic show downward trend, while cabbage and kale practically stagnate (Mutavdžić et al., 2011, 2011a).

Analysis and deal with the tendencies of the development of vegetable production in Vojvodina in the period 2001-10, is described in the following way:

- The harvested areas under the studied vegetables shrank with almost all the vegetable crops when compared to the previous period, except for the land under peas, pepper and garlic, which grew slightly, relative to the previous decade;
- The average yield of all the observed vegetable crops was higher (except tomato);
- Total vegetable production rose significantly, primarily as a result of the increase in the intensity of the production, i.e. the higher yield of almost all the species (except tomato and beans) (Novković et al., 2012, 2013, 2013a).
The topic of this paper (Ivanisić et al., 2015) is the analysis of the changes and the future tendencies of the price parameters of tomato in Serbia, with the aim to forecast the real, absolute and relative (the parity with wheat) tomato price, i.e. to forecast the economic conditions for the production.

The analysis of the time series (1994-2010) has been done by means of descriptive statistics, and the suitable ARIMA models were used for the forecast (2011-2015).

The average real tomato price in the period 1994-2010 was 0.17 EUR/kg, and the average parity price for tomato/wheat was 1.5. The tendencies for the real growth of tomato price as well as the increase in the parity price with wheat were noticed during the analyzed period.

A further real growth of tomato price and the growth of the parity with wheat have been predicted for the forecast period. This means that both absolute and relative price conditions in tomato production have been improving. The predicted tomato price in 2015 is 0.22 EUR/kg, and the parity price with wheat is 2.88, which is considerably higher than the average in the observed time period.

The models for the forecast indicated that the previous year’s tomato price, i.e. parity, has a considerable influence over the formation of tomato price and the establishing of the parity with wheat.

The topic of this research is the analysis of the changes and the future tendencies of the price parameters of cabbage in Serbia, with the aim to forecast the real, absolute and relative (in the parity with wheat) cabbage price, i.e. to predict the economic conditions for the production. Results of research shows:

- The average real cabbage price in the period 1994-2014 was 164 euro/ton (minimum: 87, maximum: 267 euro/ton) and the average parity price for cabbage/wheat was 1.49 (from 0.84 to 2.89). Cabbage had been showing negative tendencies for the real price. Average yearly change rate was -2.71%. In the same period, cabbage parity price with wheat showed the tendency of harder decreasing, by yearly change rate of -3.29%.

- Negative tendencies of cabbage price have been predicted for the forecast period as well. This means that both, the absolute and relative price conditions in the cabbage production have been worsened. The predicted cabbage price in 2015 is 136 euro/ton, and in 2020 is 112 euro/ton. The parity price with wheat is 1.34 in 2015 and 1.01 in 2020. (Novković et al., 2016).

In this research are analyzed is and forecast production parameters (sowing area, yield and total year production) of cabbage, also one of the most important kind of vegetables in Serbia (Mutavdžić and Novković, 2016).

Material and methods

The defined topic and aim of the research have created a need to adopt the appropriate quantitative methods i.e. the methods of statistical analysis. The statistical methods used in this research are classified into two groups:

- Methods of descriptive analysis;
- Analytical and statistical methods.

Methods of the descriptive statistics are to be used for the analysis of bean price changes in the period 1994-2014. The basic statistical indicators area follows: the average value of the phenomenon, extreme values (minimum and maximum), coefficient of variation and the change rate.

In an attempt to forecast the observed price changes, we have used the method of time series analysis, i.e. ARIMA models based on the time series analysis have been applied. The time
series analysis has encompassed bean price characteristics in the stated period, and the prediction refers to the future six-year period, 2015-20. The base for the analysis and prediction of bean price was the average annual price of this vegetable. Since this is about the economic element, i.e. the price, we need to consider the inflation rates as well. Hence, the analysis and prediction of bean price headed in two directions:

1. Analysis and prediction of the absolute, deflated bean prices;
2. Analysis and prediction of the relative prices, i.e. the parity price of bean with the price of wheat.

The absolute average prices of bean are deflated, i.e. reduced to the fixed prices from 1994, based on the index of retail prices, which is the most adequate inflation indicator. In 1994, the parity of dinar with German mark 1:1 was established. As a result, the deflated vegetable prices corresponded to the same prices in German mark. If divided by 2 (by 1.95, more precisely), one could get the real value of the prices in euro.

The series of the observed phenomena in this paper are acquired, or formed, based on the publications on statistics from the Statistical Office of the Republic of Serbia. The statistical software Statistica 10, Eviews 3.1 and SPSS have been used for the analysis of the collected data.

Results and discussion
The average bean deflated price in the analyzed period was 1,015 euro/ton. The price varied between 554 and 1,528 euro/ton. The bean price coefficient of variation was extremely high, 86.06% what prove instability of this production. Average annual rate of change of bean deflated price was positive, 4.97%.

Predicted absolute (deflated) bean price values are obtained based on the evaluated model (Table 1), which indicates that bean price of the current year is significantly conditioned by the prices of previous two years.

Table 1. Parameters of the model for bean price forecast

<table>
<thead>
<tr>
<th>Paramet.</th>
<th>Param.</th>
<th>Asympt. Std.Err.</th>
<th>Asympt. t(13)</th>
<th>p</th>
<th>Lower 95% Conf</th>
<th>Upper 95% Conf</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-0.005346</td>
<td>0.122268</td>
<td>-0.04372</td>
<td>0.965790</td>
<td>-0.26949</td>
<td>0.258797</td>
</tr>
<tr>
<td>p(1)</td>
<td>1.181001</td>
<td>0.345634</td>
<td>3.41692</td>
<td>0.004591</td>
<td>0.43430</td>
<td>1.927697</td>
</tr>
<tr>
<td>p(2)</td>
<td>-0.877235</td>
<td>0.299371</td>
<td>-2.93026</td>
<td>0.011707</td>
<td>-1.52399</td>
<td>-0.230483</td>
</tr>
<tr>
<td>q(1)</td>
<td>0.567773</td>
<td>0.481522</td>
<td>1.17912</td>
<td>0.259480</td>
<td>-0.47249</td>
<td>1.608037</td>
</tr>
</tbody>
</table>

Source: Result of prediction

Predicted bean price for the following six-year period indicates significant oscillations, i.e. the alternately rises and falls, year in year out. Predicted prices of bean are:

Year 2015 - 1,728 euro/ton
Year 2016 - 1,478 euro/ton
Year 2017 - 1,482 euro/ton
Year 2018 - 1,270 euro/ton
Year 2019 - 1,615 euro/ton
Year 2020 - 1,646 euro/ton.
During the whole predicted period, the price of bean will be higher than the average price in an analyzed period. The highest prices bean will have in the first and last year of prediction (2016 and 2020). In average, predicted price will be higher for more than 50% than average price in observed period. It means, that absolute economic position of bean on market in future will be much better than it was in past.

The oscillations in the price movement of bean are affirmed in the chart (Graph 1).

**Graph 1. Bean price changes**

The average parity price of bean with price of wheat during the analyzed period was 8.94. It means that one ton of bean cost almost as nine tons of wheat. The parity fluctuated between 4.43 and 14.54. The coefficient of variation of the parity price for bean/wheat (29.02%) was similar as the coefficient of variation of bean price (27.05%), what means that wheat had similar variation as bean in observed period.

The average annual parity change rate of bean price with wheat price (4.29%) was also similar as change rate of bean price (4.97%).

The model for the forecast of the parity bean/wheat prices indicated that, also the previous two year’s price parity has a considerable influence over the formation of bean price and the establishing with wheat (Table 2).

**Table 2. Parameters of the model for the parity price prediction for bean/wheat**

<table>
<thead>
<tr>
<th>Param.</th>
<th>Param.</th>
<th>Asympt. Std.Err.</th>
<th>Asympt. t(15)</th>
<th>p</th>
<th>Lower 95% Conf</th>
<th>Upper 95% Conf</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.239725</td>
<td>0.064404</td>
<td>3.722200E+00</td>
<td>0.002044</td>
<td>0.102451</td>
<td>0.376999</td>
</tr>
<tr>
<td>p(1)</td>
<td>-0.130041</td>
<td>0.277290</td>
<td>-4.689701E-01</td>
<td>0.645835</td>
<td>-0.721070</td>
<td>0.460989</td>
</tr>
<tr>
<td>p(2)</td>
<td>0.025704</td>
<td>0.291456</td>
<td>8.819249E-02</td>
<td>0.930890</td>
<td>-0.595520</td>
<td>0.646929</td>
</tr>
<tr>
<td>q(1)</td>
<td>0.583459</td>
<td>0.000000</td>
<td>2.989270E+10</td>
<td>0.000000</td>
<td>0.583459</td>
<td>0.583459</td>
</tr>
<tr>
<td>q(2)</td>
<td>0.416459</td>
<td>0.000000</td>
<td>2.989270E+10</td>
<td>0.000000</td>
<td>0.416459</td>
<td>0.416459</td>
</tr>
</tbody>
</table>

**Source:** Result of prediction
The evaluated model for the analysis and prediction indicates that the parity for bean/wheat prices also varies significantly in the forecast period. Predicted bean/wheat parity price for the following six-year period indicates significant oscillations, i.e. alternately rises and falls, year in year out (Table 3).

Table 3. The prediction of the parity prices for bean/wheat (2015-20)

<table>
<thead>
<tr>
<th>Year</th>
<th>Forecast</th>
<th>Lower 95,0000%</th>
<th>Upper 95,0000%</th>
<th>Std.Err.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>11,87422</td>
<td>6,298182</td>
<td>17,45025</td>
<td>2,616077</td>
</tr>
<tr>
<td>2016</td>
<td>11,32862</td>
<td>5,528243</td>
<td>17,12899</td>
<td>2,721327</td>
</tr>
<tr>
<td>2017</td>
<td>11,59587</td>
<td>5,795148</td>
<td>17,39660</td>
<td>2,721493</td>
</tr>
<tr>
<td>2018</td>
<td>11,81183</td>
<td>6,008869</td>
<td>17,61479</td>
<td>2,722543</td>
</tr>
<tr>
<td>2019</td>
<td>12,0535</td>
<td>6,251367</td>
<td>17,85934</td>
<td>2,723023</td>
</tr>
<tr>
<td>2020</td>
<td>12,29397</td>
<td>6,488781</td>
<td>18,09917</td>
<td>2,723589</td>
</tr>
</tbody>
</table>

Source: Result of prediction

During the whole predicted period, the parity price of bean and wheat will be higher than the average price parity in an analyzed period. The highest prices parity with wheat bean will have in the last year of prediction (2020). In average, predicted price parity will be higher for more than 32% than average price parity with wheat in observed period. It means, that relative economic position of bean, comparing with wheat, will be for 1/3 better than it was in past.

The changes of bean/wheat price parities are presented in the chart (Graph 2).

Graph 2. The changes of the parity prices for bean/wheat (2015-20)
Conclusion
The research in this paper has indicated the following:

- The average absolute deflated price of bean in the period 1994-2014 was 1,015 euro/ton (according to fixed prices from 1994);
- The average parity price for bean/wheat in analyzed period was 8.98, what means that value of 8.98 tons of wheat are equal with one ton of bean;
- During the observed period, the tendencies for the real growth of bean price (at the average change rate of 4.97% per year) and the prices parity bean/wheat (change rate 4.29%) were present;
- The real absolute growth of bean’s price have been predicted for the forecast period of six years (2015-20);
- The real relative growth of bean/wheat price parity has been also predicted;
- It means that a both absolute and relative economics conditions in bean production will be improve.

- Absolute economic position of bean production will be for more than 50% better than average in observed period;
- Relative economic position of bean on market comparing with wheat will be better for 32%;
- The predicted bean price will be highest in 2015 (1,728 euro/ton) and in a year 2020 (1,646 euro/ton);
- The predicted bean price will be the lowest in a year 2018 (1,270 euro/ton);
- The predicted bean/wheat price parity will be the highest in a year 2020 (12.29);
- The predicted bean/wheat price parity will be the lowest in a year 2016 (11.32);
- The predicted values are obtained based on the evaluated model, which indicates that bean price of the current year is significantly conditioned by the previous two year’s price;
- The model for the forecast of the parity bean/wheat indicated that, also the previous two year’s price parity has a considerable influence over the formation of bean price and the establishing with wheat

References


Measurement and analysis of income risk at the farm level

Petelin Gasper¹, Zgajnar Jaka²

Abstract
Agriculture income risk analyses have recently been subject of numerous studies. It is an important aspect of monitoring production stability of agricultural holdings. Income risk issues are increasing due to increasing numbers of adverse weather events, climate change, many diseases outbreaks and above all growing market - price risk. Development of tools to manage them is therefore gaining on importance. In this contribution, we prepare a review of tools and analyzes of income risk management. As it is evident from the literature, a first step in efficient income risk management is good source of information. This paper presents a conceptual approach how to use farm management information system, PANTHEON Farming, as a possible tool for income risk evaluation tool at the level of particular farm. Namely, PANTHEON Farming uses a combination of financial and FADN data, which are obtained from bookkeeping data. Such a tool could enable farms that use the program in easier evaluation and management of income risk. Besides that it could be applied by decision makers, it could be also benefit to potential providers of such tools, as they would get a clearer insight in the income risk on case farms.

Key words: Income risk, risk management, farm management information system, farm, PANTHEON Farming.

Introduction
Risks in agriculture have always been an important topic and are even gaining on importance in recent years. Although there are many different types of risk that influence agriculture (Girdžuute, 2012), price and production risks have the biggest impact (El Benni et al., 2015) and consequently also farmers see them as most important (Tangermann, 2011). Which of them is the most important mainly depends on the production type of a farm. Based on research of Antón et al. (2011), livestock farmers treat price risk as most important group of risks in their business. Crops producers see them also as very important and put them on second place. Production risks are the most important risk group for crop producers and the second most important for livestock breeders (Antón et al., 2011). Janowicz-Lomott (2015) and Tangermann (2011) stress that production risk is mainly influenced in crop production by weather and in livestock by disease outbreaks (Aimin, 2010). Price risk include all risks associated with price volatility. In that respect Aimin (2010) points out that volatility of input prices has the same importance as volatility of output prices and in that respect corelation between them is also crucially important (Kimura and Antón, 2011). Other two sources of risk, not so important but

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still inconsiderable, are institutional risks, associated with policy changes, and personal risks that include illness or death of workforce (usually family) members (Aimin, 2010).

Mainly due to increased price volatilities and uncertain weather conditions in recent years, risk management is becoming more and more important for efficient farm production. As we know, frequency and strength of unfavourable extreme climate events is increasing for quite a few years already. In recent years the same goes for price risks which is becoming more important, especially in developed countries, like European Union and some also for United States of America. On of the reasons for increased price risk is in liberalisation of agriculture markets (El Benni et al., 2015). As Hardaker (2006) points out, farmers in EU were in the past relatively well protected against those risks. In dairy farming this is especially the case with milk quotas and direct payments (Schaper et al., 2009) that were important factors of price stabilization in the past. Stable prices also meant stable income and consequently importantly lower price risk. Since agricultural policy in EU is transfering to decoupled payments, abolishment of direct payment and milk quotas are exposing farmers more to global markets and volatility of world prices. Consequently, price risks are significantly increasing (El Benni et al., 2015).

When we are talking about managing risks as a solution to control and minimize risks in agriculture, it is important what data source is used and, connected with that, what group of risks is measured. As Aimin (2010) points out, risks are not independent and consequently shouldn’t be measured and analysed independently. This way risk measurement combines different risks and their correlation. Risk correlation has an important influence on risk and can in some cases even lower risks (natural hedge). So if correlation is not included in risk analysis, results can be distorted (Tangermann, 2011).

To insure that all risks are covered in risk measurement and analysis, income of farm should be measured. Modestus (2014) and also Juvančič et al. (2013) have determined income as indicator that comprehensively shows economic situation of individual farm. El Benni et al. (2015) agree and add, that it also shows economic welfare of individual farm. So if we merge these findings with findings stated above, it could be concluded, that measurement of income and management of income risks is the key to improve income stability of farms and also their financial and organizational stability (Janowicz-Lomott and Łyskawa, 2014). Since economic welfare of farming community has always been a fundamental concern in countries like Canada (Kimura and Antón, 2011), USA, (El Benni et al., 2012) and also European Union (Allanson and Hubbard, 1999), this also influences their risk management tools. Risk management tools in Canada and USA are based on some form of income, whereas development of income risk management tool in EU is being analyzed (Pigeon et al., 2012).

Although income can show a comprehensive overview of economic welfare of individual farm, risk measurement on income level has quite a few drawbacks. First of all, there is no exact determination by WTO, what exactly income includes. Van Winsen (2011) for instance determined income as:

\[
\text{Income} = \text{Revenues} - \text{Variable costs} - \text{Fixed costs} - \text{Work costs} - \text{Land costs}
\]

Anyhow, in established income risk management tools (like in Canada), income as such is not used. There are more reasons for this decision. One of them is, that income includes some of the revenues and costs like wages, rent or shares, which are not appropriate in income risk management, due to possibility of moral hazard (Kimura and Antón, 2011). That is also why, in the case of Canada, reference margin is calculated, where only appropriate revenues and costs are included. Based on differences in reference margins, income drop is determined and on that basis indemnifications are then made.

Another issue in developing of a tool for income risk management is data source. To be able to ensure an effective tool, reliable and detailed information is needed (Pigeon et al., 2012).
Although there are some sources of financial data available, they are not long enough and consistent enough for risk measurement and analysis of risks (Žgajnar, 2016). Different studies are therefore using available data and are combining them with other sources.

EU risk analysis is mostly based on FADN data (for instance El Benni et al., 2015, dell’Aquila and Cimino, 2012, Pigeon et al., 2012). As indicated by Vrolijk and Poppe (2008), FADN data are a reliable data source for measurement of normal risks in agriculture. Anyhow, there is a concern regarding usability of this data for detailed risk analysis on individual farm. As we know, FADN data are gained with stratification by type of farming and size. This means that income is calculated on case of few most representative farms and aggregated to the whole sector. Consequently, income risk is also analyzed on aggregated data. The results of such analysis do not provide accurate picture about income risk on farm. Kimura and Antón (2011) had proven, that aggregate data show lower coefficient of variation than farm level data. Lower coefficient of variability shows smaller differences between farms which means that some extremes could be ignored in such a case. Besides aggregated data do not include production characteristics of individual farm which is very important in farm income risk analysis according to Dijkhuizen et al. (1995) and El Benni et al. (2015).

Another reliable data source for risk management is also financial data of individual farm level. For instance, in Canadian tool data is obtained from income tax filling of individual farm, based on cash accounting (Kimura and Antón, 2011). As Hasler et al. (2014) are suggesting, this data source is more reliable and objective than FADN data. The advantage in use of financial results of individual farm is that they contain the information about income risk that is specific to the individual farmer (Kimura and Antón, 2011). Such dataset can be used for ex ante assessment for necessary endowment, due to income loss (dell’Aquila and Cimino, 2012).

Although financial data on farm level are seen as useful, they are not sufficient for income risk analysis and besides also additional data processing is needed. One of the biggest challenges is, that data are not enough detailed. In contrast with FADN data, where each product is clearly accounted for, financial data are presented on more general level. Consequently, such inaccurate data source can increase moral hazard, which can lead to different income results (Finger and El Benni, 2014). Consequently such data source needs additional data processing. Similar applies for Canadian income management tools, where they use tax fillings as primary data source. Problem of this data source is, that it requires additional data collection and processing. Such data processing and minimization of moral hazard can extent payments for one to two years (Kimura and Antón, 2011). Due to delayed payments and complexity of data calculation the whole program doesn’t enjoy high level of confidence among farmers.

Such issues could partially be solved with a use of comprehensive data collection tool, such as PANTHEON Farming. Latter is a case of a comprehensive farm management information system that enables recording all relevant events on individual farm (Datalab, 2016). Each event is equipped with bookkeeping information (like price or value of animals and crop) and FADN group. In such a manner the software minimizes flaws of each data series. However, bookkeeping (or accounting) information do not contain detailed information about each product and availability of FADN data in aggregate form. In addition to this process, developed accounting matrixes enable automated accounting. This way more than 90 % of processes can be posted automatically, without excessive burden for the farmer. With accounting we equip individual data with accounting information (account), which enables creation of financial statements of individual farms.

Although accounting data are very reliable data source for income risk analysis on farm level (Žgajnar, 2014), it is still not likely that such data could be directly used in income risk measurement. As we could see in the Canadian case, income cannot be directly used for income risk measurement, mainly due to issues addressed with moral hazard. Therefore they include
some unwanted revenues and costs. To be able to calculate “objective” income risk, in our exercise also some of the revenues and costs are excluded. Latter are those groups, we will try to define with additional simulation analysis.

Figure 1: Schematic illustration of PANTHEON Farming data processing

Another problem by working with accounting data is, that some items, such as home grown feed and work costs, are not included in financial statement. This means that additional information should be added to get a complete picture for evaluation of income risk and later also for analysis. Anyhow, with small adaptation and correction, data from farm management information system could still be seen as reliable data source for income measurement and analysis.

Conclusion

One of the main challenges in income risk management is lack of adequate farm level database (Žgajnar, 2016) and fact that very low share of farms in Slovenia practice accounting. In this paper, we tried to present possible conceptual approach how income risk at particular farm level could be analyzed. Of course possible only for those farms that use PANTHEON Farming application. Anyhow, there are some limitations, before such database could be used to measure income risk on farm level. Since PANTHEON Farming in a new farm management information system, it cannot provide large sample or reliable data series needed for risk analysis in order to confirm its usability in income risk management. Therefore it is necessary to develop an appropriate model and test it with simulation process. This process should provide enough data in order to confirm if such a tool could be applied in income risk management.

Finally if such a tool would prove useful in providing consistent data series for income risk analysis, it could improve risk management at farm level, which could not only improve stabilization of income at farm level, but could also provide vital information about farmer’s perception to risk management tools.

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Energy efficiency in the production of tomatoes outdoors

Pesevski Mile¹, Pockovska Kristina², Zivkovic Dragic³, Ralevic Nebojsa⁴

Abstract
In this paper we will be analysing the production of outdoor tomatoes and energy consumption at ten designated agricultural holdings in Strumica region. Each of the family farms used same tomato hybrid in 2014 (Gardel F1). The basic research technique was face-to-face survey. We determined that 15,497.9 MJ/1000 m² out of nine energy carriers were spent during the technological processing of tomatoes, which is 2.6 times more than energetic value of the production.

Key words: tomato, Strumica region, output energy, input energy, synthetic indicators, MJ/1000 m².

Introduction
Nowadays, energy becomes a scarce resource, while the need for energy grows even more. There is no doubt that the need for energy will be growing in future also, especially in developing countries. Republic of Macedonia imports energy. Local energy production is between 52.9% (2015) and 56.1% (2013) out of total energy needed (133,190 TJ or 124,551 TJ). Total consumption of energy will be higher every following year. According to estimations made by Macedonian government, the energy consumption in 2017 will be 91,532 TJ or 5.9% more than in 2014 year [7]. The highest spenders of energy in Republic of Macedonia are households and industry. Their share in total amount of energy consumption in 2010 was 30%, i.e. 29.3%. Agriculture holds small share of only 1.5%. The estimations are that in the following period the share of energy from renewable sources in total energy consumption will be from 15% in 2014 to 16.4% in 2017.

For Macedonia, the agriculture is one of the main activities in rural areas, due to the fact that the population that lives in rural areas (around 43%) mainly work in area of agriculture. Growing vegetables gives opportunity for rise in income for agricultural holdings. Tomato has important role because of its wide distribution, production, yield, demand and use. Large area of distribution in last ten years (2005-2014) was between 5,377 and 5,800 ha, or 9% of total (63,000 ha) of total land area with vegetable crops. During the same period, with average yield of 25,292 kg/ha, the production of tomatoes was 141,499 tons (SSO, 2015).

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Non-renewable sources of energy are characterized by being non-renewable, that is they can be renewed or the vast amount of time is needed for their renewal. In this category are fossil fuels and nuclear energy. Fossil fuels are: petroleum, coal and natural gas. Today, more than 85% of used energy comes from non-renewable sources (Vishwas S. Patil and Deshmukh Hanmantrao V., 2015). The estimation is (Heinimo, 2008) that fossil fuels hold dominant role in energy consumption on global level, uniting 80% of providers of primary energy with 449 EJ/year. Global coal resources, according to Vishwas S. P., Deshmukh H.V. (2015), are between 6,9x10⁶ and 11,8x10⁶ Mt². They also state that if the consumption of coal in energy production continues with the same intensity, today’s reserves will be exhausted in about 200 years. Similarly, global petroleum reserves are between 1.450 and 2.685 million barrels which will be exhausted in about 20 years. On the other hand, uranium reserves globally are around 3,5 Mt and 6,6 Mt. Energy reserves of nuclear fuel would be spent in next 35 years if the capacity installed was 350,000 MW³ nuclear fuel.

Non-renewable sources of energy, along with having limited reserves, also create ecological problems. Namely, during their consumption (combustion) they release: sulphur-dioxide, carbon-dioxide, nitrogen oxides, heavy metals, nuclear waste and many other harmful materials. Because of that, scientific society’s focus is toward finding new energy sources and their efficient and economical use. First and foremost are renewable energy sources: solar energy, wind energy, geothermal energy, hydro-energy and biomass. Renewable energy has several advantages in relation to non-renewable energy: less dependence on import of energy, ease of access, fewer emission of so called greenhouse gasses and less pollution of life environment.

As any other production, tomatoes production also requires relatively large amount of energy, and its primary energy resources are declining. Promotion of renewable energy sources is becoming more significant, aiming to achieve sustainable sources of energy for future generations. The highest value of biomass in relation to coal is its economic value. It has no sulphur and its combustion doesn’t produce sulphur-dioxide which is known as the biggest pollutant among fossil fuels.

The energy from biomass in total energy consumption on global level holds a share of 10% to 14%. Bio-fuel from biomass in rural areas holds 90% of total energy consumption and in urban areas 40% (Vishwas S. Patil and Deshmukh Hanmantrao V., 2015). Biomass is composed of fuel wood, scrap wood, vegetable mass (or leftovers), animal refuse, communal and industrial solid waste etc. When combusting, vegetable biomass releases as much CO₂ as what was needed when it growing which doesn’t affect natural balance (Bulatovic M., 2012).

Economic analysis uses energy efficiency as special indicator of efficiency of energy consumption. Energy efficiency is calculated as relation between value of production and energy consumption. It indicates the unit of spent energy in relation to produced units. In outdoor tomato production, nine energy carriers are used: human labour, propagation material (seedling or seeds), machinery, fossil fuels, fertilizers, material for support (wooden or metal sticks, irrigation system and water for irrigation). If the distance between produced and consumed energy is big, the energy efficiency is higher. According to Esengun et al. (2007), the energy efficiency coefficient in outdoor tomato production in Tokat region in Turkey was 0.8. Tomatoes production in Iran showed that on average it needs: 1,093.2 h/ha of human labor, machinery is used on average 46.3 h/ha, diesel fuel 153.5 l/ha, 930.5 kg/ha of fertilizers and 13,223.5 m³/ha water for irrigation. The average tomato yield was 48,227.3 kg/ha (Jadidi et al., 2012). The consumption of direct energy, according to Mohammadi et al. (2008), in Iran.

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1 Exa Joule = 10¹⁸ J
2 Mega Tons = 10⁶ J
3 Mega Watts = 10⁶ W
Arbadil province) was 14,407.69 MJ/ha или 17.65% out of total consumption, and the consumption of indirect energy was 67,217.27 MJ/ha or 82.35%. On the other hand, the amount of renewable energy was 20,994.36 MJ/ha or 25.73%, and non-renewable energy 60,630.60 MJ/ha or 74.27%. According to same authors, energy efficiency, energy productivity, specific energy consumption and net produced energy was 1.25, 0.35 kg/MJ, 3.59 MJ/kg and 208,080.03 MJ/ha.

Galinato S. P., Miles C. A. (2013), did some parallel researches about outdoor tomato production in Poly tunnel. The number of outdoor crops was 5,500 plant/acre (13,590 бр./га), which means 1.35 unit/m² or 0.74 m²/unit. Greenhouse’s dimensions were 20 x 96 foot or 6.1 x 29.3 meters (178 m²). In this greenhouse 480 tomato plants were planted, which is 2.7 unit/m² that is 0.37 m²/unit. They also concluded that outdoor tomato production was 30,360 lb/acre 4,320 lb/tunnel 34,058 kg/ha 110,184 kg/ha. Production costs (in total) for outdoor tomatoes was 0.48 US $/square foot (1.57 US $/m²), and in greenhouse 3.85 US $/square foot (12.63 US $/m²). In their paper they emphasize that fixed costs are in relation 1:10, while return of investment is in relation 1.20:3.52. This means that the profit for tomato production in greenhouses is almost 3 times higher than for outdoor production.

The goal of the research presented in this paper is to determine energy consumption in tomatoes production, as well as to determine and evaluate rationality of energy consumption using index of energy efficiency for energy consumption. Also, the goal is to determine and evaluate energy productiveness, energy intensivity and net energy gain for tomato production in Strumitsa region.

Selection of data and working method

To achieve desired goal, we surveyed ten family farms (face-to-face method) during May, 2015. Farms are located in four villages (Gradorsorci, Vladievci, Vasilevo i Trebicino) in Vasilevo municipality (Strumica region). The data we collected was related to year 2014.

The information we gathered helped us determine the natural amount of spent energetic carriers used in production process of tomatoes. After that, we multiplied this amount with adequate energy equivalent: 1.96 MJ/h for men’s labour, 1.57 MJ/h for women’s labour, 0.28 MJ/piece for seedling material, 47.8 MJ/l for diesel fuel, 44 MJ/l for gasoline, 93.61 MJ/kg for tractors’ mass, 62.7 MJ/kg for mass of other machinery, 64.8 MJ/kg for electro-motors, 90 MJ/kg for plastic mass, 27.73 MJ/kg for iron mass, 47.1 MJ/kg for active material N, 15.8 MJ/kg for active material P₂O₅, 9.28 MJ/kg for active material K₂O, 0.3 MJ/kg for cattle manure, 199 MJ/kg for active material of insecticides, 92 MJ/kg for active material of fungicides, 238 MJ/kg for active material of herbicides, 0.63 MJ/m³ for water for irrigation and 0.8 MJ/kg for tomatoes.

The amount of energy consumption can be grouped as following; direct energy (human labor, fossil energy and water for irrigation used in the tomato production), indirect energy (seedling, chemical fertilizers, fungicides, insecticides, herbicides, cattle manure and machinery and equipment), renewable energy (human labor, cattle manure, seedling, and water for irrigation) and non-renewable energy (fossil energy, chemical fertilizers, fungicides, insecticides, herbicides and machinery and equipment).

The synthetic indicators (energy efficiency, energy productivity, energy intensity and net energy gain) are calculated using following formulas:
Energy efficiency = \( \frac{\text{Output energy (MJ/1000 m}^2\)}{\text{Input energy (MJ/1000 m}^2\)} \)

Energy productivity = \( \frac{\text{Grain yield (kg/1000 m}^2\)}{\text{Input energy (MJ/1000 m}^2\)} \)

Energy intensity = \( \frac{\text{Input energy (MJ/1000 m}^2\)}{\text{Grain yield (kg/1000 m}^2\)} \)

Net energy gain = Output energy (MJ/1000 m²) – Input energy (MJ/1000 m²)

The results from the research were processed using usual statistical methods: average values, minimum, maximum, difference between means, standard deviation and coefficient of variation.

Results and discussion

Area, yield and output energy
The average size of land for tomato production in researched family farms was 1,587m². The difference between minimum and maximum was 1,990 m² (Table 1). The size of land for any culture, including tomatoes, is in accordance with the size of parcels, which means that land changes every year.

Table 1. Quantity output energy by agricultural holding

<table>
<thead>
<tr>
<th>Number of agricultural holding</th>
<th>Area (m²)</th>
<th>Yield (kg/1000 m²)</th>
<th>Output energy (MJ/1000 m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AH-1</td>
<td>2,340</td>
<td>6,538</td>
<td>5,230.8</td>
</tr>
<tr>
<td>AH-2</td>
<td>1,575</td>
<td>7,105</td>
<td>5,683.8</td>
</tr>
<tr>
<td>AH-3</td>
<td>2,990</td>
<td>6,405</td>
<td>5,123.7</td>
</tr>
<tr>
<td>AH-4</td>
<td>1,034</td>
<td>6,886</td>
<td>5,508.7</td>
</tr>
<tr>
<td>AH-5</td>
<td>1,500</td>
<td>8,013</td>
<td>6,410.7</td>
</tr>
<tr>
<td>AH-6</td>
<td>1,200</td>
<td>9,058</td>
<td>7,246.7</td>
</tr>
<tr>
<td>AH-7</td>
<td>1,008</td>
<td>6,855</td>
<td>5,484.1</td>
</tr>
<tr>
<td>AH-8</td>
<td>1,000</td>
<td>7,790</td>
<td>6,232.0</td>
</tr>
<tr>
<td>AH-9</td>
<td>1,300</td>
<td>7,215</td>
<td>5,772.3</td>
</tr>
<tr>
<td>AH-10</td>
<td>1,925</td>
<td>7,018</td>
<td>5,614.5</td>
</tr>
<tr>
<td>Average</td>
<td>1,587</td>
<td>7,475</td>
<td>5,979.7</td>
</tr>
</tbody>
</table>

Source: Calculation of the authors based on data from surveys

The realized yield was between 6,405 kg/1000 m² and 9,058 kg/1000 m², while the average value of coefficient for variation was relatively small (Cv = 10.1%). The realized yield per hectare for researched family farms was 74,750 kg/ha, what is 195.5% higher than country’s
average and 36.3% higher than in rest of Strumitsa region. Harvesting tomatoes started around July 15th and was repeated 7 to 8 times. The yield in first harvest was the lowest (271 kg/1000 m$^2$ on average), fifth harvest gave maximum yield (1,934 kg/1000 m$^2$ on average), and in eighth 372 kg/1000 m$^2$, which means that harvests appeared in parabolic trajectory. Due to the fact that the amount of produced energy is a function of yield and energetic value (0.8 MJ/kg), it reflects the situation with produced amount of tomatoes.

Input energy

Input energy depends on production technology. Technological process starts with preparing the soil and ends with harvesting the tomatoes. Basic soil preparation consists of one or two ploughing in a year. During that time and before second ploughing the soil is treated with mineral fertilizers, mostly $\text{N}_{15}\text{P}_{15}\text{K}_{15}$ for approximately 100 kg/1.000 m$^2$, and granular herbicides. The amount of mineral fertilizers, according to researched farmers, depends on whether the soil was fertilized with manure in previous years. The propagation of tomatoes happens around May 10$^{th}$. Immediately after propagation, wooden sticks are planted next to tomatoes so they can support and hold a metal wire ($\phi$ 2 mm). Metal wire carries string pieces which hold the plant and later gives support to the stem so it can grow upward. In the meantime, there are other working processes going along in the field – plant care, irrigation, fertilization with nitrogen fertilizers with approximately 70 to 80 kg/1000 m$^2$, pruning, protection from weed, disease and pests. Irrigation system is set along the rows. Harvesting tomatoes is done by hand. During harvest, tomatoes are simultaneously classified and ordered in carton boxes with capacity of 8 to 20 kg.

However, during production of tomatoes, nine energetic carries are used: human labor, seedling, machine, oil and gas (fossil energy), fertilizers, pesticides, material support, irrigation system and water for irrigation (Table 2). Average energy consumption is 15,497.9 MJ/1000 m$^2$.

One of specific characteristics of vegetables is that they are labor intensive cultures. The human labor per unit land area for outdoor production of tomatoes goes between 191.1 h/1.000 m$^2$ for family farm number 7 and 633.7 h/1.000 m$^2$ for family farm number 3, or 333.3 h/1.000 m$^2$ on average. The processes of harvesting, packing, pruning and tying strings to hold plant hold dominant role in labor intensive processes (40.8 % or 30%). The labor productivity, expressed by the amount of picked tomatoes during one hour of human labor was 22.4 kg/h on average, while specific labor productivity was 0.04 h/kg. Energy consumption for human labor at researched family farms has relatively strong variations ($\text{Cv} = 34.3\%$).
Table 2. *Input energy according to energy carriers (MJ/1000 m²)*

<table>
<thead>
<tr>
<th>Number of agricultural holding</th>
<th>Energy carrier</th>
<th>Human labor</th>
<th>Seedling</th>
<th>Machinery and equipment</th>
<th>Fossil energy</th>
<th>Fertilizers</th>
<th>Pesticides</th>
<th>Material support</th>
<th>Irrigation system</th>
<th>Water for irrigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>AH-1</td>
<td></td>
<td>593.8</td>
<td>895.0</td>
<td>1,136.7</td>
<td>9,204.5</td>
<td>870.3</td>
<td>116.8</td>
<td>4,037.9</td>
<td>660.6</td>
<td>239.3</td>
</tr>
<tr>
<td>AH-2</td>
<td></td>
<td>686.4</td>
<td>906.7</td>
<td>2,265.8</td>
<td>4,244.7</td>
<td>1,289.2</td>
<td>82.5</td>
<td>3,984.6</td>
<td>663.1</td>
<td>230.5</td>
</tr>
<tr>
<td>AH-3</td>
<td></td>
<td>1,140.7</td>
<td>880.3</td>
<td>2,294.5</td>
<td>4,151.4</td>
<td>1,086.6</td>
<td>94.3</td>
<td>3,883.6</td>
<td>670.1</td>
<td>218.9</td>
</tr>
<tr>
<td>AH-4</td>
<td></td>
<td>466.5</td>
<td>866.5</td>
<td>2,519.7</td>
<td>4,475.8</td>
<td>2,760.0</td>
<td>53.9</td>
<td>3,802.7</td>
<td>685.2</td>
<td>223.4</td>
</tr>
<tr>
<td>AH-5</td>
<td></td>
<td>627.3</td>
<td>896.0</td>
<td>2,272.4</td>
<td>3,634.0</td>
<td>2,917.0</td>
<td>87.8</td>
<td>3,935.9</td>
<td>671.1</td>
<td>278.1</td>
</tr>
<tr>
<td>AH-6</td>
<td></td>
<td>602.5</td>
<td>886.7</td>
<td>2,001.9</td>
<td>4,720.8</td>
<td>2,779.0</td>
<td>88.5</td>
<td>3,896.8</td>
<td>677.1</td>
<td>298.4</td>
</tr>
<tr>
<td>AH-7</td>
<td></td>
<td>351.9</td>
<td>861.1</td>
<td>2,141.1</td>
<td>3,407.3</td>
<td>1,140.1</td>
<td>48.4</td>
<td>3,783.1</td>
<td>678.2</td>
<td>223.5</td>
</tr>
<tr>
<td>AH-8</td>
<td></td>
<td>408.0</td>
<td>896.0</td>
<td>2,552.5</td>
<td>4,797.4</td>
<td>2,928.4</td>
<td>100.8</td>
<td>3,935.9</td>
<td>670.5</td>
<td>252.6</td>
</tr>
<tr>
<td>AH-9</td>
<td></td>
<td>511.5</td>
<td>904.6</td>
<td>2,527.4</td>
<td>4,739.2</td>
<td>1,396.2</td>
<td>62.2</td>
<td>3,975.2</td>
<td>667.2</td>
<td>234.1</td>
</tr>
<tr>
<td>AH-10</td>
<td></td>
<td>605.6</td>
<td>930.9</td>
<td>2,799.2</td>
<td>6,013.3</td>
<td>631.6</td>
<td>96.6</td>
<td>3,967.3</td>
<td>663.9</td>
<td>227.2</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>601.1</td>
<td>892.3</td>
<td>2,254.3</td>
<td>5,054.0</td>
<td>1,779.8</td>
<td>83.2</td>
<td>3,920.3</td>
<td>670.3</td>
<td>242.6</td>
</tr>
</tbody>
</table>

Source: Calculation of the authors based on data from surveys

One of the basic criteria when choosing the agricultural holdings was for them to use the same hybrid. They used unspecified type of hybrid (Gardel F1) that is intended for outdoor and indoor growing of tomatoes. Energy consumption for seedling material (3,187 No/1.000 m² on average) is 892.3 MJ/1.000 m² on average. For researched group of holdings the energy consumption is relatively stable (Cv = 2,1%).

The assumed energy for machinery on average is 2,254.3 MJ/1.000 m² and that is the equivalent of 24.0 kg. The energy consumption for this group of farmers was within 1.921,4 MJ/1.000 m² with the coefficient of variation of 19%.

The consumption of fossil energy, i. e. motor fuel, for automated working processes depends on used machinery and time it spend engaged, but mainly on realized yield. This type of energy for researched family farms was between 3,407.3 MJ/1.000 m² and 9,204.5 MJ/1.000 m². The coefficient of variation was 31.2%.

The energy consumption for fertilizers was on average 1.779,8 MJ/1.000 m². For the group, the energy consumption varied around 2.296,8 MJ/1.000 m² for about 48%. The analysis showed that the farmers used relatively wide assortment of fertilizers (12 different formulas). For one kilogram of tomatoes they spent on average 8 MJ of energy from fertilizers.

The researches show that the lowest level of energy consumption comes from pesticides, 83.2 MJ/1.000 m² on average. The energy consumption for the group was between 48.4 and 116.8 MJ/1.000 m² with standard deviation of 20.7 MJ/1.000 m². The first place (according to amount) goes to energy consumption from fungicides, followed by energy from herbicides with 16.6% and insecticides with 7.2%.
In the structure of total energy consumption, second place (Figure 1) goes to energy that transforms through materials that help plants to grow upward. This group of energy carriers consists of 308 wooden sticks, 2.98 kg of string and 28.68 kg of metal wire.

Water for irrigation of the tomatoes comes from the well and with help of fueled motor pumps goes to crops in rows using system of plastic hoses. This irrigation system uses relatively high amount of water because water evaporates. The average consumption of water is around 385 $m^3/1000 \ m^2$ or 242.6 MJ.

It is generally known that in every production, i.e. technological process, some energy carriers are directly involved, that is, their substance is directly spent. Some of them help the process by increasing the efficiency and efficacy of the percentage, i.e. are indirectly spent. Other energy carriers are renewable, or relatively unlimited in comparison with others that are easily spent. The fact that over 90% of energy consumption is non-renewable is concerning (Table 3).

<table>
<thead>
<tr>
<th>Energy group</th>
<th>Input energy (MJ/1000 m$^2$)</th>
<th>Participation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct energy</td>
<td>5655,1</td>
<td>36,49</td>
</tr>
<tr>
<td>Indirect energy</td>
<td>9842,8</td>
<td>63,51</td>
</tr>
<tr>
<td>Renewable energy</td>
<td>1493,4</td>
<td>9,64</td>
</tr>
<tr>
<td>Non-renewable energy</td>
<td>14004,5</td>
<td>90,36</td>
</tr>
<tr>
<td><strong>Total energy</strong></td>
<td><strong>15497,9</strong></td>
<td><strong>100,00</strong></td>
</tr>
</tbody>
</table>

*Source: Calculation of the authors based on data from surveys*

The analysis of synthetic indicators: energy efficiency, energy productivity, energy intensity and net energy gain (Table 4) showed that during the process of production of tomatoes relatively high amount of energy is spent than it is produced (energy from tomatoes).

**Conclusion**

For Republic of Macedonia, tomato is one of the most significant vegetable cultures because tomatoes grow on 9% out of 63,000 ha of land used in vegetable production. Main production
is in Strumica region, not only in regard to total land for growing tomato, but because of realized yield also. Here, 20% of total amount of tomato in Macedonia is produced. Strumica region has adequate natural conditions for successful vegetable production and that is why tomato yields 2.5 times higher here than is the average in Republic of Macedonia.

Table 4. Synthetic energetic indicators

<table>
<thead>
<tr>
<th>Number of agricultural holding</th>
<th>Indicator</th>
<th>Energy efficiency</th>
<th>Energy productivity</th>
<th>Energy intensity</th>
<th>Net energy gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>AH-1</td>
<td></td>
<td>0,29</td>
<td>0,37</td>
<td>2,72</td>
<td>-12524,1</td>
</tr>
<tr>
<td>AH-2</td>
<td></td>
<td>0,40</td>
<td>0,49</td>
<td>2,02</td>
<td>-8669,7</td>
</tr>
<tr>
<td>AH-3</td>
<td></td>
<td>0,36</td>
<td>0,44</td>
<td>2,25</td>
<td>-9296,6</td>
</tr>
<tr>
<td>AH-4</td>
<td></td>
<td>0,35</td>
<td>0,43</td>
<td>2,30</td>
<td>-10345,0</td>
</tr>
<tr>
<td>AH-5</td>
<td></td>
<td>0,42</td>
<td>0,52</td>
<td>1,91</td>
<td>-8905,0</td>
</tr>
<tr>
<td>AH-6</td>
<td></td>
<td>0,45</td>
<td>0,57</td>
<td>1,76</td>
<td>-8705,1</td>
</tr>
<tr>
<td>AH-7</td>
<td></td>
<td>0,43</td>
<td>0,54</td>
<td>1,84</td>
<td>-7150,7</td>
</tr>
<tr>
<td>AH-8</td>
<td></td>
<td>0,38</td>
<td>0,47</td>
<td>2,12</td>
<td>-10310,2</td>
</tr>
<tr>
<td>AH-9</td>
<td></td>
<td>0,38</td>
<td>0,48</td>
<td>2,08</td>
<td>-9245,4</td>
</tr>
<tr>
<td>AH-10</td>
<td></td>
<td>0,35</td>
<td>0,44</td>
<td>2,27</td>
<td>-10321,0</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td><strong>0,39</strong></td>
<td><strong>0,48</strong></td>
<td><strong>2,07</strong></td>
<td><strong>-9518,2</strong></td>
</tr>
</tbody>
</table>

Source: Calculation of the authors based on data from surveys

Growing tomatoes is labor and energy intensive culture. Due to the fact that the tomato has low energetic value, technological process is at loss energetically, which means that more energy is spent than it is gained.

Reference
An approach to sustainability on a global level

Răduțu Andrei¹

Abstract
Sustainability (S) and Sustainable Development (SD) represent two complementary concepts, having as purpose to describe the behavior of societies by continuously improving and developing the quality of life for the citizens. While it is customary to affirm that there exist only a relevant and consistent way of measuring this, an agreed version of key performance indicators denominated as Sustainability Development Indicators (SDIs) have been defined over time, in the quest of optimally identification of the three dimensions that are constituting the SD: economic, social and environmental. Over time, while it is still a subject for debate, the question that every person has had is represented by their impact and hierarchy of priority, in order for achieving sustainability. The aim of this paper is to illustrate the effect of various organizations, countries or communities with regard to the development of sustainability in the attempt of reaching a world-wide consensus to the subject matter and to the relevance of SDIs.

Key words: Sustainability, Sustainable Development (SD), Sustainability Development Indicators (SDI), SD Dimensions

First steps in the sustainability concept: a glimpse of complexity
The sustainability concept can be perceived rather complex in its simplicity. Starting from a shared view that the past and present generations have as much the right to share the resources with the future ones, in order to properly live and at the same improve the quality of life and human welfare, the concept involves also other principles. One of them can be defined in basic terms of scarcity, because as all the individuals (especially the economists) already know that resources possess a limited character which should satisfy the human needs, which at their turn are unlimited. The above stated idea implies also the principle of equilibrium, which should be reciprocal from a generation to another, between nations and continents and probably most important in every person’s attitudes and perceptions. Other important aspects related to sustainability can involve also the more dynamic variable, such as performance, efficiency, or innovation. While can be perceived to be very simple at a random moment in time, the envisioned scenario for the future generation could not be quite easy to define and predict. From a continuous improvement point of view, which states each individual and organization should become better tomorrow today than it was yesterday, one could argue that sustainability should take into account also the performance and efficiency that all the major parties involved have. This can mean that in a dynamic world where the trends are evolving, the increase or decrease in needs of population should gain the performance point where the efficiency, technological progress and the research and development area should provide that the fulfillment of those specific needs with less resources than before, by consuming them in a rationale way and by focusing on other ways also. This is the point where innovation intervenes. Having so much

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potential in exploiting what until maybe 100 years ago seemed impossible, the unlimited perceived resources such as the solar, water, wind energy and so on (clean or green energy) bring another opportunity of improvement of an continuously changing model of equation for properly defining the way of achieving sustainability.

These few elements and many others are being constantly studied and debated from quite some time ago by international organizations, in order to update the sustainability concept and for an optimum applicability. The United Nations Organization defined sustainability in 1972 as it follows: “the development as being sustainable, when it satisfies the present needs, without compromising the future generations’ development”, characterizing three generic dimensions, under which umbrella should be incorporated all the variables and point of reference: the economic, social and environmental one. From that moment on, due to this definition and its agreement on the international level, the decision became the fundamental ground rule for implementing action plans and measures by companies and organizations on a global perspective. The next step was made by the World Watch Institute in 1985. According to their report, the future has to be reshaped in order to reach the sustainability. This can be done by means of collective actions all over the world, through the implementation of policies related to the economic, social and environmental dimensions defined earlier before. A new milestone was represented by the “Sustainable Development (SD)” concept, which was introduced in a report from the United Nations Brundtland (1987). According to this, the meaning was being perceived as “the development that is sustainable when it meets the needs of the present without compromising the development of future generations”. The next step consisted in the Rio Summit from 1992, when the very first set of SD Indicators (SDI) were agreed as a set of generic indicators, having specific goals and targets for each of the three dimensions of SD. Accordingly, each came up with an action plan and with a monitoring agenda. It was no long until the European Union managed to design its own set of SD Indicators, having the purpose of properly monitoring the EU Sustainable Development Strategy (EU SDS). This is done every 2 years by publishing the results into a Eurostat report.

During time, by the fact that the emphasis shifted from the economic to the social and environmental dimensions of SD, these traits have taken various forms. The latest vision on sustainability and sustainability concept was presented in 2015 by the United Nations Economic Commission for Europe. The meeting lead to some confused conclusions in the action plans and performance assessment, according to which, they “can mean anything for any person”. But what the future brings us? Can be the case of a global harmonization of indicators for each dimension? Will they be relevant and consistent in time? The premises for answering these questions should provide us the actual status on the overall sustainability perceived importance.

**Sustainability dimensions and their specifics**

For a better and proper understanding of each dimension of the sustainability concept, the following section will provide specific information related to the subject matter. While one can assess that the importance of the dimensions as being equal or not, this situation can be encountered in reality and depends on the area, activity and on the community focus.

**Social dimension**

Although, one can state that the tendency that exists is to affirm that this specific dimension is considered to be the one with the biggest opportunity of improving, the social perceived dimension of sustainability has attracted a lot of interest in the literature (Missimer, 2013). Colantonio et. al (2009) affirm the following in describing the research status on the subject: “The concept of social sustainability has been under-theorised or often oversimplified in existing theoretical constructs […]. Furthermore, no consensus seems to exist on what criteria
and perspectives should be adopted in defining social sustainability. Each author or policy maker derives their own definition according to discipline-specific criteria or study perspective, making a generalised definition difficult to achieve”. Missimer et al. (2010, 2016) underlines also a potential solution for the still broad and lack of specificity of the sustainability concept in general. The authors propose the constitution of a unifying structure which to join the work and efforts of scientists interested in the topic, for creating the “Framework for Strategic Sustainable Development (FSSD)”. Functioning on strategic management and emphasizing the scientific understanding of the systems, FSSD the urgency character for future research of the social dimension.

In the attempt of synthetizing the most important traits of the social sustainability and more important, in linking it to the sustainable development, the research of three authors has proven to be very important (Vallance et. al, 2011): Sachs (1999) identified as important factors of influence for the subject matter the access to goods, services and employment, social homogeneity and equitable incomes. The author also brings into light the concept of “cultural sustainability”, underlining the harmony that has to exist between an external flow (change) with the internal one (consistency and development from within); Godschalk talks in 2004 about a new approach in the alignment of the social sustainability characteristics, respectively the conflict. This served as point of discussion and debate, due to the overall agreement until that time, according to which the sustainability concept can bring alignment and positive outcomes for everybody; Chiu (2002, 2003) found out on a research conducted on the housing of Hong-Kong that regarding on the social sustainability, there can be a discussion which has at its turn, other three components: the social limits perceived as social norms, ecological limits as a prerequisite for ecological (environmental) sustainable development and equality perceived as the equally distributed access to the resources or opportunities for the citizens.

**Economic dimension**

Sustainability can be perceived also from the point of view of economic dimension. As more emphasis is being put when talking about economic indicators, one can argue that this dimension can be related very well with the performance of individual business, with the companies’ sectors overall and of course with the GDP, as the most important indicator of progress and well-being of a country. Based on these premises, several authors have expressed their findings related to the topic. Weitzman (1976) puts an accent on the sustainability perceived as a focus on the continuous improvement related to quality of life, and not on the Gross Domestic Product (GDP) increase. Ekins (1992) supports the arguments of Weitzman, stating that there are many important aspects related to economic sustainability, other than GDP, such as the human or natural capital. While when talking about GDP, one can take mainly into consideration the consumption component, materialized in the consumption of goods and services, by becoming aware of the other components, makes the variables complement each other, in the same manner in which the three dimensions are evolving towards the sustainability achievement. Nourry takes the research a step forward in 2008 when studying how the GDP is impacting the sustainability concept in the developed countries. His findings were quite interesting, stating that even though the GDP is increasing, the quality of life tends to have the around the same value, even to decrease in some cases.

As these authors found in their research and at a general level it was already argued, the economic dimension does not represent the integral process of sustainability. While it is logic and normal to assume that this should be perceived as an important pillar of the economic growth, when thinking about the sustainable development, the general opinion seem to be that the economic dimension should have provide an equilibrium between the other two components, respectively the social and environmental one. For a deeper connection, future
research should evaluate also the influence and dependencies of the microeconomic and macroeconomic components related to sustainability.

**Environmental dimension**

While it can be difficult to assess the importance of the three dimensions of sustainable development, one can argue that the grounds for discussion in what it concerns the sustainability have begun from the environmental dimension (Fitzpatrick, 2016). As discussed before, the main implication of the concept is for the future generation to benefit also in the same manner of the resources and human welfare that the mankind has the potential of using and achieving in the present moment. Another reason for which the environmental dimension is perceived as being the essential one by researchers is represented by the fact that humans need the resources of natural environment first in order to survive, to continuously provide the resources for tomorrow and to establish an harmonious way of living, consuming and cleaning. As formal as the latter expression could have been, the responsibility represents a key pillar in this dimension, because the pace in which the population is growing, consuming resources and polluting at the present moment is not only leading to a unsustainable way, but has the potential of affecting the well-established equilibrium of the planet in a non-reversible way (Meadows et. al, 2011). The bad news do not stop here; the predictions realized for the next decades, keeping into account the actual dynamics and the analysis of the changes from the last 50 years for example, are illustrating some significant changes that should worry the population. As it was still a very challenging objective of achieving, the environmental dimension of sustainability possesses in the views expressed above two major components: the sustainability of natural resource use and the impact on the environment due to the waste, emissions and fuel use (Fitzpatrick, 2016). Solutions exist of course, the variability of the indicators of the three dimensions all over the world giving the potential of achieving local objectives within a global strategy. The use of biofuels, recycling and non-pollution alternatives on a large scale can become a start for the well-development of environmental sustainability.

**Analysis of Sustainable Development Indicators (SDI)**

The Sustainable Development Indicators (SDI) provide an overview which analyze whether the countries are using correspondent or similar measures for assessing the sustainable development. Being developed, tested and calibrated according to the responsibilities assumed by countries, organizations or governments, the SDI are representing derived versions from the international level. In the next section, a comparison between different United Nations SDIs and European Union SDIs will be realized, in order to evaluate some common grounds and the main differences for assessing the sustainability from a global perspective.

**United Nations SDIs**

The year 1992 represents a milestone for the establishment of the United Nations SDIs, when at the United Nations Conference on Environment and Development from Rio, the United Nations Commission on Sustainable Development (CSD) agreed on a general framework of the United Nations’ Sustainable Development Indicators (UN SDIs). These specific SDIs comprise fourteen major themes and represent the international environment policies. Each of them includes also a number of sub-themes, relevant for the subject matter, as the document states it, having as purpose to reach to a better and deeper understanding of information and for becoming an easy way of best practice. After the establishment of the first set of indicators in 1996, the continuously improvement process indicated different numbers of indicators by adjusting to the international policies and situations (Agenda 21).
The next step consisted in assigning the themes and sub-themes (in brackets) to the Sustainable Development concept, the complexity and diversity of these specific subjects being more relevant if associated with the three dimensions (Table 1).

<table>
<thead>
<tr>
<th>SOCIAL</th>
<th>ECONOMIC</th>
<th>ENVIRONMENTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poverty (6)</td>
<td>Economic development (6)</td>
<td>Consumption and production patterns (4)</td>
</tr>
<tr>
<td>Health (4)</td>
<td>Global economic partnership (2)</td>
<td>Land (4)</td>
</tr>
<tr>
<td>Education (2)</td>
<td></td>
<td>Atmosphere (3)</td>
</tr>
<tr>
<td>Demographics (2)</td>
<td></td>
<td>Oceans, seas and coasts (3)</td>
</tr>
<tr>
<td>Governance (2)</td>
<td></td>
<td>Biodiversity (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Freshwater (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Natural hazards (2)</td>
</tr>
</tbody>
</table>


After a short analysis, the total number of themes and sub-themes associated with each dimension was computed. The environmental dimensions was perceived to be as the most influential, having 7 themes (half of them) and 20 sub-themes which accounts for approximately 45% of the overall agreed topics. The next in line was the social dimension, having 5 themes and 16 sub-themes, while the economic dimension counted 2 themes and 8 sub-themes. As a main implication, one could state that UN SDIs are focusing on the grounds of sustainability by placing an exponential role in protecting the natural environment, at the same time trying to solve the world-wide existing social problems and fostering the economic development.

**European Union SDIs**

Perceiving the sustainable development as a priority by means of continuous and constant improvement of its citizens’ lives, therefore “reconciling economic efficiency, social solidarity and environmental responsibility”, the European Union adopted in 2001 the EU Sustainable Development Strategy (EU SDS). As in the case of UN SDIs, the European Union designed its own set of sustainable indicators (EU SDIs), the themes and sub-themes (in brackets) being agreed and the presented updates are found in the next table from the Eurostat Report (2015)

<table>
<thead>
<tr>
<th>SOCIAL</th>
<th>ECONOMIC</th>
<th>ENVIRONMENTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social inclusion (16)</td>
<td>Socioeconomic development (16)</td>
<td>Sustainable consumption and production (20)</td>
</tr>
<tr>
<td>Global partnership (13)</td>
<td>Good governance (7)</td>
<td>Climate change and energy (9)</td>
</tr>
<tr>
<td>Demographic changes (12)</td>
<td></td>
<td>Natural resources (9)</td>
</tr>
<tr>
<td>Public health (9)</td>
<td></td>
<td>Sustainable transport (9)</td>
</tr>
</tbody>
</table>

**Source:** *2015 Eurostat Report (Available Online at: http://ec.europa.eu/eurostat/web/sdi/indicators)*
As it can be observed from the table, the themes follow the same logic, but are distributed in a different manner than in the case of the UN SDIs. In the case of EU SDIs, there can be observed that the social and environmental dimensions are perceived to be equally important (4 themes each), the only slight difference being in the sub-themes number, their proportion being “favorable” to the social dimension (41% vs. 39% from the total sub-themes). Again, the economic dimension is completing the other two, as a mean of economic development in achieving sustainability.

Conclusions

After the presentation of the SDIs for each type of analysis, respectively the United Nations and European Union, it can be said that the SD dimensions (economic, social and environmental) encounter slight variations in values. The main implication of these results seems to regard the diversity of themes, their numbers and the objectives of SD indicators. However, the emphasis should be put on dimensions, their orientation illustrating the perspective to be followed for the future of the sustainability. In case of UN SDIs, it can be stated that the tendency seem to be more environment oriented, while in EU, the emphasis is put on both, the social and environmental dimensions.

On the grounds on these specific orientations, dynamics of the international policies regarding sustainability should take into consideration also other important factors such as the European Union Strategy 2020. In obtaining the potential equilibrium between the three dimensions, one could argue that also the CSR component and its effects could make the communities more responsible. Another important aspect to be researched could be represented also by aggregated and complex indexes such as the UN Human Development Index (HDI), which involves other important and relevant variables for the subject matter (e.g. Life Expectancy, Education Index or Income Index).

References


Postharvest Technology and Production of Apples in Serbia

Stevanovic Snezana¹, Stevanovic Simo¹, Dimitrijevic Bojan¹

Abstract
There is constantly increasing the amount of fresh fruits in trade flows in the world. According to FAO, postharvest losses of fresh fruits and vegetables ranges from 5% in developed, up to 40% in less developed countries. To preserve fresh fruits as long as possible and deliver to consumers with less losses, it is necessary to provide optimal conditions in postharvest period. Therefore, modern postharvest technology, such as controlled and modified atmosphere for storage of fresh fruits are increasingly used.

The study showed that ULO (Ultra Low Oxygen) controlled atmosphere as postharvest technology for storage of fresh apples in Serbia have wider application in the last ten years. It was pointed out that modern cold storage are not sufficient in themselves for longer fruits storage, but it is necessary to pay attention to the quality, type and variety of the cold stored fruits.

The average apple production in Serbia for the period 2006-2014. was 261.8 thousand tons, out of which 81.9 thousand tons or 31.3% was exported. Despite the fact that the annual influx of foreign currency from exports of fresh apples in gender for years over $ 80 million (2014), built ULO storage capacity by 2014 in Serbia are very modest (38.0 thousand tons).

Key words: postharvest technology, apple production, ULO storage, controlled atmosphere.

Introduction
Fresh fruits have a short usability, especially early varieties of fruit. Therefore, it is necessary to harvest fruit at the optimum maturity, and quickly transport to markets and consumers. In addition, the characteristic of fresh fruits is high sensitivity to various mechanical injury. Therefore, the harvesting should be performed professionally in order to minimize the damage of fruits (Milic et al., 2013).

The reports of the World Organization for Food (FAO), indicated that the losses of fresh fruits and vegetables are high and reach the amount of 5 - 25% in developed, while in un developed and developing countries is 25 - 40% (FAO, 2002).

Fruit production in Serbia occupies an important place in the total value of agricultural production. In recent years, an increasing amounts of fresh fruits are exported. Therefore, there is a need for both modern and large storage capacity, in order to preserve fresh food quality for a longer period of time. Refrigeration plays an important role in meeting the needs of a growing

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number of consumers in urban areas, as well as reduction of postharvest losses caused by spoilage. Modern postharvest technology aimed at full control of biochemical processes in fruits, in order to reduce the changes, decay and deterioration. Thus it is possible to significantly reduce losses and extend the storage time and quality of fresh food.

In order to preserve the quality of fresh food for a long period of time, the most important environmental conditions to be provided in storage area are temperature and humidity. (Jankovic, 2000). Controlled atmosphere (CA) is increasingly being used for longer storage and better quality of fresh food. Controlled atmosphere is achieved by reducing the oxygen concentration from 21%, as it is in the atmospheric air, to the concentration that is optimal for a particular type of fresh food. At the same time the percentage of carbon dioxide should be increased from 0.03% to optimal values, mainly to 3% (Jankovic and Mašović, 2000).

Controlled atmosphere is mostly used for storage of apples. To achieve more significant placement on foreign markets it is necessary to ensure the preservation of the quality of different varieties of apples in the postharvest period, as the exported amounts increasing. European standards are introducing in all aspects of production, processing and storage of food. New technologies that ensure safe and prolonged products storage are warehouses with controlled atmosphere and ULO (Ultra Low Oxygen) cold storage.

Taking into account that in some years 50% of apple production in Serbia was exported, the goal of this work was analysis of apples storage in cold storage facilities with controlled atmosphere, with a desire to export quality fresh apples out of harvest season when prices are significantly more favorable, earning higher exchange inflow.

Types of storage for apples
Since ancient times, people have sought to preserve fresh foods for human consumption as long as possible. In order to preserve products fresh as long as possible during transportation, Romans were used vehicles covered with straw and natural ice.

So far cooling is the most successful method for longer storage of fresh fruits and vegetables. Scientists have begun to deal with cooling problems in the 16th century, as can be seen from the theses of Spaniard, Francisco Sanchez, titled: “Similarities between heat and cold and the conditions of their movement during heating” published in 1576. The first compressor installation for cooling in Serbia were established in the “Vajfert” brewery in 1895. (Jankovic, 2002).

To preserve the freshness of apples in a longer period of time after harvesting fruits can be stored short or longer time in a cold storage. For cold storage of apples the attention must be taken of the five key elements of integrated cold chain: 1. the production, 2. processing and packaging, 3. cold storage and distribution, 4. transport and 5. sales. Above mentioned elements represent an indivisible entity, but each of them can be considered separately. Integrated food cooling chain can not exist if only one of these elements is missing, or if there is a problem in it’s functioning.

The main purposes of the cold storage are cooling and freezing of a large number of products (fruits amongst others), but can also be used for controlled of ripening.

There are a larger number of divisions of cold storage facilities (Jankovic, 2002):

1. According to purpose:
   – Multifunctional cold storage (for freezing and cooling of large number of food products);
   – Specialized cold storage (designed only for storage of one type of product and usually are the parts of dairies, slaughterhouses and plants processing).
2. According to the function:
   - Economic-productive (where can be carried out preparation of products for storage, production of frozen food - ready to eat food or frozen fruits or vegetables);
   - Cold storage facilities (used exclusively for products storage for a longer period of time);
   - Distribution cold storage (for keeping goods in a short period of time, preparing goods for sale and distribution).

3. According to accommodation capacity:
   - Small cold storage (10 to 3,000 t);
   - Medium cold storage (3,000 to 10,000 t);
   - Large cold storage (over 10,000 tons).

There are following types of cold storage facilities for fruits:

NA – cold storage with normal atmosphere (temperature and humidity);
CA – cold storage with controlled atmosphere (temperature, humidity, CO₂ and O₂ concentration);
ULO – ultra-low oxygen (O₂ content up to 2%);
ULE – ultra-low ethylene content (removal of ethylene feature);
DCA – cold storages with dynamic controlled atmosphere (equipped with software for monitoring of physiological condition of the fruit in the warehouse and automatically adjustment of storage conditions to current physiological condition of the fruits.

It is believed that after invention of cooling techniques, controlled atmosphere is the second most important discovery for storage of fruits. Today, almost 2/3 of the total apple production in the world is stored in controlled atmosphere. With increasing interest in fresh apples in April – May in the European market and relatively high price that could be achieved during this period, it is likely expect further increase in the use of storage in controlled atmosphere.

When it comes to the quality of the storage of fresh fruits and vegetables, ULO (Ultra Low Oxygen) controlled atmosphere is suppressed all other solutions. In ULO controlled atmosphere respiration rate and changes in the fruits decrease by combined influence of low temperatures, extremely low concentrations of O₂ and elevated CO₂ concentration. It is of great importance to increase the relative humidity in the chamber, to avoid dehydration and shriveling of fruits. That is the reason why the apples are mostly stored in ULO today.

There are requirements for establishing ULO atmosphere, namely: extremely well isolated chamber; equipment for cooling; gas supply for establishing and maintaining the modified atmosphere; measurement and control of process parameters and gas concentrations of O₂, CO₂, humidity and in some cases, ethylene concentrations.

ULO chambers require perfect conditions for sealing because of extremely low concentrations of O₂, but also content of CO₂ and other gases. The requirement for measuring the concentration of gases every 30 minutes has been imposed, which is much more frequent than in a conventional controlled atmosphere.

The technical-technological solution and storage regime must be adapted to the characteristics and requirements of certain varieties of apples. Apples are considered as less sensitive fruit with regard to storage. Fresh apples can be successfully stored in cold storage, if optimal conditions are provided. The duration of successful storage largely depends of biological specificity of the fruit and therefore, there are differences in the storage durability of certain varieties. The conditions under which the fruits are grown, then the degree of maturity of fruits, as well as the procesing and packaging, also affect the storage duration and losses that occur during storage.
In addition these factors, the ability and storage duration of apples depends on the characteristics of the variety, growing regions, climatic conditions and applied agricultural technology. Only the fruits with excellent properties (extra and I class) can be stored longer. Different varieties of apples need the different storage conditions, although quite often the fruit of the same variety produced in different regions require different storage conditions.

In Table 1. were presented the recommended parameters and optimal conditions for storage of different apple varieties grown in France. Optimal temperatures are different for different varieties, but all values are in the range of 0 to 4 °C. Varieties Hanny cranch and Idared are sensitive to low temperatures that are near 0 °C and its optimum was from 2 to 4 °C. Values of oxygen optimal concentration were very uniform and ranged from 1.5 to 1.8%. Only the variety Melrose is sensitive to very low concentrations of oxygen and therefore it’s optimum is above 2%.

Optimal concentrations of CO₂ are quite different for different varieties. In the condition of extremely low concentration of O₂, most varieties are sensitive to elevated concentration of CO₂ and the optimal values generally ranging from 0.8 to 1.5%. Varieties Aidared, Jonagold, Red and Golden Delicious were some tolerated to increased CO₂ concentrations (up 3%) then the others apples varieties, which allows them longer storage, even up to 10 months.

**Characteristics of production and trade of apples in Serbia**

Along with oranges and bananas apples dominate the world markets as one of the favorite fruits, which are used throughout the year (Bound, 2005).

Apples are produced in almost all countries of the world, especially in the countries of northern hemisphere. According to FAO, the world’s production of apples in 2010 amounted to slightly less than 70 million tonnes, of which the share of China is more than 40% (30 mil. tons). Other
major producers of apples in the world are United States, Turkey, Poland, Italy and France (Stevanovic et al., 2008, Stevanovic, 2009). There are over 100 varieties/cultivars commercially cultivated in the US, however, 15 varieties accounted for about 90% of the total apple production.

**Table 2. The most common apple varieties in the US, Europe and Serbia**

<table>
<thead>
<tr>
<th>USA</th>
<th>Europe</th>
<th>Serbia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Delicious</td>
<td>Golden Delicious</td>
<td>Idared</td>
</tr>
<tr>
<td>Golden Delicious</td>
<td>Red Delicious</td>
<td>Granny Smith</td>
</tr>
<tr>
<td>Fuji</td>
<td>Jonagold</td>
<td>Golden Delicious</td>
</tr>
<tr>
<td>Granny Smith</td>
<td>Granny Smith</td>
<td>Red Delicious</td>
</tr>
<tr>
<td>Gala i Royal Gala</td>
<td>Gala</td>
<td>Jonagold</td>
</tr>
</tbody>
</table>

*Source: Kupferman, 2006 and calculations of authors.*

Idared is the most common apple variety in Serbia, but it is not in the „Top 5“ in Europe and in the United States, which is the most striking difference. Delicious varieties (Golden and Red) are equally represented in the US and Europe, as well as Serbia (Table 2).

From a commercial standpoint the apple is one of the most important fruit species on the Serbian market, and also the most common fruit species on the market of fresh fruits. Considering annual fruit production in Serbia, apples are in the third place (after plums and grapes), with an average of about 262,000 tons. With regard to the consumption during the whole year, the apple is very important, both in the diet, as well as economically. About 2/3 of the total apples production are consumed fresh.

To prolong the offer of fresh apples produced in Serbia and thus meet the needs of costumers at the domestic market, there is a need for it’s longer storage in cold storage (from November to May/June). Most cold storage facilities (NA) in Serbia were built in the 50s and 60s of the last century. These were large-capacity cold storage built within the system of the food industry.

During the harvest season, the prices of apples are the lowest. Storage of apples in ULO controlled atmosphere extends the period in which fresh apples can be offered at the market. Also, the prices of apples during the spring months are much higher than the prices in the harvest season. Besides the fact that ULO storage can preserve the quality of apples, that postharvest technology can provide the opportunity to place the apples on the market when the price is the highest.

Construction of ULO storages in Serbia have began after year 2000. By 2014, there were built 22 ULO cold storage facilities, with capacity of 38,200 t, Table 3. Half of which (11) in Srem and South Backa District with capacity of over 26,000 tons. It can be seen in Table 3. that these are cold storage of small and medium capacities and only one high-capacity (6000 t).

It should also be noted that these are very modest capacity. Average production of apples in Serbia is over 260 thousand tons, and exports over 80 thousand tons. Therefore, only 14.6% of production and 47.5% of exported apples are stored in ULO controlled atmosphere.

Observed by the regions, the largest apple production in Serbia was realized in the north district (the municipalities of Backa Topola, Mali Iđoš and Subotica), which is 12% of total production in Serbia. Major producers were still the city of Belgrade, South Banat, Podunavlje and Srem districts, which together provide almost 50% of domestic production of apples.
In 2006-2014 period, average production of apples in Serbia amounted to 261.8 thousand tons (Graph 1, Table 4), with variations (standard deviation) of 46.8 thousand tons per analyzed years (from 178.7 thousand in 2012 to 336.3 thousand tons in 2014). The average annual growth rate of the volume of apple production amounted to 4.29%.

Table 3. Capacity of ULO cold storage facilities in Serbia

<table>
<thead>
<tr>
<th>No.</th>
<th>County</th>
<th>Capacity of cold storage facility (t)</th>
<th>Number of chambers</th>
<th>In use: a) non-stop b) occasionally</th>
<th>Type of goods stored</th>
<th>Capacity of ULO cold storage facility (t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Severnobački</td>
<td>3.000</td>
<td>10</td>
<td>occasionally</td>
<td>apples, plums, pears, paprika, peaches</td>
<td>7.800</td>
</tr>
<tr>
<td>2</td>
<td>Severnobački</td>
<td>1.800</td>
<td>10</td>
<td>occasionally</td>
<td>apples</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Severnobački</td>
<td>1.500</td>
<td>6</td>
<td>occasionally</td>
<td>apples, pears, plums</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Severnobački</td>
<td>1.500</td>
<td>10</td>
<td>occasionally</td>
<td>apples</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Južnobački</td>
<td>400</td>
<td>7</td>
<td>occasionally</td>
<td>apples</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Južnobački</td>
<td>6.000</td>
<td>31</td>
<td>non-stop</td>
<td>apples</td>
<td>11030</td>
</tr>
<tr>
<td>7</td>
<td>Južnobački</td>
<td>2.830</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Južnobački</td>
<td>1.800</td>
<td>54</td>
<td>occasionally</td>
<td>fruits and vegetables</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Sremski</td>
<td>3.200</td>
<td>17</td>
<td>non-stop</td>
<td>apples</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Sremski</td>
<td>1.500</td>
<td>10</td>
<td>non-stop</td>
<td>apples</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Sremski</td>
<td>1.100</td>
<td>8</td>
<td>non-stop</td>
<td>apples and peaches</td>
<td>15.040</td>
</tr>
<tr>
<td>12</td>
<td>Sremski</td>
<td>2.000</td>
<td>10</td>
<td>occasionally</td>
<td>apples</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Sremski</td>
<td>2.500</td>
<td>15</td>
<td>occasionally</td>
<td>apples</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Sremski</td>
<td>1.800</td>
<td>8</td>
<td>occasionally</td>
<td>apples, peaches, plums</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Sremski</td>
<td>2.940</td>
<td>14</td>
<td>non-stop</td>
<td>apples</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Šumadijki</td>
<td>700</td>
<td>4</td>
<td>non-stop</td>
<td>plums, apples, pears, breskve nektarins</td>
<td>2210</td>
</tr>
<tr>
<td>17</td>
<td>Šumadijki</td>
<td>100</td>
<td>2</td>
<td>occasionally</td>
<td>fresh fruit</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Šumadijki</td>
<td>210</td>
<td>4</td>
<td>non-stop</td>
<td>plums, apples, pears, breskve nektarins</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Šumadijki</td>
<td>1.200</td>
<td>6</td>
<td>occasionally</td>
<td>fresh apples</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Moravički</td>
<td>870</td>
<td>5</td>
<td>occasionally</td>
<td>raspberry, blackberry</td>
<td>2070</td>
</tr>
<tr>
<td>21</td>
<td>Moravički</td>
<td>1.200</td>
<td>7</td>
<td>occasionally</td>
<td>apples, pears, plums, nektarins</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Beograd</td>
<td>50</td>
<td>1</td>
<td>non-stop</td>
<td>fruits, vegetables</td>
<td>50</td>
</tr>
</tbody>
</table>

Source: www.stat.gov.rs, internal documentation

In 2006-2014 period, average production of apples in Serbia amounted to 261.8 thousand tons (Graph 1, Table 4), with variations (standard deviation) of 46.8 thousand tons per analyzed years (from 178.7 thousand in 2012 to 336.3 thousand tons in 2014). The average annual growth rate of the volume of apple production amounted to 4.29%.
Graph 1. Production and sales of apples in Serbia in the period 2006-2014 (000 t)

The average volume of exports of apples from Serbia amounted to 81.9 thousand tons, with variations from 38.7 thousand tons (35.2 thousand in 2008 to 136.0 thousand tons in 2014). The average annual growth rate was 17.61%. The value of exports of apples amounted to 39.2 mil. $ and grew at an annual rate of 27.44%. The average export price of apples amounted 479 $ / t, with variations 113.9 $ / t (from $ 314.8 / t. in 2006 to $ 672.9 / t in 2012).

Table 4. Production, import and export of apples in Serbia

<table>
<thead>
<tr>
<th>Year</th>
<th>Production (t)</th>
<th>Export</th>
<th>Production (t)</th>
<th>Export</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Value (t)</td>
<td>Price ($/t)</td>
<td>Value (t)</td>
<td>Price ($/t)</td>
</tr>
<tr>
<td>2006</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2010</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>2011</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the reporting period the share of exports in the total apple production in Serbia amounted to 31.3%, ranging from 12.5% (from 14.2% in 2009 to 49.0% in 2011). The share of exports in apple production grew at the rate of 12.78%.

Average import of apples in Serbia was 24.9 thousand tons, with variations from 10.5 thousand tons (12.1 thousand in 2006 to 47.5 thousand tons in 2012). The average annual growth rate of imports was 8.61%. The average value of imports of apples amounted to 8.2 mil. $ and grew at an annual rate of 13.36%. The average import price of apples amounted to $ 330.5/t, with variations of 56.3 $/t (from 237.9 $/t in 2006 to 426.7$/t in 2008).
Despite high growth in production volume (4.29%) and exports (17.61%) of apples from Serbia in the period 2006-2014, high-value of deviations (standard deviation) indicate that it is still a haphazard process, usually imposed by natural conditions for the production of apples during the year.

**Conclusion**

Long term storage of fresh apples, with better preservation of fruit quality can be ensured by applying ULO controlled atmosphere. Low concentrations of oxygen, increased carbon dioxide content, optimal low temperature and high relative humidity in the ULO chambers slows down the physiological, biochemical and microbiological processes in the fruits. That reduces the losses with longer fresh apples storage and high quality preservation.

In addition, the duration of apples storage in ULO controlled atmosphere is affected by the quality of fruits, as well as the postharvest optimal condition adapted to characteristics of certain varieties. At the same time, in ULO postharvest technology, the need for chemical treatments during the storage of apples is minimized.

Total annual exports of apples from Serbia is more than 80 thousand tones, but less than 50% is stored in ULO controlled atmosphere. Multiple economic effects can be achieved by capacity building for storage of apples in ULO controlled atmosphere. Firstly, the offer of fresh apples at the domestic market out of harvest season, and sales when prices are significantly higher. Secondly, it provides an increase in foreign exchange earnings by increased volume of exports and higher export prices. And thirdly, prolonged offer of domestic, fresh apples out of harvest season reduces the imports of apples, and on that basis reduces the outflow of foreign exchange from Serbia.

Research results are part of the projects of the Ministry of Education, Science and Technological Development:

- Technological development program entitled:“Research and development of equipment and systems for industrial production, storage and processing of vegetables and fruits”, number: TR 35043, as well as the Project III 046010,

- Basic science program, entitled:“Rural labor market and the rural economy of Serbia - diversification of income and poverty reduction”, number: ON179028.

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Agricultural cooperatives – social networks for information transfer in post-socialist countries

Tuna Emelj¹, Azderski Jovan²

Abstract
In post-socialistic countries functional agricultural cooperatives are rare and often fail to justify their purpose of existence. This is mostly determined by the lack of trust and social capital, evident in transition countries such as the Republic of Macedonia. The aim of this paper is to show the structure of relations among farmers in a region where an agricultural cooperative exist, as well the potential benefits from the cooperatives in terms of information flow for the existence and application for rural development programs (RDP). Social network analyses are the primary methodological approach which provides illustration of the levels of social capital and its structure. The analyses show that although the level of social capital is low in the region with an operational agricultural cooperative, the cooperative acts as a valuable provider of the RDP information for its members, confirmed by their more active application for the RDP. The structure also reveals that farmers aboard the cooperatives’ management hold an important and powerful position in the information transfer structure. They act as brokers and provide valuable source for sending and receiving information regarding the RDP. This is a confirmation that agricultural cooperatives are indeed a valuable form of institutionalized network which provide effective support and access to various types of information for its members, and as such provides individual economic potential for the farmers as well as for the rural development in general.

Key words: cooperatives, networks, post-socialist, RDP, social capital.

Introduction
Distortions of the economic and institutional systems in Western Balkan region caused by transition, generated mistrust and low levels of social capital. Due to the weak and inadequate institutional and legal structures, most of the agricultural cooperatives in the post-socialist countries ceased to exist (Chlupkova et al, 2003). The concept of cooperation and cooperatives, as imposed by the socialistic governments, often characterized by corruptive and self-interest politics, contributed for additional destruction of trust in the voluntary cooperation arrangements (Paldam and Svendsen, 2000). Therefore, the continuous attempts by the

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government and foreign donors (through specialized measures and support) to revive the idea of cooperatives in the transition period failed.

Social capital is defined as the level of benefit that each individual can extract from their personal network (Bourdieu, 1986). It is based on trust and embedded in the formal and informal social structures of cooperation (networks), and is believed to have impact on rural development, networking and decision making in rural areas (Wiesinger, 2007). Networks enable activities for joint problem solving and often provide more efficient flow of the much needed information, knowledge, extension and development activities for the rural population (Mikulcaka et al, 2015; Woolcock, 1998). They also support the transfer of information among farmers in rural areas, and the transfer of information and experience on rural development program (RDP) is often dependant on the existence of social networks (Murray, 2006).

Transition countries such as Republic of Macedonia are still confronted with limitations in the horizontal and vertical relations in the agricultural sector (Kotevska and Martinovska, 2015). Considering that agriculture is the main source of income for the rural population in the country, small-scale farmers should be able to recognize the benefits of the agricultural cooperatives. However, in spite of the tradition of agricultural cooperatives during the socialistic period (ibid), there is still a small number of functional agricultural cooperatives in the country - around 15 registered agricultural cooperatives in 2015 (S. Gacov, 2014 personal communication, September 26, 2014). The low rate of farmers’ membership in agricultural cooperatives is one of the first indications for the level of social capital in the rural areas (Kotevska and Martinovska, 2015). Farmer’s small size and low modernization emphasizes the need for changing farmer’s attitudes towards cooperation and re-establishing the social capital potentials.

The aim of this paper is to show the structure of relations among farmers in a region where an agricultural cooperative exist, as well the role and potential benefits from the cooperatives in terms of information flow for the existence and application for rural development programs (RDP). The paper will more specifically analyse the following issues: (1) How do farmers communicate and transfer information regarding RDP’s in the selected region where an agricultural cooperative operates, and (2) Which are the key farmers (actors) in the cooperative network with the highest levels of relations (SC), and if they can be used for more efficient transfer of RDP and other type of information and knowledge.

Material and methods
Analysing social structures (networks) requires specific data for conducting social network analyses. The data for this research was collected through face-to-face surveys, using a structured questionnaire as a frequently applied mean of data collection in social network analysis (Marsden, 1990; Wasserman and Faust, 1994). The survey was completed in the period from November to December 2014. Around 150 farmers from the Strumica region were surveyed. The selection of the specific region was based on the fact that one of the most established and efficient agricultural cooperative in the country, the vegetable cooperative “Vegefresh”, is situated. A whole-network approach was applied, as a common method of data collection in which the largest portion of dyadic relations in the network are included. This approach produces networks that are bounded (Hanneman and Riddle, 2005) with a small number (21) of additionally nominated farmers from the list of 150 farmers which was already listed and offered to the surveyed farmers (total of 171 farmers in the final network). The whole-network approach is also an analytical design, suited for performing ego-centric network analysis (DeJordy and Halgin, 2008)
The questionnaire which addresses the social network analyses was constructed in the form of a “name-generating table”. It is a table which collects information on each farmer’s relation to other farmers (Lin, 2005; Wasserman and Faust, 1994). Each of the surveyed farmers was asked to nominate certain number (most often three to five) of other people with whom they discussed or shared information on important issues regarding RDP. The number of nominations was given as a motive for more nominations, having in mind that limitation of this number could produce measurement errors (Lin, 2005; Wasserman and Faust, 1994). The “name generator” included part known as the “name interpreter” which refer to the attributes of each nominee (i.e. relation to other farmers, age, educational level, main reasons for and frequency of cooperation, past experience with R&D support, and membership affiliation with an organisation) (Borgatti et al., 2013). Trough adjacency matrices (NxN in terms of number of nodes) the actors in the network were coded (1 in the case of an existing relation and 0 when the relation was absent).

The total network of all the farmers in the selected region (member and non-members of the cooperative) and the structure of the cooperative network are presented through sociograms. Additionally, the ego networks of the most influential actors in the cooperative network were presented in order to expand the understanding of their role and position in the transfer of RDP information. Ego networks can reveal the key players in the groups, their sources of information, social support, the patterns of information diffusion, and many other characteristics which influence the behaviour patterns of the selected nodes (actors) in the network. Ego network analysis include: network size (the number of relations) each of the analysed ego’s (central farmers) have, structure (how it connects other farmers, and if it have relations with other significant farmers in the network) etc.

The coded data were analysed using UCINET, which is a specialised software tool for analysing social structures (Borgatti et al, 2002), and their visualisation was presented using NetDraw (Borgatti, 2002). The basic network cohesion measures (network density, average node degree, average distance, betweeness centrality, reciprocity, network fragmentation) represent the social capital structures and the patterns and flow of information in the surveyed region.

**Results and discussion**

Social network analysis applies several measures by which abstract concepts such as trust and social capital can be quantified (Sabatini, 2009). In this respect, we present the primary cohesion measures for the farmers’ network for RDP information transfer in table 1. The network of farmers in the selected region in Strumica is constituted of 140 components which indicates to a very fragmented network, fact supported by the fragmentation measure which is very close to 1 (0.971). This fragmentation also contributes to the low level of density, which shows the probability that a relation (tie) exists between any pair of nodes in the network, and is one of the primary indicators of social cohesion of the network. The density measure, is relative to the network size and in bigger networks are expected to express lower values (Borgatti et al., 2013). However in this case, the overall social capital and information transfer trough the network expresses extremely small values. The average degree of the nodes or the farmers in the network is also very low, mostly due to the significant number of outliers (nodes without relations), and dyads (separate pairs of nodes) disconnected from the major component in the network (see Figure1). Another measure of social capital and trust is the reciprocity value which is 0.335, meaning that 1/3 of the ties in the network are reciprocal (ties between the nodes in both directions). The majority of this reciprocated ties are between the isolated pairs of nodes (see Figure 1). The “distance” measure analyses the shortest path between the more distant
nodes, and if the connecting relations are absent than those nodes would be unreachable (Wasserman and Faust, 1994). The average distance in the studied networks has a value of 1.581, indicating that the network contains relatively close relations in terms of informational flow (Kadushin, 2012), and each actor in the network might be reached in less than two steps, regardless of the apparent fragmentation of the network. Because of the expectation of larger network disconnections, we also included the measure of “breadth”, or the distance weighted fragmentation which shows the average distance among nodes in the case of removing certain nodes in the network (Borgatti and Everett, 2006).

### Table 1. Selected network measures for the selected region

<table>
<thead>
<tr>
<th>Measure</th>
<th>Values</th>
<th>Range and explanations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average degree</td>
<td>1.018</td>
<td>Average number of ties of each node.</td>
</tr>
<tr>
<td>In degree (H-index)</td>
<td>4</td>
<td>Average of ties received by each node</td>
</tr>
<tr>
<td>Density</td>
<td>0.006</td>
<td>Values closer to 1 - better connectedness of the actors in the network</td>
</tr>
<tr>
<td>Components</td>
<td>140</td>
<td>Number of component comprising the network</td>
</tr>
<tr>
<td>Component ratio</td>
<td>0.822</td>
<td>1- every node is isolate, 0 – there is one component</td>
</tr>
<tr>
<td>Connectedness</td>
<td>0.029</td>
<td>1 – each node belongs to the same component, 0 – every node is in a different component</td>
</tr>
<tr>
<td>Network fragmentation</td>
<td>0.971</td>
<td>1- all nodes are at distance1 from each other (complete graph), 0 – all nodes are isolates</td>
</tr>
<tr>
<td>Average distance</td>
<td>2.966</td>
<td>The time length for information diffusion across the network</td>
</tr>
<tr>
<td>SD distance</td>
<td>1.581</td>
<td>Sees distances beyond actors’ direct relations.</td>
</tr>
<tr>
<td>Diameter</td>
<td>8</td>
<td>The longest path of the information flow (between the furthest nodes in the network)</td>
</tr>
<tr>
<td>Distance - Breadth</td>
<td>0.987</td>
<td>Average distance among nodes when certain nodes in the networks are removed (when all nodes are distance 1 from each other - complete graph, and 0 when all nodes are isolates)</td>
</tr>
<tr>
<td>Reciprocity</td>
<td>0.335</td>
<td>Average reciprocated ties (ties in both directions)</td>
</tr>
<tr>
<td>Dyad reciprocity</td>
<td>0.201</td>
<td>Reciprocity between pairs</td>
</tr>
</tbody>
</table>

*Source: Wasserman and Faust, 1994, Hanneman and Riddle, 2005*

Most of the nodes in the network are at distance close to 1 indicating to a complete graph. The diameter of the graphs shows the maximum distance on which the information in the network can travel between any pair of nodes in the network, or how distant are the remotest two actors in the network, which in this case is eight steps.

The social network measures give valuable inside about the general patterns of relations among nodes in the network and the overall description of the studied social structure. It often provides more evident illustration of the most important features of the network structure (Hanneman and Riddle, 2005). The graphical analysed network of RDP information diffusion (Graph 1) clearly shows the existence of one large component with higher density of relations, within which there is a group of nodes which constitute the cohesive sub-group of the network, so called the k-core. These are the nodes where the highest level of social capital is concentrated. Most of the nodes in this component and sub-group are members of the “Vegefresh” cooperative.
Additionally two nodes in this components standout noticeably – 154 and 152. They participate in the management structure of the existing agricultural cooperative in the region and are the nodes with the highest degree and eigenvector values measuring their direct and indirect connections with others. Those nodes have also the highest values of betweeness, showing that are the information brokers in this network, and they can regulate the flow of information among the nodes in the RDP information network.

The basic measures which describe their ego-networks are presented in Table 2. Cooperative managers have the largest size of network size, and the largest number of in-degree, which in relation to the survey question (How do you seek RDP information from?); would mean that those are the persons which are mostly consulted regarding RDP issues.

Table 2. Basic ego-network measures – selected nodes representing management structure of the “Vegefresh” cooperative

<table>
<thead>
<tr>
<th>Node</th>
<th>Network size</th>
<th>Out degree</th>
<th>In degree</th>
<th>Density</th>
<th>2-step reach</th>
<th>Broker</th>
<th>Normal. broker</th>
<th>Ego between.</th>
<th>Normalized betweeness</th>
</tr>
</thead>
<tbody>
<tr>
<td>152</td>
<td>24</td>
<td>2</td>
<td>53</td>
<td>0.54</td>
<td>68</td>
<td>274.5</td>
<td>0.99</td>
<td>42.00</td>
<td>7.61</td>
</tr>
<tr>
<td>154</td>
<td>24</td>
<td>1</td>
<td>63</td>
<td>1.27</td>
<td>65</td>
<td>272.5</td>
<td>0.99</td>
<td>58.00</td>
<td>10.51</td>
</tr>
<tr>
<td>155</td>
<td>11</td>
<td>1</td>
<td>59</td>
<td>3.64</td>
<td>52</td>
<td>53</td>
<td>0.96</td>
<td>16.00</td>
<td>14.55</td>
</tr>
</tbody>
</table>
Conclusions

RDP application depends on the access to information and resources often embedded in the personal networks of farmers in the rural areas. The mechanisms to diffuse these information and resources are often underdeveloped in socialist countries in the transition, such as the countries from the Western Balkan region. In order to investigate the existing structures which might be available for the purpose of RDP information transmission, in this paper we studied the structure of relations among farmers in a region where one of the few agricultural cooperatives in Republic of Macedonia exists. The role and potential benefits from the cooperatives in terms of information flow for the existence and application for rural development programs (RDP) was analysed through social capital lens and social network analysis. In this paper we perceived the relation in the network as a representation of the level of social capital and trust or trustworthiness in certain actors in the diffusion (access) of RDP information.

Based on the results of this study, we can conclude that in general, the levels of social capital in a relatively narrow rural region is very small. However, information travels fast in the network, regardless of the fact that the network is constituted of large number of components, constituted of farmers which in most instances are not members of the cooperative – membership in cooperatives matters. The agricultural cooperative in this region is the nucleus of this network, where most of the access to RDP information is concentrated. Moreover, the managers of the cooperative which operates in the surveyed region, are the most important social capital hubs and the most trustworthy when information on RDP is acquired.

The agricultural cooperative in this study provides evidence that cooperative members have better access to information and resources, thus it can serve as a positive example for small-scale farmers still doubting the concept of cooperation. In this respect, this research was only the first step describing the social capital structure and benefits. In order to motivate changes of farmer’s attitudes towards cooperation and re-establish social capital potentials, further research on the relational aspects and role and attributes of the cooperative and cooperative members is advises.

Acknowledgement

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References
Evidence of calculating maize self-sufficiency in Bosnia and Herzegovina

Vasko Zeljko¹, Ostojic Aleksandar², Drinić Milanka³

Abstract
For Bosnia and Herzegovina (BaH) maize production is significant because that crop covers most of its arable land. The subject of research addressed in this paper is level of self-sufficiency in maize production in BaH. The aim of research was to check the hypothesis that BaH produced enough maize for human, livestock and fish consumption and has no need for its import, based on analysis of historical data for the period 2005-14. The results of research confirmed that BaH constantly had a deficit in maize, which amounted between 150 and 228 thousand tons per year in the analyzed period. The maize self-sufficiency was between 78% and 86%. This disproved the hypothesis that BaH meets all its needs with its own production of grain maize, making it dependent on import of maize. This conclusion is confirmed also by calculations of necessary quantities of maize as a component of livestock, fish and human nutrition according to which deficit of maize is even higher.

Key words: maize, production, consumption, self-sufficiency, Bosnia and Herzegovina.

Introduction
Agricultural economists have to explore and analyse conditions and tendencies in the agriculture sector and to provide valid inputs to policy makers in the function of development of efficient and sustainable agriculture production. One of such contributions is the analysis of results presented in this paper, which represent the economic and marketing analysis of situation in maize production and consumption in Bosnia and Herzegovina.

Maize is the most common crop in Bosnia and Herzegovina. In 2015, the area of 192 thousands hectares, or 37% of total area was sown by maize (Agency for statistics of Bosnia and Herzegovina, 2015). According to an average yield of maize, BaH is lagging behind the world and EU-28. The average yield of maize in BaH was 4.1 t/ha in 2015 (Agency for statistics of Bosnia and Herzegovina, 2016), in the world in the same year, it was 5.65 t/ha, and in EU almost double higher 7.85 t/ha (USDA, 2016).

Maize is mainly used for livestock feed and for industrial processing, and only 3-5% for human consumption. In developed countries, it is relatively small consumption of maize in human nutrition, although consumption increases in recent years due to concerns for health. In less

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developed and developing countries its participation in the human nutrition is more important (Vlahović, 2010). There is no reliable data on the maize consumption for human nutrition in BaH, but there are some estimates. For the purpose of this analysis, the following figure was taken into account, 12 kg of maize consumed per year of people in BaH (MVTEO BiH, 2010).

Grain maize is most important energy feed in the nutrition of all types of animals, whose organic matter digestibility is up to 90%. The content of starch in grain maize could amount 62-76%, crude fat 4-7%, crude proteins 7-14%, resoluble carbohydrates 1-3% and crude cellulose 1-3% (Gatarić et al., 2014). Maize is mostly used for nutrition of swine, poultry and cattle, even though it is practically the main energy feed for all kind and categories of animals. It is used in mixture. The young cattle, sheep and horses use whole grain of maize. Maize is basic energy nutrient for fattening categories of livestock (Đorđević and Dinić, 2007). Maize is combined in non-ruminants nutrition with a high quality protein supplements, minerals and deficient vitamins and in that case, it may be the single cereal in mixture of concentrate (Jovanović et al., 2000). In diet of non-ruminants, grain maize participates with 50-80% depending on the percentage of participation of other components from the group of cereals, as well as needs of specific categories of livestock (Đorđević et al., 2009). In the feeding of beef cattle, dairy cows and sheep, share of maize in a meal can be from 30-45% (Grbeša, 2004).

Looking worldwide, production and consumption of maize is approximately balanced. Some parts of the world and countries are traditional exporters, and other are traditional importers of maize. The American continent is a traditional producer of surpluses of maize, whose importers are Africa and Asia. The more than half of world maize production is produced in the United States (where lot of maize are used for production of bio fuels) and China (FAOSTAT, 2016). In the case of EU-28 in the 2015/16 season, it had a surplus of 16.9 million tons of maize, which was about 18.4% of realized production (EC, 2016).

While some emphasize self-sufficiency in food production only globally (that the whole world produces enough food to feed the world's population), for countries such as Bosnia and Herzegovina, one of the aims of agricultural development, is to achieve self-sufficiency in food production. In case of maize that means that the country produces sufficient quantity of maize to meet dietary needs of people, livestock and industrial processing. This aim is even more relevant for BaH because it has about 500 thousands hectares of uncultivated but potentially arable land (MVTEO BaH, 2015).

FAO generally deals with an issue of self-sufficiency of production respective to agricultural products and regularly update its food balance database. In addition to FAO, some other institutions deal with food self-sufficiency such as the European Commission, which found that its self-sufficiency in the case of maize was 98% in 2013 (Noleppa and Cartsburg, 2013). In Bosnia and Herzegovina in 2010 (MVTEO) made efforts to calculate self-sufficiency ratios for key agricultural products, and for maize, it was determined at the level of 86.8%. The authors of this paper calculated that there were food self-sufficiency for the Republic of Srpska, one of two BaH entities, in 2011 (Mirjanic et al.) and 2015 (Vaško et al.). In the region, Grgić et al. (2011) calculated self-sufficiency of Croatia with a grape and wine. Especially for maize, self-sufficiency calculated by Miah et al. (2014) in the case of Bangladesh, Fernandez et al. (2012) in case of Mexico, and Jayne and Rukuni (1993) in case of Zimbabwe.

Material and methods
The subject of research in this paper is the production and consumption of mercantile maize in Bosnia and Herzegovina (the quantities of maize seed are excluded from production data, and therefore from the balance of consumption). Maize production and consumption have been analyzed for the period 2005-2014. The research has done by combination of methods of
analyzing historical data, balancing, calculating self-sufficiency ratio and method of comparison.

The aim of the research is to determine the level of self-sufficiency ratio of maize production in Bosnia and Herzegovina. Self-sufficiency (SSR₁) is calculated according to usual formula as the ratio of domestic production and domestic production corrected for the difference between maize export and import (FAO, 2001; FAO, 2016). Industrial consumption of the maize for alcohol production is minor, and the bio fuel production from maize doesn't exist in BaH. In this calculation, starting and ending stocks are ignored (there are no reliable sources for valid assessment in BaH), whose effects in perennial period invalidated each other.

\[
\text{SSR}_1 = \frac{\text{DP}}{\text{DP} + \text{I} - \text{E}} \times 100
\]

We have tested previous indicator by additional control over the estimation of maize consumption for nutrition of livestock, fish and humans. In that, the second way (2) self-sufficiency (SSR₂) was calculated as the ratio of estimated domestic consumption of maize for animal and human nutrition and achieved domestic production of maize.

\[
\text{SSR}_2 = \frac{\text{DP}}{\text{DC}} \times 100
\]

In the third way (3) self-sufficiency (SSR₃) was calculated as the ratio between maize consumption for animal and human nutrition increased by the difference between its import and export.

\[
\text{SSR}_3 = \frac{\text{DP} + \text{I} - \text{E}}{\text{DC}} \times 100
\]

Descriptive statistics was also applied to analyze the observed trends, and their stability is measured by coefficient of variation. Starting from the assumption that in teen-years period, from the year to year, there are present some fluctuations in the production of mercantile maize, which is an essential component in diet of the almost all domestic animals, two research hypotheses were set up:

H1: Bosnia and Herzegovina produces sufficient mercantile maize and it does not have to be imported.

H2: The number of animals in Bosnia and Herzegovina is adjusted according to available quantities of mercantile maize.

Data on realized production of maize and the number of livestock and quantity of produced fish were taken from Institute of Statistics of Bosnia and Herzegovina. Data on export and import of maize were taken from the International Trade Statistics.

**Results and discussion**

Of all the crops in Bosnia and Herzegovina, the largest area was sown with maize. Areas under maize have been relatively stable in the last ten years in BaH (min=169,948 ha; max=204.266 ha; \(\bar{x}=192,729; \text{Cv}=4.79\)).

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Table 1. Sawn area, total production and yield of maize in BaH (2005-2014)

<table>
<thead>
<tr>
<th>Year</th>
<th>Harvested area (ha)</th>
<th>Total production (tons)</th>
<th>Yield (tons/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>196.372</td>
<td>1.004.099</td>
<td>5,11</td>
</tr>
<tr>
<td>2006</td>
<td>196.244</td>
<td>993.850</td>
<td>5,06</td>
</tr>
<tr>
<td>2007</td>
<td>197.430</td>
<td>635.344</td>
<td>3,22</td>
</tr>
<tr>
<td>2008</td>
<td>204.266</td>
<td>1.004.359</td>
<td>4,92</td>
</tr>
<tr>
<td>2009</td>
<td>188.688</td>
<td>962.921</td>
<td>5,10</td>
</tr>
<tr>
<td>2010</td>
<td>188.752</td>
<td>853.376</td>
<td>4,52</td>
</tr>
<tr>
<td>2011</td>
<td>195.970</td>
<td>764.119</td>
<td>3,90</td>
</tr>
<tr>
<td>2012</td>
<td>196.504</td>
<td>539.432</td>
<td>2,75</td>
</tr>
<tr>
<td>2013</td>
<td>189.554</td>
<td>798.500</td>
<td>4,21</td>
</tr>
<tr>
<td>2014</td>
<td>169.948</td>
<td>798.487</td>
<td>4,70</td>
</tr>
</tbody>
</table>

∑   1.923.729          8.354.486             43,49

x̄  192.373             835.449                 4,35
Cv (%) 4,79               19,31                   19,10

Source: Processing of data obtained on request from Institute of Statistics of BaH by the authors

Realized production of grain maize and average yields have registered significant variations. Annual total production of mercantile grain maize was between 529 thousands (2012) and 1 million tons (2008), and the yield per hectare was from 2.7 tons (2012) to 5.1 tons (2005 and 2009). Variations are mostly the results of favourable or unfavourable weather conditions. That suggests that the number of livestock should be reduced after the "bad" years with low production of maize, because of the lack of fodder, and because of increase of its price as a consequence of lower supply compared to demand.

The data on the number of livestock are available in BaH only since 2014, so in the following analysis, it is based on ten-year period 2005-14 for which data is known.

Table 2. Number of livestock and Bosnia and Herzegovina (2005-2014)

<table>
<thead>
<tr>
<th>Year</th>
<th>Cattle</th>
<th>Sheep</th>
<th>Goats</th>
<th>Swine</th>
<th>Horses</th>
<th>Poultry</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>459.790</td>
<td>902.731</td>
<td>73.474</td>
<td>653.943</td>
<td>27.140</td>
<td>10.339.886</td>
</tr>
<tr>
<td>2006</td>
<td>514.869</td>
<td>1.004.686</td>
<td>76.489</td>
<td>712.141</td>
<td>25.907</td>
<td>13.331.564</td>
</tr>
<tr>
<td>2007</td>
<td>467.986</td>
<td>1.033.264</td>
<td>70.255</td>
<td>734.764</td>
<td>25.408</td>
<td>14.989.229</td>
</tr>
<tr>
<td>2009</td>
<td>457.743</td>
<td>1.054.689</td>
<td>70.604</td>
<td>529.095</td>
<td>21.185</td>
<td>18.741.442</td>
</tr>
<tr>
<td>2010</td>
<td>462.519</td>
<td>1.046.035</td>
<td>64.170</td>
<td>581.188</td>
<td>19.261</td>
<td>21.802.000</td>
</tr>
<tr>
<td>2011</td>
<td>455.258</td>
<td>1.020.690</td>
<td>65.260</td>
<td>576.789</td>
<td>19.149</td>
<td>18.703.069</td>
</tr>
<tr>
<td>2012</td>
<td>444.595</td>
<td>1.004.494</td>
<td>65.375</td>
<td>539.990</td>
<td>18.411</td>
<td>19.401.283</td>
</tr>
<tr>
<td>2013</td>
<td>446.893</td>
<td>1.019.782</td>
<td>69.369</td>
<td>529.644</td>
<td>17.683</td>
<td>24.735.625</td>
</tr>
<tr>
<td>2014</td>
<td>444.337</td>
<td>1.025.109</td>
<td>73.732</td>
<td>532.580</td>
<td>17.208</td>
<td>20.664.066</td>
</tr>
</tbody>
</table>

∑   4.613.208          10.141.994            699.120        5.892.331     214.261   178.892.894

x̄  461.321            1.014.199            69.912          589.233      21.426    17.889.289
Cv (%) 4,42             4,17               5,78             13,98          17,16     23,76

Source: Processing of data obtained on request from Institute of Statistics of BaH by the authors
In the period 2005-14 the number of livestock recorded relatively small variations in relation to the ten-year average and the highest is recorded in the poultry, horses and swine. If the number of animals did not change significantly and maize production did, it would be logical that stock of maize from the previous years and its import balance its production and consumption. Official data on maize import show that import is mostly balanced and ranges from 133 to 250 thousand tonnes per year, e.g. from 17% to 31% of domestic production. Significant export of maize from BaH is achieved only in 2009, 2010 and 2015, although in those years its production wasn't greatest.

Table 3. Self-sufficiency in corn production in BaH (2005-2014)

<table>
<thead>
<tr>
<th>Year</th>
<th>Production (t)</th>
<th>Import (t)</th>
<th>%</th>
<th>Export (t)</th>
<th>%</th>
<th>Available for consumption</th>
<th>SSR₁</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>1,004,099</td>
<td>222,317</td>
<td>22.14%</td>
<td>1,358</td>
<td>0.14%</td>
<td>1,225,058</td>
<td>82.0%</td>
</tr>
<tr>
<td>2006</td>
<td>993,850</td>
<td>228,602</td>
<td>23.00%</td>
<td>247</td>
<td>0.02%</td>
<td>1,222,205</td>
<td>81.3%</td>
</tr>
<tr>
<td>2007</td>
<td>635,344</td>
<td>165,344</td>
<td>26.02%</td>
<td>611</td>
<td>0.10%</td>
<td>800,077</td>
<td>79.4%</td>
</tr>
<tr>
<td>2008</td>
<td>1,004,359</td>
<td>183,337</td>
<td>18.25%</td>
<td>608</td>
<td>0.06%</td>
<td>1,187,088</td>
<td>84.6%</td>
</tr>
<tr>
<td>2009</td>
<td>962,921</td>
<td>162,294</td>
<td>16.85%</td>
<td>12,067</td>
<td>1.25%</td>
<td>1,113,148</td>
<td>86.5%</td>
</tr>
<tr>
<td>2010</td>
<td>853,376</td>
<td>186,130</td>
<td>21.81%</td>
<td>24,300</td>
<td>2.85%</td>
<td>1,015,206</td>
<td>84.1%</td>
</tr>
<tr>
<td>2011</td>
<td>764,119</td>
<td>157,470</td>
<td>20.61%</td>
<td>3,061</td>
<td>0.40%</td>
<td>918,528</td>
<td>83.2%</td>
</tr>
<tr>
<td>2012</td>
<td>539,432</td>
<td>133,452</td>
<td>24.74%</td>
<td>1,242</td>
<td>0.23%</td>
<td>671,642</td>
<td>80.3%</td>
</tr>
<tr>
<td>2013</td>
<td>798,500</td>
<td>223,325</td>
<td>27.97%</td>
<td>421</td>
<td>0.05%</td>
<td>1,021,404</td>
<td>78.2%</td>
</tr>
<tr>
<td>2014</td>
<td>798,487</td>
<td>249,706</td>
<td>31.27%</td>
<td>53,645</td>
<td>6.72%</td>
<td>994,548</td>
<td>80.3%</td>
</tr>
<tr>
<td>∑</td>
<td>8,354,486</td>
<td>1,911,977</td>
<td>97.560</td>
<td>9,756</td>
<td>10.168,903</td>
<td>1,016,890</td>
<td>17.96</td>
</tr>
</tbody>
</table>

Source: Processing of data obtained on request from Institute of Statistics of BaH and data of the International Trade Statistics (export and import) by the authors

It is usual to determine the consumption of certain agricultural products on the above-mentioned way, which is based on the assumption that we can't spend more than it was produced and imported. The lowest maize quantity was imported in 2012, when the production was too low, that balance of available maize for animal feeding was only 671 thousands of tons. Previous year has not been particularly generous, so stock of maize that year could not be high, too. That was the reason why we decided to do additional needs assessment of maize consumption for animal feeding based on the number of animals and maize consumption for their feed. They composed average diets for all type of animals and participation of maize in them based on the standard nutritional norms (Obaračević, 1990).
need for grain maize in BaH was between 250 and 900 thousands of tons. It is partly calculated (table 5).

### Table 4. Maize need assessment of feeding livestock, fish and humans (2005-2014)

<table>
<thead>
<tr>
<th>Year</th>
<th>Cattle</th>
<th>Sheep</th>
<th>Goats</th>
<th>Swine</th>
<th>Horses</th>
<th>Poultry</th>
<th>Fish</th>
<th>Total for feeding livestock and fish</th>
<th>Total for human consumption</th>
<th>Total needs for maize</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>498.642</td>
<td>39.069</td>
<td>1.954</td>
<td>407.910</td>
<td>7.565</td>
<td>363.843</td>
<td>78.930</td>
<td>1.397.914</td>
<td>45.500</td>
<td>1.443.414</td>
</tr>
<tr>
<td>2009</td>
<td>435.942</td>
<td>40.951</td>
<td>1.804</td>
<td>303.593</td>
<td>6.186</td>
<td>521.828</td>
<td>112.626</td>
<td>1.422.930</td>
<td>45.500</td>
<td>1.468.430</td>
</tr>
<tr>
<td>2010</td>
<td>446.629</td>
<td>40.080</td>
<td>1.640</td>
<td>333.853</td>
<td>5.624</td>
<td>606.845</td>
<td>122.382</td>
<td>1.557.053</td>
<td>45.500</td>
<td>1.602.553</td>
</tr>
<tr>
<td>2011</td>
<td>440.423</td>
<td>38.779</td>
<td>1.667</td>
<td>330.862</td>
<td>5.592</td>
<td>518.812</td>
<td>125.964</td>
<td>1.462.099</td>
<td>45.500</td>
<td>1.507.599</td>
</tr>
<tr>
<td>2012</td>
<td>424.029</td>
<td>37.793</td>
<td>1.670</td>
<td>309.260</td>
<td>5.376</td>
<td>539.073</td>
<td>83.448</td>
<td>1.400.649</td>
<td>45.500</td>
<td>1.446.149</td>
</tr>
<tr>
<td>2013</td>
<td>426.983</td>
<td>38.254</td>
<td>1.772</td>
<td>304.284</td>
<td>5.163</td>
<td>685.082</td>
<td>76.554</td>
<td>1.538.093</td>
<td>45.500</td>
<td>1.583.593</td>
</tr>
<tr>
<td>2014</td>
<td>423.327</td>
<td>38.239</td>
<td>1.884</td>
<td>305.292</td>
<td>5.025</td>
<td>572.283</td>
<td>64.962</td>
<td>1.411.012</td>
<td>45.501</td>
<td>1.456.513</td>
</tr>
</tbody>
</table>


Source: Own calculations of the authors

The table above shows that, starting from the number of livestock, fish and population in BaH and recommended norms in their diet, the needs for maize for animal and human nutrition in BaH were between 1.25 and 1.60 million tons, that much maize was not produced in none of those years in BaH. Based on projection of consumption and production, i.e. the available quantities of maize after import, are calculated the virtual self-sufficiency in maize production is calculated (table 5).

### Table 5. Self-sufficiency in maize production based on maize needs assessment

<table>
<thead>
<tr>
<th>Year</th>
<th>Production (tons)</th>
<th>Consumption (tons)</th>
<th>Deficit (tons)</th>
<th>Self-sufficiency SSR2 (%)</th>
<th>Export-import balance (tons)</th>
<th>Deficit (tons)</th>
<th>Self-sufficiency SSR3 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>1.004.099</td>
<td>1.253.012</td>
<td>-248.913</td>
<td>80,1%</td>
<td>220.959</td>
<td>-27.954</td>
<td>97,8%</td>
</tr>
<tr>
<td>2006</td>
<td>993.850</td>
<td>1.443.414</td>
<td>-449.564</td>
<td>68,9%</td>
<td>228.355</td>
<td>-221.209</td>
<td>84,7%</td>
</tr>
<tr>
<td>2007</td>
<td>635.344</td>
<td>1.449.693</td>
<td>-814.349</td>
<td>43,8%</td>
<td>164.733</td>
<td>-649.616</td>
<td>55,2%</td>
</tr>
<tr>
<td>2008</td>
<td>1.004.359</td>
<td>1.377.710</td>
<td>-373.351</td>
<td>72,9%</td>
<td>182.729</td>
<td>-190.622</td>
<td>86,2%</td>
</tr>
<tr>
<td>2009</td>
<td>962.921</td>
<td>1.468.430</td>
<td>-505.509</td>
<td>65,6%</td>
<td>150.227</td>
<td>-355.282</td>
<td>75,8%</td>
</tr>
<tr>
<td>2010</td>
<td>853.376</td>
<td>1.602.553</td>
<td>-749.178</td>
<td>53,3%</td>
<td>161.830</td>
<td>-587.348</td>
<td>63,3%</td>
</tr>
<tr>
<td>2011</td>
<td>764.119</td>
<td>1.507.599</td>
<td>-743.481</td>
<td>50,7%</td>
<td>154.409</td>
<td>-589.072</td>
<td>60,9%</td>
</tr>
<tr>
<td>2012</td>
<td>539.432</td>
<td>1.446.149</td>
<td>-906.718</td>
<td>37,3%</td>
<td>132.210</td>
<td>-774.508</td>
<td>46,4%</td>
</tr>
<tr>
<td>2013</td>
<td>798.500</td>
<td>1.583.593</td>
<td>-785.093</td>
<td>50,4%</td>
<td>222.904</td>
<td>-562.189</td>
<td>64,5%</td>
</tr>
<tr>
<td>2014</td>
<td>798.487</td>
<td>1.456.513</td>
<td>-641.965</td>
<td>54,8%</td>
<td>196.061</td>
<td>-265.904</td>
<td>68,3%</td>
</tr>
</tbody>
</table>

Total 8.354.486 14.588.667 -6.038.120 57,3% 1.814.417 -4.223.703 69,7%

Source: Own calculations of the authors

The data in table 5 shows that the estimated annual deficit between produced quantities and need for grain maize in BaH was between 250 and 900 thousands of tons. It is partly 1 Quantity of maize for human consumption are determined by multiplying the number of inhabitants on the basis from the census in 2013 (3,791,662) and maize consumption of 12 kg per capita per year.
compensated by the import of maize, but these quantities were not sufficient to satisfy calculated needs.

Knowledge about non-sufficient quantities of maize available for livestock, fish and human nutrition opens the dilemma how it is possible to maintain deficit between available and required quantities of maize for years. Possible answers on that dilemma are:
- data on domestic maize production are underestimated;
- data on the number of livestock are overestimated;
- livestock farmers adopt animal diet according to the available quantities of animal feed in order to subsidize maize with other components.

Expert assessment of the authors are that the data on the number of some types of livestock is probable underestimated, and as well as requirements for the maize. However, the main reason why this virtually identified and more years present deficit of maize doesn't escalate in reality, is the strategic response of livestock breeders to reduce or totally exclude maize from the livestock diet. In the function of intensification of livestock production and bigger inclusion of maize in livestock diet, BaH would sow about 50 thousand more hectares of maize than now.

**Conclusion**

Maize is, by the covered areas and produced quantity of grain, number one crop in Bosnia and Herzegovina. In the human diet, maize is rarely present, but it is common component of livestock feed.

The first research hypothesis that BaH produces enough maize for own needs is rejected based on data on its higher import than export during the ten analysed years and on the basis of calculations of needed quantities of maize for humans, livestock and fish that are significantly higher than production.

The second research hypothesis that the number of livestock is adjusted according to the available quantity of maize, is also rejected since in case of reduction of available quantity of maize from domestic production and import, the number of livestock in BaH has not been significantly reduced. This conclusion suggests that livestock farmers don't adjust the number of animals according to available quantities of maize, than primarily adapted livestock feeding according to available quantity and structure of animal feed reducing the intensity of production, which is one of the reasons of quite low production performances in livestock production in BaH.

Confirmed deficit in production and consumption of maize, for which there are present secure and stable consumers, and recently created opportunities for export of milk and meat, indicate that Bosnia and Herzegovina can and should increase its own production of maize.

Despite the drop of world price of maize, additional produced quantities could be through the animal fattening and thus contribute to reducing the deficit in foreign trade of all kinds of meat. Agricultural producers in BaH know very well the technology of maize production, have agricultural machinery as well as available additional area of currently uncultivated land. One of the problems, due to which average maize yields in BaH are low, is more frequent droughts and low level of application of irrigation, so this agro-technique measure would be applied in the future and in the maize production, wherever it is possible.

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Organizational, economic and business activity of the family winery

Zivkovic Jelena¹, Zivkovic Dragic², Milovanovic Nemanja³

Abstract
While the first traces of winemaking dating back to the 6000 BC, however, the main role in the development of winemaking, from the year 400 AD takes over the church and the monastic orders, which from that time take care of the vineyards and making wine. In the meantime, the wine obtained religious significance and is increasingly used in religious ceremonies. The turning points in the production and storage of wine occurred in the 16th and 17th century. The invention of the bottle, and the introduction of sulfur dioxide application in barrels disinfection in 1700, influenced the prolongation of the period of the wines storing, and that changing properties of the wine and getting bouquet during wine maturation.

Vinification is the first stage in the process of wine production. It is a set of operations that transforms grapes or grape juice into wine. The second stage deals with wine processing and stabilizing, i.e. qualifies wine for direct consumption or further safekeeping. High quality wines are made of grape varieties characterized by the ability to accumulate large amounts of sugar (which provides an alcohol content of 13 to 15%), that have a specific varietal flavor, aroma and harmonious relationship of all other ingredients.

Wine production in the world shows an increasing trend, but with large fluctuations in individual years. The Republic of Serbia has a noticeable place in the production and consumption of grapes and wine in the region of the Western Balkans, with a modest annual share in overall value of agricultural production. Exports of wine from Serbia are still lower than imports.

The subject of this paper is organizational and economic conditions and the results of business activities of the family-owned winery in Trstenik city region. The attention is focused on the history and basic characteristics of the family-owned winery, especially on varieties and their characteristics, equipment for production and processing of grapes and wine production equipment, as well as the structure of the employees. There has been no review of the harvesting, transport and reception of grapes, nor racking, clarification, filtration of wine, or selection and filling bottles with wine.

The paper gives special emphasis on the cost aspect of wine production by individual components, the analysis of the structure and distribution of total income and business income. Efficiency and profitability of production, and labor productivity as important business performance indicators have also found their place in the paper.

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There are also indicators of business activities such as customer turnover ratio, customers age, inventory turnover ratio, age of inventory, suppliers turnover ratio, age of suppliers, structure indicators: ratio of fixed assets and the ratio of current assets to total assets of the winery, the share of long-term and short-term capital in total liabilities, as well as indicators of debt and interest coverage ratio.

**Keywords:** winery, grapes, wine, organization, economics, business activity.

**Introduction**

Wine can be considered as the oldest product of mankind. Traces of winemaking date back to 6000 BC from the areas of today's Georgia. Winemaking was expanding further, so that wine became the most important drink of the kings of Mesopotamia and Egypt. After Egypt, wine arrives to ancient Greece, where for the first time it is assigned a god, Dionysus. With the conquest of the Apennine peninsula, Greeks transferred the wine culture to that territory. A great influence on the spread of the wine culture in the world, especially in the conception of vineyards in France were the ancient Romans who, besides the development of winemaking in Rome, presented wine in the very famous regions of the present day such as Burgundy, Bordeaux, Champagne, Loire, Rhone, Moselle and Rhine.

From the ancient mythological times, the power of wine to exalt the man, to give him serenity and the gift of speech, made it in the eyes of the people a drink of gods. However, with the drop of the divine drink the wars were announced and peace was made, wine was used to celebrate the births, celebrate success, wine was and remained the most appreciated drink of many civilizations.

The wine culture is not measured by the quantity of the drunk wine, but it represents the adoption of specific skills and procedures in the field of viticulture, winemaking and catering. The true wine culture is acquired over time and implies a certain knowledge of grapevines, on their occurrence on earth and in our region, the knowledge of the basics of production of certain types of wine, the method of storing wine, the wine categorisation by quality, wine serving, reading labels, conversance of wine temperature, knowledge of the cap for wine, matching wine and food, as well as knowledge related to wine and aesthetics, art and wine, wine and health, especially the knowledge of the ritual at table.

Today, thanks to all the richer wine list of Serbian wines, Serbia can be presented as a country of grapes and good wine.

It is the largest wine exporter in Europe, but is also the largest importer of wine. The best-known wine producing regions in the world are Piedmont (Italy), Napa Valley (California), Mosel (Germany), Bordeaux (France), Tuscany (Italy), Ribely del Duero (Spain), Barossa Valley (Australia), Champagne (France).

The five largest wine producers in the world are: France, Italy, Spain, the USA and Argentina. Europe produces about two-thirds of the world's wine production.

Among our neighbouring countries, the largest wine producer is Bulgaria.

The Republic of Serbia is an evident producer, as well as a consumer of grapes and wine in the Western Balkans region.

In the foreign trade exchange of wine, Serbia realises the deficit that varies from year to year, and it is a result of the insufficient production of wine and growing trend in the consumption of wine.

The areas planted with vines in Serbia in the last 15 years reduced from 70,634 ha to 30,000 ha. About 120,000 households are engaged in the production of grapes, and the average per vine yield ranges from 0.7 to 1.54 kg. It is estimated that about 83% of the area under vineyards are
located in Central Serbia, and only 17% in Vojvodina. It is estimated that in Serbia the average per capita annual consumption is between 3.3 and 4 litres of wine. When it comes to consumption, surveys show that in Serbia three out of four drunk bottles of wine are from imports.

According to the Agreement on Stabilization and Association, Serbia has 9 defined wine-growing regions and 66 defined vineyards whose names can be used for labelling wines with geographical origin.

The new system of geographical origin is based on emphasizing the characteristics of the particular production area through the quality and characteristics of wine from those regions, which gives extra value to the wine. All of the above mentioned, together with the promotion of certain production areas, or geographical indications will enable easy placement of such wines.

Keywords: winery, wine, organization, economics, business activity.

The subject of work
This paper deals with organizational, economic and business characteristics of the family winery located in the area of Trstenik. The winery deals with not completely pure organic production of premium wines, which are mainly sold to foreign markets.

Methods of work and data sources
For consideration of the above subject we used the method of analysis of the business organization of the winery, production structure, the structure of employees, the use of resources and analysis of financial statements.

Description methods used to delineate the historical development of wine as well as the history of the family winery and the description of the wine production.

The method of comparison refers to the comparison of the position values in financial statements and indicator values in two consecutive periods (years).

The internal data from the winery and bookkeeping data from the relevant literature are used. The operating results were obtained from the winery financial statements, as well as data necessary for the calculation of the production cost, i.e. for determination of the cost.

The necessary data are also collected electronically.

History and main features of the family winery
The considered family winery is located on the fertile slopes of Trstenik rural areas in the untouched nature and landscape that offer extraordinary enjoyment.

In 1892, the family winery had the oldest documents on barter, and in 1980 the company was first registered as a cellar for the production of wine and brandy. During 2005, the farm was registered, and in 2008 the company was registered as a limited liability company, and today it is, due to changes in the law, an entrepreneurial store.

Twenty-eight years ago the owner started upgrading his 200 year old family tradition in the winery Rebbaugenossenschaft Spiz in the Swiss canton of Barry, where he met with German precision and French sophistication, and then he wanted to apply the acquired knowledge and hand it over to his son and grandson in his native Serbia so that he came back home.

Every other row of vines is covered by grass, so that the useful flora and fauna bear down the harmful. Thus, for the first time in Serbia this aspect of ecological production of wine is applied.
The production of high quality wines is performed in the cruses of stainless steel with a controlled fermentation with selected yeasts. The varieties of grapes in the family vineyard are the red varieties: Cabernet Sauvignon, Merlot, Chiraz, Prokupac, and the white varieties: Sauvignon blanc and Tamjanika. The aforementioned grape varieties naturally have their own distinctive features, as well as the types of wines obtained from them.

The family firm mechanically farms the vineyard which has green pruning. Oilseed rape is sown in every other row, and after mowing it is machine crashed, whereby the humus is produced which is used for the vineyard fertilization.

The vineyard is 3 ha in size. The production is integrated with a minimum of spraying, without the use of mineral fertilizers, which gives the characteristics of organic production, but not pure organic production.

The family winery exports its wines to Estonia, Germany, France and Montenegro. In 2013, there was the total production of 18,750 litres and in the year 2014 the total production amounted to 11,300 litres. Wine bottles are transported from Moldova, labels are produced by the company "Crveno" from Valjevo, the quality control is carried out in the laboratory "Jugoinспект" in Belgrade and it is a regular exhibitor at wine fairs.

As permanently employed personnel in the winery there are the owner of the winery and his wife, both with a high school education. During the harvest period, seasonal workers are engaged, whose number depends on the fertility and in the year 2013 there were 57 workers (39 men and 18 women), in 2014 there were 49 seasonal workers (27 men and 22 women). The structure of seasonal workers according to the level of education is 47% with a high school education and 53% with primary school education.

The results of operations of the family winery

Expenses by the elements and the production results of the most important wine

Expenses represent the amount of spent production elements in the process of reproduction. The value is expressed in the price, expenses are denominated monetary quantity of consumed manpower, instruments and subjects of work. The expenses of developing of a single product consist of labour costs, the cost of the work means and the cost of the subjects of work spent to produce that product.

Calculation of price, i.e. cost accounting, taken from the book-keeping:

- preparation, processing, hygiene of basement 8 days x 8 h = 64 h
- further treatment (separation of wine from yeast, streaming) 4 days x 8 h = 32 h
- filtering (rough - fine) 2 days x 8 h = 16 h
- labelling 4 days x 8 h = 32 h
- sales 20 days x 8 h = 160 h

Total: 42 days x 8 h = 336 h
336 h x 240.00 = 80,640.00
- the price of 1 kg of grapes 34.80 + depreciation of tractors 15.60 = 50.40
- closure of cork Class I = 9.60
- bottles 0.75 = 33.60
- self-adhesive labels = 9.60
- filter plate (average) = 156.00

Calculation was performed for 10,000 bottles of wine, and takes into account that 1 € = 120 RSD.
- 10,000 kg of grapes x 50.40 = 540,000.00
- 10,000 pieces of corks x 36.00 = 360,000.00
- 10,000 bottles x 33.60 = 336,000.00
- 10,000 labels x 9.60 = 96,000.00
- enzymes, yeast, gelatine, sulphur = 24,000.00
- the work of cellar 336 hours x 240.00 = 80,640.00
- filter plate 1,000 pieces x 156.00 = 156,000.00
- electricity = 24,000.00
- transport of wine = 48,000.00
- advertising = 252,000.00
- amortization of tanks (for 50 years) = 24,000.00
- amortization of machinery 1,200,000.00 per 10 years = 120,000.00
(Pumps, filling machines, filter)
- depreciation of cellar 3,600,000.00 per 50 years = 72,000.00
- depreciation of car 1,800,000.00 per 10 years = 180,000.00

= 2,136,240.00

VAT on 10,000 bottles, 20% is 2,000 bottles
10,000 bottles - 2,000 bottles = 8,000 bottles
Cost of a bottle of wine: 2,136,240.00 / 2,000 = 276.03

Analysis of the structure and arrangement of the total revenue
The structure of total revenue shows based on what the revenue has been achieved and how much revenue is generated, that is it shows the share (percentage share) of all types of income in total revenue. At the same time, the structure of the distribution of the total revenue shows the total revenue load by certain types of expenditure and participation of the achieved financial results, gross profit (loss) or income (loss) before tax and net income (loss) in total revenue.

Business revenues are a major component of total revenues of each production company, given that they represent monetization of the effects from the basic activities of the company in the market. Operating incomes should make up at least 90% of total revenue, which is not the case in the winery, although the growth in operating revenue can be seen from the previous year from 68.91% to 76.99%. The growth rate of operating revenue in the current year comparing to the previous year is 15%.
Financial revenues are the result of short-term loans of liquidity (cash) funds (short-term financial investments) or investing in other companies and banks (long-term financial investments). Given that the production company has not been established for the collection and placement of money and capital, which is an activity of banks, the share of financial income in the total revenue should not be significant, not exceeding 10%. In the winery, this form of income does not exist in both years.

Other revenues are the result of irregular transactions (e.g. revenue from surpluses, realized revenues in the current year from the previous year). For enterprises the share of other incomes in the total revenue should be less than 1% and the company may not rely on them. However, in the winery they are far from that percentage, but their decline is observed in the current compared to the previous year from 31.09% to 23.01%.

Operating expenses should mostly burden the total revenues of the observed company. Financial expenses actually represent costs of interest based on loans of the company. Their participation is very limited. Other expenses are the result of irregular transactions (e.g. expenses from deficit, subsequently determined expenses from the previous year). For enterprises the share of other expenses in the total revenue should be less than 1%. However, the winery has a lot of their participations, they increased from 24.73% to 33.40% and the growth rate is even 41.47%. The load the total revenue by total expenditure shows how much of total revenue is used to cover the total expenditure (8,640-8,517 = 123). In addition, the share of total expenses in total revenue shows the level of achieved economy of the company (101.4%).

Table 1. Structure of total revenue

<table>
<thead>
<tr>
<th>No.</th>
<th>Position</th>
<th>Amounts in 000 dinars per year</th>
<th>Structure by years (%)</th>
<th>Index (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Current</td>
<td>Previous</td>
<td>Current</td>
</tr>
<tr>
<td>1</td>
<td>Operating income</td>
<td>6.652</td>
<td>5.772</td>
<td>76.99</td>
</tr>
<tr>
<td>2</td>
<td>Financial incomes</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Other incomes</td>
<td>1.988</td>
<td>2.604</td>
<td>23.01</td>
</tr>
<tr>
<td>4</td>
<td>Total revenue</td>
<td>8.640</td>
<td>8.376</td>
<td>100.00</td>
</tr>
<tr>
<td>5</td>
<td>Operating expenses</td>
<td>5.662</td>
<td>6.050</td>
<td>66.48</td>
</tr>
<tr>
<td>6</td>
<td>Financial expenses</td>
<td>10</td>
<td>70</td>
<td>0.12</td>
</tr>
<tr>
<td>7</td>
<td>Other expenses</td>
<td>2.845</td>
<td>2.011</td>
<td>33.40</td>
</tr>
<tr>
<td>8</td>
<td>Total expenditure</td>
<td>8.517</td>
<td>8.131</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Source: Family Winery

Analysis of the structure and arrangement of the operating income

The structure of operating income shows based on what the operating income has been achieved and how much of operating income was accomplished, i.e. it shows the percentage share of all types of operating income in total operating income.

The structure of the arrangement of operating income shows the load of the operating income with certain types of business expenses and the share of the operating results in the operating income.

In the structure of operating income, it is important that the income from sale dominates which actually turns stocks of products, goods and services in cash needed for the continuation of the business processes of a company. This is the case in this winery. In both years most incomes were achieved from sales of products and services i.e. in the current 99.97%, and 99.89% in the previous year. In the structure of operating expenses, the largest share is of material costs in...
both years, although their share in the current compared to the previous year decreased by 10%. Then there are the costs of salaries, which have increased sharply in the current year compared to the previous 6%, from 4.84% to 12.93%. The least is the share of intangible costs, although their share has increased in the current compared to the previous year from 5.90% to 7.51%.

Table 2. Structure of operating income

<table>
<thead>
<tr>
<th>No.</th>
<th>Position</th>
<th>Amounts in 000 dinars per year</th>
<th>Structure by years (%)</th>
<th>Index (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Current</td>
<td>Previous</td>
<td>Current</td>
</tr>
<tr>
<td>1</td>
<td>Operating incomes</td>
<td>6.652</td>
<td>5.772</td>
<td>100,00</td>
</tr>
<tr>
<td>2</td>
<td>Incomes from sale of goods</td>
<td>2</td>
<td>-</td>
<td>0,03</td>
</tr>
<tr>
<td>3</td>
<td>Incomes from sale of goods and services</td>
<td>6.650</td>
<td>5.766</td>
<td>99,97</td>
</tr>
<tr>
<td>4</td>
<td>Incomes from premiums, subsidies, grants, donations and the like</td>
<td>-</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Operating expenses</td>
<td>5.622</td>
<td>6.050</td>
<td>100,00</td>
</tr>
<tr>
<td>6</td>
<td>Purchase cost of sold goods</td>
<td>20</td>
<td>-</td>
<td>0,36</td>
</tr>
<tr>
<td>7</td>
<td>Cost of materials</td>
<td>3.391</td>
<td>4.279</td>
<td>60,32</td>
</tr>
<tr>
<td>8</td>
<td>Wages, salaries and other personnel expenses</td>
<td>727</td>
<td>293</td>
<td>12,93</td>
</tr>
<tr>
<td>9</td>
<td>Costs of production services</td>
<td>580</td>
<td>753</td>
<td>10,31</td>
</tr>
<tr>
<td>10</td>
<td>Depreciation and amortization expenses</td>
<td>482</td>
<td>368</td>
<td>8,57</td>
</tr>
<tr>
<td>11</td>
<td>Intangible costs</td>
<td>422</td>
<td>357</td>
<td>7,51</td>
</tr>
<tr>
<td>12</td>
<td>Operating profit</td>
<td>1.030</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>13</td>
<td>Losses</td>
<td>-</td>
<td>278</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Family Winery

Analysis of derivative business indicators
Derived indicators of business operations are production efficiency, productivity and profitability.

Economy of production
The ratio of the total economy = Total revenue / Total expenditure
In the year 2014 = 8,640 / 8,517 = 1.014
Every RSD (*monetary unit) of expenditure is covered with 1.014 RSD of revenue. The coefficient is acceptable if it is greater than 1, which is the case in this year, therefore, the winery operated economically in the current year.
In the year 2013 = 8,376 / 8,131 = 1.030
Every dinar (*RSD) of expenditure is covered with 1.030 RSD of revenue. The coefficient is acceptable if it is greater than 1, which is the case in this year, therefore, the winery operated economically in the current year.
If the ratio is greater than one, it is acceptable in the analysis, that means that the company achieved total revenue that covers operating costs, i.e. that it operates economically. In both years, the winery is on the border of economic efficiency.
The ratio of business economics = Operating income / Operating expenses
In the year 2014 = 6,652 / 5,662 = 1.175
Every RSD of operating expenses is covered with 1.175 RSD of operating income, the coefficient is acceptable if it is greater than 1, which is the case in this year, the company has a positive operating result and it operates efficiently.
In the year 2013 = 5,772 / 6,050 = 0.954
Every RSD of operating expenses is covered with 0.954 RSD of operating income, the coefficient is acceptable if it is greater than 1, as in this, previous year is not the case, but it is very close to 1, so we can say that even this year the winery operated on the border economy.

**Profitability of production**

Operating profit Ratio = (Operating profit / Operating Revenues) x 100
In the year 2014 = 1,030 / 6,652 x 100 = 15.48% is the percentage share of the business income to operating income, i.e. it is the profit margin.
In the year 2013 = the winery had an operating loss
The rate of net income = (Net income / operating income) x 100
In the year 2014 = 163 / 6,652 x 100 = 2.45% is the percentage share of net income to operating income, i.e. it is the profit margin.
In the year 2013 = 245 / 5,772 x 100 = 4.24% is the percentage share of net income to operating income, i.e. it is the profit margin.
The rate of net income shows a decline in the current compared to the previous year. This means a reduction of net income in the current year, which is twice lower than in the previous year. The rate of net income depends on the amount of costs for interest (financial expenses). If there is the large debt of the company and it pays high interest rates, and if there is a big business profit the company may have a small net income or even a loss.
The rate of return on total assets = (Operating income / average assets) x 100
In the year 2014 = 1.030 / [(8.561 + 8.399) / 2] x 100 = 1.030 / 8.480 x 100 = 12.15% is the percentage of return on investment, i.e. interest rate.
In the year 2013 = the winery had an operating loss
The rate of return on net assets = (Net profit / Average net assets) x 100
In the year 2014 = 163 / [(2,189 + 2,035) / 2] x 100 = 163 / 2,112 x 100 = 7.71% is the percentage return on invested own funds, i.e. interest rates of net capital.
In the year 2013 = 245 / 2,035 x 100 = 2.04% is the percentage return on invested its own funds, i.e. interest rates of net capital.
The rate was increased for 5.67% in the current compared to the previous year. The problem with this indicator is that the ratio puts profit from operations accomplished by the whole year, and the average net asset are the category defined as shareholders' equity, at one time, at the end of the fiscal year.
**Labour productivity**

Operating revenue per employee = Operating income / average number of employees
In the year 2014 = 6,652,000 / 2 = 3,326,000 RSD is the achieved operating revenue per employee.
In the year 2013 = 5,772,000 / 2 = 2,886,000 RSD is the achieved operating revenue per employee.

Operating revenue per employee has increased in the current compared to the previous year, indicating increased productivity in the current compared to the previous year, as a result of the unchanged number of employees, and increased operating income.

Operating result per employee = Operating result / Average number of employees
In the year 2014 = 1,030,000 / 2 = 515,000 RSD is the established operating result of per employee.
In the year 2013 = the winery had an operating loss.

Labour productivity is higher in the current year as in the previous year the winery operated with business loss.

The net result per employee = Net result / average number of employees
In the year 2014 = 163,000 / 2 = 81,500 RSD was realized net result per employee.
In the year 2013 = 245,000 / 2 = 122,500 RSD was achieved net result per employee.
Net result after deduction of interest expenses and taxes, was higher in the previous compared to the current year, a number of workers is the same in the current and previous year, and this reduces labour productivity.

**Indicators of business activity**

This part of the financial analysis shows how efficiently a business organization invests in individual assets or total assets.

Customer turnover ratio = Net revenues from sales / average balance of customers
6,652 / [ (2,113 + 1,873) / 2] = 6,652 / 1993 = 3.34
The winery annually charges on average the receivables from customers 3.34 times.

Customers age = 360 / 3.3376 = 107.86 days
The winery extends credit for every 107.86 days, from the time of the sale until the moment of collection an average of 107.86 days elapsed.

The inventory turnover ratio = Cost of realized products /Average balance stocks
In the year 2014 = 3,391 / [ (4,283 + 3,636) / 2] = 3.391 / 3,959.5 = 0.86
The winery annually realized stock on average 0.86 times.

Inventory age = 360 / 0.8564 = 420.36 days.
The winery annually on average realizes stocks on 420.36 days. From the moment of purchase of raw materials to the moment of realization of products the average lapse is 420.36 days.

Turnover ratio = Total purchases of suppliers on credit from suppliers / Average balance of suppliers
In the year 2014 = 2,060 / [5,540 + 4,971)/ 2] = 2,060 / 5,255.5 = 0.3942
Annually the winery pays its liabilities on average 0.3942 times.

Supplier age = 360 / 0.3942 = 913.242 days
On average the winery pays its obligations in 923.242 days.
**Indicators of structure**
The analysis of the structure of the assets expressed in percentage the share of fixed assets and working capital in the total assets of the balance sheet.
The share of fixed assets = (fixed assets / total assets) x 100
The share of working capital = (Current assets / total assets) x 100
In the year 2014 = 2.134 / 8.561 = 0.249 x 100 = 24.92% is the share of fixed assets in the total assets of the winery.
In the year 2014 = 6.427 / 8.561 = 075.08 x 100 = 75.08% is the share of current assets in total assets of the winery.
In the year 2013 = 2.164 / 8.399 = 0.2576 x 100 = 25.76% is the share of fixed assets in the total assets of the winery.
In the year 2013 = 6.235 / 8.399 = 0.74 x 100 = 74.24% is the share of current assets in total assets of the winery.
The share of long-term capital = (Long-term equity / total liabilities) x100
In the year 2014 = (2.189 / 8.561) x 100 = 25.57% is the share of long-term capital in total liabilities of the winery.
In the year 2013 = (2.035 / 8.399) x 100 = 24.23% is the share of long-term capital in total liabilities of the winery.
The share of short-term capital = (Short-term capital / total liabilities) x 100
In the year 2014 = (6.372 / 8.561) x 100 = 74.43% is the share of short-term capital in total liabilities of the winery.
In the year 2013 = (6.364 / 8.399) x 100 = 25.57% is the share of short-term capital in total liabilities of the winery.

**Indicators of debt (indebtness)**
These indicators point to the expose of financial risk, and it occurs when an enterprise has debts i.e. borrowed sources of financing.
Interest coverage ratio = Operating income / Interest on loans
In the year 2014 = 1030/10 = 103
This ratio shows how much of business profit is covered by every RSD of expenses for interest, i.e. a higher coefficient is more favourable to the business organization. So every RSD of costs for interest, the winery achieves 103 RSD of business profit. The reason is the small amount of interest, and the winery does not use a lot of borrowed money.

**Conclusion**
Wine is one of the oldest products of human society, and the production of grapes and wine is widespread in the world. In Serbia, in the last decades there are reduced area under vineyards, which was a direct lining for the collapse of big socially-owned wineries, inability of grapes placement and overall poor economic situation.
The family winery produces high quality wines, has its own brand of "Villa wine" and receives tourists, exports wine to several countries, and uses the latest equipment for the production of wine.
The wines are branded and have been awarded gold and silver medals for quality. The winery is re-registered from a limited liability company to entrepreneurial store. The winery has two full-time employees, but during the harvest it hires seasonal workers.

The indicators obtained from the financial statements indicate a decrease in liquidity in the current compared to the previous year, especially negative net - working capital fund, which means that part of the fixed assets is financed by short-term sources, contrary to the "golden balance sheet rule", which again confirms the lack of liquidity.

The winery has positive indicators of cost-effectiveness and productivity. However, the indicators of profitability point to the operating with a loss in the previous year. The rate of net income has increased in the current compared to the previous year since the winery achieved net profit in the current year.

Regarding the structure of the funds, about 25% of the share of fixed assets, a 75% share of current assets. The reason for this is in the stocks that are the biggest part of current assets. The share of long-term capital is 75%, and the share of short-term capital is 25%.

Debt indicators show that the winery is not much indebted, i.e. that it is not burdened by bank loans, although the rate of net-profit decreased in the current compared to the previous year.

This paper describes the movement of the indicators of business activity that showed: customer turnover ratio, customers age, inventory turnover ratio, inventory age, turnover ratio of suppliers and supplier age.

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The importance of the implementation of Information technology in agribusiness

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Abstract
Today, to be information–computer illiterate person means to be a person without opportunity within modern society characterized by fast growth through rapid changes.

Information technology is a subsystem of the information system created by merging three core technologies: microelectronics, communication and computer technology. Information and communication technology assume transfer and the use of all types of information and represents a driver of social changes. It encompasses all aspects of life and the distance is not anymore a problem to access the information, e.g., work and distance learning, e-banking, e-governance, etc.

The most widespread and best-known network is the Internet as an integral part of the social and economic structure of each country. So, there are about two billion users with daily growing thereof. The Internet is now the world’s largest market, available 24 hours a day, 7 days a week, 365 days a year.

Information technologies have directed all mankind and affected every aspect of social life, including government authorities, science, education, health, communication, commerce, etc.

Information, undoubtedly has become the key resource of today, which has not reached the level of European standards in our country.

For making worthy decisions, reliable and complete information on subject are needed.

In agricultural production these are data on soil, climate, cultivated plant type, pre-crops, agricultural machinery and other parameters of importance for the quality and quantity of products, preservation and restoration of land and water.

Food-production sector is facing global challenges that cannot be met without support of information technology.

New conventional techniques in computer software and computer intelligence are tracing their way into agriculture.

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Operator of the machines, based on information obtained determined by sensors and displayed on the instrument, and on its knowledge and experience impacts the working process. Tracking the depth of work, fuel consumption, plant protection, adjustment the speed of movement, utilization of working hours, etc., all in order to achieve the greatest possible effect.

A location-specific agricultural production can be implemented as well, because it is in line with specific local resources (fertilizers, water, etc.), and counter-resources (weeds, plant pests, etc.).

Planning in crop production by using computer means, represents the most effective way. Incorporating work and resources within the available capacity, i.e. biological and economic constraints.

In livestock production, the computer programs are used for planning the required area under fodder crops and balancing animal feed by species of animals, categories of livestock, feeding periods and the like.

In meat industry, the whole technological process from slaughter to the production of finished products is controlled from one place. Any change is immediately registered and processing of all necessary data is done in the computer center, which is at the same time the research center, since the knowledge is concentrated in one place, i.e. techniques and information needed to develop new products.

Documentation of production, all activities, time, effects and other goods is the basis for the proper management of the production and making the right decisions.

For all of the aforesaid, a database required, as a set of interconnected and stored data aimed to optimally serve the information system.

**Keywords:** information technology, communications, internet, agribusiness.

**Introduction**

Without innovative technology there are no conditions for gaining competitive advantage and technology should be seen as part of competitive business strategies based on time and knowledge.

Unrecorded speed the development of new, or the speed of obsolescence of current resources, create difficulties for developing countries to reach the level of application of information and communication technologies in developing countries.

However, the characteristics of these technologies do not require a consistent and gradual continuity in the implementation, but directness of their hardware and software solutions enable sudden connection to any level of application.

Information technologies have the following characteristics: a high scientific-research and educational intensity, low consumption of raw materials per unit of output, low energy consumption in production and operation, negligible level of environmental pollution.

The most significant advantages of the use and development of information technology are: an increase in labor productivity, increase product quality and competitiveness of manufacturers, reducing the number of production stages and production costs, development of new approaches to the management of the production process, freeing man from manual labor, the development of new industries based on information technologies, regional restructuring of the world economy, multinational gathering around the complete program of technological development, large investments in scientific research and so on.
Objective of the research, methodology and data sources

The aim of this paper is to express in a meaningful way problems of information technology, which penetrates into the implementation of new technologies in agricultural production, bearing in mind, first of all, the innovative features. The reason why is because it is hard to be an entrepreneur without introducing at least some innovations that carry on a risk, assessment and profit potential. All this cannot be achieved without entrepreneurship as an important initiator of the entire economy of our country.

Methodology is based on analytical methods, methods of direct observation, a hypothetical-deductive methods, statistical methods, and descriptive method with using the professional literature.

Data sources relate to the professional literature of relevant authors, scientific papers in specific areas relating to the entrepreneurial aspect of applying innovative technologies in agribusiness and Internet sources.

There are no conditions for gaining competitive advantage without innovative technology and it should be seen as part of competitive business strategies, based on time and knowledge.

Unrecorded speed of development of new, but also the speed of elapsing of current resources, create difficulties in under developed countries to achieve the level of application of information and communication technologies in developing countries.

However, the characteristics of these technologies do not require a consistent and gradual continuity in the implementation, but directness of their hardware and software solutions enable sudden connection to any level of application.

Information technologies have the following characteristics: a high scientific-research and educational intensity, low consumption of raw materials per unit of output, low energy consumption in production and operation, negligible level of environmental pollution.

The most significant advantages of the use and development of information technology are: an increase in labor productivity, increase of product quality and competitiveness of manufacturers, reducing the number of production stages and production costs, development of new approaches to the management of the production process, relieving human from manual labor, development of new industries based on information technologies, regional restructuring of the world economy, multinational gathering around the complete program of technological development, large investments in scientific research and like.

Research results

For making good decisions we need reliable and complete information on the subject to decide upon. In agricultural production these are data on soil, climate, cultivated plant species, previous crops, available agricultural mechanization and all the other parameters, important for the quality and quantity of products as well as for the preservation and restoration of land and water. Therefore, the application of the latest technologies in agriculture is justified, provided that it leads to increased quality of the product (desirably the quantity, too), with simultaneous protection and restoration of land and water to be left to other generations but non-degraded.

New conventional techniques based on computer software and computer intelligence are finding their way into agriculture. The evolution towards the information society of the 21st century, thanks to powerful new IT, such as the Internet and wireless communication, affected the people's lives, communities, business, organizations and nations around the world. Communication today dominate the evolution and have been expressed in agriculture, not only as a cable farms and precision agriculture, but also as a great opportunities of distance education, remote support, and e-commerce. The most important result of these new developing
trends is the ability to expand into the area of agriculture, and to provide to each agriculture component in any part of the world the same competitive power, as well as to provide equally to all citizens of the global city the equal rights and opportunities. Remote farmer may soon sit comfortably in its "intelligent room" as he has been located in the center of the global city.

Food-producing sector is facing global challenges that cannot be met without the support of information technology.

ICTs are increasingly used on tractors and agricultural machines and devices, and in the future the even higher is expected. Tractors and agricultural machines operation’s control commenced by using simple analog tachometer engine, coolant temperature and more. Later, the application of electronic sensors began, which enabled monitoring of many parameters of the elements and assemblies of tractors and agricultural machines, as well as application of actuators for adjusting the operating parameters. By the development of sensors, application of computer and electronics, tractor systems have been connected into a whole, which is managed by means of electronic control units - ECU (Electronic Control Unit), taking into account the interaction and implementation of automatic control.

Further development was directed towards control - monitoring of parameters of the connected machine/tool and management of tractor and appliances’ parameters in accordance with the needs and the strategy objective given. The highest level of control and management development requires intelligent management of the system - tractor - connected machines/tools, based on set criteria, aimed to achieve the least possible energy consumption and as much as possible the impact of changes and/or parameters in accordance with the needs of the specific location of the plot. The operator, based on information determined by sensors and displayed on the instrument, in conjunction with his/her knowledge and experience, impacts the working process. For example, the operator - tractor driver, monitors the depth of the plow over the cursor position and adjusts manually the position of the plow by raising and lowering of the plow hitch, or for example, based on the displayed data on the flow of liquid for plant protection adjusts the speed of movement. The operator monitors fuel consumption and time spent working in a field, and this information is saved for later enter into bookkeeping.

At the highest level, operator only gives task - expresses the need and desire for process operation, while ECU, based on data received from the sensors, and via actuator and connected device, manages the working process. A typical example is the maintenance of plowing depth and/or uniform resistance by the change of pace, with simultaneous gearshift aimed to achieve as lower as possible the specific fuel consumption. The operator sets the target, for example, working with the lowest specific fuel consumption (and at least possible change to the depth of work in relation to the desired), or achieving the greatest possible output. The entering of an input can be automatically achieved by selecting and specifying the planned trace, depending on working procedures. With the full GPS implementation – an identification of the plot is being carried out, there is a possibility for data collected to be automatically assigned to the accounting for designated plot and for plant species that being produced.

The data obtained from tractor’s and attachments’ sensor can be processed in tailored programs in order to obtain functioning values, for example, the skating could be calculated based on the rotation of the drive wheels of the tractor and the tractor speed. Data transfer from tractor’s computer to company or farmer’s computer is enabled by various memory holders, usually using the flash memory, for example, USB memory stick, SD Card and Compact Flash. Sometimes it is atedious task for the operator. Therefore, the big providers of mechanical services in Germany and Austria currently apply a wireless data transfer via, so-called, Bluetooth device.
Management the system of precision farming

The title - precision agriculture (Precision Agriculture and Precision Farming) refers to agricultural production technology, which means that the agri-technical measures and inputs (fertilizers, pesticides, water, etc.) have not been applied to the whole plot in the same manner, but in accordance with local needs. The very name would be location-specific agricultural production, since it is conducted in accordance with specific local resources (fertilizer, water, etc.), and counter resources (plant pests, weeds, etc.).

Although the idea of implementing such an agricultural production is old, the same could be achieved only by developing new technologies for global positioning using GPS (Global Positioning System). Positioning is based on the fact that GPS receiver simultaneously receives signals from at least four satellites for positioning and based on the time elapsed for receiving signals, calculates own current position.

Based on determining the resources, potential and needs and their graphical representation per locations, mapping, one comes to the basis for certain operation. For example, based on the results of soil analysis, maps of phosphorus and potassium presence can be developed. By the means of the appropriate device for continuous measurement of yields, while simultaneously positioning, the yield map is obtained. By the analysis of these data the practitioner determines the location of specific mineral fertilizer needs, aimed to achieve the most favorable economic effects in the following plant species (not theyield, but higher earnings).

Programs that enable the implementation of this procedure belong GIS – (Geographic Information System), since geographical parameters are used to display data. In order to, for example, distribute mineral fertilizers in accordance with mapped needs, with as little deviation, a spreader with possibility of variable distribution during operation is needed, with remote control, as well as the tractor that has a device for positioning and adequate computer equipment ECU, enabled to manage a spreader by program. Between the control – managing system of the tractor and spreader there should be a link that allows the spreader’s actuators, which - based on application’s map - and positions of tractor and spreader, order the amount to be spread.

Precision agriculture is applicable to larger plots. Larger plots can form by merge of multiple owners, where, on the basis of good positioning, one can accurately determine individual participation in costs, as well as aliquot earnings distribution. Besides the economic effects, the use of precision farming has environmental benefits since it can reduce the amount of mineral fertilizers and pesticides, with the realization of equal and/or even better effects on the crop.

Management the guidance process - Tracking the walkthrough

Proper tracking of the flow, so that the overlapping is as small as possible and that there are “empty” areas, represents a problem in many agricultural operations, especially in the work with modern machines of large operation. Attempts of optical guiding, by some of the spectra of electromagnetic waves, as well as the laser beam as a special case, are still applying. The great shortage of this is that the lasers quickly become dirty in agricultural working conditions. Also, when applying laser guidance, it is needed to set the reference device on the opposite side of the field, which requires the commitment of an additional worker.

Thanks to increased accuracy, the new advances in GPS positioning enable its use in all agricultural operations. A new problem occurred in positioning accuracy, i.e. when working in the field with variable lateral inclination, or while tractor crosses bumps and depressions, because the GPS receiver is installed on the roof of the tractor, at the height of 3 m, thus by an inclination of 10 degrees, a deviation is 0.5 m. The problem was corrected by measuring the
slope of the tractor, placing two GPS receivers, or special elevation sensor and thus calculating corrections.
The use of markers is not feasible by the mineral fertilizer spreaders and plant protection machinery with furrow width of up to 36 m. Route guidance with the help of GPS positioning has begun applying with a simple device, called a lightbar. The operator sets the width of the catchment and starts the operation. The device, with the help of GPS positioning, “remembers” the first path, and by switching on the light emitting diodes informs the operator how to take a proper distance and how to follow the first walkthrough. When operator deviates from the required trajectory, diodes switch on left or right from the central position, informing that the correction should be done and to turn left or right. Automatic guidance and walkthrough tracking implies that steering wheels are managed by ECU, on the basis of pre-set width and overlapping. Application of GPS - in guidance - walkthrough tracking, will first be applied in practice in our country, as they can accrue positive economic effects.

**Possibility of planning in crop production**
The task of planning in crop production by using a computer, is to most successfully combine work and resources within the framework of available capacity, biological and economic constraints. In preparing the plan of crop production, one starts from the assumption that the plan is developed for well-known climatic and soil conditions.
When developing plans in crop production, one should start from the definition of manufacturing technologies for a range of crop species, while the elements of these plans are based in technological maps. All these serves as a baseline for setting sowing plans. This process is the foundation of further plans related to the identification and verification of a number of other indicators, such as needs for labor force, machines, etc. PCs application for planning purposes in crop production represents a qualitative improvement, compared to current situation.
The advantage of this mode of management is reflected in the possibility of an unlimited number of variants of technological cards, and thus sowing plans, and moreover the check of each of the variants from the point of needs for labor force, machines, materials and fuel, as well as a check from the viewpoint of accrued financial results.
For these tasks, there are software packages that are used for simulation of sowing plan and technological cards. One of the programs that provides the planning of activities during the year, month, week, day eating is - MSPROJ.
For many years there is a tendency in the development of software for the introduction of simulation methods in order to involve computers for planning and management tasks. Simulation models, in principle cannot be solved without a computer. This in turn requires the development of necessary programs (flowcharts, developing and testing of programs).

**The possibility of applying IT in livestock production**
PCs can be used in planning and balancing animal feed and planning the necessary areas under forage crops by the implementation of appropriate programs; planning and balancing animal feed by species of animals and periods of food; planning and balancing fodder, food preparation needs depending on the time and categories of livestock; optimization of nutrition; search of origin; search for the optimal combination of mating.
In addition, PCs are used for expressing the results of food production in energy units at the nutritional values of various types and categories of livestock in different periods and feeding.
regimes. Calculations by the standards, necessary for offsetting the missing quantity of food that must be replaced by another, can be done, too.

One of the program for searching the optimal production structure or the optimal nutrition is - QBS or LINDO program.

The use of a computer provides faster and more accurate simulations of other production lines, economic simulation, technology simulation, energy management, etc.

**Computer applications in process technology for agricultural production**

The use of computers for processes management is of more recent date. For now, it is mostly used for these purposes in the storage and drying of grain and meat industry. They are able to perform: monitoring the state of the grain; monitoring the input and output of grain, energy consumption, raw materials and spare parts; drying process; optimal management of the maintenance process; balancing all the necessary economic effects.

These systems can be associated with certain measuring devices or microprocessor systems that register all changes of parameters (temperature and humidity) and signal the same.

A similar procedure is also in the meat industry. The whole technological process, from slaughter to the production of the final product, is controlled from one place. Any change is immediately registered and stops work in a particular sector. Processing of all the necessary data is carried out in the computer center, which is at the same a research center, thus at one place concentrated is knowledge, technology and information, needed for new products development.

In regards to the application of computer techniques, the developed countries are far ahead of us. In these countries, the question is about organized government agencies’ actions of to spread the use of computers. Thus, for example, in the United Kingdom information systems were established that cover the majority of dairy farms. Western countries pay a great attention to ecology in recent years. Especially interesting is the experience of the United Kingdom where a program has been designed for the protection of plant species from certain diseases. In just 30 seconds the user is able to obtain information on the application of appropriate pesticides and profitability of spraying for individual varieties.

**IT application in documented production**

The problem of the introduction of computers into agriculture has not been underlayed in hardware and software, but the main obstacle used to be the staff with no appropriate level of expertise. Another reason is the lack of funds. The fall of prices of personal computers, customizing the software to the user, enabled computer to find its application in the farm.

Nevertheless, the farm has not been systematically organized and did not apply the equipment that could meet all information needs in a short period of time. Records are manual and simple, and any additional informational needs require subsequent treatment of those of manual records. The data are not entered in time, they are incomplete and unreliable for good business decision making. Thus, the problem is that existing records are not collected systematically and each presented data or data review should be exposed to the actual check. The records do not provide even minimum data for operational work, especially by monitoring the situation in the warehouse, monitoring of individual consumption of materials, working equipment, situation in the stock of finished products and like.

The solution to these problems is the introduction of computers in the warehouse, in order to obtain faster and better information. The first data that should be entered into the computer are
the types of materials. It is the most concise description of the material and aimed for subsequent searches, given that there is no insight into content of the warehouse. The quantities of inputs and outputs are recorded in the appropriate units of measurement, with each change of balance, thus the program is able to calculate the quantitative status of certain materials, based on the difference of inputs and outputs.

The records of production orders (work orders) and the price of materials is essential in order to calculate the total amount spent for certain tasks. In addition to records of the current situation, it is necessary to record all previous changes in the balance, as to enable to plan the procurement of materials, since frequency shift of certain sheet material over time can be observed as well as its total consumption. For more successful production monitoring and management, the costs should be traced in certain fields, harvested quantities of products in order to determine the total income. Records of payments from the customer enable to track the status of payments and claims.

Documenting the production, all operations, weather, effects, inputs and other, represents a solid foundation for a proper management of the production and right decisions’ making. In addition it enables the traceability of production. Reputable manufacturers of tractors and agricultural machinery develop programs and resources for successful and easier monitoring of operating parameters, and their transfer to the computer and further processing later on. In order to achieve this, it is necessary that the tractor and machine are equipped with modern means of control, management and logging.

Some manufacturers have developed a complex system of control and management. It provides assistance in the implementation of the operations, with positioning and realization of precise agriculture, and ends with documenting production processes, and up to evaluation assessment of economic effects.

**Other domains of IT application in agriculture**

**The need for databases:**

The database is the backbone of the information system. It represents a set of interrelated and together stored data, aimed to optimally serve the information system, and make the IT data independent of the program applications using them.

The database helps in storing large amount of data, needed in the functioning of the agricultural system. It represents the knowledge base, which must constantly add new knowledge and should contain most of the necessary knowledge of the exploitation of agricultural mechanization and description of the utilization of commonly used machines in our agriculture, as well as general agro-technical knowledge.

Data can be stored on one of the contemporary information storage, with a minimum to ensure: storing large amount of data, which is unthinkable in the manual processing; in a very small space; with the simple manipulation; and to significantly speed the availability of data, which can then be further reused.

**The need for e-communications:**

Using the Internet as a global network is inevitable in resolving certain problems of misinformation, as well as in the implementation of new trends in communication. Global communications offers a variety of resources, slowly but surely permeating the pores of contemporary society, whose awareness of communication is constantly growing. Need for global communication in agriculture is reflected in marketing, negotiating, buying, selling, and the connection between different subjects.
Once farmers used the bulletin board in the center of the village as the only place for advertising and sales. Today, the boundaries are extended. IT enabled the farmer to disseminate his message to unlimited number of people from different places, in one day, with the help of “just one click”.

By connecting to a commercial bank, e-communication enables the control of products’ sales and collection.

There is also a Web presentation of farms, which by its content reflects the state of the real system in agriculture, performs the function of marketing, a part of the site, in English or another language to communicate with people from other language areas, which opens borders of the manufacturer’s operation even more widely. Web presentation of agricultural holdings should normally include: general information about the farm (location, name, phone); information on products (fruit, wine, meat products, etc.), description of the level of use of modern techniques; environmental aspects; contact with potential buyers and farmers (phone, fax, email); the possibility of ordering and payment over the Internet.

In Novi Sad, in 2006, the company MK IT Business Solutions was established, whose mission is to capture a leading role in selling SAP ERP solutions and in providing consulting services in Serbia, as well as in the whole of the Western Balkans. Through investment in staff skills and constantly improving the quality of implementation, continuously impacts the increase of satisfaction of current and potential clients. In addition to implementing SAP solutions, the company also provides external services and the development and implementation of specific solutions for specific business management.

For the purposes of managing agricultural production SAP ZAGA module has been developed. This is an information system that allows the view and control of the entire agricultural business in the real time.

Conclusion

Many people encounter the entrepreneurial challenges, however the entrepreneurs become only those who do not give up, who overcome obstacles and follow the given opportunity to end. "I knew that I would not regret if I fail, but I also knew I would regret it if I have not tries." (Jeff Bezos, founder of amazon.com website).

Entrepreneurial ventures stimulate economic growth and create new opportunities and prospects for both entrepreneurs and companies, as well as for society and the state.

As a driver of development, as a factor that can significantly accelerate growth and mitigate the consequences of changes in economic structures through self-employment and job creation, entrepreneurship is of an interest for all transition economies, both for the developed economies of the world that have in 21st century entered a period of transition from information to the era of knowledge or economy and the knowledge-based economy as a leading and irreplaceable factor of development, and for the underdeveloped countries and developing countries that are in transition period from traditional agricultural and industrial development to the new information - technological stage.

Innovation is the basic characteristic of entrepreneurship. It is therefore necessary to develop an appropriate culture of behavior that will support and encourage innovation. By creating and introducing innovations, company increases the chances of survival or derives a competitive advantage. Innovation is not just a way to better business of a company, but also lead to a better social relationships, more profitable companies and wealthier society at large.

Information technology as a new mean of communication brought innumerable changes in everyday life. It has promoted it, facilitated, and brought new challenges to all spheres of life and business. One cannot even imagine the further operation without IT. In fact, farming is no
exception and those who have modernized their business by the usage of various innovations, offered today by information technology, got better than yesterday and more successful compared to the others.

For the owner of the agricultural holding to monitor the production process, he has to spend time on data entry, as well as their analysis and use of database in the process brings to the rationalization, and based on reports stemming from a database, he gets aid in controlling the production process and making business decisions.

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Can off-farm employment provide new pathways to improve livelihood of rural farming households? Evidence from Nigeria

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Abstract
Farming which is mainly practiced by rural dwellers remains the backbone of the Nigerian agricultural and food sector with substantial contribution to the country’s quest towards attaining food self-sufficiency. Unfortunately, rural farming households encounter constraints that may hinder production and threaten food security. As farm households become more diversified by involving in the non-farm sector, market imperfections may cause interdependencies between farm and off-farm activities and may lead to spillovers effect. In recent time, family Farming households tend to participate more in non-farm employment. Negative externalities might however result from the expansion of off-farm activities through labor transfers out of farming. Conversely, off-farm activities are viewed as an important source of cash income, which can potentially improve farm productivity if it is used for farm input purchase or longer-term capital investments purposes. Labour market imperfections may cause the linkages to be negative while credit market imperfections may lead them to be positive. The way to enhance agricultural production and improve food security while at the same time increase employment is still an important policy question in Nigeria.

This study therefore asked whether increasing self-employment opportunities is beneficial (or not) for livelihood of rural farming households in Rural Nigeria. This study assessed the effect of off-farm employment opportunities on welfare of rural farming households. It was found that farm and non-farm related factors determine off-farm employment opportunities in rural Nigeria. Also, the participation in employment increases food and non-food item expenditure, therefore, improving household welfare. The results confirmed that the policy of promoting non-farm sector can be harmonious with the development of the rural farming in Nigerian agricultural sector. Thus, there is a scope to increase or create favourable conditions for the development of the non-farm sector in rural Nigeria.

Key words: Off-farm employment, Agricultural expenses, Welfare, Rural, Nigeria.

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Introduction

Studies and research outcomes over the past decades revealed that agriculture contribute more than 65% to the Nigeria economy and employ more than 60% of the total population (FAO, 2014). This signifies the role of agriculture to Nigerian economy as a whole. Further to this, more than half of the rural population in Nigeria are engaged in agriculture therefore bulk of the food consumed in the country are produced in the rural areas. Despite this, the rural areas in Nigeria are characterized with high inequality in income and food consumption, vulnerability to poverty and food insecurity. The nationwide undernourishment prevalence declined from 37% in 2004 to 33% in 2009; however, rural undernourishment, especially among the poorest households, slightly increased (NBS 2013), raising concern over food security issues among rural farmers and the poorest population. This result suggests that more attention should be paid to rural economic development. One of the causes of vulnerability often put forward is the lack of diversification of revenues of farm households and their concentration on agricultural production. A potential alternative in risk management strategies of a large numbers of rural households is thus their involvement in the rural non-farm economy. As an important route out of poverty, there is a new interest in promoting the development of the rural non-farm economy as a source of growth in agricultural-based countries (FAO, 2011). Although Nigeria has a higher potential for agriculture, nonfarm activities can play a crucial role in developing the rural economy, especially in alleviating poverty. It is well recognized that farm households’ engagement in nonfarm activities is a pathway out of poverty in rural areas of developing countries (IFAD, 2011).

The traditional image of farm households in developing countries has been that they focus almost exclusively on farming and undertake little rural non-farm (RNF) activity. This image persists and is widespread even today. Policy debate still tends to equate farm income with rural incomes, and rural/urban relations with farm/non-farm relations neglecting streams of income from other sources. Industry Ministries have thus focused on urban industry and Ministries of Agriculture on farming, and there has been a tendency even among agriculturists and those interested in rural development to neglect the RNF sector. Development policies of rural sector have often targeted in improving farm productivity to combat the major economic problems like rural poverty, food insecurity and inequality among the rural families. However, there is growing evidence that the rural sector is more than farming in developing countries. The rural economy is not based solely on agriculture but also on a diverse array of off-farm employment activities (Reardon et al., 2001).

In this study, we ask whether increasing off-farm employment opportunities is beneficial (or not) for agricultural households in Nigeria. This is a question on the nature of the relation between farm and non-farm sector in the country. As farm households become more diversified by involving in the non-farm sector, market imperfections may cause interdependencies between farm and off farm activities and may lead to spillovers effect. According to the literature on the linkage between farm and off-farm activities, labour market imperfections may cause the linkages to be negative while credit market imperfections may lead them to be positive. Off-farm activities are viewed as an important source of cash income, which can potentially improve farm productivity if it is used for farm input purchase or longer-term capital investments purposes (Reardon et al., 1994). There is also the argument that, negative externalities might however result from the expansion of off-farm activities through labor transfers out of farming (McNally, 2002; Gedikoglu et al., 2011). The promotion of non-farm activities can attract the agricultural labor force and even generate the unemployment if the cost of the waiting and seeking for the non-farm labor is lower than the loss in income by remaining
in the agricultural sector. In such a case, policy interventions in rural Nigeria derived from models that consider farm and off farm decisions as independent may be misleading. Furthermore, improving the rural welfare continues to be a major public policy challenge in developing countries. This has been continuous increase in the level of absolute poverty in the most developing counties of the world despite the dedication of international organizations, government and various non-profit organization to reduction of poverty (FAO, 2008). Obviously, agricultural development is crucial for reducing hunger and poverty in rural areas, but non-agricultural growth can be important as well (Diao et al., 2007). Specifically for African countries, with strong population growth and increasingly limited agricultural resources, the potential role of the rural off-farm sector deserves particular consideration. Smallholder farm households usually maintain a portfolio of income sources, with off-farm income being a major component (Barrett et al., 2001).

But often a clear policy strategy to promote the off-farm sector is lacking. In the available literature, considerable attention has been given to the poverty implications of off-farm income in developing countries (e.g., Block and Webb, 2001; de Janvry and Sadoulet, 2001; Lanjouw et al., 2001). In contrast, much less is known on welfare in terms of its effect on per capita expenditure and the totality of rural household livelihood (Chang and Mishra, 2008). A few empirical studies have looked into related linkages, but all of them are confined to issues of household calorie availability. For instance, Reardon et al. (1992) found that diversification into the non-farm sector improves calorie consumption in Burkina Faso. We are not aware of studies that have analyzed livelihood impacts from a broader perspective, taking into account per capita expenditure outcomes. Here, we address such issues, building on a detailed survey of farm households in Nigeria.

**Methodology**

**Scope of the study**

The study was carried out in Ogun state, Nigeria. Nigeria is in the West African sub-region, lying between latitudes 4°16’ and 13°53’ north and longitudes 2°40’ and 14°41’ east. With a total land area of 923,768 square kilometers, Nigeria is the most populous nation in Africa with about 170 million people (NPC 2012). Comprising of about 81 million in the urban sector and 79 million in the rural sector (NPC 2012).

Ogun state is a state in the southwestern Nigeria. It borders Lagos State to the south, Oyo and Osun states to the north, Ondo State to the east and the Republic of Benin to the west. It consists of tropical rainforest and a small stretch of derived savannah. It covers land area of 16,980 km² and population of 3,751,140 (NPC, 2012), located at latitude 6°50’N and longitude 34°6’E. There are about 20 Local Government Areas (LGAs) in the state with various administrative unit. However, for the case of this study, only six (6) local government were examined. The choice of these LGAs is premised on the fact that the main rural areas in the state are located in the areas and the subject of the research are rural inhabitants in the state. The LGAs understudied include: Ido, Ipokia, Odeda, Olorunsogo, Remo North and Surulere LGAs.
Data for the study was obtained from both primary source. Data were obtained from primary source through the aid of well-structured questionnaire. The questionnaire was administered to individuals in the study area, in order to collect data on their: general socio-economic characteristics, farm and non-farm activities, farm income and off-farm incomes.

**Sampling procedure/techniques and sample Size**

A multi stage sampling procedure was adopted for the study. The first stage involves purposive selection of six local governments from the twenty local government in Ogun state namely; Ido, Ipokia, Odeda, Olorunsogo, Remo North and Surulere LGAs.

The second stage involves random selection of thirteen (13) villages from the six local governments. The selection of the villages was done based on the proportion to size of the local government area; in case of Ido (Igbonna and Odebode), Ipokia(Idemose, Ifoyintedo and Mogbara), Odeda(Ojebiyi, Orile-ilugun), Olorunsogo(Igbeti, Tesi-Garuba), Remo North(Gbasemo, Ilara and Jowoje) and lastly Surulere(Pooro).

Random selection of 30 farming households from each of the selected villages constitutes the third stage, giving a total number of 325 respondents, table. However, out of the 325 questionnaires administered, 291 were correctly filled and returned and these were used for the analysis.
Table 4. Summary of selection procedure

<table>
<thead>
<tr>
<th>Local government Selected</th>
<th>No of village</th>
<th>Names of villages</th>
<th>No of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ido</td>
<td>2</td>
<td>Igbonna and Odebode</td>
<td>60</td>
</tr>
<tr>
<td>Ipokia</td>
<td>3</td>
<td>Idemose, Ifoyintedo and Mogbara</td>
<td>90</td>
</tr>
<tr>
<td>Odeda</td>
<td>2</td>
<td>Ojebiyi, Orile-ilugun</td>
<td>60</td>
</tr>
<tr>
<td>Olorunsogo</td>
<td>2</td>
<td>Igbeti, Tesi-Garuba</td>
<td>60</td>
</tr>
<tr>
<td>Remo North</td>
<td>3</td>
<td>Gbasemo, Ilara and Jowoje</td>
<td>90</td>
</tr>
<tr>
<td>Surulere</td>
<td>1</td>
<td>Pooro</td>
<td>30</td>
</tr>
</tbody>
</table>

Source: Author’s editing, 2016

Analytical technique

The study focuses on the impact of off-farm employment on livelihood outcomes of rural farming households in Nigeria. The sub population selected for the analysis was Ogun State, Nigeria. The analytical tools employed in this study include: Descriptive statistics, probit regression and Ordinary Least Square regression were used to analyse the data. It is noteworthy to state that the rural households’ welfare was proxies by per capita expenditure.

Probit regression model

The probit regression model was used to analyse the determinants of households’ participation in off farm employment in the study area. The probit model which is based on the cumulative probability function was adopted because of its ability to deal with a dichotomous dependent variable and a well-established theoretical background. Probit regression, according to (Sala-i-Martin et al, 2010) is a uni/multivariate technique which allows for estimating the probability that an event will occur or not through prediction of a binary dependent outcome from a set of independent variables. The model is specified following the welfare impact of adoption of agricultural technology on poverty reduction (Awotide, 2012).

A household - level regression model is estimated thus:

\[
\text{Prob}(Y_i=1) = f(b_kX_k + b_iX_i + u_i)
\]  

(1)

Where \( Y_i \) is the dummy variable for house hold participation status (1= participate in off employment; 0=). \( X_k \) and \( X_i \) are vectors of exogenous variables affecting households’ food security status. Also, \( b_k \) and \( b_i \) are vectors of parameters to be estimated, \( u_i \) is a zero-mean error term, and \( f(.) \) is a probit or logit function. (Gujarati, 2003) argues that in most applications, both probit and logit models are quite similar. The main difference however, is that the conditional probability \( Pi \) approaches zero or one at a slower rate in logit than in probit. He concludes that there is no compelling reason to choose one over the other, and in practice, the choice depends on the ease of computation, which is not a serious problem with sophisticated statistical packages that are now readily available. The model estimates are in 0-1 range and these probabilities are non-linearly related to the explanatory variables. In this study, the probit model is employed to estimate the parameters of the model. Variables included in the model are presented as follows:

\( Y = \) Participation in Off farm employment of the \( i^{th} \) household (1 = Participate, 0=Do not participate)
Explanatory Variables;

\[ X_1 = \text{Age in Years} \]
\[ X_2 = \text{Household size (in numbers)} \]
\[ X_3 = \text{Educational status (1, literate, 0, if otherwise)} \]
\[ X_4 = \text{Year of working experience (in years)} \]
\[ X_5 = \text{Access to credit facilities (1 if yes, 0 if no)} \]
\[ X_6 = \text{Farm size in hectares} \]
\[ X_7 = \text{Access to public markets (1, if yes, 0, if no)} \]

Ordinary least square

Ordinary Least Square was employed in the study to analyse the effect of off farm employment on farming household welfare. Empirical studies have shown that household per capita expenditure can provide insight into economic welfare or living condition of households especially in the situation where the major proportion of household income comes from informal sector. Studies such as Okojie (2002) and Adele and Adewuyi (2010) have modelled the determinant of household welfare by using per capital expenditure/consumption as the dependent variables (Y) and other household characteristics and/or community factors as the independent variables.

This can be expressed both in implicit form and explicit form:

Implicitly: \( Y = f(X_1, X_2, X_3, X_4, X_5, e) \) \hspace{1cm} (2)

Explicitly:

\[ Y = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + e \] \hspace{1cm} (3)

Where

\[ Y = \text{Household’s per capita Expenditure (Naira)} = \frac{\text{Total household expenditure}}{\text{Household size}} \] \hspace{1cm} (4)

Explanatory Variables;

\[ X_1 = \text{Off farm self-employment (1, Participate, 0, if otherwise)} \]
\[ X_2 = \text{Off farm wage-employment (1, Participate, 0, if otherwise)} \]
\[ X_3 = \text{Access to credit facilities (1 if yes, 0 if no)} \]
\[ X_4 = \text{Cooperative membership (1 if yes, 0 if no)} \]
\[ X_5 = \text{Household size in numbers} \]
\[ e = \text{Error term} \]

\( b_0, b_1, \ldots, b_5 \) are the parameters where “\( b_0 \)” is the constant/intercept and “\( b_1, \ldots, b_5 \)” are the slopes.

Results and Discussion

This section entails the discussion of results obtained from the data analysed for the purpose of the study.
Determinants of Participation in Off Farm Employment in the Study Area

The sub-section entails the results of factors that influence the participation in off farm employment in the study area using probit model where the dependent variable is the participation decision in off farm employment (proxied by 1, household that participate and 0 as households that do not participate) while the dependent variables include age, household size, educational status, years of working experience, access to credit facilities, farm size and access to public markets.

Table 2 presents the estimated coefficients of the explanatory variables and their marginal effects of a unit change in these variables on the probability of decision to participate in off farm employment. The diagnostic statistics reveals that the chi square value for the model is significant at the 1% level which means that the explanatory variables jointly influence the participation decision of household in off farm employment in the study area.

Table 2: Probit Regression output of factor influencing Rural Farming Households Participation in Off Farm Employment in the Study Area

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>P (Z/Z)</th>
<th>Marginal effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-0.308</td>
<td>0.908</td>
<td>-0.007</td>
</tr>
<tr>
<td>Household size</td>
<td>0.092</td>
<td>0.004</td>
<td>0.036***</td>
</tr>
<tr>
<td>Educational status</td>
<td>0.017</td>
<td>0.002</td>
<td>0.006***</td>
</tr>
<tr>
<td>Years of working experience</td>
<td>0.023</td>
<td>0.966</td>
<td>0.001</td>
</tr>
<tr>
<td>Credit access</td>
<td>0.011</td>
<td>0.037</td>
<td>0.004**</td>
</tr>
<tr>
<td>Farm size</td>
<td>-0.478</td>
<td>0.280</td>
<td>-0.122</td>
</tr>
<tr>
<td>Access to public market</td>
<td>-0.118</td>
<td>0.023</td>
<td>-0.181**</td>
</tr>
</tbody>
</table>

Number of observations =291  Pseudo $R^2 = 0.431$  LR chi square(13)=18.67  Prob > chi2 = 0.000  Log likelihood = -124.71

***Significant at 1%level, ** Significant at 5%level, *Significant at 10%

Source: Author’s editing, 2016

The results from table 2 showed that educational status, credit access, household size and access to public markets do significantly influence the probability of household’s having access to developed infrastructure while age, farm size and years of working experience are insignificant factors.

**Household size** – The coefficient of this variable is positive, implying that household size has a positive relationship with decision of household to participate in off farm employment. The household size reflects the financial need of the rural households. The marginal effect of this variable is 0.036, implying a unit increase in household size will increase the probability that households will participate in off employment. Large households implies more financial responsibilities which has to be attended to. Farming households tend to seek for different activities that could increase their income sources in order to attend to sustain their financial needs.

**Educational Status**: This variable was found to be significant at 1% with positive sign, implying that literacy of farmers will increase the probability of rural farming household to participate in off farm employment by 0.6%. The emergence of this occurrence can be reason out due to the fact that education is key to any rural farming households as it provides a platform that improves the level of farmers’ knowledge to various other income sources that could help
to create more opportunities for the households while of also increasing the financial supply for agricultural production activities.

**Access to credit facilities** was found to be significant and positively signed. This explains that access to credit could increase the probability of households’ decision to participate in off farm employment. Access to credit facilities is key to empowering key actor of local economy toward increased productivity and capacity expansion. Therefore, attempt should be made at improving credit access by the households in the study areas in order to promote the level of participation in off farm activities in the study area.

**Access to public market** was found to be significant, negatively signed has a marginal effect of 0.181 implying that access to public market may reduce the probability of household decision to participate in off farm employment by 18.1%. Market is pertinent to providing a platform to where farming households sell their produce. In case of lack of access to market to sell their produce farmers tend to look for alternative income source in term of off farm self or off farm wage employment for livelihood sustenance.

**Estimating the effect of off farm employment on rural household welfare**

This section reports the results of the ordinary least square model used to determine the effect of off farm employment on rural household’s welfare (proxied by per capita expenditure). The result of the estimated welfare model is presented in Table 3. The coefficient of multiple determination ($R^2$) with value 0.765 implies that 76.65% of the total variation in the household expenditure per capita is accounted for by all the explanatory variables in the regression model. The significance of the F-value (22.53) implies that all the explanatory variables jointly exact significant influence on household welfare (as proxy by household expenditure per capita).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>t-values</th>
<th>P(Z/Z)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off farm self-employment</td>
<td>0.176***</td>
<td>3.39</td>
<td>0.001</td>
</tr>
<tr>
<td>Off farm wage-employment</td>
<td>0.197***</td>
<td>3.36</td>
<td>0.001</td>
</tr>
<tr>
<td>Access to credit facilities</td>
<td>0.044</td>
<td>0.87</td>
<td>0.386</td>
</tr>
<tr>
<td>Cooperative membership</td>
<td>0.017**</td>
<td>2.12</td>
<td>0.034</td>
</tr>
<tr>
<td>Household size in numbers</td>
<td>0.017</td>
<td>0.41</td>
<td>0.685</td>
</tr>
<tr>
<td>Constant</td>
<td>7.270</td>
<td>5.06</td>
<td>0.000</td>
</tr>
</tbody>
</table>

*Number of observations =263  $R^2=0.756  Prob > chi2 = 0.000  F( 10,   280) =    22.50
***Significant at 1%level, ** Significant at 5%level, *Significant at 10%

**Source:** Author’s editing, 2016

Out of the five explanatory variables, three were statistically significance at different levels. The significant variables are off farm self-employment dummy, off farm wage-employment dummy and cooperative membership.

**Off farm self – employment** – The result of the regression analysis clearly showed that household participation in off-farm self-employment influence rural farming households. This variable was found to be positive and significant at 1%. This explains that household participation in self-employment may increase the per capita expenditure on both food and non-food items, implying, improved rural households welfare. The income streams from self-employed activities are either reinvested into agricultural activities which increase the income sources and their corresponding sources, or are used as supplement for sustaining the food and
non-food need of the entire family. This result is in line with the finding of Idowu et al, 2011 where off farm self-employment was confirmed as important determent of rural households.

**Off farm wage – employment** – Some rural farming household equally participate in some wage employment outside farming. The effect of this seemed to be inconclusive in literature, however, this result of the research found that off-farm wage employment positively influence rural farming households’ welfare. In our study, off farm wage employment dummy is positively signed and positively influence rural household welfare. This means that households that participate in off farm wage employment have higher and better welfare compared with their counterparts that do not participate in off farm employment, implying, that the off farm wage-employment serves as a complement financially to the existing farm income and in most cases are even used in farm production financial needs.

**Cooperatives membership of household heads** was found to be significant, positively signed with coefficient of 0.017 implying that membership in any community association is pertinent to providing a platform to voice the needs of the various communities to government agencies. Also, cooperative membership also provide a platform where farmers share their felt needs and proffer solutions.

**Conclusion**

This study assessed whether increasing off farm employment opportunities is beneficial (or not) for rural households welfare in Nigeria. It was found that farm and non-farm related factors determine off-farm employment opportunities in rural Nigeria. Also, the participation in employment increases rural households welfare. Self-employment and wage employment opportunities favour food and non-food expenditure, therefore, providing a platform for food security and improved livelihood among rural farming households. The results confirmed that the policy of promoting non-farm sector can be harmonious with the development of the rural farming in Nigerian agricultural sector. Thus, there is a scope to increase or create favourable conditions for the development of the non-farm sector in rural Nigeria.

While investing into agricultural growth is currently featuring high on the development policy agenda, promoting the rural off-farm sector receives much less attention. This should be rectified, especially in regions where agricultural resources are becoming increasingly scarce. Therefore a clear policy strategy on linking rural youth employment creation to agricultural production should be implemented.

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Здружение на агроекономистите на Република Македонија – ЗАЕМ

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