UDC 338.43:63

ISSN 0352-3462

ЕКОНОМИКА ПОЉОПРИВРЕДЕ

ECONOMICS OF AGRICULTURE

Vol. LXVII, № 1 (1-304), 2020

BELGRADE

UDC 338.43:63

ISSN 0352-3462

ЕКОНОМИКА ПОЉОПРИВРЕДЕ
ECONOMICS OF AGRICULTURE

Journal is indexed and abstracted in Emerging Sources Citation Index.

67.

"Сагласно одлуци из члана 27. став 1. тачка 4), Закона о научноистраживачкој делатности („Службени гласник РС", бр. 110/05, 50/06-испр. и 18/10), утврђена је категоризација домаћих научних часописа

Листа часописа за друштвене науке

5. Економика пољопривреде М24"
(Часопис међународног значаја)
http://www.nauka.gov.rs (28. Jun 2010)

Београд, јануар-март 2020. године
Belgrade, January-March, 2020

Часопис
◊ ЕКОНОМИКА ПОЉОПРИВРЕДЕ ◊

Journal
◊ ECONOMICS OF AGRICULTURE ◊

Основан 1954. године / Established 1954

ИЗДАВАЧИ / PUBLISHERS

Научно друштво аграрних економиста Балкана, Београд
The Balkan Scientific Association of Agrarian Economists, Belgrade
Институт за економику пољопривреде, Београд (Србија)
Institute of Agricultural Economics, Belgrade, (Serbia)
Академија економских наука, Букурешт (Румунија)
Academy of Economic Studies, Bucharest (Romania)

Адреса уредништва / Editorial office
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http://ea.bg.ac.rs

INTERNATIONAL EDITORIAL REVIEW BOARD

UDC 338.43:63 **ISSN 0352-3462**

ECONOMICS OF AGRICULTURE

CONTENT

SOCIOMETRIC RESEARCH IN THE SERVICE OF APPOINTING MANAGERS IN THE AGRICULTURAL PHARMACIES

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ARTICLE INFO

Original Article

Received: *30 September 2019*

Accepted: *02 February 2020*

doi:10.5937/ekoPolj2001009N

UDC 005.953.2:632

Keywords:

sociometric research, sociometric criteria, sociometric techniques and instruments, sociometric methods of classification, human resources management.

***JEL**: Q13, M12, M51*

ABSTRACT

The purpose of this paper is to prove possibility of the application of the sociometric method in human resources management with the aim of appointing managers in one organization. Based on the some results, published in the scientific papers, authors established general and particular hypothesis about applying sociometry as a research method in human resources management. The concrete research of the applications of sociometry for appointing managers was conducted in one company in Serbia. Sociometric research shows real relations in a social group, as well as the projection of the position of individuals, mutual attraction and rejection within the group. Presented research is one of the "pioneering" attempts of broader application of the sociometric method in human resources management with the aim of appointing managers in one organization, especially in Serbia.

Introduction

Sociometry is a method for describing, revealing and estimating the social status, structure and development by measuring the level of acceptance or rejection among individuals within groups (Maheshwari, 2011). It is a methodology which allows us to study choices, communication and models of interaction among individuals in a group which is performing a certain task. The basis of this methodology is the procedure that requires each member of a work team to choose, according to some determined,

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established criteria, one or more persons with whom they think they could cooperate successfully. Sociometry practically represents a study of connections – affinities among individuals in a work team. Sociometric research gives us results which enable us to intervene in a work team in order to increase creativity, leadership and innovation and thus increase the satisfaction of work team members and achieve better results. It shows patterns of the way in which individuals in a work team associate with each other, and when they act as a group in order to achieve a certain goal – finding a solution to a problem.

Sociometry has two main domains: research sociometry and applied sociometry (Hoffman, 2000; Maheshwari, 2011; Bansal, 2014). Research sociometry represents research activity conducted with groups with the goal of discovering socio-emotional connections in relations by using criteria defined in advance, for example which members of the group does one want as a work partner. Applied sociometry uses a series of methods which help people and groups to perceive, expand and develop their own existing psycho-social networks in relationships.

The concept of sociogram was introduced by (Moreno, 1978) and it represents, in the form of a diagram, corresponding relations among individuals within a group. The data from a sociogram can also be represented in a matrix called sociometric matrix. Sociogram is a very important tool in sociometric research. Its goal is to reveal group structures and the relationship each individual has with the group as a whole.

The broadest application of sociometry has been in pedagogy, sociology and psychotherapy. Cillessen, Jiang, West and Laszkowski, 2005, used this method in the study of friendships among children. Fredrickson and Furnham, 2004, used the sociometric technique in order to estimate the quality of life of children with difficulties in learning and in relations with their family members. Blatner , 2010 sees many advantages of this method, considers sociometry a relatively new field and thinks that what we have learned so far about the use of this method is probably just a part of what we still have to learn.

Some authors question the validity of this method because they think it does not measure anything useful. However, based on research conducted by a number of researchers, Mouton, Blake and Fruchter, 1995, concluded that the sociometric choice represents a useful method for measuring characteristics of individuals and groups. The authors (Campion, Medsker, Higgs ,1993) analyzed a significant number of applications of sociometry and concluded that the number of sociometric choices tends to predict criteria of efficiency such as productivity, the efficiency of the efforts made, the training ability and leadership.

The sociometric results can be applied when dealing with real problems in the practical domain (Hathaway, 2017). Sociometry as a methodology can provide all the necessary and important factors for appointing a work team or an individual – manager – by measuring the levels of acceptance or rejection among the individuals of a given group (Kurzman, 2008; Maheshwari, 2011).

In the last few years, numerous scientific papers have dealt with the problem of appointing a work team made up of members capable of cooperating while dealing with joint problems (Ballesteros-Pérez, P. et al., 2012). In that sense, it has been stressed that organizational behavior and industrial and organizational psychology are very important factors for a team's functioning (Hollenbeck et al., 2004).

Unlike Team Formation Problem (TFP), a new term was defined (Gutiérrez et al., 2016) – a problem named Multiple Team Formation Problem (MTFP). It was developed based on TFP by expanding its dimensions and taking into account more projects and people's devotion to certain parts. Also, an optimization model was suggested for the posited problem.

Some authors have dealt with the problem of individual members of work teams, which is also very important for successful functioning of a work team as a whole (Campion et al., 1993).

In Ballesteros-Pérez, González-Cruz, Fernández-Diego, 2012, a new, original method, based on sociometry, is suggested for choosing members of a work team among the workers in the company in which the projects work tasks should be done.

Materials and methods

The subject of the research is the identification of strategic management's new approach in the process of selecting managers in the service industry organizations of smaller scale and of entrepreneurial type, and a presentation of a case study of applying sociometry as a research method with that objective.

The problem of the research is practical application of the sociometric method in human resources management of an organization with the goal of appointing managers, and including this research method in the arsenal of methods for choosing managers from an organization's internal resources.

The goal of the research was to identify the employee who represented 'the favorite person', that is, in the terminology of sociometry, 'a leader', in the sector of retail stores, who already had the integrity and respectability in the eyes of the workers and who positively influenced forming of relationships among the people within the group, and to appoint them manager.

General hypothesis (H) is: "By applying sociometry as a research method in human resources management we obtain precise data about potential choices for managers from internal resources, and about appointing them to a certain managerial function within the organization.

Also, **particular hypotheses** arise from the research: **H1** – "By using the sociometric method it is possible to identify the state of interpersonal relationships within the researched social group, to precisely determine its cohesion or expansion, as well as the affective atmosphere index and group tension index, and to present the results

quantitatively." **H2** – the sociometric method gives the top management a clear picture of the subjects' individual statuses within the researched group, based on which the top management can have the level of interpersonal relationships raised and group cohesion index improved.

During the research, analytical-synthetic method and the sociometric method were applied. An example of sociometric questionnaire as a technique for gathering data, and statistical method of data analysis in the form of calculating individual sociometric indices, quantitative presentation of results and graphic model of sociogram were presented.

The concrete research of the applications of sociometry for appointing managers was conducted in the one company in Serbia which has five (5) agricultural pharmacies.

Candidate recruiting for management functions

The company where the research was conducted has five (5) agricultural pharmacies. The total number of employees is 42 direct executors. Mentioned company has a simple organizational structure. Due to the increase of workload, a need for appointing a manager in the sector of retail stores (agricultural pharmacies) – 5 in total, with the total of 10 workers – arose. The entrepreneur wanted to appoint a manager (recruitment) chosen from the internal resources within the organizational unit. At the request of the entrepreneur, is conducted sociometric research as the primary method for choosing the manager, surveying 10 female workers, and the results were then used for appointing the manager.

The filling of vacancies begins with the process which is usually called recruiting (providing, attracting) human resources. It is the process of identifying and attracting candidates whose abilities, professional and personal skills meet the requirements of the currently filled vacancies or future jobs (Pržulj, 2011; Arsenovic et al., 2017).

When recruiting candidates, organizations must also take into account the factors which can influence a candidate's job choice (White , 1961). For each individual, it is a very important life decision. In that situation, the individual is under the interactive influence of personal aspirations and characteristics (professional values, personal characteristics, needs, attitudes and similar) as well as under the influence of their impressions about the job and organization (real characteristics, the way in which the job has been presented, previous experience and the knowledge about the organization) (Pržulj, 2011). Candidate recruitment represents direct expression of the organization's employment policy and strategy, and this activity reflects the management's basic ideas and orientation regarding human resources. This is particularly visible in the answers to the following questions (Pržulj, 2011):

- What kind of people does the organization need?
- Which resources have the priority, internal or external?
- What is of primary importance when it comes to estimation?

- Is the organization ready and how ready is it to invest in the future development of the employees, or is it looking for 'readymade' personnel; is the priority given to specialists or generalists?
- Which criteria will be used in the selection?

The advantages of choosing job candidates from internal resources over choosing them from external ones are:

- Knowing the candidates; motivational effect of the given chance for promotion;
- Candidates know the organization and its way of work well;
- Better use of the employees' potentials due to using their abilities on other jobs as well;
- Higher reliability of estimation;
- Speed and lower costs;
- Feeling of belonging, and feeling that the company takes care of good workers.

Special attention is required when choosing and appointing a manager within a functional social i.e. organizational group, considering the newness of the position, power and authority, power to make decisions and assume responsibility for achieving the organization's planned goals. The bearer of this 'new role', who was until yesterday at the same organizational level as others, assumes leadership under the hypothesis of having highly ranked personal skills and authority over workers, which should guarantee good relations among the people and the platform for achieving the organization's goals.

However, it is hard to claim with certainty that choice will be 'the right one' if the relations among the members of the group, the existence of cliques, desirable and undesirable individuals, a potential 'leader' etc. are not identified. Conducting sociometric research in a social group provides, with precisely these results, thus also giving clear directions for identifying 'the right manager' within a group (organization), as well as showing the range of the existing interpersonal relations, attitudes and aspirations of individuals (with their first and last name) within a group, which represents a 'scanner' of an organizational unit, and is the base for further study and redistribution of employees' tasks and jobs, with a high degree of guarantee of company's efficiency and effectiveness.

Sociometry is usually applied to social groups consisting of up to 40 members (subjects), where it can be successfully identified the socio-emotional relations within a group, as well as harmony or potential disharmony of interpersonal relations within a social group.

Great importance for this paper have the results obtained by sociometric research in terms of identifying a 'leader', individual suitable for a managerial position, person seen as a role model and similar (Rostampoor – Vajari, 2012). Results differentiated in this way give the 'top' management a clear picture enabling them to choose

candidates for positions in higher and middle management levels from the existing internal resources, with a high degree of approval among the subordinates of the newly appointed manager, which is an important precondition for successful functioning of an organization and achieving the set goals. Equally important are the findings about the sustainability and state of interpersonal relations within the social group (organization) that is being studied, which are also clearly presented by sociometric research and are an important constituent of employees' organizational behavior.

The primary postulates of each sociometric research are considerations of methodological requirements in terms of defining (Maheshwari, 2011):

- sociometric criteria;
- choice of sociometric technique and instruments;
- distribution (display) of results obtained by sociometric research.

Selection of sociometric criteria

Depending on the goals and purpose of the sociometric research that is being conducted, one of the two kinds of criteria (social or intellectual) will be dominant. Considering the fact that the purpose of this paper is to present sociometric research whose goal is identifying the status of candidates for managerial positions in a functional organization or company with a smaller number of employees (up to 40 workers), most of the criteria will be from the domain of social criteria (about 70 %), and the rest from the domain of intellectual criteria (team work on certain tasks).

According to Jacob Moreno (Moreno, 1966), in order for sociometry to be fair it must satisfy the following conditions:

- data confidentiality – the data will not be publically disclosed because it is important for the subjects' motivation,
- subjects' motivation – the data can be used for the reorganization of the group in accordance with its members' wishes,
- limited size of the group – if the group is too big, the relationships within it are not close enough and subjects exclude some members from their choice only because they do not know them well enough. Sociometric research only makes sense in a group that has a size of a class (about 30 and not more than 40 individuals),
- selection criteria must be utterly explicit. Questions must be clear and concrete, not ambiguous and multidimensional.

When selecting sociometric criteria, it is necessary to make sure they are logical and that they apply to the activities which are important for the individual and for the group (organization) itself. In order for the results to be valid it is also necessary to meet the necessary preconditions when selecting sociometric criteria, first and foremost the following ones:

- the members of the group must share working space in real time (presence of

permanent communication and perception within the organization);

- the researcher or interviewer must be trusted by the entire group, and discretion must be guaranteed;
- the members of the group must know each other (at least for several months);
- when defining the criteria it is obligatory to precisely say how many individuals will be chosen and which population will be subjected to the research.

Considering the methodological requirements, it is clear that the sociometric criteria play the essential role in each sociometric research. They are a unique core, and choosing or rejecting group members depend on them (Ilic, 2013).

Sociometric research for the needs of the 'top' management of an organization will first serve to obtain the relevant results regarding appointment of managers in a functional work unit, as well as regarding the level of interpersonal relations in it. Sociometric criteria will be defined according to the context of that goal and presented through the following directions and questions (Petrović, 2015):

- questions concerning team work in some group activity (walk in nature, gardening tasks),
- questions for identifying the leader ("Under whose leadership would you like to perform your activities at work?". An example for the selection of manager in a financial sector: "Who would you like to do the company's annual financial statement with?". An example for shop assistants in a shop: "Who would you like to work with in your shift?"),
- group members can make positive and negative choices for certain activities,
- the number of choices can be limited to the number of members (example: two positive ones and one negative).

Selection of sociometric techniques and instruments

Banđur & Potkonjak, 1999 say that sociometric method includes the use of testing and surveying techniques and the use of the following instruments: sociometric test, sociometric questionnaire and role-playing.

Moreno (Moreno, 1978) says that while conducting sociometric research the following methodological requirements should be taken into account:

- the group must be well defined and choosing and rejecting limited to the group members only;
- the subjects should be provided with unlimited number of choices and rejections;
- the criteria activities should be clearly defined so that they are understandable to all group members;
- the results obtained by sociometric questionnaire should be used for the group's restructuring;

- the subjects should be allowed to anonymously choose and reject, the other group members should not be informed about the answers (Ilic, 2013).

Sociometric questionnaire should contain questions that all the group members will be asked, each member should be asked to give opinion about everyone, to make their personal choice (giving first and last name), to say with whom they would like to participate in a real or imagined activity, but also to say with whom they would not like to. Also, two modified questions can be added to these questions, asking the individual to say who they think chose them in a positive sense and who chose them in a negative sense regarding the participation in the activities mentioned in the first two questions. These questions enable us to see if the subject knows their social status within the group.

The data regarding interpersonal relations within a group allows the "top" management to take adequate steps and measures for improving or consolidating interpersonal relations within the surveyed organization, which is also a benefit obtained by sociometric technique.

Distribution of the results obtained by sociometric research

In sociometry, there are two ways of distributing the obtained results (Moreno, 1996; Maheshwari, 2011):

- graphic (sociogram)
- quantitative (sociometric matrix)

Graphic display of the results obtained (Zakharchyn & Kosmyna, 2015) is a visual representation of all subjects on a sociogram, with marked affinity directions (positive and negative) among the members of the group (organization) surveyed. Each member of the surveyed group is displayed with a specific mark (first and last name initials, numbers etc.). The direction of the choice made is represented by an arrow, a solid line with an arrow representing a positive choice, and a broken line with an arrow a negative choice, or rejection, of that group member. Graphic representation is only applicable in smaller organizations or organizational units with a smaller number of employees, because the results on a sociogram must be clear and easy to perceive.

Quantitative display of results is actually a mathematical model of sociometric matrix making, where the use of defined formulae gives us three types of results:

- individual sociometric index (the status of each subject within an organization);
- group sociometric index (it shows interpersonal relations and the status of a group within a bigger unit);
- the state of social relations and the level of their disharmony within an organization.

When making a sociometric matrix, positive answers are marked by (+), plus sign inside brackets, and negative ones by (-), minus sign inside brackets, after the mark designating a subject.

The status of each individual within the group surveyed represents the ***Individual Sociometric Index***, and it can be:

- positive selection status IS (+), and it is calculated using the formula: Do(+) N-1
- negative selection status IS (-), and it is calculated using the formula: Do(-) N-1
- positive expansion IE (+), and it is calculated using the formula: Da(+) N-1
- negative expansion IE (-), and it is calculated using the formula: Da(-) N-1

The meaning of the symbols in the formula:

N= the number of subjects within a group, Do(+) = the total number of the positive choices that the subject received, Do(-) = the total number of the negative choices that the subject received, Da(+) = the total number of the positive choices that the subject made, Da(-) = the total number of the negative choices that the subject made.

The indicators of the structure of relations within a group or a group's position within a bigger unit represent the ***Group Sociometric Index***, which can be expressed in the following way:

Group Expansion Index (GEI) = sum (+) / N,

where sum (+) = the sum of all positive votes, and N= the number of subjects, and

Group Cohesion Index (GCI) = R /Rm,

where R= the number of mutual choices within a group; N = the number of subjects; Rm = the number of possible mutual choices (Rm = N(N-1) / N (Petrović 2015).

The state of a group's (organization's) social relations and the level of their disharmony can be expressed in the following way:

Group Tension Index (GTI) = sum (-) / N,

where sum = the sum of all negative votes, and N = the number of subjects, or:

Affective Atmosphere Index (AAI) = sum (+) (sum (+) + sum (-));

Where sum (+) = the sum of all positive votes, and sum (-) = the sum of all negative votes.

Higher value of GEI indicates better interpersonal relations within a group. Higher value of GTI indicates higher intolerance and unfavorable socio-emotional climate within a group. The value of AAI, if all the votes are negative, is zero.

Making a sociometric matrix is a far more complex process of analysis of the data obtained by sociometric research (Moreno, 1996), but it is necessary for a precise insight into the results which the 'top' management needs when making a decision regarding appointment of a manager. The best solution, if a surveyed group is not big, is to accompany a sociometric matrix with a graphic display in the form of a sociogram, which completes the picture regarding results.

Research results

The sociometric research surveyed 10 female workers in 5 retail stores - agricultural pharmacies. The instrument used for gathering data was a sociometric questionnaire containing two questions, i.e. *sociometric criteria*, adjusted to the goal of the research, those questions being:

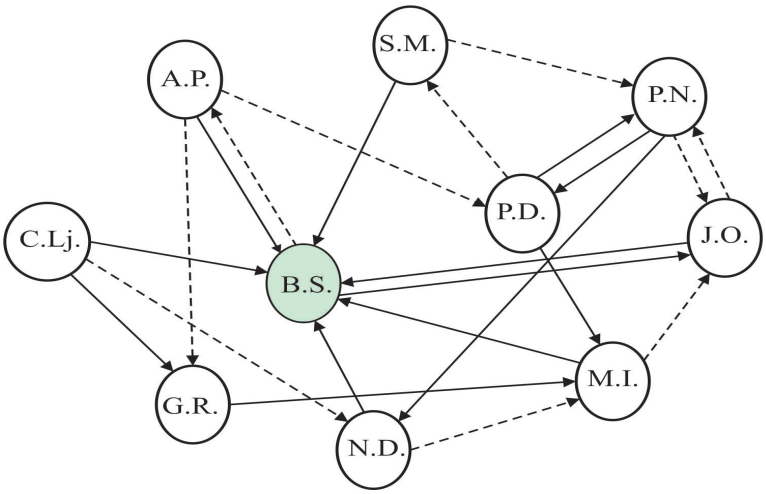
- With whom would you like to work in the store? (write their first and last name) Give a reason.
- With whom would you not like to work in the store? (write their first and last name) Give a reason.

It was possible to give maximum two positive and two negative answers.

The sociometric questionnaire was filled in individually, and the subjects were explicitly told that the results would not be disclosed to anyone but to the person who had requested the research.

In the sociogram, the subjects are marked by the initials of their first and last names, and they are marked by circles containing their initials (*Figure 1.*). The solid lines with arrows represent positive answers (desirable), and the broken lines with arrows represent negative choices. It is necessary to be very careful when it comes to making a sociogram and to how and with whom to use it (Jones, 2006). A sociogram should be simple and easy to use. Then it can be used successfully for estimation of different relations within a group – work team (Leung et al., 2006; Rostampoor – Vajari, 2012).

Figure 1. Sociogram



Source: Own authors research

After the graphic display in a sociogram, the obtained results were represented in a sociometric matrix (*Table 1.*).

Table 1. Sociometric matrix

CHOSEN										
Initials of respondents		**A.P.**	**S.M.**	**P.N.**	**J.O.**	**M.I**	**N.D.**	**G.R.**	**C.Lj.**	**B.S.**	**P.D.**
A.P.								-		+	-
S.M.				-						+	
P.N.					-						+
J.O.				-						+	
M.I.					-					+	
N.D.						-				+	
G.R.						+					
C.Lj.							-	+		+	
B.S.		-			+						
P.D.			-	+		+					
CHOOSES											
COLLECTIVE RESULTS											
Got positive	Do(+)	0	0	1	1	2	0	1	0	6	1
Got negative	Do(-)	1	1	2	2	1	1	1	0	0	1
Give positive	Da(+)	1	1	1	1	1	1	1	2	1	2
Give negative	Da(-)	2	1	1	1	1	1	0	1	1	1
Leadership index	Lx	1	1	2	2	3	1	2	2	7	3
Rejection index	Ex	3	2	3	3	2	2	1	1	1	2
Lx = Do(+) + Da(+) Ex = Do(-) + Da(-)											

Source: Own authors research

Based on the data obtained from the sociometric matrix, the subjects can be grouped in *sociometric status groups* (*Table 2*.).

Table 2. Classification of respondent in groups of sociometric status

Groups of sociometric status	Score of positive choice	Score of negative choice	Score of social preference	Score of social influence
Popular	> 0	< 0	> 1	
Rejected	< 0	> 0	< -1	
Controversial	> 0	< 0		> 1
Neglected	< 0	< 0		< -1
Average				
- not belong to the specified scores				

Source: authors adapted by (Ilic, 2013)

The quantitative representation of results gives us the values of the *Individual Sociometric Index (Is) – positive Is (+) and negative Is (-) –* and the values of the *Group Sociometric Index*, i.e. the *Group Expansion Index (GEI)*, the *Group Cohesion Index* (GCI) as well as the indexes indicating the state of interpersonal relations and the level of their disharmony within a group: the *Group Tension Index(GTI)* and the *Affective Atmosphere Index (AAI)*. The results obtained are represented in *Table 3.*

Table 3. Results of sociometric indexes

Initials of respondents	Positive elective status **Is(+)**	Negative elective status **Is(-)**	Positive expansiveness **Ie(+)**	Negative expansiveness **Ie(-)**
A.P.	0,11	0,11	0	0,11
S.M.	0	0,11	0,11	0,11
P.N.	0,11	0,22	0,22	0,11
J.O.	0,11	0,22	0,11	0,11
M.I.	0,22	0,11	0,11	0,11
N.D.	0,11	0,11	0,11	0,11
G.R.	0	0	0,11	0,11
C.Lj.	0	0	0,22	0,11
B.S.	0,67	0	0,11	0,11
P.D.	0,11	0,11	0,11	0,11

Source: Own authors research

Based on the results obtained it can be concluded that the values of the sociometric indexes are:

GEI = 1.10, GCI = 0.22, GTI = 1, AAI = 0.55, R = 2; Rm = 9; N = 10; sum (+) = 12; sum (-) = 10

Discussion

Considering the goal of the research, it can be concluded that the subject B.S. is the best person to be appointed manager in the company. Based on the research, the subject gets the title of a 'leader' or a popular person. Reasons: the value of the Leadership Index (Lx) for B.S. is 7, which is a far higher index value than the index value of the person immediately after them (3), and the rejection index (Ex) is 1, which does not surpass the average Ex of other subjects within the group.

We also identified undesirable (rejected) subjects, who got two negative points, P.N. and J.V., but considering the small index value it can be concluded that it is not a prominent characteristic of the individuals within the group nor of the group itself.

Based on the mutual choices, we revealed 'cliques': J.O. and B.S.; and P.N. and P.D. Considering the fact that according to the results B.S. should be appointed manager, it is to be expected that, if she can personally name them, her assistant or her substitute will be J.O.

There are no 'abstainers' within the group. The results show that there are no persons whom the others chose and who did not choose others.

Mutual rejection or mutual hostility was identified between P.N and J.O. because they gave each other negative votes.

Unreciprocated choice was revealed between B.S and A.P. A.P. chose B.S. but B.S. rejected her. The conclusion is that B.S. has had some negative experience with and has some negative opinions concerning A.P., and A.P is not aware of that.

Conclusion

Some of the forms of expressed classifications according to the sociometric results can be presented in the following way:

- The popular ones (leaders) – members who have at least 13 or more positive votes. This information is the most important for the "top" management and for this paper.
- The rejected ones – they choose others, but for others are a negative choice;
- The unpopular ones – members who have 13 negative votes;
- The abstainers – they do not choose others, but others choose them;
- The lonely ones – nobody chooses them and they do not choose anyone;
- Mutual attraction or mutual rejection – when two members choose each other as a positive choice (attraction) or as a negative choice (rejection).
- Unreciprocated choice – when one of the subjects chooses another as a positive choice but the other one chooses them as a negative choice.

Based on the conducted research, personal experience and data from literature (Rostampoor – Vajari, 2012) it can be concluded when it is necessary to use sociometry:

- When it is necessary to study group relations which could disable people from achieving good work results,
- When it is necessary to move one's own organization from isolated work units to collaborative groups,
- When we want to strengthen work teams working in specific situations,
- When it is necessary to identify and solve the problems of group conflict, trust and identity,
- When we want to develop behavior suitable for our ideal work culture,
- When it is necessary to integrate consideration, feeling and action in business relations,
- When it is necessary to free informal leadership abilities within one's own organization.

The results presented in this paper and their description represent the starting base and directions for a possibility of a broader application of sociometric research in the service of appointing managers in each organizational unit by the "top" management whose philosophy is to choose personnel from internal (their own) resources. In this way the established hypothesis is confirmed.

The conducted research and the obtained data confirm the general hypothesis (H) and it can be concluded that "by applying sociometry as a research method in human resource management we get precise data about the potential choice for managers from internal resources". The implementation of sociometry as a scientific method which modern

strategic management should use to see the level of interpersonal relationships in their organizations and organizational units in order to improve them (which is the basic precondition for achieving goals and increasing the organization's efficiency) represents the confirmation of both particular hypotheses (H1 and H2). Quantitative representation of the results concerning individual and group indices gives us a clear picture about each individual and about the group as a whole and all relationships that function within it.

It should be also mentioned that the research presented in this paper is one of the 'pioneering' attempts at a broader application of the sociometric method in human resources management with the aim of appointing managers in an organization, considering the fact that this technique is very often used in pedagogical research. In Serbia, as well as in the wider region, this is the first research of this kind.

Conflict of interests

The authors declare no conflict of interest.

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DOES SUSTAINABILITY MATTER IN MERGERS AND ACQUISITIONS? THE CASE OF THE SERBIAN FOOD INDUSTRY

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ARTICLE INFO

Original Article

Received:*06 December 2019*

Accepted: *18 February 2020*

doi:10.5937/ekoPolj2001025D

UDC 631.564:338.439(497.11)

Keywords:

Mergers and acquisitions, sustainability, Serbia, food-processing industry

***JEL**: G34, G32, M14, Q56*

ABSTRACT

This paper investigated key areas in which environmental, social and governance issues may be important in M&A transactions, with a particular emphasis on the Serbian food industry. The analysis was conducted using a sample of 11 realized M&As in the Republic of Serbia with the food producers as target companies and is based on the data acquired from the targets` annual reports and web sites. The analysed transactions, that have been randomly elected, belong to different legal types of M&A: acquisition of asset, acquisition of shares, tender offer and merger/consolidation. Following the classification of sustainability issues, two types of M&A in the Serbian food industry have been distinguished: one enables the acquirer to build the presence in the key segments with sustainability products in line with modern health trends, while the other helps the buyer to improve synergies and consolidate leadership position by acquiring target with a recognized sustainability profile and credibility.

Introduction

Mergers and acquisitions (M&A), as transactions characterized by a consolidation of companies or assets through different types of financial transactions, are an increasingly important factor of the modern economic activity. The scope and far-reaching consequences of mergers and acquisitions strategy in capital, labor, product and service markets of the companies involved in M&As is described by the fact that in 2018 the total value of transactions on a global level was $4,073 trillion and that the total number of M&A reached 52.009 (IMMA Report, 2019). According to the UNCTAD data (2018), the total value of foreign direct investments during 2017 reached $1,42 billion while the value of cross-border M&A took part in this value with a very high amount of $0,86 billion.

Considering nowadays international orientation of the companies, and the continuous

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process of integration in global markets, a further growth trend of M&A activity is expected in the upcoming time. Future period will certainly bring new challenges for the implementation of M&A strategy, such as changing regulatory requirements, the change of needs and consumer habits, new risks that companies face in implementing the chosen strategy of growth and development, and in particular, computerization and the digital transformation (see Denčić-Mihajlov, Spasić, 2018). A changing and complex business environment forces companies to respect the requirements for sustainability management and to build carefully their external growth strategies in order to realize and maintain competitive advantage over the long term. With the awareness of importance of environmental consequences and sustainability, market value in the post-acquisition period is no longer determined by single financial performance indicators.

Even though including sustainability consideration in the M&A transactional matrix could release the potential value of sustainability, reduce the possible faults and therefore lead to better strategic investment decisions, these external growth strategies have been for a long time uninfluenced by the "green trend". Still, realized transactions during the last years, initiated by a spectrum of factors, have indicated that sustainability consideration can help in increasing the value of M&A deals. Regulatory changes, environmental and reporting requirements, digitalization as well as the emergence of new risks in the corporate environment, are among others, the factors that have influenced incorporation of sustainability consideration into M&A process the most.

New regulation requirements, enforced by the governments (but also at local levels), come as a reaction to shareholders concerns about natural resources and the environmental and social impact of business activities. Along with the strengthening of environmental regulations, companies deal with growing demand for information about their environmental liabilities. In light of this, it's important for both buyers and sellers in M&A deals to understand the scope and impact of new regulation requirements on the structure, execution, and value of the deals. "A number of regulatory bodies have worked and are still working on establishing guidelines and standards for sustainability reporting in order to achieve a higher level of harmonization throughout the world" (Dencic-Mihajlov, Stojanovic-Blab, 2017).

Digital economy is becoming an increasingly important factor in modern global business. Regardless of the strategic vision of the company, it is certain that the M&A decisions in the future are to be made in the digital world, companies will need to effectively handle the large amount of information and use such information for M&A activities faster than ever. A wide range of investors already make investment decisions using digital assessment tools that link sustainability issues with corporate performance. However, even though new digital technologies lead to sustainable innovations and improve sustainability performances, they could generate new vulnerabilities (such as cybercrime and the loss of privacy).

As stated in the Global Report on Risk Management (World Economic Forum, 2016), the inability and failure to understand the economic risks and the lack of application

of instruments to manage risks associated with the technology, the company and environment, can have far-reaching consequences on the intensity of realization and efficiency of the implementation of external growth strategies, especially in an international context. New risk that have emerged last years force companies that intend to pursue M&A to respect the requirements for sustainability management in order to achieve and maintain competitive advantage over the long term.

The environmental, social and governance (ESG) issues may play part in M&A transactions in several areas, such as (1) selection of target company, (2) due diligence process, (3) deal valuation and (4) post-acquisition integration. From sustainability perspective, a purpose of due diligence is to supply the acquirer with adequate information to make decision on investment in external growth. Having understood and incorporated all the identified risks, the buyer valuates the deal. Incorporating sustainability issue in valuation process supposes not only direct impacts (for example, cost savings resulting from energy efficiency or growth of profits achieved with sustainable products), but also indirect effects (manifested in improved reputation, employee engagement or customer loyalty). However, according to survey made by PwC (2012), in practice, few companies currently measure the value that they are generating from management of sustainability factors. The valuation process has to take into account all the costs of post-acquisition integration together with the potential costs resulting from the increased risk reflected in the bid (the incurred costs due to more comprehensive covenants or to target´s withdrawal from the transaction). As stated in Deloitte report (2008) on the role of sustainability in M&A, due to still evolving sustainability metrics, the evaluation of a target company's sustainability activities should incorporate much more than the "target's public claims regarding carbon output reduction, lowering of energy use, or other sustainability successes". Seller company could be too aggressive or too conservative while representing its sustainable activities. Therefore, an acquiring company, during valuation process, should investigate the target's processes and controls that support such claims.

In the post-acquisition period, the acquiring company has to plan the activities directed to quick and efficient improvement of sustainability efforts of the combined entity. The acquirer is proposed to determine the request towards target in regard with disclosure of sustainability performance in order to unify performance on ESG factors according to its own standards.

During the past decades the topic of M&A has been extensively studied from the different aspects such as motivation, determinants, value creation, payment methods as well as behavioural, organizational and cultural aspects (for an updated literature review see: Caiazza, Volpe, 2015). Despite the enormous importance given to M&A transactions in the framework of growth and value creation, only a few studies tackle the process of M&A structuring in the context of sustainability. More recently, and not unexpectedly, researches have been focusing on some of the "sustainability factors relating to before-during-and-after M&A process" (see: Hečkova et al., 2019). Isolated examples of researches of the sustainability in M&A in the food industry are studies

done by Schmidt-Riediger (2008), Manocha et al. (2016), Bonny (2017) and Clapp (2018). The aim of the paper is to investigate key areas in which environmental, social and governance issues may be important in M&A transactions. This paper's contribution is in identifying the key theoretical and practical issues relevant when assessing and incorporating sustainability within the M&A process in the food industry.

Materials and methods

Selection of target company and due diligence process, as stated before, are two crucial areas in M&A realization, where sustainability issues should be thoroughly taken into account. An acquiring company that takes into account ESG issues may add value to its shareholders if in selection process look for a target with well-developed, sustainable business. This would enable the acquirer to obtain expertise and experience to increase business efficiency. In the opposite case, as highlighted by Mannheimer Swartling (2017), by selecting a target which operations are related to "the risk of severe contamination, demands for emission reductions, direct or indirect violations of human rights, poor working conditions or the risk of corruption", could result in negative publicity and increase of integration costs. The sector in which target operates plays also a significant role as a selection criteria, particularly if there are differences between the buyer and the target sectors´ attitude towards sustainability. More precisely, the information which are subject of due diligence process are those related to (Deloitte, 2008):

- "sustainability policies;
- any external reports on the ESG status of individual portfolio companies, and of the portfolio as a whole,
- copies of any management system standard certificates as well as copies of any regulatory licences/consents, and details of any breaches,
- details of health and safety accidents/incidents,
- any evidence of governance arrangements (such as Codes of Conduct, Bribery and Corruption Policies)".

In addition to above mentioned, due diligence is dealing with the details of performance on ESG factors, using sustainable indicators where appropriate (see: Denčić-Mihajlov, Zeranski, 2017). As pointed out by Cooper (2017), since sustainability issues are getting more connected with risk mitigation, a due diligence of a potential target company that take into account target´s sustainability engagement and performances is becoming increasingly relevant part of M&A strategy planning and valuation. In line with the economics evaluation of the M&A deal, the acquiring company should a) assess potential acquisition targets with regard to energy and water use, solid waste handling or wastewater disposal, and other environmental issues, and b) project potential expenditures related to these environmental components.

There are three groups of risks associated to the M&A realization. At a global level, acquiring companies are faced with risks of macroeconomic, technological, legal, socio-cultural and ecological development. At sector level, risks related to the competitors, suppliers and customers have to be considered. Finally, risks connected to potential target company (target´s strategy, portfolio, location, business model) are very important in due diligence process.

Legal due diligence, as an in-depth analysis and review of corporate documents, contracts and agreements, current, future and potential litigation, environmental factors as well as legal and regulatory compliance, is critical part of M&A due diligence process. However, the possibility of full contractual protection against sustainability risks in practice is restricted, since target company often avoids to provide guarantees related to third parties. This is particularly important in sustainability due diligence, because a lot of sustainability risks arise from the relationships and contract that target has with its suppliers and other business partners. Along with risk associated with target´s operations and business, acquiring company has also to analyze and evaluate the practice of risk management in the target company. In order to have an objective picture of specific sustainability risks related to specific M&A transaction, a comparison of target´s and acquirer´s risks´ portfolio and risk management models is required.

One of the areas in which above discussed sustainability considerations in the process of target company selection and due diligence impact M&A transactions most obviously is the food industry. According to consumer´s behaviour studies, the sustainability in the food production gains increasing significance to consumers. With the changing business environment, the food industry faces new challenges, and strategies such as M&A become critical for corporate success, achieving and maintaining corporate advantage. On one hand, a low growth perspectives in this industrial sector and growing demand (driven significantly by consumerism, phenomenon related with the Generation Y), create a need for M&A realization among companies operating in food industry. In the same time, the fact that recent recession had high negative impact on this mature sector, forced food producers to maintain low prices and margins. On the other hand, these companies are faced with numerous challenges such as changing consumer priorities and motivations in relation to food purchase and consummation as well as intensifying competition from smaller, innovative oriented producers.

According to Food Dive institution (FoodDive, 2015), two most important trends in food industry that took place last years are: 1) orientation to natural components without artificial colours and flavours due to health requirements, 2) M&A continuing to be dominant strategy in the industry. Thus, the Kraft-Heinz merger was the biggest realized M&A transaction in the sector. Some examples of sustainable M&A among multinational companies operating in the food sector are the acquisition of plant-based food company Sweet Earth by Nestle or the fusions between Unilever and UK ethically-sourced tea brand Pukka, Danone and the US plant-based and organic dairy business White Wave Foods, Finland's Bioferme and the food corporation Fazer Group.

The objective of this paper is to test whether sustainability considerations are important in the M&A deal selection assessment and execution processes in the food industry. Thus, the research questions are settled as:

RQ1: *Do sustainability issues play a role in M&A in the Serbian food industry*?

RQ2: *What are the patterns in the field of M&A and sustainability in the case of the food processing industry in the Republic of Serbia*?

In order to answer to these questions, the main characteristics of the M&A process at the Serbian market should be primarily considered. The Serbian M&A transactions have been influenced by the existence of narrow national capital markets with a small number of potential domestic acquirers, the presence of investment funds from tax haven countries and conglomerates as foreign acquirers, and the predominant realization of horizontal M&A (Todorović, Denčić-Mihajlov, 2004). By comparing the volume and intensity of M&A activity in Central and Eastern European countries, it can be concluded that M&A activity in Serbia still lacks volumes and depths compared to these countries (during 2016 and 2017 any single large-scaled deals has not been realized). According to statistical data (Statista, 2018), the aggregate value of M&A deals in Serbia amounted to 624.4 million euros in 2017, which is a decrease when compared to 2011 when almost two billion euros worth of deals were completed. Such a low level of M&As in Serbia could be related to the fact that despite a slow emergence from the long recession, Serbian economy continued to growth depressed due to public spending cuts. The situation is gradually improving last years, and the economic recovery has been indicated by country's real GDP growth rate approaching 2,8% in 2016 and 1,87 % in 2017 (World Bank Report, 2019).

Manufacturing is in Serbia the most active sector according to M&A number and total value. As a type of manufacturing sector, Serbian food and beverage industry is one of the few sectors recording a trade surplus. According to the Development Agency of Serbia (2017), the agro-food sector accounts for a massive proportion of foreign direct investments, both in terms of value and the number of projects (13.1% of total FDI stock since 2001). Advantages such as an excellent raw material base, a network of free trade associations' agreements, a long tradition of high-quality food production and strong regional brands are key reasons for world class multinational companies to direct M&A activity towards Serbian companies operating in the food industry. Tadić et al. (2019) suggest that efficiency, innovation, quality and flexibility are critical profitability factors in the case of 200 companies operating in the Serbian food industry sector.

From the sustainability point of view, one should also add the fact that the Serbian law prohibits the production and import of any genetically modified (GMO) foods and seeds. It seems that the Serbian government has recognized the importance of food and agricultural sectors for the development of the whole country. However, even though above mentioned data could lead to a conclusion that Serbia has comparative advantages in the field of food sector, Momčilović et al. (2015) indicated that suitable circumstances for the sustainable growth were limited or there was no real sustainable growth in this sectors during the previous period.

In the food industry, the highlight is a consolidation driven purchase of the Niška Mlekara by the largest sector player Imlek. In addition, the Serbian food concern Swisslion acquired the wine producer Vršački Vinogradi. Analysing the M&A practice and trend in the Serbian food industry, at a first sight, a strong impact of sustainability considerations in the M&A decision making and realization process is not observed. The trend in the food consumption recognized at the developed economies is also present in the Serbian market. Healthy conscious consumers prefer natural, non GMO food and environmentally friendly food alternatives. However, in the environment characterized by the low purchasing power, companies that operate in food industry are forced to decrease production costs and selling price of their goods. According to the official data published by the National Institute for Statistics (2019), the average family in Serbia has spent on food and non-alcoholic beverages 34.9% of the total family budget in 2018. The realization of operating synergy through the economy of scale effect appears to be the mean driving factor for M&A in the Serbian food industry. However, during the last decade the investors begin to find sustainability much more worth and interesting than before.

In order to explore whether ESG issues play role in M&A transactions, we used categorization given by Maloni and Brown (2006) who report about eight types of corporate social responsibility issues that can be understood as sustainability issues (SI) in the food industry as well: (SI1) animal welfare, (SI2) biotechnology (e.g. growth hormones or genetic testing), (SI3) health and safety (e.g. food safety, healthy lifestyles or local food sources), (SI4) environment, (SI5) labour and human rights (e.g. compensation, forced labour, child labour, training, education), (SI6) community, (SI7) fair trade, and (SI8) procurement (e.g. professional competence, confidentiality, disadvantaged suppliers, minority suppliers).

The analysis was conducted using a sample of 11 realized M&A in the Republic of Serbia with the food producers as target companies. The analyzed transactions have been randomly elected and are classified as different legal types of M&A: acquisition of asset, acquisition of shares, tender offer and merger/consolidation. The analysis was conducted using the data acquired from the annual reports and web sites of the target companies operating in the food and beverages sector involved in M&A transactions.

Results and Discussion

The data presented in *Table* 1 show the way sustainability considerations have been factored into M&A strategies, and prove weak relationship between sustainability and acquisition motives and moves.

Table 1. Sustainability issues in M&A in the Serbian food industry

Acquirer	Target company	Possible sustainability issues considered by the acquirer
MK Group, Belgrade	Carnex, Vrbas	Socially responsible business, donatory activities, waste management (SI4, SI6)
Delta Agrar, Beograd	Danubius d.o.o., Novi Sad	Danubis pata souses are completely natural, without artificial colours, flavours and aditives (SI3)
Nektar d.o.o., Backa Palanka	Heba a.d., Bujanovac	Water production; promotion of a healthy life; emphasis on a production safety management system (SI3)
Dijamant a.d., Zrenjanin	Kikindski mlin a.d., Kikinda	Commitment to caring for the environment and the maintenance of product quality through the implementation of environmental management systems (EMS) (SI3, SI4)
Trivit d.o.o. Becej	Klas doo, Loznica	Socially responsible business through employment of sensitive groups of citizens (SI5, SI6, SI8)
Grand kafa Beograd	Soko Nada Stark a.d., Beograd	Socially responsible business; technological process is managed in such a way to preserve the nutritional properties of natural raw materials (SI2, SI3)
Dukat d.d, Zagreb	Somboled d.o.o., Sombor	Social responsibility through environmental protection, sponsorship and donations and foodsafety and quality management (SI3, SI6)
Perutina Ptuj d.d., Ptuj	Topiko d.d., Backa Palanka	Product quality is the result of tradition, local farming and controlled production on small farms and in natural environment (SI3)
Frikom a.d, Beograd	Nova Sloga a.d., Trstenik	Mineral water as final product; promotion of a healthy life, fruit and vegetables consumption (SI3)
Galus doo, Pančevo	Soya Food, Lokve	Soya Food products are made from non-GM soy, completely natural, without artificial colours, flavours and aditives (SI2, SI 3)
Swiss Lion	PIK Takovo Gornji Milanovac	Socially responsible business; top quality row materials; care for employees (SI4, SI5, SI6)

Source: Author's presentation

Two types of acquisitions could be distinguished. One type *enables the acquirer to build the presence in the key segments with sustainability products in line with modern health trends* (for example, the target company is producing mineral water, or has plant-based production). Industry of frozen food FRIKOM ad Beograd acquisition of Nova sloga Trstenik, a company specialized in mineral water production (brand Mg Mivela), is just one of the latest M&A deals at Serbian capital market that suggests that sustainability cares in the Serbian food and beverage industry. By taking over Nova sloga, Frikom has underlined its strategic priorities to build the portfolio which is in line with modern health trends. Following the classification given by Maloni and Brown (2006), the most important for these transactions are SI2 are SI3.

The other type of M&As are those that *help the buyer to improve synergies and consolidate leadership positions by acquiring targets with a recognized sustainability profile and credibility.* An example of such a strategy is the acquisition of Somboled a.d. Sombor, a company that tracks social responsibility reputations by environmental protection, sponsorship and donations, food safety and quality management, by Dukat, dd Zagreb. The crucial categories of sustainability issues for these M&A deals are SI5, SI6 and SI8.

Understanding the relationship between sustainability and acquisition motives among the Serbian M&As is particularly important taking into account the value creation chain in the food sector, with food processing companies as decisive players. Since food producers influence both agriculture as upstream, and retail and consumers as downstream links within the chain, and vice versa, the way sustainability issues are perceived by those companies and their growth strategies is partly impacted by the level of the sustainability in the whole value creation chain. Thus, taking into account a high concentration in the Serbian retail sector and the low purchasing power of end consumers, there are obviously limited opportunities for sustainability improvements of the food products. On the other side, a state of the development of the Serbian sustainable agriculture describes the supply side for the sustainable products and explain a moderate intensity of this M&A driver in the Serbian food industry.

Regarding sustainability consideration in the M&A transactions, in the food industry and generally, Serbian companies need to continually cope with the growing expectations of the stakeholders by including the sustainability issues in their strategies, operative management and reporting systems. It should be pointed out that the new regulation (Law on Accounting, Official Gazette of the Republic of Serbia No. 62/2013, 30/2018, 73/2019) brings additional requirements for large companies (500 or more employees) in the field of non-financial reporting. Such companies are now required to include some sustainability issues in their annual reports (Article 37). In our opinion, this will increase transparency and improve sustainability due diligence process of M&A transactions at the Serbian capital market.

Conclusions

The paper explored key areas in which environmental, social and governance issues may play important role in M&A transactions, with a particular emphasis on the food industry in the Republic of Serbia. The study has answered the research questions concerning the role and the pattern of the sustainability issues in the case of M&A in the Serbian food industry. By doing so, it reveals some important messages for companies involved in M&A deals, capital market institutions, consumers, society and policy makers.

Firstly, regardless of the underlying realization motive, companies involved in M&A should be better prepared by addressing sustainability issues early in the process, i.e. during the section of target company, due diligence process and transaction valuation. Acquiring companies should not neglect the importance of sustainability issues during the post-acquisition integration too.

Secondly, while defining and realizing M&A strategy, companies operating in food industry, should adjust their existing portfolios in order to meet long-term changes in consumer tastes in relation to health and wellness trends, and sustainability. M&A in the food industry are becoming strategic investments less concerned to generate high returns in the short run.

Thirdly, a strong impact of sustainability considerations in the Serbian food industry (such animal welfare, biotechnology, health and safety, environment, labour and human rights or community) cannot be observed.

Finally, two prevailing types of M&A in the Serbian food industry could be distinguished. The sustainability issue that has moved to the forefront in the first M&A type are those related to biotechnology, modern health trends and safety. The other type of M&A deals helps the buyer to gain sustainability synergies by acquiring target with a recognized sustainability profile and credibility obtained by engaging for community and labour and human rights.

However, it is important to underline that the M&A activity in the Serbian food industry present in the last two decades might lead to some unfavourable impacts on the society, environment and the governance. These negative consequences from the sustainability point of view are related to a lowering of the level of competition in the food sector, loss for small and medium sized food producers, barriers to entry for new producers and lack of transparency for food consumers. Creating synergies through M&A is glamorous, but integrating sustainability issues is difficult and disturbs Serbian managers who are mainly seeking to create synergies by cutting costs. Sustainability and responsibility are often, unfortunately, far from their point of interest.

Conflict of interests

The authors declare no conflict of interest.

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HETEROGENEITY OF SERBIAN CONSUMERS' PREFERENCES FOR LOCAL WINES: DISCRETE CHOICE ANALYSIS

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ARTICLE INFO

Original Article

Received: *20 October 2019*

Accepted: *03 February 2020*

doi:10.5937/ekoPolj2001037K

UDC 366:634.8(497.11)

Keywords:

Wine, Serbia, preferences, attributes, discrete choice analysis, segmentation

***JEL**: Q13, C50, C93*

ABSTRACT

The unique and at the same time very complex nature of the wine requires a more thorough selection process compared to other consumer products. Wine consumers are faced with a number of brands, grape varieties, and regions of origin, diverse tastes and prices. Using discrete choice experiment this study explores the importance that consumers in Serbia attach to five attributes of the local wine brands. Respondents were asked to evaluate 10 choice tasks, each with three different wines, and to choose the one that they would like to have with friends or family. The sample results indicate the high importance of the wine brand, while the price proved to be the least important. However, preference-based segmentation identified three clusters that differ primarily in the type of wine they favor, but also whether they like or not sweet and sparkling wines. It turns out that the price is a moderately important attribute in all clusters.

Introduction

Due to the dynamic nature of the wine sector, in recent decades a growing number of practitioners and academics have become interested in analyzing the various stages of the wine consumption process as well as the preferences and behavior of wine consumers. The dynamics are primarily reflected in the diversification of offer, reduced consumption in traditional wine producers and the emergence of new producer and consumer regions (Martinez et al., 2006). Moreover, in developed societies, consumer preferences and behaviour becomes diverse and creates continuous socio-economics changes, but also changes in modern lifestyles. These processes have led to a different pattern of consumption of alcoholic beverages, especially wine, in the sense of reducing

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the consumption of table wine and increasing demand for quality wines and wines with regional specificity (Caniglia et al., 2006). However, consumers are faced with a choice between non-regional but more familiar wines, and newer, regional or local lesser-known products (Kolyesnikova et al., 2008; Di Vita et al., 2019).

The European Union is the world's leading producer of wine, accounting for about 60% of global production and consumption, while top producers are Italy, France and Spain (Kotzeva et al., 2018). The wine industry in Republic of Serbia is showing signs of significant growth in last decade. With 198 million tons of wine produced in 2014, Serbia ranked 19th among the world and 12th among European wine producers (FAO, 2015). The majority of Serbian wines are produced in local wineries. A gradual increase in both, production and consumption of high quality wines can be noticed. The growing number of wine producers in Serbia presents a challenge for marketing professionals to formulate a strategy targeting Serbian consumers.

The purpose of this paper is to empirically research the consumers' preferences towards characteristics of local wines in Serbia, as well as to determine whether those preferences are heterogeneous. To our knowledge, several research related to consumers' preferences, wine choice and purchase behaviour were conducted in Serbia (Vlahović et al., 2012; Radovanović et al., 2017). For the purpose of modeling and analyzing consumer preferences in choosing wines, this paper uses the Discrete Choice Analysis (DCA). DCA refers to the class of the probabilistic selection model, which emerged in mathematical psychology. It has been widely used to measure individual preferences in many fields, and in recent years, there has been a growing body of research in wine-related research to address the preferences of both consumers and sellers (Lockshin et al., 2006; Veale & Quester, 2008; Tempesta et al., 2010; Kallas et al., 2013; Tait et al., 2019).

Related literature

The unique and at the same time the very complex nature of wine causes a special selection process in comparison with other consumer products. When purchasing, consumers are faced with a huge number of brands, numerous grape varieties and regions of origin, as well as a wide range of prices to choose from (Mueller et al., 2010). Furthermore, the specificity of wine as a product affects the willingness of consumers to even try out a particular type of wine (Everett et al., 2018).

The literature have identified a numerous factors that influence the consumer's wine purchase decision. Two categories of factors are particularly distinguished: extrinsic and intrinsic attributes (MacDonald et al., 2013). Intrinsic attributes are those associated with physical characteristics such as vintage, grape type, year of production and sensory characteristics of the wine such as taste, flavor, sugar content and colour. Extrinsic attributes refer to non-sensory characteristics of wine among which are price, region of origin, brand name and packaging (Lu et al., 2017).

Although most studies on wine consumer behavior are focused on red (Mehta and Bhanja, 2018; Sena-Esteves et al., 2018) or white wine (Saliba et al., 2009), recent market trends show the growing worldwide popularity of rose wine, leading to an increase in research studies related to this type of wine (Kolyesnikova et al., 2008; Wang & Jeffery, 2018; Capitello et al., 2019).

The results of numerous studies indicate that wine prices depend on the quality, reputation of the producer and other sensory and non-sensory characteristics of the wine (Lockshin et al., 2006). Therefore, the price can be an important cue when the product cannot be evaluated prior to purchase and when there some risk of making a wrong decision, such as while purchasing wine in the retail stores (Chrea, et al., 2011). Veale and Quester (2008) concluded that respondents perceived even poor quality wines as tasty, if they are expensive and with a reputable country of origin.

In addition to price, grape variety has been found to be one of the most influential factors when buying wine in retail stores (Thomas & Pickering, 2003; Mehta & Bhanja, 2018), while region of origin is one of the most important factors for consumers when choosing a wine in restaurants and bars (Corsi et al., 2012). Many authors consider packaging and label design to be major marketing tools for attracting consumers and influencing their choices (Rocchi & Stefani, 2005; Sáenz-Navajas et al., 2013; Tempesta et al., 2010).

The literature indicate that the region of origin affects consumers' preferences significantly (Kallas et al., 2013). Lecocq and Visser (2006) found out that consumers are willing to pay a higher price for the local and national wines. Perrouty et al. (2006) found that less experienced consumers are more likely to consider wine origins, but some studies showed that even high involved consumers and wine experts can be strongly influenced by this cue. Recently, Escobar et al. (2018) used Generalised Multinomial Logit Model to determine the impact of the 2008 economic crisis on preferences of the citizens of Catalonia towards four wine attributes: wine origin, wine references, grape variety, and price. The research showed that the wine origin was the most important attribute before the crisis, while the price became the most important attribute during the crisis.

Materials and methods

This study aims to explore the habits and preferences of consumers of wine in Serbia. The results of the study should answer questions such as: (1) Which wine characteristics most influence consumers' choices; (2) How important is price of wine; (3) To what extent consumers' preferences are heterogeneous; (4) Is there a difference between the preferences and behavior of certain socio-demographic groups of respondents; and (5) Whether and to what extent habits arise from or are conditioned by preferences. To determine individuals' preferences, an online discrete choice experiment was conducted on individuals older than 18 years who consumed wine at least once in the past year.

Discrete choice analysis

Discrete choice analysis (DCA) is a stated preference method based on micro-economic theory and Lancaster's characteristics approach to consumer demand, according to which consumers attempt to maximize their benefit derived from the consumption of the characteristics of products (products attributes), rather than from products as a whole (Lancaster, 1966; McFadden, 1974).

The basic assumption of the DCA is that any product or service can be defined as a combination of different levels of multiple attributes. In the experimental procedure, individuals are presented with sets of alternatives that differ in the levels of their component attributes, and for each choice set they are asked to choose the most preferred alternative. The outputs from DCA, the so-called utility results, are numerical values that reflect the extent to which each attribute and level influences customer choice (Kuzmanovic et al., 2020).

The benefits of using DCA to reveal the preferences of individuals are numerous. Firstly, the choice tasks are very similar to real purchasing situations in which respondents have to make trade-offs between conflicting attributes such as price and quality. Secondly, DCA preferences are measured indirectly, which can reduce the bias of strategic responses. Furthermore, utilities are calculated at the individual level and can be used for the purpose of *post hoc* segmentation (Popović et al., 2018).

There are five main steps in conducting Discrete Choice experiments. The first step is to identify the key product attributes and corresponding levels that best describe the product and allow them to differentiate one from the others. An experimental design should be generated based on these attributes and levels. Respondents' answers are then analyzed at the aggregate level using Logit method or for each individual respondent in the sample using Hierarchical Bayes method. In addition to revealing respondents' preferences, the data obtained can be further used for segmentation as well as for predicting and simulating market shares and profits. It is also possible to measure willingness-to-pay for a change in attribute levels.

Attributes used in the experiment

In accordance with the research objective and based on the literature review, two extrinsic (winery, price) and three intrinsic attributes (type, sweetness and sparkling), were taken into consideration in this study (see Table 1). Depending on grape variety, three types of wine are distinguished. Thus, for an attribute Type we choose three levels: Red, White and Rosé. Wines can be made with a wide range of sweetness levels, from dry to sweet one. According to EU regulation 753/2002 (eur-lex.europa, 2002), the following terms may be used on the labels both table and quality wines depending of the sugar content: Dry, Medium dry, Medium and Sweet. Based on the amount of carbon dioxide in the wine, it can be either sparkling i.e. with significant levels of carbon dioxide in it, making it fizzy, or non-sparkling (still).

We have developed the levels of the attribute Winery from available data on the Serbian wine market. There is a considerable number of small family winery in Serbia, whose wine is considered to be of high quality and popular among the consumers. Therefore, in addition to an industrial winery with a tradition (Rubin), five more wineries has been taken into account (see Table 1). These wineries were selected for being one of the most popular in Serbia (Portal Vino, 2016). Moreover, in 2016, Cabernet Sauvignon Reserva 2012 "Podrum Radovanović" was declared best Serbian red wine, while Triumph Gold 2015 of Aleksandrović winery was proclaimed as the best white wine. The Best rose wine award went to the Zvonko Bogdan Winery for the popular Rose sec 2015, while the best sweet wine was the Black Tamjanikae 2015 of Matalj Winery. Prices on the Serbian wine market for the wines of these wineries range from 400rsd to 1600rsd, thus the four price points were selected for the attribute Price.

Table 1. Key attributes and corresponding levels

Attribute	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
Winery	Rubin	Kovačević	Radovanović	Aleksandrović	Z. Bogdan	Matelj
Type	Red	Rose	White			
Sweetness	Dry	Medium dry	Medium	Sweet		
Sparkling	Sparkling	Non-sparkling				
Price	400 RSD	800 RSD	1200 RSD	1600 RSD		

The choice experiment design and survey technique

Based on selected attributes and their levels, a total of 576 (= 6x3x4x2x4) virtual wine concepts could be constructed, giving a large number of choice tasks. However, it is unrealistic for respondents to compare and select from such a great number of tasks. Usually respondents are becoming fatigue after comparing more than 15 concepts. Thus, in this study blocked fractional factorial choice design was created using software conjoint.ly. Blocks are partitions of the choice tasks in the design of experiment that contain a limited number of choice questions for each respondent. In our study, an experimental design with 70 choice tasks was partitioned into seven blocks so that each respondent evaluated only 10 choice tasks, each consisted of three full profile wine alternatives plus the "none of the above" option. In this way, the survey covered a total of 210 (10×3×7) profiles. The no-choice option is included to give a more realistic purchase situation and thus increase data validity. Participants were asked to select the bottle of wine they would most like to buy.

Along with the choice tasks, respondents were presented with a short survey that included socio-demographic data such as age, gender, household income, level of education, as well as data on wine consumption habits (wine type they most commonly drink, drinking frequency, place, and quantity). One of the additional questions was about the willingness to try new wines. To test the questionnaire, the survey was piloted using a sample of 20 respondents. As DCA calculates preferences for each individual respondent, a large sample is not necessary for the results to be valid. To collect responses, this study used an online survey. Online surveys have been shown to be

suitable for discrete choice experiments due to ease of completion, time savings and high response rates. In accordance with the purpose of the study, the respondents were recruited through convenient sampling method. The survey was distributed on social networks, wine-related forums and distributed by e-mail. The intention was to select participants who would be willing to provide the most relevant information, the request being that they occasionally or frequently consume wine.

Analytical method

Discrete choice models (DCMs) can be derived from Random utility theory (RUT), providing a mathematical form that associates consumer utilities with product attributes (Zhu, 2007). A DCM specifies the probability that an individual chooses a particular wine concept, with the probability expressed as a function of observed variables that relate to the concepts and the individual. The probability of individual *i* choosing alternative *j* from a set of *J* mutually exclusive alternatives is given by:

$$P_{ij} = P(U_{ij} \geq U_{ik} \mid k \in J) \;\; \forall k \neq j, i = 1,...,I, \tag{1}$$

where U_{ij} is the utility that individual *i* obtains from choosing alternative *j* and can be can be decomposed into an explainable component V_{ij} and random component e_{ij}:

$$U_{ij} = V_{ij} + \varepsilon_{ij} \,. \tag{2}$$

Random component e_{ij} represents the unobservable or unobserved sources of utility that can be due to unobserved preference variation, variability within and between individuals and measurement error. V_{ij} is a deterministic component of utility associated with the observed factors (attributes) that influence it. The functional form for V_{ij} is usually linear additive form that maps the multidimensional attribute vector into one-dimensional total utility:

$$V_{ij} = \sum_{k=1}^{K} \sum_{l=1}^{L_k} \beta_{ikl} x_{jkl} \,, \tag{3}$$

where β_{ikl} represents utility respondent *i* attaches to l^{th} level of attribute *k*, $k = 1,...,K$ also known as part-worth utility, and x_{jkl} is a binary variable that equals 1 if hostel *j* contains level *l* of attribute *k*, otherwise it equals 0.

To estimate the model parameters (part-worth utilities associated with attribute levels), multinomial logit model or Hierarchical Bayes (HB) estimation can be used. However, in this study HB was used due to its possibility to estimate individual-level parameters. HB estimation implies that hierarchical models are analyzed using Bayesian methods that are based on the assumption that probability is expressed as a degree of belief. The value of the HB model lies in its ability to estimate more parameters with fewer data collected from each respondent.

Estimated part-worths reflects how strongly that level influences the decision to choose a certain wine. Attributes with large variations in the influence are consider as more important. Accordingly, relative importance of each attribute for each respondent are calculated by dividing the utility range for each attribute separately with the sum of the utility ranges for all attributes (Kuzmanovic et al., 2013):

$$W_{ik} = \frac{\max_{l} \beta_{ikl} - \min_{l} \beta_{ikl}}{\sum_{k=1}^{K} \left(\max_{l} \beta_{ikl} - \min_{l} \beta_{ikl} \right)}. \quad (4)$$

These individual values of the relative importance of the attributes can be further used to calculate the attributes importance for the sample as whole if the preferences prove to be homogeneous, or at the cluster level in the case of heterogeneous preferences.

For the purpose of preference-based, i.e. post hoc segmentation, both hierarchical and nonhierarchical clustering techniques can be used. One of the techniques that has proven to be suitable for clustering individual part-worths is k-means cluster analysis. It is a nonhierarchical technique that aims to partition *I* vectors of part-worths into *k* clusters in which each observation belongs to the cluster with the closest mean. Despite the fact that the problem of minimizing within-cluster variances is computationally demanding, efficient heuristic algorithms converge quickly to a local optimum. The key feature that make algorithms efficient is that the number of clusters k is an input parameter. Since inadequate choice of k may produce poor results, it is important to run diagnostic tests to determine the adequate number of clusters.

Results

Sample characteristics

Data were collected online using Conjoint.ly platform in June 2017. In total, 256 individuals answered the survey. After the elimination of incomplete and low quality surveys, an eligible answers of 240 respondents were used in analysis. The sample characteristics as well as respondents' habits concerning wine consumption are presented in Table 2.

As young people use the internet more and are more willing to fill out surveys, it is not surprising that as many as 42.92% of the sample are students. With regard to the frequency of wine consumption, 34.17% of respondents indicated they drink wine once a month, 25.83% drink wine once a week, while only 12.5% % of them stated that they drink wine several times a week or even every day (2.08%). Respondents state that most often consume wine in restaurants (34.17%), and most of them drink white wine (45.42%). As much as 81.67% of respondents are willing to try new brands and types of wine, with woman being more willing than men. Only one third of the respondents (32.5%) do not choose wine depending on the food they consume, while 31.65% of them declared that the choice of the wine type is affected by the season. More than half

of the respondents (60%) mostly buy domestic (Serbian) wine brands. Furthermore, respondents most often choose to have Rose wine in restaurants or bars (very rarely at home), while red wine they prefer to have at home.

Table 2. Socio-demographics data and respondents' habits

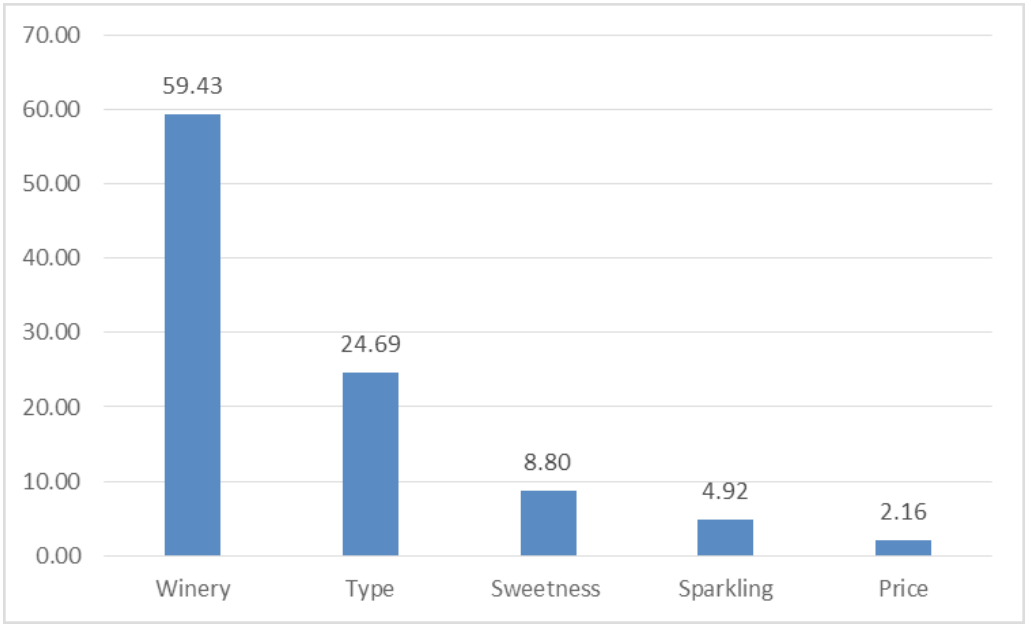
Demographic	Category	Frequency	Percentage
Gender	Male	123	51.25%
	Female	117	48.75%
Age	18-20	17	7.08%
	21-40	194	80.83%
	41-60	21	8.75%
	>61	8	3.33%
Level of education	Primary school	9	3.75%
	High school	43	17.92%
	Undergraduate	140	58.33%
	Master degree	45	18.75%
	PhD degree	3	1.25%
Employment status	Student	103	42.92%
	Unemployed	16	6.67%
	Employed	116	48.34%
	Retired	5	2.09%
Averaged monthly income	do 25000	34	14.17%
	25000-50000	80	33.33%
	50000-75000	58	24.17%
	>75000	68	28.33%
Frequency of wine consumption	Every day	5	2.08%
	Several times a week	30	12.50%
	Once a week	62	25.83%
	Once a month	82	34.17%
	Rarely	61	25.42%
Quantity	1 glass	45	18.75%
	2 glasses	90	37.50%
	3 glasses	42	17.50%
	at least 4 glasses	63	26.25%
Place of consumption	At home	56	23.33%
	At friends'/family place	55	22.92%
	In clubs/pubs	47	19.58%
	In restaurant	82	34.17%
Type of wine commonly consumed	White	109	45.42%
	Red	66	27.50%
	Rose	65	27.08%

Source: Authors' calculations

Aggregated preferences

The results of the analysis are given in Figure 1 and Figure 2, with Figure 1 showing the importance of attributes. It can be seen that Winery is the most important attribute to Serbian consumers, with an average importance value of even 59.43%. The attribute Type is shown to be second by importance (24.69%). The third ranked attribute is Sweetness (8.8%) followed by Sparkling (4.92%), while the least important attribute is Price with importance values of just 2.16%.

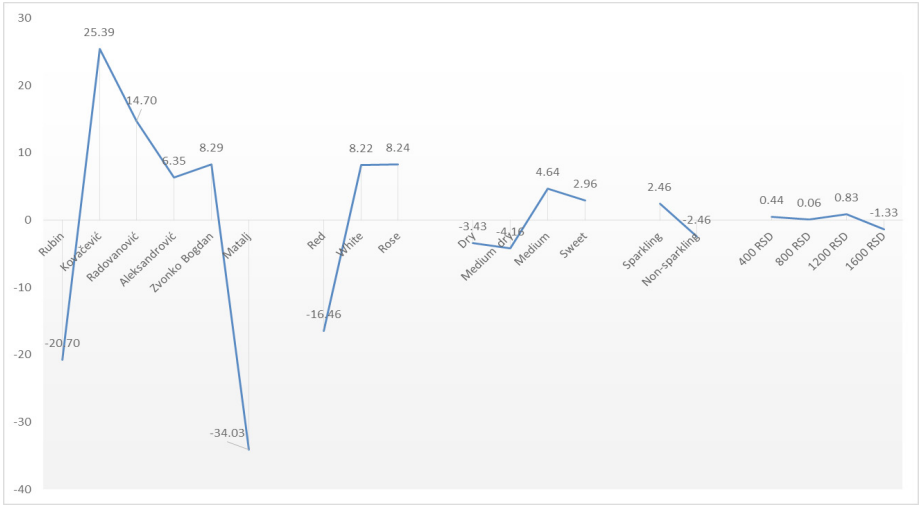
Figure 1. Relative importance of attributes (in %)



Source: Authors' calculations

A more detailed insight into averaged preferences toward attribute levels (part-worths) is given in Figure 2. When it comes to the most significant attribute, Winery, respondents most prefer Kovačević, followed by Radovanović. The least desirable are Matalj and Rubin. On average, respondents almost equally prefer white and rose, and at least red wine, with an affinity for sweeter and sparkling wines. Looking at the price attribute, it can be seen that there is no significant difference between the utilities attached to it levels (price points), with the slightly higher part-worth assigned to the price of 1200rsd. At first glance, respondents do not seem to be price sensitive, which is not in line with findings in the literature where price is one of the most important factors. We further used socio-demographic and psychological variables (gender of the respondents and willingness to try new tastes and wines) to define segments a priori, and to test whether they differ in preferences and behavior.

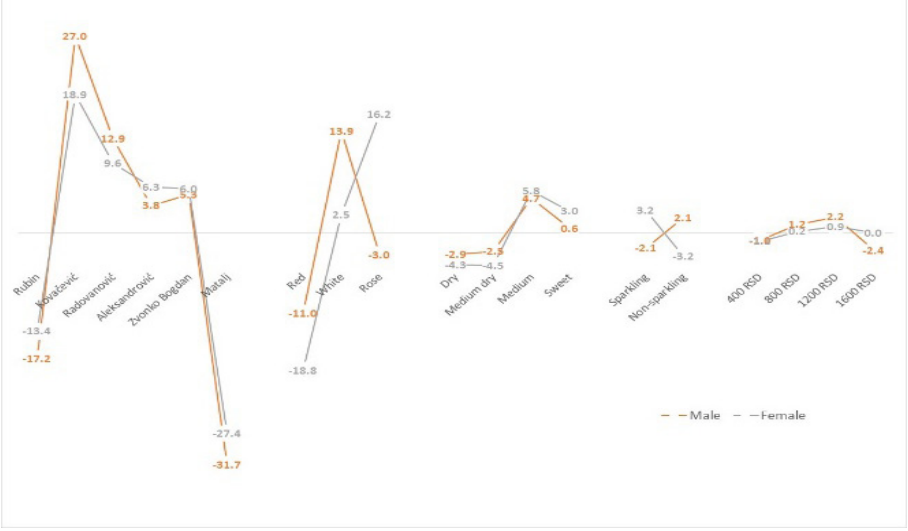
Figure 2. Averaged part-worth utilities

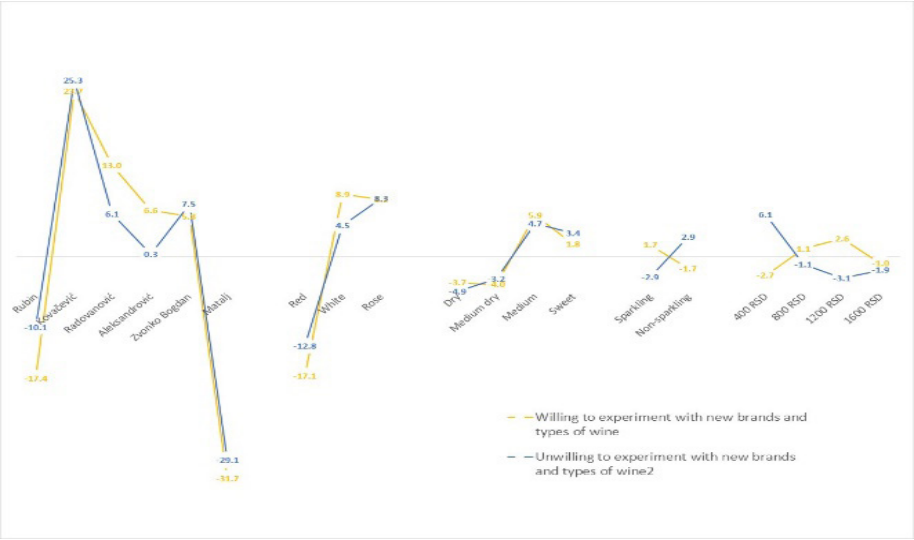


Source: Authors' calculations

As can be seen from Figure 3, there are some differences among the segments when it comes to the importance of attributes. Winery and Price are more significant for men than for women, who in turn, attach more importance to the remaining three attributes. This is especially true for the Type attribute. Furthermore, women prefer sparkling, medium or sweet rosé wines, while men prefer non-sparkling white wines. Those who are unwilling to try new brands and types of wine, attached more importance to the attribute Price and less to the Type attribute than other groups of respondents. They prefer cheap non-sparkling rose wines, unlike the so-called "adventurists" who prefer expensive sparkling white wines.

Figure 3. Segment level part-worth utilities





Source: Authors' calculations

Post hoc segmentation

Aggregated data often blur the real picture of respondents' preferences due to their averaging. The same applies to the preferences of segments defined a priori based on socio-demographic data. This can be overcome by the use of preference-based segmentation procedure. A more detailed analysis of individual part-worth utilities revealed heterogeneity in consumer preferences, so three distinct groups representing authentic market segments were isolated using K-means cluster analysis: dry red wine fans (Cluster 1), sweet rose wine fans (Cluster 2), and expensive white wine fans (Cluster 3). The solution was sought for two, three and four segments, but the three-segment solution proved to be best fit, both in terms of the segments size and sum of squared deviations between part-worth utilities in different segments. Table 3 shows the relative importance of attributes within each segment.

Although price has proven to be the least important attribute throughout the sample, it can be noted that it is significantly more important at the segment level. This result indicates that averaging can cause the loss of important information related to respondents' real preferences, which may be reflected in the wrongly defined market strategy. Similar observations are made for other attributes as well. Once the clusters were identified, socio-demographic data were used to further profile consumers.

Table 3. Relative importance of attributes (in %)

	Winery	Type	Sweetness	Sparkling	Price
Cluster 1	33.10	**35.16**	10.99	8.61	12.14
Cluster 2	22.17	**38.22**	17.78	4.40	17.43
Cluster 3	**39.57**	31.91	2.80	7.27	18.44

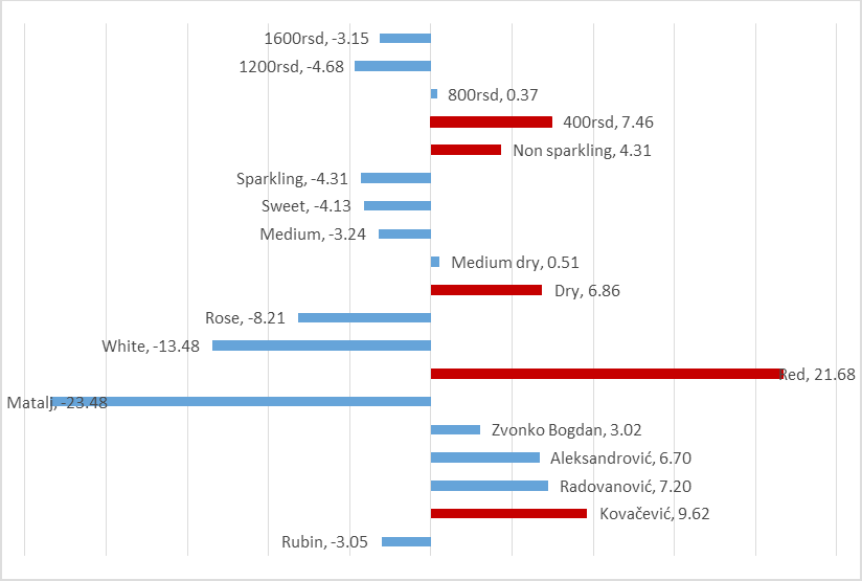
Source: Authors' calculations

The Cluster 1 covers 26.25% of the respondents and consists mostly of employed male respondents, who regularly consume wine, most often at home. This cluster includes respondents who especially prefer the red wine (which is in sharp contrast with the sample as a whole) and usually consume it (54%), so it is not surprising that they find the Type to be the most important attribute (35.16%). Somewhat less important is the attributes of Winery (33.10%), where respondents prefer Kovačević, Radovanović and Aleksandrović wine brands. The other three attributes are significantly less important to this cluster, even though members prefer non-sparkling dry wines, with the price of up to 800rsd (see Figure 4).

Most of the members of Cluster 1, 58.73% of them, have monthly earnings per household member over 50000 (app. 420 euros), of which 31.75% exceeds 75000 rsd. 44.45% of cluster members consume wine at least once a week, usually 2 glasses, most often at home (31.75%), and rarely in a club or tavern (14.29%).

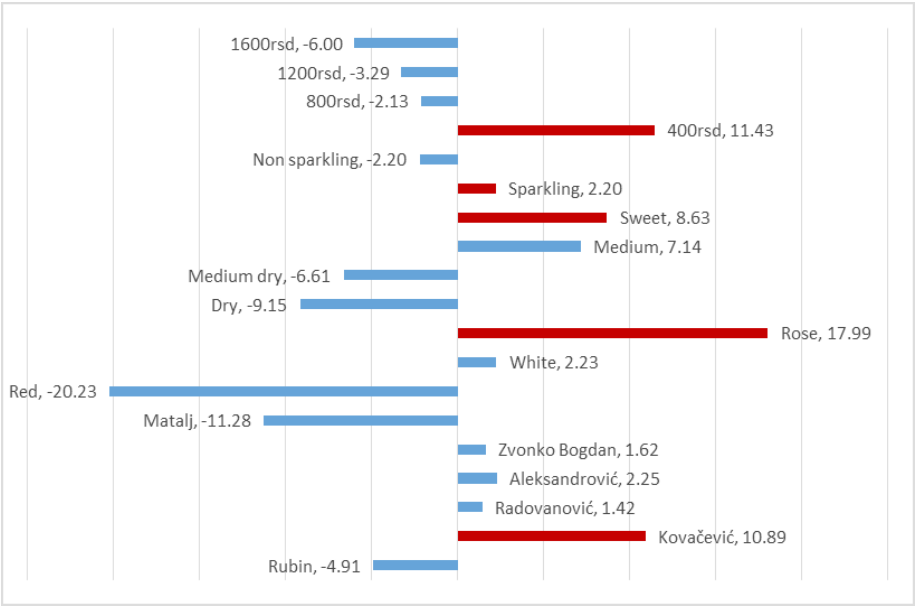
The second, slightly larger cluster consists of 73 respondents (30.42%). The most important attribute for this segment is also Type (importance value = 38.22%), but respondents belonging to this cluster prefer rose wine, and to some extent white, at the same time showing considerable aversion towards red wine (see Figure 5). The Winery attribute is much less important for this cluster than for Cluster 1. In the same time, members of the Cluster 2 prefer the Kovačević brand wine by far more than the brands of other wineries. Sweetness and price are approximately equally important attributes (about 17%), whereby respondents prefer sweeter wines at a price of 400rsd. Cluster members are very price sensitive, with an aversion to the more expensive wines (price of 800 rsd and above), which can be concluded on the basis of the negative part-worths for all price levels except for 400 rsd.

Figure 4. Preferences of Cluster 1



Source: Authors' calculations

Figure 5. Preferences of Cluster 2

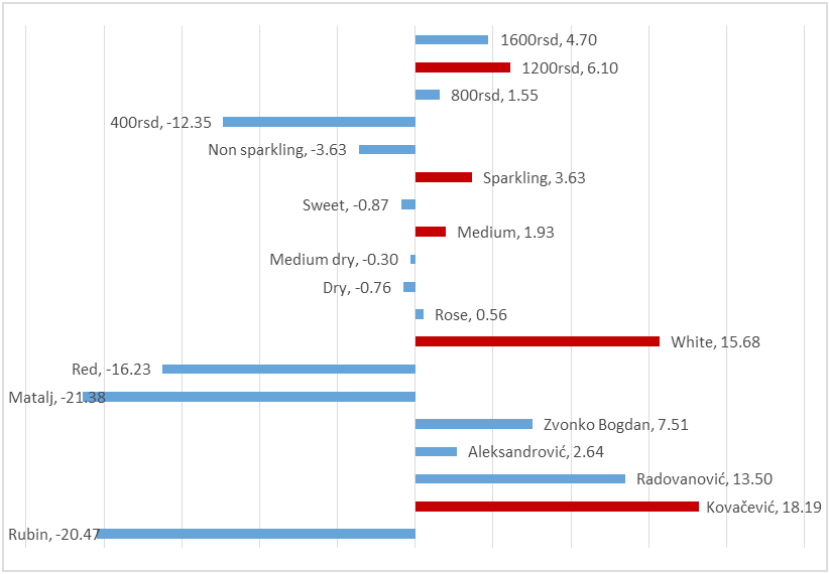


Source: Authors' calculations

The demographic data shows that the majority of the respondents in this segment are young women, with lower earnings and education than the remaining two segments. In fact, as many as 63.2% of them have incomes lower than RSD 50,000. Members of this segment are least willing to try new flavors and less often consume wine than other clusters. They usually drink rose (49.32%) or white wine (35.62%), while only 15% cluster members consume red wine. When it comes to the place of consumption, they prefer a restaurants or a friend's place, rarely drinking in their own home.

Cluster 3 is the largest one (43.33% of total sample) with Winery as the most important attribute (39.57%). Members of this cluster prefer Kovačević and Radovanović brands, followed by Zvonko Bogdan. Again, Matalj and Rubin are the least popular wine brands (see Figure 6). The type of wine is the second by importance attribute, whereby the respondents prefer white wine, but have an aversion to red. This cluster is price-sensitive, although the respondents' preferences to price levels are unexpected. In fact, respondents prefer more expensive wines, which can be due to the fact that they use price to conclude about the quality and value of a wine. Moreover, the quality wines of the favourite Serbian producers are exactly in the price range that the members of this cluster prefer. Although sweetness is negligible important attribute for this cluster (only 2.8%), respondents prefer semi-sweet (medium) sparkling wines.

Figure 6. Preferences of Cluster 3



Source: Authors' calculations

Members of cluster 3 have higher incomes than other clusters, with as many as 39.42% of them earning over 75,000rsd per household member. Over 40% of cluster members consume wine at least once a week, with 16.35% who consume it every day, usually 2 or 3 glasses. As many as 66.35% of them mainly choose white wine, which is in line with revealed cluster preferences, while only 13.45% cluster members drink rose wine. They most commonly consume wine in a restaurant (40.38%) at home (31.75%), and least frequently in clubs or pubs (14.29%). Of all the clusters, this one is the most willing to try new flavors and wines.

Conclusions

Due to the large number of different cues that can influence consumers' purchasing decision, the choice of wine is complex task and can be confusing. These cues are typically associated with the physical characteristics of the wine as well as extrinsic attributes such as price and brand, labels and the like. Consequently, understanding how consumers choose wine is a great challenge for both researchers and practitioners.

In this paper, we examined the importance that consumers in Serbia attach to the key attributes of local wine brands. In addition to the brand, four other attributes were considered: price, type of wine, sweetness and whether it is sparking or still. Consumer preferences were modeled using a discrete choice model, while a hierarchical Bayes method was applied to calculate the individual utilities assigned to attribute levels.

The average results of the sample at whole indicated the high importance of brand attributes as well as the negligible importance of price. However, heterogeneity in preferences was

observed and three unique segments were identified using k-means cluster analysis. These segments differ primarily in the type of wine they favor, but also in whether they like sweet and sparkling wines or not. Price has proven to be a moderately significant attribute in all three clusters, while Kovačević is the preferred brand.

The findings of this study represent the first empirical insights into individual preferences of consumers in Serbia according to wine characteristics using discrete choice analysis. However, since 40% of the sample drinks wine at most once a week, the question arises as to whether or not the preferences of true wine connoisseurs have been discovered. Future research should be directed towards revealing the preferences of the quality wines connoisseurs.

Conflict of interests

The authors declare no conflict of interest.

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ANALYZING FINANCIAL PERFORMANCES AND EFFICIENCY OF THE RETAIL FOOD IN SERBIA BY USING THE AHP – TOPSIS METHOD

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ARTICLE INFO

Original Article

Received: *06 November 2019*

Accepted: *04 March 2020*

doi:10.5937/ekoPolj2001055L

UDC 658.14/.17:330.342]:339.372 (497.11)

Keywords:

efficiency, retail food, Serbia, AHP, TOPSIS

***JEL**: L81, M31, M41, O32*

ABSTRACT

The aim and purpose of this paper is to point out to the quality of financial performance and efficiency of food retailers in Serbia, as well as measures for improvement in the future, based on theoretical knowledge and empirical analysis using AHP-TOPSIS methods. The problem of analyzing the financial performance of all companies, which includes trading companies, is very topical, significant and complex. Consequently, mathematical methods and models have lately been increasingly used. With this insight in mind, this paper investigates the financial performance and efficiency of food retailers in Serbia using AHP and TOPSIS methods. Of all the observed optimization criteria (cost of goods sold, operating costs, gross margin and net profit), the most significant was the cost of goods sold. The most efficient food retailer in Serbia is Aman. The Mercator-S Company is inefficient. In order to improve the efficiency of food retailers in Serbia, it is necessary to apply the Western business models (private brand, multichannel sales, organic food sales and others), the concepts of strategic management accounting and to strengthen the digitalization of business.

Introduction

Given its importance, this paper's research subject is to measure the efficacy of food retailers in Serbia, such as analysis in Western literature (Danielle at el., 2019; Jacob at el.,

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2019; Jian at el., 2019; Kalpana at el., 2019; Yonggan at el., 2019). The aim and purpose of this research is to determine the factual state based on which adequate measures for improvement in the future will be suggested.

As is well known, a very rich body of literature is devoted to the general issue of applying the DEA analysis in evaluating company performance (Hwang, 1981; Hwang, 1995; Andersen, 1993; Yousefi, 2010; Li, 2014, 2017; Tsolas, 2015). It is also richer in terms of application in the retail sector (Bhargava, 1998; Karan, 2008; Keener, 2013; Kingyens, 2012; Konuk, 2018; Lau, 2013; Manini, 2018; Martini 2017; Pang, 2013; Parades , 2014; Rogova, 2018; Simbolon, 2017; Trejo, 2017; Zaernyuk, 2016; Üçüncü, 2018; Urbonavičiūtė, 2019). Recently, in the Western literature, in addition to the DEA methods, AHP methods have been used (Chang, 1996) as well as the TOPSIS method. As far as literature in Serbia is concerned, it is, to our knowledge, very poor in this regard, only in some works the AHP and DEA methods are partially applied (Lukic, 2011a, b; 2018, 2019; Lukic, 2018; Popovic, 2018) , which is not the case with the TOPSIS method. This void should be filled to a certain extent by this work, which should reflect its scientific and professional contribution among other things.

From the very nature of the problem addressed in this paper, the basic hypothesis of the research itself arises: knowledge of the current financial situation of food retailers in Serbia is a prerequisite for improvement in the future. This can be easily achieved by taking adequate measures.

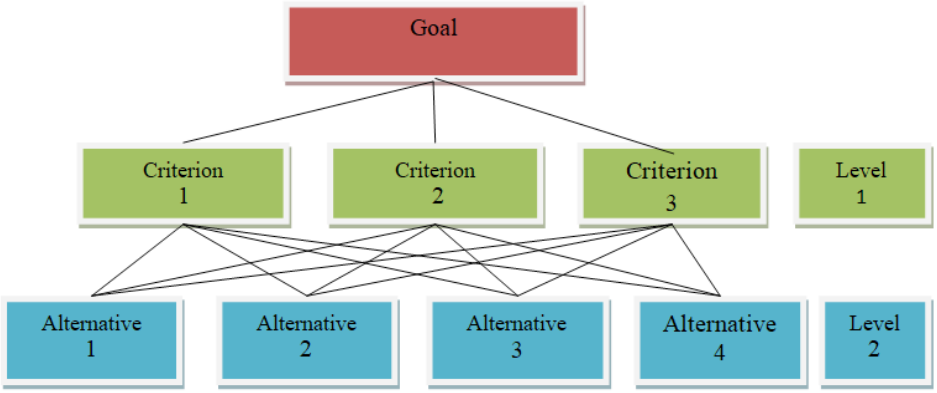
The research of the given hypothesis in this paper is based on the application of the AHP and TOPSIS methods. For the sake of comprehensiveness, ratio analysis and statistical analysis are here used to a certain extent.

For the purpose of investigating the treated problem in this paper, empirical data were taken from the Business Registers Agency of the Republic of Serbia. They are "manufactured" in accordance with relevant international standards and there are no restrictions on their global comparability. This completely refers to the data obtained in this research.

Materials and methods

The Analytical Hierarchy Process Method (AHP) is a multi-criteria decision making recommended by Thomas Saaty in the 1970s (Saaty, 1970; Saaty 1980; Saaty, 2001; Saaty, 2008). It is used to solve complex structural hierarchical problems of decision-making and weighting coefficients (ponders) for each criterion (Harker, 1987; Hanie, 2016; Stojanovic, 2016). Figure 1 shows an example of a hierarchy in AHP.

Figure 1. An example of hierarchy in the AHP



The analytical hierarchical process method is based on the following axioms (Saaty, 1986; Harker, 1987; Alphonce, 1997):

The reciprocity axiom: If element A is *n* times more significant than element B, then element B is *1/n* times more significant than element A.

The homogeneity axiom: Comparison makes sense only if the elements are comparable.

The dependency Axiom: It is allowed to compare between a group of elements of one level with respect to higher elements, i.e. lower-level comparisons depend on higher-level elements.

The expectations axiom: Any change in the structure of the hierarchy requires an estimate of priorities in the new hierarchy.

Each comparison of the two elements of the hierarchy (model) is made using the Saaty's value scale (*Table 1.*).

Table 1. Saaty's value scale

Importance intensity	Definition	Explanation
1	Equal importance	The two elements are of identical importance with respect to the goal.
3	Weak dominance	Experience or reasoning slightly favors one element over another.
5	Strong dominance	Experience or reasoning favors one element a lot more than the other.
7	Demonstrated dominance	The dominance of one element is confirmed in practice.
9	Absolute dominance	The highest degree dominance
2,4,6,8	Intermediate values	A compromise or further division is needed.

Source: Saaty, 2008

The analytically hierarchical process (AHP) method proceeds through the following steps (Saaty, 2001; Saaty, 2008; Hanie, 2016; Stojanovic, 2016):

Step 1: Forming a pairwise comparison matrix

$$A = [a_{ij}] = \begin{bmatrix} 1 & a_{12} & \cdots & a_{1n} \\ 1/a_{12} & 1 & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ 1/a_{1n} & 1/a_{2n} & \cdots & 1 \end{bmatrix} \quad (1)$$

Step 2: Normalization of the pairwise comparison matrix

$$a_{ij}^{*} = \frac{a_{ij}}{\sum_{i=1}^{n} a_{ij}}, i, j = 1, \ldots, n \quad (2)$$

Step 3: Determining relative importance, i.e. weight vectors

$$w_i = \frac{\sum_{i=1}^{n} a_{ij}^{*}}{n}, i, j = 1, \ldots, n \quad (3)$$

Consistency index - CI is a measure of deviation of *n* from λ_{max} and can be represented by the following formula:

$$CI = \frac{\lambda_{max} - n}{n} \quad (4)$$

If CI <0.1, the estimated values of the coefficients a_{ij} are consistent and the deviation of λ_{max} from *n* is negligible. This means, in other words, that the AHP method accepts an inconsistency of less than 10%.

Using the consistency index, the consistency ratio CR = CI / RI can be calculated, with RI being a random index. *Table 2* gives random consistency indices.

Table 2. Random consistency indices

Matrix size (a number of criteria) (n)	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

Source: Hanie, 2016

The TOPSIS *(Technique for Order Preference by Similarity to Ideal Solution)* method has been used very successfully in evaluating companies' financial performance (Üçüncü et al., 2018). It is a multi-criteria decision-making technique first developed and applied by Hwang and Yoon (1981). (Hwang, 1981; Hwang, 1995). According to this method, alternatives are determined by their distances from the ideal solution. The goal is to choose the optimal alternative that is closest to the ideal solution, i.e., farthest from the negative ideal solution (Young, 1994). A positive ideal solution maximizes utility, that is, minimizes costs (in relation to a given problem). In contrast, a negative ideal solution maximizes costs, i.e. minimizes utility (Yousefi 2010; Wang 2007).

The TOPSIS method consists of 6 steps (Üçüncü et al., 2018).

Step 1: Create an Initial Matrix

The initial matrix A_{ij} shown with *"m"* denotes the alternative number and with *"n"* the number of criteria:

$$A_{ij} = \begin{vmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{vmatrix}$$

Step 2: Formation of the Weighted Normalized Decision Matrix

The normalized decision matrix (R_{ij}; i = 1,…, m; j = 1,…, n) is determined by the equation (14) with the elements of the matrix A_{ij}:

$$r_{ij} = \frac{a_{ij}}{\sqrt{\sum_{i=1}^{m} a_{ij}^2}} \qquad (5)$$

$$t = 1,2,3,\dots,m \qquad j = 1,2,3,\dots,n$$

$$R_{ij} = \begin{vmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{vmatrix}$$

In the equation (6) the weight measure *"j"* is represented by W_{ij}. The weighted normalized decision matrix *(V_{ij}; i = 1,..., m; j = 1,..., n)* was determined using the equation (6) with the elements of the normalized matrix:

$$V_{ij} = W_{ij} * r_{ij} \qquad (6)$$

$$i = 1,2,3,\dots,m \qquad j = 1,2,3,\dots,n$$

Step 3: Determine the Positive and Negative Ideal Solution

The value of the positive-ideal solution *(A^+)* and negative-ideal solution *(A^-)* is determined from the value of the weighted normalized matrix *(V_{ij})*. A^+ is better and A^- is a worse performance score.

The value of the positive-ideal solution *(A^+)* and the negative-ideal solution *(A^-)* is determined as follows (equation (7) and (8) respectively)

$$A^+ = \{v_i^+,\dots,v_n^+\} = \left\{\left(\max_i v_{ij}, j \in j\right)\left(\min_i v_{ij}, j \in j'\right)\right\}\ i = 1,2,\dots,m \qquad (7)$$

$$A^- = \{v_i^-,\dots,v_n^-\} = \left\{\left(\min_i v_{ij}, j \in j\right)\left(\max_i v_{ij}, j \in j'\right)\right\}\ i = 1,2,\dots,m \qquad (8)$$

where *j* is related to the benefit criterion, and *j'* is related to the cost criterion.

Step 4: Determine special measures (i.e. distance of alternatives from the ideal and negative-ideal solution)

The distance from the positive-ideal solution (S_i^+) and the negative-ideal solution (S_i^-) for each alternative according to the given criterion is determined using equations (9) and (10).

$$S_i^+ = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^+)^2} \qquad (9)$$

$$S_i^- = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^-)^2} \qquad (10)$$

$$i = 1,2,3,\dots,m \qquad j = 1,2,3,\dots,n$$

Step 5: Determine the coefficient of relative closeness to the ideal solution

Specific measures of positive-ideal solution (S_i^+) and negative-ideal solution (S_i^-) were used to determine the relative closeness to the ideal solution (C_i^+) for each decision point. C_i^+ represents the relative closeness to the ideal solution and takes a value in the range $0 \leq C_i + \leq 1$. "C_i^+" = 1 indicates the relative closeness to the positive-ideal solution. "C_i^+" = 0 indicates relative closeness to the negative-ideal solution.

The relative closeness to the ideal solution (C_i^+; i = 1,…, m; j = 1,…, *n*) was determined using the equation (11):

$$C_i^+ = \frac{S_i^-}{S_i^- + S_i^+} \qquad (11)$$

$$i = 1,2,3,\dots,m$$

Step 6: Sort the alternatives according to relative superiority

Determining the relative superiority of the score represents the company's realized performance. High scores correlate with better performance. The results can be used to determine company's rankings within the industry (Üçüncü et al., 2018).

Results and discussion

Table 3 shows some financial indicators of the performance of selective major food retailers in Serbia for 2018.

Table 3. Some indicators of financial performance of selective food retailers in Serbia, 2018

	Gross margin/Sales (%)	Operating costs/Sales (%)	Net profit/Sales (%)
Delhaize Serbia	30%	27%	3%
Mercator-S	21%	23%	-2%

	Gross margin/Sales (%)	Operating costs/Sales (%)	Net profit/Sales (%)
DIS trade	10%	9%	1%
Aman	17%	14%	2%
Univerexport	23%	23%	0%

Note: Author's calculation

Source: Agency for Business Registers of the Republic of Serbia

There are therefore significant differences in the gross margin rate between observed food retailers. They range from 10% (DIS stores) to 30% (Delhaize Serbia). These differences are in their own way reflected in their efficiency, since operating expenses (business expenses) are covered by gross margin as the difference between the sale and the purchase value of goods sold and the rest is net profit. *Table 4* presents the statistics of input / output data as criteria used to evaluate the effectiveness of selective food retailers in Serbia for 2018 using the AHP and TOPSIS methods.

Table 4. Data input / output statistics

		(I) Purchase value of goods sold (in millions of RSD)	(I) Operating costs (in millions of RSD)	(O) Gross margin (in millions of RSD)	(O) Net profit (in millions of RSD)
Delhaize Serbia		70666	27157	29822	2665
Mercator-S		65054	19376	17714	-1662
DIS trade		17490	1840	1879	39
Aman		14256	2451	2871	420
Univerexport		14236	4309	4339	30
Statistics of Input / Output Data					
Max		70666	27157	29822	2665
Min		14236	1840	1879	-1662
Average		36340.4	11026.6	11325	298.4
SD		25823.9	10324.4	10885.4	1385.5
Correlations					
Purchase value of goods sold	Pearson Correlation	1	.979**	.952*	.185
	Sig. (2-tailed)		.004	.013	.766
	N	5	5	5	5

		(I) Purchase value of goods sold (in millions of RSD)	(I) Operating costs (in millions of RSD)	(O) Gross margin (in millions of RSD)	(O) Net profit (in millions of RSD)
Operating costs	Pearson Correlation	.979**	1	.993**	.349
	Sig. (2-tailed)	.004		.001	.565
	N	5	5	5	5
Gross margin	Pearson Correlation	.952*	.993**	1	.458
	Sig. (2-tailed)	.013	.001		.438
	N	5	5	5	5
Net profit	Pearson Correlation	.185	.349	.458	1
	Sig. (2-tailed)	.766	.565	.438	
	N	5	5	5	5
**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).					

Source: Agency for Business Registers of the Republic of Serbia. Author's calculation of input / output statistics using DEA - Solver and SPSS software

In the further presentations of the problem, we will examine the effectiveness of selective food retailers in Serbia for 2018 using the AHP/TOPSIS method (*Table 5*). Weighting criteria were determined using the AHP method (CR =1.9%). In this particular case, therefore, in the order of importance of the criteria, the situation is as follows: purchase value of goods sold, operating expenses, gross margin and net profit. This is quite understandable given the fact that the cost of goods sold represents the most important investment in the trade sector. Operating costs are very significant in commerce and most of them relate to employee earnings. Employee earnings affect employees' motivation to achieve the best possible sales. Gross margin yield from inventories is a significant indicator of trade performance. And the return on net sales is also a significant indicator of trade performance. For these reasons, the relevant optimization criteria were chosen in this paper. The optimization criteria in this case are designated as: C1 - cost of goods sold, C2 - operating costs, C3 - gross margin and C4 - net profit. The alternatives are: A1 - Delhaize Serbia, A2 - Mercator-S, A3 - DIS store, A1 - Aman and A5 - Univerexport. (Data was processed using AHP Online System - AHP-OS, and ARASSoftware.xlsx.)

Table 5 shows the initial decision matrix.

Table 5. The initial decision matrix

weights of criteria	0.533	0.321	0.082	0.064
kind of criteria	-1	-1	1	1
	C1	C2	C3	C4
Delhaize Serbia	70666	27157	29822	2665
Mercator-S	65054	19376	17714	-1662
DIS trade	17490	1840	1879	39
Aman	14256	2451	2871	420
Univerexport	14236	4309	4339	30
MAX	70666	27157	29822	2665
MIN	14236	1840	1879	-1662
0-Optimal Value	14236	1840	29822	2665

Table 6 shows the normalized decision matrix.

Table 6. The normalized decision matrix

weights of criteria	0.533	0.321	0.082	0.064
kind of criteria	-1	-1	1	1
	C1	C2	C3	C4
0-Optimal Value	0.2362	0.2994	0.3450	0.4580
Delhaize Serbia	0.0476	0.0203	0.3450	0.4580
Mercator-S	0.0517	0.0284	0.2049	0
DIS trade	0.1923	0.2994	0.0217	0.0067
Aman	0.2359	0.2247	0.0332	0.0722
Univerexport	0.2362	0.1278	0.0502	0.0052

Table 7 shows the weighted normalized decision matrix.

Table 7. Weighted normalized decision matrix

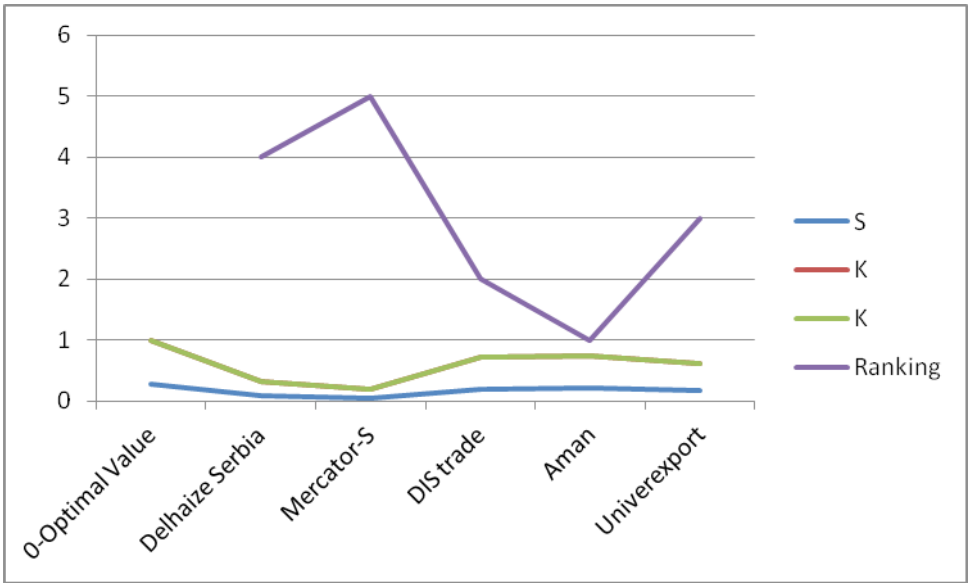
	C1	C2	C3	C4
0-Optimal Value	0.1259	0.0961	0.0283	0.0293
Delhaize Serbia	0.0254	0.0065	0.0283	0.0293
Mercator-S	0.0276	0.0091	0.0168	0
DIS trade	0.1025	0.0961	0.0018	0.0004
Aman	0.1257	0.0721	0.0027	0.0046
Univerexport	0.1259	0.0410	0.0041	0.0003

Table 8 and *Figure 2* show the ranked decision matrix.

Table 8. Ranked decision matrix

	S	K	K	Ranking
0-Optimal Value	0.2796	1	1	
Delhaize Serbia	0.0895	0.3200	0.3200	4
Mercator-S	0.0535	0.1913	0.1913	5
DIS trade	0.2008	0.7181	0.7181	2
Aman	0.2052	0.7340	0.7340	1
Univerexport	0.1714	0.6130	0.6130	3

Figure 2. Ranked decision matrix



We can therefore conclude that Aman is an efficient food retailer in Serbia. It is followed by the following companies respectively: DIS store, Univerexport, and Delhaize Serbia. Inefficient is, understood broadly, the Mercator-S Company.

Conclusions

The research conducted in this paper in the context of measuring the efficiency of food retailers in Serbia using the AHP method has shown that the importance of certain criteria is as follows: purchase value of goods sold, operating costs, gross margin and net profit. The cost of goods sold and operating expenses are inputs and gross margin and net profit are outputs. The goal is to maximize yields with given resources. In our opinion, the given optimization criteria, given the nature of the business of food retailers, are very significant.

The results of the research in this paper that used the TOPSIS method show that an efficient food retailer in Serbia is Aman which is followed by the following companies respectively: DIS store, Univerexport, and Delhaize Serbia. An inefficient food retailer in Serbia is the Mercator-S Company.

In order to increase the efficiency of food retailers in Serbia in the future, it is necessary, in principle, to apply new business models which are in line with the Western model (private brand, multichannel sales, organic food sales and others), and concepts of modern strategic management accounting. Likewise, business digitalization needs to be improved.

Conflict of interests

The authors declare no conflict of interest.

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CYBERNETICS IN FUNCTION OF AMBITIOUS FUTURE OF AGRICULTURE

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ARTICLE INFO

Original Article

Received: *25 February 2020*

Accepted: *06 March 2020*

doi:10.5937/ekoPolj2001069T

UDC 007:338.43

Keywords:

cybernetics, digitalization, accounting, agriculture, robotization.

JEL*: Q18,M41*

ABSTRACT

Cybernetics deals with basic laws of management, managing systems and systems that are being managed. It is about organization complex of different elements and mutual influences bonded in a system. That bond functions based on feedback, companies management evaluates information that are causing new commands to emerge which can correct work in accordance with delegated task. By mobilizing large number of scientific disciplines and ways, cybernetic has become a science of mutual regularity of management. Mathematical logic and theory of algorithms (base of digitalization) have benefited from cybernetics. Theory of recognition occurs. AI and isomorphism have happened that are characterized by equality of forms and it doesn't bypass agriculture, which is manifested through: ground analysis, choice of planting material, prescription for treatment and processing procedures, storage, transport and distribution. Robotization, IT, AI and digitalization make up symbiosis of action for achieving ambitious goals of agriculture.

Introduction

Everything is a system. Starting from stars all the way to atoms, and further, exists if we admit its existence. Natural systems have come to be, grown out in some spontaneous way, and social organizations were constructed. This understanding is expressed in accordance with an enterprise that is seen as efficient and a purposeful creation, whose shaping and lead is solely based in purposeful rational, and goal oriented action. Small and medium enterprises are a result of rational behavior of decision makers. Can evolution be fast forwarded? Difficult. Is it, however, possible to fast forward social and economic processes? The answer is yes, but with logistic approach. Science is growing by the law of exponential growth. Science is growing similarly as population,

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and population is growing proportionally to latest generation. Science grows in proportion to mass of knowledge that was achieved and left by the last generation (De Solla Price, 1963). Exponential growth cannot go beyond because it would achieve absurd measurements, which in real world would not allow its implementation, and every system that becomes absurd, necessarily falls apart. That is why, after period of exponential growth, comes to transition in logistic (mechanism of break and balance), and after certain period we again have exponential, and logistic growth in continuity of occurrence and mutability. It is similar with differentiation and integration of science. Differentiation represents movement of science from real to abstract, while integration represents elevation from abstract toward specific in thoughts of science as a whole (Tomin, 1974). Because of the fact that topic of agriculture includes IT, robotics, digitalization, evolution, where all their missions are, through adaptation, pointed on results, it is important to explain their dependencies. Need for connection abides that integration of science in one organic whole becomes dialectic process. It becomes wider and deeper. It has come to scientific fields that are connecting sequences of scientific disciplines. Integration of knowledge in these cases takes big scales that make primary disciplines closer to the case where they are losing their identity in new integrated science.

Cybernetics in process of cybernization and digitalization

Thanks to processes of integration of knowledge in research of reality, it has come to occurrence of cybernetics. What does digitalization and result oriented process' contain, in comparison to creation and growth of value for different interest groups that have consolidated result? Where do science and technology lead us? Are both of them heading for next day and are not turning back. Who mastered them and adapted to them will last, and who did not will disappear. If some achievement, regardless of thinking characteristic of innovative achievement isn't realized, it will mean that it was not worth it.

Fundamental categories of natural sciences: space, time, matter, movement, causality, is a result of Newton's parsing of nature into different fields, based on conceptual characteristics. Newton, basically parsed unique matter in movement in matter deprived of self movement to a movement whose source is the "force", which acts from the outside on matter. We have come to globalization based on alignment with law of movement of matter, which we observe as "expression of force and power". That force and that power are demonstrated by robotics and IT and digitalization. All of these occurrences are making us be more forthcoming. Ways for the future are requesting changes in economic and social ambient. New working culture is needed and new dynamic of cultural changes, that come as milestone of renewing strategy, reconstruction strategy, modernization strategy or strategy for evolution of new age. Help for adequate reaction

can be found in modification of Newton's laws on cultural changes[2]. Starting with basic Newton's laws, we will make small vocabulary modifications without bypassing intuitions in order to achieve process of adaptation toward phenomenon of cultural change in organizations (Davidson, 1995).

First law: behavior of an organization will not change unless and external force makes action on it (technical progress, competition).

Rare are organizations that are facing need for making a significant inner change without any significant influence from external forces that are acting from the environment that refer to it. If success of an organization can be seen as a value of outputs placement in function of time, than characteristics and quality of output are not good. Reasons for their acceptance and active feedback are found in environment. Under the influence of main categories of real and potential customers, inner reactions of enterprises on challenges from the outside are achieved.

Second law: amount of changes will be directly proportional to amount of effort that is being input.

"Amount of effort" asks a question about efficiency of different types of efforts and clearly points out that main change of strategy requires main changes in sources of obligations, this procedure is not automatically followed with requests for behavior changes.

Third law: resistance of organization for change will be the same value but different direction from the amount of tries that have been put in that change.

As Davidson M. Says in his book "The Transformation of Management", this law keeps changer awake at night. The more the organization is homogenous, historically successful and natural in its essence, the less "sleep" will changers expect. The stronger the culture, the stronger the thrust. If it cannot find a way to channel outside resistance, result is a pat position. If changers are in minority and represent the only source of external force (1st law), their chances for making important decisions are small.

Biggest aspect of culture in total culture of mankind manifests in cultural work that has productivity as side effect (Todosijević, 2010). In Serbian economy, effects of production work are very low, because for one hour of work we pay much more than highly developed countries. Just like in many European countries, propulsive sectors such as tourism, agriculture, IT, represent a potential development opportunities (Jovanović & Ilić, 2017).

2 Newton's laws:
1. An object will stay in place or will keep moving on a straight line path with constant speed until a different force makes action on it.
2. Change of speed of movement of an object is directly proportional to the force that is acting on it.
3. Action and reaction, by which two objects are acting on one another, is always equal and opposite by direction of action.

With growth of cultural levels and expressions of effects of production work competitive position of an enterprise will grow alongside economy as a whole. Withholding high level of success is a manifestation of competitive healthy position of an enterprise.

We need to point out a stand of closing natural, technical and social sciences, where natural and technical sciences are an answer for problems dictated by evolution of society. Research has shown high correlation between divergent thinking and creative abilities.

Informatics society

It is important to pay attention to two aspects of information: as stimulating factor and as mobilizing forces. There are process of information exchange in front of us for planned development of society, whose actions must be subjected to management and control. It is on managing duties to define who and when will achieve these activities. Idea of globalization does not confirm with any significant and timely experimental conception of historical development. Does this idea, in the essence, throw away uniqueness of process of development of every human activity or specialty of civilizations? We think that pointers are always toward specialties regardless of many.

It is obvious that in the essence of the management process in modern conditions must be a developed, new and strong education system, capable of gathering, processing, selecting and distributing large amount of structured information.

There is no production of new knowledge on internet, but presentation of current, is why network has several times enlarged possibility of achieving communications. Internet - it is at the same time, mean and environment of virtualization of society, due to professions of many people and their relationships with one another are changing reality. This change goes in all aspects of life (Čogovadze, academic, deputy president of executive advisory, UNESCO). If we understand intellectual production as creation of new information from known information, then convergent thinking can relate to production of new information that is maximally determined with existing and known information. Convergent thinking, which makes up base of creativity, represents substitution of intellectual research effort in terms of seeking for different answers, from which, not one is determined in advance. Associative theory looks at experience and repetition for main elements of creative and innovative approach. Moment of choice (decision) comes as second most important element. Treasure of information (prior experiences and achievements) in evolutionary sense for both biological and technical systems promotes analogy. Based on methods of sounding mistakes, with new ideas we can associate on old problems. “Based on associative theory, creative thinking represents result of establishing connections and depends of amount of associations that can be found in scientists mind” (Osborn, 1959). Based on dependency between number of original ideas, we can point out that the greater the number of ideas, greater the probability of occurrence of original valuable ideas.

We will look at agriculture as a cybernetic system that is based on union of elements that are forming a degree of connection of elements in the system and the system with

surrounding (Lerner, 1975). Management of development comes from information about choice of action of management, and managing actions alone are formed based on information that are found in "commands" of management. If production of information relies on research, it stems that management is always connected with using research. Exchange of information between systems and surrounding, as well as inside of a system, is achieved with help of connections of different types through which information are flowing (Lerner, 1975). Network comes as the main characteristic of digitalization.

Special place in function of agriculture as a cybernetic system has a system of characteristic feedbacks, through which information about managing results are brought into the system. Thanks to function of feedbacks, agriculture as a cybernetic system is capable of coming out of projected boundaries of its action and influences that are pre set by managing decision. That is where large potential of cybernetic system for development reaction can be found. By accepting cybernetization, we are in reality going toward informatization, robotization, and digitalization because we are admitting and confirming existence of cybernetics, capable to answer, through mobilization of factors in favor of business, on all challenges from the future. Theory of regulation, theory of recognition and theory of systems have been present for a very long time and eventual ignorance of them cannot serve as an excuse. Need for enlargement and implementation of achieved from problematic imposes. It is about need of new way of reacting on components that are occurring and coming from the environment.

If, as a general goal of an organization we set permanent survival, only then can materialistic explanation come into fact of sustaining organization through constant absorption of information from outside world, about occurrences that are happening and process' that are ongoing in organization itself. To remind readers that cybernetics study managing systems in their movement and development and are characterized in relativity of position of action.

Under the influence of different actions, agriculture has ability to change in the movement and "production" of different states. That gives it ability to position in space (ability of selection) which depends from quality of management. Tie of agriculture as cybernetic system with environment of its action, can be shown in matter of quantitative characteristics independent from qualitative nature of specific ties. Agricultural field is managing entities with biological transformation or by collecting biological means for sales or processing in agricultural products or for creation of additional biological means (international accounting standard 41).

Accounting information system, as a sub system of integral system of informing an enterprise, not only correlated but determined to other sub systems, of integral information systems, with which, in a whole, represents a compatible system of informing. Other sub systems of business information system are made of: financial, procurement, market research, marketing, planning, constructive and technological, operative-technical, controlling, commercial, legal etc. With intention to generate complex information, relevant for making optimal, business decisions, it is needed

to integrate all of prior mentioned sub systems in a uniformed system of informing (Vidaković & Parnicki, 2017).

Agriculture as an economic branch and complex organizational system and sub system possesses potential possibilities for managing complex and complete organizational structure by establishing purpose for its nomenclature, essential parts and organizational systems far from thermodynamic balance. Digitalization will bring us closer to this phenomenon.

Accounting possesses all symptomatic features of an information system such as: goal, function, structure, behavior norm, input, output, result, documenting, whole, methodology, benefits for processing with modern means for data processing, as well as value (Vidaković & Parnicki, 2017). Accounting information system makes significant number of information sub systems, projected to offer operative information about specific activities of an enterprise. Projected sub systems of accounting information system are, on certain levels, connected into a unified accounting information system.

Accounting today is, and we are sure it will be tomorrow as well, a "bibliography" of an enterprise. Transformation will happen. We are witnesses that traditional accounting is becoming interactive accounting. With mobile glasses for data storage, facebook friends can meet in virtual reality anywhere in the world - thanks to 360° view. We are witnesses of work environment revolution thanks to digital transformation (Todosijević & Todosijević Lazović, 2018).

For a technician, accountant, physiologist, economist, agronomist, role of information and techniques of measurement and distribution represent a separate discipline. Starting with message theory, method of measuring quantity of information starts with a unit of information taken from a single decision (removing uncertainty) between two equally probable alternative outcomes. We come to an answer, that measurement of amount of information is defined as an algorithm of number of possible states of observed system. As a negative value, symmetric, with information, has been brought, one of the basic categories of statistical mechanics - entropy, measurement for disorganized is a system in the sense of amount of information in a system as a measure of its degree of organization. Information occurs as substitution for management and as a base for decision making, and making a decision means managing (Todosijević, 2010). By overcoming sharp systematic obstacles between structures, it came to development of basic theory of management and communication.

In this paper we rely on applied cybernetics, which includes questions of application of cybernetic conceptions in different aspects of human work, including agriculture (Parin & Bajevski, 1967). Development and changes of its state are basic characteristics of cybernetic systems.

Robotization and digitalization as cybernetic portfolio

In evolutionary sense, common research and development focuses on activity profile applications, production, services and virtual systems in the fields of autonomous

controlling processes, monitoring state and predictive technical and technological sustainability and improvement. Other focus points are IoT platforms (Internet of Things), digital infrastructures and standards for connecting elements of system structure with systems of new higher level or with peripheral devices. Besides that, new applications for data analysis must be developed mutually in order to generate valuable information from data and make possible for the system as a whole to develop. With technology based changes and innovation, need for new management technology of complex dynamic systems imposes.

In the world of growing uncertainty, change is a direction without a clear intention (Davidson, 1995). As nomadic tribes, modern companies, within their possibilities, define their development for competitive level, while in external environment the move from market to market in search for position to sustain their abilities. Winners are those who have knowledge and energy to develop special abilities and values for specific markets. Measure of business success in certain point is shown in financial means. Digitalization of economic and social sector with use of modern technologies in business process' opens a question of informatics and cybernetic security of digitalized structure and achieves a significant development in that direction. "Cognitive cybernetics are a new scientific discipline that based on cognitive founding and cognition as human mental charge , connects cybernetic intellection of all as a system (technical, social, natural etc.) with new intelligent technologies and to cognize of interactions show captologic antropomorfization of modern man" (Balaž & Meštrović, 2018). We recognize two main types of technological changes: quant and development (incremental). Quant technological change is fundamental movement in technology that has innovation of new goods and services as a consequence. Two examples of that technological change are development of internet that brought to revolution in computer industry and development of genetic engineering that promises evolutionary results. Evolutionary trends such as digitalization have brought to significant revisions of many current understandings. Radical changes are happening from a revolutionary perspective. That perspective warns of modesty, restraint and thinking of boundaries of possible. Cybernetic systems always inaugurate control. That also goes for management as the most important social function in shaping. Digitalization of economic and social sector with use of modern technologies in business processes asks of informatics and cybernetic security of digitalized structure and achieves a significant development in that direction (Todosijević Lazović, 2010). Modern industrial process and smart organizations, without of incorporation of intelligent technologies, could not function. It would come to radical discontinuity in performing business missions, crisis and devastation of system. Technology is included in all organizational activities and its rapid changes will make technological change be a significant factor in almost every innovation of an organization.

We are witnesses of transfer from evolutionary change of knowledge economy into economy of many dimensions, determinations and common changes (Zelenović, 2011). Evolutionary occurrence is a natural continuum of prior relations in world of labor and an introduction to digital Darwinism.

IT with characteristics of universal diffusion, digital processes, installed and programmed robots, simplify the process and steps and make control more efficient. Digital robotization of profiled capacity has in advance defined software, just like digital profiling of production sand services of an enterprise represents an inevitable process. This process is inducted and autonomous. Process of robot development, by following evolutionary tendencies, brought to bio-robots, and cyborgs. With development of genetic engineering we are closing AI to mimicking a human. In segments, it came to speech, memory, thinking and decision making. Sensors are copying human brain. Are we facing a chi as a peak of AI? Tendency of implementation of robots is in expansion. Thanks to digitalization that provides networking, it is possible with informatization to project a system that could combine several functions (https://publications.hse.ru). We observe modern development of an enterprise, through its ability to apply technology and behavior of society on development itself with digital transformation in order of process tasks and achieved level of working culture. Enterprise with advanced digital technologies becomes a living organism that is able to evolve and in that way achieve a characteristic of self-participating, adaptive and self-organizing system. In order for digital transformation to be successful, it is necessary to achieve process of adaptation and active reverse action of an enterprise on its changing environment. User's needs are a determining on behavior of an enterprise in sense of profiling and production capacity. Those needs are diverse and unequal which implies a difernetiative approach in choice of business orientation. Modern enterprises are adjusting to users by "code halos" which gives them ability to map behavior. State of enterprises spirit determines ability of technical technological and innovative development. Research has shown that enterprises that have accepted process of digital transformation and existence of digital Darwinism, are far beyond competition and have much earlier entered in wanted future. Enterprises that have managed to realize process' of digital Darwinism, have managed to achieve a significant growth in value, especially in secondary economy sector.

If economies and societies will develop by laws of digital Darwinism in future, we can put an end on fact that there is no need for dark apocalyptical perspective of future. Future is on the other side of reality, but it is human to approach it (Todosijević & Todosijević Lazović, 2017).

We will observe process of digitalization as convergence of economy, informatics, telecommunications, computing, robotics and digital electronics. Characteristic of universal diffusion has made it possible for digitalization to have a place and use in all fields of human activity. Digital times are in the essence, achievements, process' and steps that came to be through evolutionary times. Evolution economy represents a research field of economy, by applying analogue methods, models and laws of occurrence, action and survival of nature and relationships of balancing and misbalancing, that take place in it. Role of knowledge is pointed out, as well as change and limitations for efficient functioning of economy. Theories of adaptation end exploitation are valued in comparison to surrounding in which permanent existence of entrepreneur theory is taking place (Schumpeter, 1997), resource-theoretical approach (Penrose,

1959), as well as theory of microeconomic equilibrium. Digital economy includes economic and social activities that make platforms such as internet, mobile phones and sensor networks and e-trade possible. Total contribution of digital economy to growth of a country consists of direct effect by accumulating digital capital and indirect effect measured with diffusion of digital capital in production system (Todosijević & Todosijević Lazović, 2018).

Evolution orientation on industry 4.0 could be a great chance for revitalization of economy as a whole, as well as society as a whole. It would be a way toward redistribution of jobs in world economy. Evolution and not revolution. Industry 4.0 has digital technologies as a base: internet, robotics, telecommunications, computers, cloud computing, cyber systems and big data are all included in concept of industry 4.0 (Todosijević & Todosijević Lazović, 2018). Individualism is beaten with digitalism. Networking occurs (Todosijević & Todosijević Lazović, 2018). It will come to turn around in new missions. New forces of altruistic and universal determination, which are present at the moment, will come to rule on global level, as an empire of ecological, ethical, economic, and cultural and political certainty. That will be possible when digitalization comes closer to absolute organization. It will come to affirmation of and universal intelligence, which will point out creative abilities and will create circular-relational, new type of economy that, will create resources without profit. It will develop in competition with market before it completely pushes it out, just like free market did to feudalism a few centuries ago. In EU, until 2030, they are planning to invest 1.350 billion Euros into industry 4.0, which means that it is dedicated to digitalization and development of industry 4.0. We need to react on these challenges. Wanted future, as best version of future, will happen only if and how much we approach it as a challenge with certain pace and intensity.

Under the influence of digitalization and robotization it will come to change of process' due to dynamic changes and organization redefining. Functional strategies (finance, procurement, production, personnel and marketing) will make combination of inner communications by which they act integrative, systematically and interdisciplinary. Program of integration of single professions is achieved. "Hybrid professions" occur.

Digitalization - ambitious future of agriculture

Historically observed, research and occurrence of technologies, in order of occurrence of mechanic, energetic and informatics machines, constantly accelerated. With occurrence of acting digitalism that gained characteristic of "fast, faster and furious". Usage of digital solutions for gathering information, processing and selection of information for management of agricultural field, assumes inner connection based relationship of all participants in functioning of one organizational system and its constitutive elements. Agro industry, that delivers agricultural machines and equipment, in interaction with food industry, which uses reproducible resources of agricultural origins and agricultural complex, represents a systematic and informatics symbiosis which has "specter of supply" as a consequence, where main function of that total and single output satisfies

demand, whether its productive or individual consumption. Target groups, mutually bonded and individually identified, form a network of evolutionary character, whose cohesion and way of functioning provides digitalization. Job for companies from agro industries, from which, many are small and medium businesses, are in great manner based on their ability to always improve current products and develop new, in order for brand to be one of the best on the market, just like cleaners and dump trucks are (https://www.teknologisk.dk).

Era of new technologies and intense development of new models and way of production and work is taking its toll on all means of industrial production and production diversification (Subic et al., 2010). Industrial development of new age influences agricultural sector and makes new evolution in digitalized industry possible (https://www.victorialogistic.rs). Informatization is a process of creating digital networks or physical things such as documents, photographs, recordings, sounds, or converting analogue signals to digital.

Digital transformation can be defined as integration of digital technologies (due to characteristics of universal diffusion) in all fields of business which results with fundamental changes in business and by delivering value to users. Therefore, using digital technologies that radically transform business models, generates new revenue flows and completely change business process' (https://startit.rs).

With digitalization of agriculture it is possible to close optimal yield to maximum possible and control irregularities in nature (droughts, floods, blazes and even earthquakes) which eliminates variations of agricultural output that from 2 to 4 times at the moment. Unlike digital approach in agriculture, mechanic approach represents danger for soil through dispatch or chemicalization. Robotization, digital information system and AI, based on pre defined software, with millions of processed pieces of data, are able, without consequences, to control and direct business systems to their state of sustainable balance and sustainability.

"According to latest research, predictions say that value of global market of smart agriculture in period between 2017 and 2022 will grow from at least 10 to 24 billion dollars, which is a 140% growth". Potentials exist. Skills and knowledge are needed for their management (http://www.color.rs).

Setting complete digital solutions represents setting complete interactions with numerous digital technologies that are necessary for implementation into machines and equipment, infrastructure, process', all with goal to sustain level of modern and competitive power. Enterprises of agricultural production is facing challenges from sphere of technological services and rapid digitalization, which is also made up of tools and methods that are including software and analytic modules as well as consulting tools. If a company wants to apply digitalization process', it can develop communication protocols and data bases, use some of generic methods, tested forms and proven methods of data analysis. Company strives toward cheaper and more secure process' of digitalization. That process requires combination of specialized competencies, for example, sensors,

managing data and advanced statistics in combination with knowledge from agronomy, which is a union of competencies which have only a few research entities.

For livestock production, it is possible to develop and implement standardized digital software. Specialties refer to type and layers (kettle, cows, beef, calf, oxen, sheep, goat, pigs, sows, fatteners). For poultry also (stretchers, broilers, and breeding flocks). For beekeeper's production, size of swarm and location are not sufficient, but also type of pasture (dredge, rapeseed, sunflower, linden, field, forest etc.) From diversification direction is toward special unifications.

For field crops production, things are more complicated. Base is economic policy, policy of agriculture, policy of natural rural areas, which can together be represented on degree of satisfactory generality. Key question is land policy. In Serbia, there are 18.6 million of parcels. Small possessions. Expenses are higher from one field to another than on the field itself. Application of digital technologies wouldn't give wanted efficiency. Exit is in enlarging parcels, pedological map and planned selective sowing (type of culture, size of land, expected yield). In future due to advancement in biology and genetic engineering overall, for vegetable production, soil will not be necessary, but only space and large number of information for defining digital process'. Production will be totally determined. Plants will be fed with special dose-meters, software designed compounds, systems that are managed for every type of plant separately (red eggplant, cucumber, lettuce, onions, potatoes, carrots etc.). Process is closed; there is no loss or disorder in plants nutrition. Every plant takes only as much food as it needs, and excess is returned to stock depot (there is no spilling and decay in soil) from where with circular flows, is in constant communication with the plant. Plant maturity process is speeding up, because plants do not "sleep". Produced light is equal to sunlight, and we also have 3D printer! Information is becoming primary input data. With transformation of information into job it gets materialistic dimension and value. Business data imply activities that are tied to business models. System becomes networked. Technologic digitalization comes to being through relationship of interdependence with enterprise form the field of "closed olericulture" (greenhouses) and environment protection technologies, as well as machine building, electro machine building, computer, robotics, knowledge, skills about function of stable based on digital solutions. Technology in business network should not be a limitation. Search for it (research or commercial) is nonstop, because technical progress doesn't bypass a single field of economic and social activities.

By using smart phones or computers, it is possible to monitor, manage and in optimal way set up all flows and process of an enterprise. With users' technologies, agriculture will be able to follow changes of total plant production and to have a detailed insight into state of crops on the open (http://www.color.rs).

Hardware and software solutions are on highly competitive level can provide support for agriculture and all of its organizational units (farms, field farming, apiaries, viticulture, herbs, greenhouses, and orchards). From production, storage, transport and sales support is possible and absolute functioning of digital system through content of

a complex and priority field such as agriculture. System becomes networked, and that is a base for its functioning. Informatization and digitalization will bring downfall in costs of communication. Development of agricultural and food sector has brought up level of industry, which affected development of economic markets on international level. Conditions for competitive advantages are made (Erokhin, Ivolga, Andrei, Cvijanović, 2013). Generally observed The obtained directed results showed that during the observed period as a whole Western Balkan countries significantly, but still insufficiently improved creation of favorable conditions for business activities" (Cvetanović, Nedić, Despotović, 2019).

Digitalization of agriculture and combination of business activities

In Serbia, there is a project for construction of free standing solar photovoltaic power plants in free areas outside of towns based on analysis of soil that is good for the project. Power of solar plant is 3 mega watts on which author of this work have worked. Cell based panels haven't been chosen (shade blocks work of the whole panel), but were chosen based on their technical solutions (no stopping in function of solar panel or in mutual exchange). Panels are set on 3m tall stands with sensors that are always pointing panel toward the source of light, in order to achieve maximum capacity. Location, deserts - sour soil that is not good for farming, but when nourished with nitrogen it gives an area for breeding 3000 sheep. Through two synthesized investments we go over self organized and adaptable to digitalized farm and a solar plant. Circular economy than occurs and many other digitalized production and services process'. Specialized teeter is possible, specialized dairy farm, honey bee development, leather processing, wool, confection etc. With help of inventory for solar and wind generated energy, we storage produced solar energy (electricity) and provide continuous supply of users or complete delivery to single electro energetic systems. Recycling of organic waste produces CH4 gas, and with small modifications we have free energy source on a farm. All structures, investments installation of circular economy in this field, through return of invested means for period of 4 to 5 years, in continuum of its functioning and achievement of its mission will be above average competitive, and total efficiency of installed capacities (energetic, productive and servicing) will be above average. There are no limits regarding geographic areas for building solar plants and additional production capacities of livestock production and on it based other industrial capacities. Whole system and its sub systems can be projected to a degree of high level of determination with work force that would have function of communication, control and management. Generally observed „powerful competition can bring significant benefits to consumers, taking into account that manufacturers are superior in terms of product quality, prices, service delivery, warranty period, deferred payment and various other bonuses to attract as many customers as possible to their product or service". (Nikolić, Vesić, Cogoljević, 2019)

Based on world's food organization FAO, it is estimated that with use of new technologies, IT sectors has potential to help growth of agricultural productivity up to 70% until 2050. At this moment, 70-80% of new agricultural equipment contains

a component that relies on concept of precise agriculture. Based on IBM's research, 90% of all losses from crops occur due to bad weather conditions. These crop damages could be lesser by 25% with usage of prognostic modeling of weather and techniques of concepts of precise agriculture (https://www.victorialogistic.rs). Our last stands about an organization in the future correspond with prognostic statement of FAO organization, with that that tendency of growth and efficiency will depend on level of achieved and level of technical and technological equipment of the system and ability to manage it. "Identification of perfect time and amount of every input used for production on every field, production can personalize, apropos, maximally optimize for every producer with simultaneous lower of costs of production. New technologies of ground recordings and infra red images will be able to point out fields and their parts that are suffering stressful factors even before they can be noticed by humans (https://www.victorialogistic.rs). It is confirmed that digital technologies with their predictive action have place in managing risks whether they are they are caused by humans or nature. "Electronic book of fields" gives objective possibilities for management and control of activities and process'. All information that come, lead to materialistic changes, which are recorded, by creation of new information for management behavior and decision making. Profession of accountants gains importance.

"Two times more food with twice less effort", project from Holland from the 90's has confirmed and overcome expectations in less than 20 years, because on "ranking list of countries for export of agricultural goods Holland is 2nd in the world behind USA that has 161 times more farm lands than Holland. In 2017 only from export of agricultural goods Holland has earned a recording 91.7 billion Euros" (https://www.netokracija.rs). Organization and ability to mobilize resources is a key factor for success.

Conclusion

Total contribution of digital economy to growth and development of economic and social systems, is made up of digital effect with accumulation of digital capital and indirect effect measured with diffusion of digital capital in production system (Todosijević & Todosijević Lazović, 2018). In total complex occurrence and action, digital agriculture gains characteristic of strategic sector of social economy and its contribution to growth of state and economy is greater than contribution of traditional sector. Reproducing resources of agricultural origin come as a base for industrial changes. With digitalization of agriculture and occurrence of benefits that it provides, we achieve chain effect in chain of value that connects and extends. Complete industrial adaptation occurs. There is no waste, everything is recycled. Circular economy with digital organization is confirmed and earns right for citizenship. Digital economy is becoming vector of growth of production and competition of companies and countries. Its transversal nature affects all sectors of economy, including innovative sectors. Its achievement is: it made everyone around it dependent on it. It has become a universal technology that has produced many developing influential information and communication technologies on economic sectors. It affects growth, productivity of economies, governing states, including: company's environments,

individuals, households and their behavior. Dilemma, which soon will not be, is: will intellectual capitalism become dominant and push out goods capitalism? It is a fact today, that huge masses of poor intellectual nomads, infranomads, are crossing borders in search for jobs. Using electronic, generic, genetic and nanotech discoveries, resources will thin out while robots will multiply. We are witnesses of a hyper conflict. That will, however, not happen, because humans' greatness is made up form freeing from destiny through developmental projection of the future.

Conflict of interests

The authors declare no conflict of interest.

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EVALUATING EFFECTIVENESS OF PAYMENTS FOR FOREST ECOSYSTEM SERVICES BY PROPENSITY SCORES ANALYSIS

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ARTICLE INFO

Original Article

Received: 23 *January 2020*

Accepted: *21 February 2020*

doi:10.5937/ekoPolj2001087N

UDC 330.342:502.131.1

Keywords:

Propensity scores, payments for forest ecosystem services, Average Treatment Effect on Treated, Average Treatment Effect, Difference-to-differences approach

JEL*: Q18, Q23, R23*

ABSTRACT

The Vietnamese Government have been implementing the Payment for Forest Ecosystem Service (PFES) since 2008 with the aim of both improving natural forest status and enhancing income for mountainous community. Yet, effectiveness of the PFES scheme is now debated because of the shortage of experimental studies. So, the overall purpose of this study is to measure the effectiveness of the PFES program by propensity scores analysis. To do so, the study randomly surveyed 469 households located in four districts across Quang Nam province and then estimated the Average Treatment Effect on Treated (ATET). It is found that: (1) the households within PFES had got a insignificantly higher income than those without PES in the short-run; (2) yet, PFES was effective in long-run due to the improvement on income for participants; (3) PFES had an important role in increasing income inequality. Although this study demonstrated reasonable results, some limitations still exist due to the objective reasons, thus more studies with alternative methods should be conducted to confirm the results of this study for better policies.

Introduction

The forest ecosystem (ES) has been providing a wide range of important benefits to human beings so far, including water provision, carbon sequestration, biodiversity improvements, farmland abandonment restoring, water and air purification, production raw materials, as well as social and cultural values such as recreation, traditional resource uses and spirituality (Ruggiero, Metzger, Tambosi, & Nichols, 2019; Wang,

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Bilsborrow, Zhang, Li, & Song, 2019). Thus, Jespersen and Gallemore (2018) and Treacy, Jagger, Song, Zhang, and Bilsborrow (2018) emphasized that the degradation of the forest ecosystem will definitely affect all objects of the economy and might result in sophisticated changes, both economically and socially. In fact, ES gives the way of life for local communities by so many different kinds of plants and animals originating from the forests, that is why Watson et al. (2018) argue that maintaining and restoring the integrity of forest ecosystem services is a high priority to limit the growing biodiversity crisis, slow down continuing climate change as well as accomplish sustainable development targets. In Vietnam, to hinder the forest ecosystem degradation, the Vietnamese government has been implementing a national program nationwide since 2008, called *Payments for Forest Ecosystem Services (PFES),* yet there is the shortage of ex post assessment to measure effectiveness and sustainability of this scheme. Although some current studies assess the effect of intervention schemes on local livelihoods as well as explore the determinants of scheme participation, a little literature show clear evidences about total income of households and use robust methods. Hence, to estimate the impact of PFES schemes as well as potential unplanned outcomes, it is necessary to investigate the depth, the extent, and allocations of the effects of conservation intervention over many period of time (Beauchamp, Clements, & Milner-Gulland, 2018).

Presently a large number of empirical studies demonstrate the effectiveness of PES projects on the environment including land loss reduction and forest coverage improvement, whereas the positive impacts of PES schemes on local livelihoods, income increase and poverty alleviation have been debated. Zhou, Wang, and Wang (2019) posit that there is considerable trade-off between the objectives of environmental conservation and social-economic growth, hence when implementing PES policy makers should focus on only one target either environmental or social-economic objectives. This argument is consistent with the argument of Arriagada, Sills, Ferraro, and Pattanayak (2015) that although the conservation programs have positive influence on environmental outcomes (i.e. forest cover, land loss and biodiversity), the improvement in household assets or well-being is insignificant because the PES programs not only decrease two main on-farm inputs (cattle and hired labor), but also pay a small amount of cash to each household for daily expenses.

The studies on the effect of PES programs on household prosperity display different results, with both positive and negative outcomes regarding total income, well-being and total assets (Alix-Garcia, McIntosh, Sims, & Welch, 2013; Q. Li & Zander, 2019). The reason for this situation is explained that the effect of PES is able to strongly rely on the specific context of study site and household characteristics, implying that the PES implementation does not definitely make improvements on livelihoods and total income for participants as planned. Empirical studies of Clements and Milner-Gulland (2015), Alix-Garcia et al. (2013), Hanauer and Canavire-Bacarreza (2015) argue conservation interventions having neither substantial influence on income nor considerable contributions to poverty reduction at the community level. In addition,

Beauchamp et al. (2018) add that protected areas might be able to improve local traditional livelihoods, yet reduce households' socio-economic status, in spite of not hampering the progress. These arguments are in line with socio-economic assessments of Manjula, Venkatachalam, Mukhopadhyay, and Kumar (2019) who illustrate that such conservation actions may lead to negative influence on livelihoods of local residents, for example, increased production cost, unstable crop productivity, and thereby increase social pressure because of unequal distribution of benefits.

On the contrary, the research of Birte Snilstveit et al. (2019) argue that PES schemes have significantly positive influences on socio-economic outcomes such as strengthening the knowledge of locals and shifting the economic structure, and on measures of overall income of participants, but do not have an impact on income from off-farm activities such as tourism, hired labor as well as handicrafts. Additionally, PES schemes in Mexico are demonstrated to improve community income by both creating more off-farm jobs and diversifying income sources from agricultural activities such as crop planting, cattle rearing and the timber products harvesting (Costedoat, 2017). The studies of Hanauer and Canavire-Bacarreza (2015), Ruggiero et al. (2019), and Beauchamp et al. (2018) have also suggested that the payments from PES programs might be too low to develop total local income and to enhance the standard of living, whereas such PES programs have the role of changing community skills, knowledge as well as attitude towards the functionality of forest conservation, and providing a lot of other income streams namely forest services and rural non-agricultural employment.

In Vietnam nowadays, to the best of our knowledge, there are a few household-level studies exploring the roles of PFES programs on community livelihoods and the standard of living. To date, some current studies of Pham et al. (2013), Asian Development Bank (2014), Do, Vu, and Catacutan (2018), and Vietnam Administration of Forestry (2019) investigated the challenge of applications of PFES in Vietnam, yet one of the key limitations is that most studies have not examined factors influencing the participation of PFES yet, analyzed results are mainly descriptive statistics by describing the basic features of data instead of using econometric models to interfere and test the research hypothesis, and thereby lack methodological robustness. To end the mentioned-above debates, we carry out in-depth interviews with rural household where PFES scheme is being implemented with the aim of evaluating effectiveness of PFES over a period of 10 years (from 2010 to 2019), before and after PFES was introduced in the study region.

We concentrate on answering the following research questions (1) How is the influence of the PFES program on the livelihood outcome in terms of total income, the change in total income as well as the change in income inequality? (2) What are the implications for designing PFES schemes in the context of tropical countries in the future? This study's contribution is to fill the literature gap of PFES in terms of social-economic evaluation by using the propensity scores analysis which is quite rarely in currently PES-related studies and has also never been applied for PES-related researches in Vietnam before.

This research proceeds as follows: Section 2 introduces the overview about the PFES scheme in Vietnam; section 3 presents the method used in this study consisting of the study site, sampling and survey methods, data analysis and data validation; section 4 displays results and discussion of the empirical research; and the last section of this study, the main conclusions are summarized, and the policy implications of the research work are presented.

Table 1. The impact of PES on the local livelihoods

Authors	Study region	Methods	Livelihood outcomes
Beauchamp et al. (2018)	The Northern Plains of Cambodia	Multi-period impact evaluation	Decrease households' socio-economic status
Birte Snilstveit et al. (2019)	China, Mexico, Costa Rica, Ecuador	Meta-analysis	Positive effect on total income
Zhou et al. (2019)	Anhui (China)	Survey	Reduce cultivated land
Hanauer and Canavire-Bacarreza (2015)	Protected Areas (Bolivia)	Quasi-experimental	Uncertain impact on income and poverty alleviation
Ruggiero et al. (2019)	Atlantic Forest (Brazil)	Propensity score matching and differences-in-differences	Little improvement on financial outcomes Inconsiderable progress in diversifying off-farm jobs
Pauline (2016)	Sub-Saharan Africa	Meta-analysis	Extra income for poor households Additional profits for planting crops Decrease opportunity cost
Costedoat (2017)	Protected Areas in Chiapas (Mexico)	Quasi-experimental	Create more part-time jobs Diversify agricultural activities
Muttaqin, Alviya, Lugina, and Hamdani (2019)	Customary and Research Forests, Nature Reserves, National Parks (Indonesia)	Qualitative approach	Promote national tourism Develop economic alternatives Create off-farm jobs
Samii, Lisiecki, Kulkarni, Paler, and Chavis (2014)	Mexico, Mozambique, China, Costa Rica	Meta-analysis	Little additional income Little contributions to poverty reductions Insignificant welfare effects

Source: Summary from the previous studies

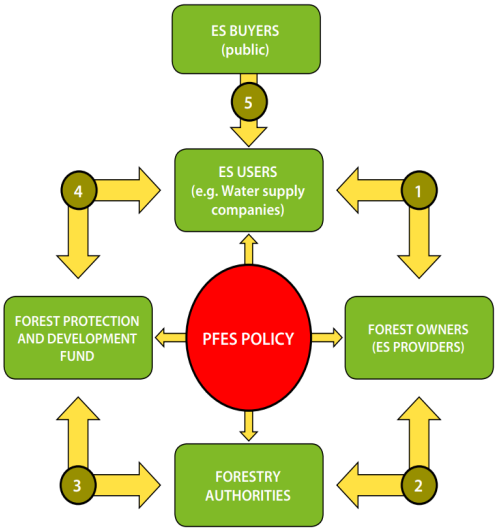
Overview of PFES in Vietnam

Since 1990s, Vietnam has been actively shifting forest management and protection from exploitation to conservation of forests, especially native and national forests, after fairly rapid deforestation and degradation in the past decades. At the same time, several national forest schemes like Program 661 in 1998 and Program 327 in 1993 has been carried out across the country so far. Despite of so many achievements from these national programs, a large number of challenges still exist because of the shortage of mid and long-term funds and low disbursement rates. Hence, in an effort to improve and develop Vietnam's natural forest, the Vietnamese government set up Payments for Forest Environmental Services or Payments for Forest Ecosystem Services (PFES) in 2008 for the purpose of boosting the country's overall forest coverage up to 42% by 2020 and roughly 45% by 2030.

In 2009, the piloted PFES schemes were initially introduced in Son La province and Lam Dong province where deforestation and forest degradation were regarded as the most serious in Vietnam at that time. Next, Decree No. 99 in 2010 mandated the implementation of PFES nationwide even though the PES mechanism is quite different from the PES definition of Wunder (2005) because *(1)* ES buyers and sellers are selected instead of volunteering to participate, (2) the authorities have right to establish the levels of payments relied heavily on the specific types of forest ecosystem services (i.e. biodiversity loss, carbon sequestration, afforestation and watershed protection). In most cases, forest owners sign a civil contract (also called as the forest protection contract) with local peasant farmers who have so much experience in taking care of and protecting forest and often took part in the national forest programs (i.e. Program 661 and Program 327) in the past. Nearly 11000 contracts have been signed up till now, and more importantly, more and more local households want to participate the PFES scheme if any. The Forest Protection and Development Fund has responsibility for collecting payments from ES buyers, then re-distribute them forest owners, who in turn pay local peasant farmers once at a specific periotic time, often every quarter.

To date, more than 20 PFES programs have been implemented nationwide through a civil contract drafted by the government so far. The terms in every PFES contract oblige private and state agencies to finance to forest owners for protection and development of forest and inversely forest ecosystem services suppliers (forest owners) will be punished in case of non-compliance. The progressive enhancement of legal frameworks regarding the implementation of PFES is clear illustration for the government's interest and commitment to achieving effective, efficient and equitable outcomes from PFES schemes (Pham et al., 2013).

Figure 1. Roles and responsibilities of ecosystem service providers and buyers



1. Relationship between environmental services (ES) buyers/users and sellers/providers (applies to direct payment agreements).
2. Traditional relationship for control and management of forest quantity and quality outside PFES scheme.
3. Relationship in monitoring and evaluation by checking randomly 10% of the forest area under PFES scheme.
4. Relationship in signing contracts for PFES (applies to agreements for indirect payments).
5. The PFES scheme covered by Decree 99 establishes a fixed payment rate for hydropower plants and water supply and tourism companies (20 VND (around 1 cent) for 1 kWh, 40 VND for 1 m3 of clean water, 1–2% of revenues, respectively), but payments may be included in the price of electricity and clean water and any entrance fees.

Source: Adapted by Pham et al. (2013)

Methods

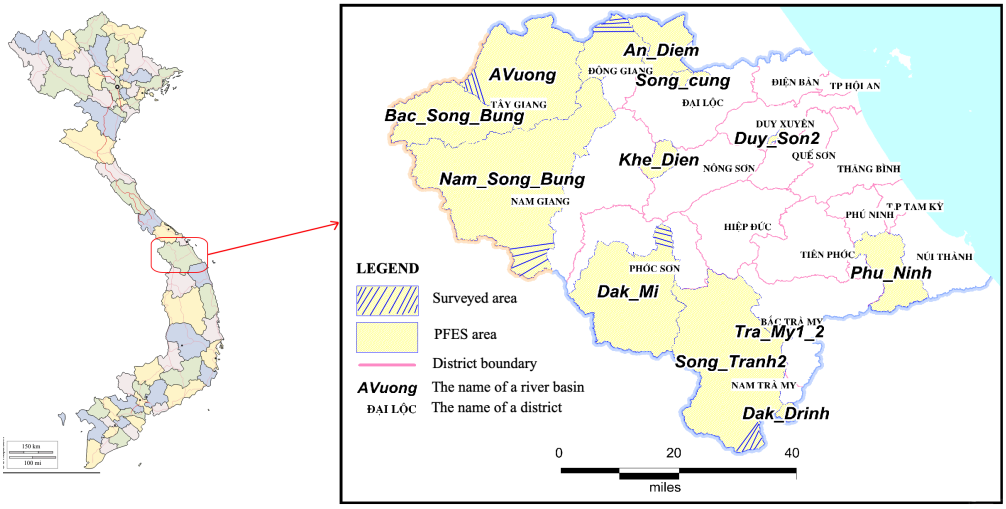
Study site

The study region is located in Quang Nam province of Vietnam, where the PFES project has been implementing across 13 forested districts since 2012 under Decree No. 99, and focused on four categories of PFES, including (1) watershed protection, namely soil protection, reduction in land erosion, prevention of sedimentation of rivers, streams and reservoirs; (2) protection of natural landscapes and biodiversity conservation for developing tourism; (3) carbon sequestration, reduction in greenhouse gas emission by preventing forest resources from deforestation and degradation; and (4) provision of natural seeds and feeds as well as sources of water for the aquaculture sector. Presently, beneficiaries or ES buyers are hydropower plants, fresh water supply firms, tourism company while ES sellers are forest owners including forest management boards, state-owned forest enterprises, private company, and so many households.

Nowadays, more than half of Quang Nam is covered by forests, in which the high percentage of forest are natural forests with some many species of extinction-risk and precious flora and fauna. Quang Nam province is also the place where the vast majority of indigenous residents still earn their living under the forestry sector. Quang Nam is also home to the conservation parks of the saola (*Pseudoryx nghetinhensis*), the red-shanked douc (*Pygathrix nemaeus*), the Song Thanh protected area and the Cu Lao Cham Biosphere reserves. The forests in Quang Nam now contains the sheer richness of biodiversity with respect to genes, individual species, communities of creatures, and entire ecosystems, however are also highly been threating by climate change as well as deforestation and forest degradation (Pham et al., 2013).

In present, a large proportion of total natural area is considered as "forest land", whereas there is the shortage of production land for planting activities and animal husbandry, leading to substantial reduction in the living standards of mountainous people. Thus, current conservation policies like PFES can support and encourage forest conservation and economic development in private lands as well as protection of natural resources.

Figure 2. The location and map of Quang Nam province, Vietnam



Source: Quang Nam Provincial Forest Protection Department (2019)

Currently, according to the latest report from the Quang Nam Provincial Forest Protection Department (2019), total PFES area is coral reefs 276,826 ha across 31 river basins of 13 forested districts of Quang Nam with total payments in 2019 of 4,662,531 US dollar (roughly 17% increase in payments compared to that of 2018).

Sampling and survey methods

PES-participants and nonparticipants were selected randomly in 4 districts of Quang Nam province, specifically sampling procedure mainly based on demographic and socio-economic characteristic information provided by the local forest management boards. There were two different forms of the questionnaire used to survey, one for PES-participants and the other for nonparticipants. For PES-participants, this study was designed as a cross – sectional investigation, in which 323 households were randomly sampled by the cluster sampling scheme from July 2018 to March 2019, while 146 nonparticipants were interviewed at the same time. To ensure the robustness of estimated results, our survey only included (1) respondents with the age of 18-60, (2) respondents taking part in both agriculture and agroforestry activities, (3) a balance share between Kinh people and ethnic groups. Every interview lasted from 60 to 120 minutes.

Every questionnaire for PES-participants and nonparticipants comprised of five parts, in which the questions were very straightforward and mainly involved household socio-demographic characteristics, revenue streams and cost from agriculture and agroforestry before and after the implementation of the PFES project, household attitudes towards economic impact of PFES. The households for the survey came from four districts, including Hiep Duc, Phu Ninh, Dai Loc and Tien Phuoc. The socio-demographic characteristics of surveyed households in the sample were summarized in Table 2.

Table 2. The social-demographic characteristics of respondents

	Hiep Duc	Phu Ninh	Dai Loc	Tien Phuoc
Total respondents	**155**	**102**	**132**	**80**
Gender				
Female	18	10	16	8
Male	137	92	116	72
Control groups	46	22	50	28
Treated groups	109	80	82	52
Ethnic groups				
Kinh	54	25	40	30
Minority	101	77	92	50
Main crop				
Maize	49	57	59	18
Other crops	106	45	73	62
Age of respondents (years)	41.30	40.46	39.52	41.19
Year of schooling	6.59	7.35	7.54	6.83
Total members in the household	**4.74**	**4.80**	**5.05**	**4.81**
Working members	2.63	2.64	2.72	2.73
Members under the age of 15	2.08	2.17	2.10	1.81
Total income ($)	**4480.39**	**3573.26**	**4520.82**	**4969.87**
Income from forest activities ($)	406.45	456.39	358.39	375.60
Income from agricultural activities ($)	3376.62	2289.28	3313.82	3402.76
Income from hired labor ($)	452.54	680.32	650.99	661.74

Source: The calculation from the authors

Data validation

To detect fallacy and ensure data accuracy and reliability, we used the solutions as follow: (2) the survey questionnaire was well-designed, pre-tested and improved before the official survey; (1) the chosen respondents were initially approached by phone with the help of the local authorities, in case they agreed to join the survey, questionnaires would be finished through direct interviews; (3) interviewers were taken part in several

courses in terms of interview skills training before the fieldwork; (4) outlier data and responses with significant errors were eliminated from the analysis; (5) interview procedure was scrupulously organized and controlled by the team leader; finally, the finished questionnaires were coded, imported in STATA, then double-check prior to official analysis.

Propensity Score Matching

As a rule, the local authorities will select participants in the PFES projects on purpose, meaning that participation is, certainly, not stochastics, thus this study used a statistical matching technique called Propensity Score Matching (PSM) to measure the PFES scheme's impact by the Average Treatment Effect on Treated (ATET). Propensity scores (PS) are known as the estimated probability of the treatment by accounting for the covariates that predict receiving the treatment and in this research, PS will be estimated by an probit regression model (Ramsey, Forsyth, Wright, McKay, & Westbrooke, 2019) with the help of STATA 14. Through a treatment effect model, the research compared the average potential outcome of interest between treated and controlled groups to assess the intervention actions' effectiveness.

Let $E[Y_1|D=1]$ be the average potential outcomes (i.e. income) for the treated group (participants), and $E[Y_0|D = 1]$ be the average potential outcome for the controlled group (nonparticipants). Then, ATET could be calculated as follow (Słoczyński & Wooldridge, 2018):

$$ATET = E[Y_1|D=1] - E[Y_0|D=1]$$

$$ATET = E[Y_1 - Y_0|D=1]$$

In the above formula, $E[Y_1 - Y_0|D=1]$ represents the effectiveness of PFES. Y_1 and Y_0 are overall income of PES-participants and nonparticipants, respectively. The term *D* is a dummy variable as the treatment indicator which equals one if the surveyed household is in the PFES group and zero if otherwise.

However, the challenge was that we could not observe the outcomes of a household participated in PFES (D=1), but presently no longer participates anymore ($Y_0|D = 1$). To deal with this challenge, we created a counterfactual variable from group of nonparticipants in the sample, then simply replaced ($Y_0|D = 1$) by ($Y_0|D = 0$). Thus, ATET is simply estimated as $ATET=E[Y_1|D=1] - E[Y_0|D=0]$ (Guo & Fraser, 2015). Additionally, to improve the ATET to be appropriate for calculation of the treatment effect, the research mimicked the conditions for a randomized experiment satisfying the equation $Y_0,Y_1 \wedge D\backslash X$, where X represented the covariates influencing to selection and the estimator outcome.

Furthermore, the study also used the difference-differences (DID) method to enhance the robustness of the matching procedure and to decrease the bias when the treated and controlled group are systematically different from each other. This approach computed the effect of an intervention on a specific outcome by comparing the average change of

the outcome variable for the treated and controlled groups over time. The DID estimator is defined as:

$$DID = E[Y_n - Y_m|D=1] - E[Y_n - Y_m|D=0]$$

$$DID = E[\Delta Y|D=1] - E[\Delta Y|D=0]$$

In the above formula, n and m represent "before" and "after" the implementation of PFES, and hence ΔY stands for the change in outcomes "*before*" and "*after*" the PFES is introduced in the study site.

Gini index

To assess the effectiveness of the PFES project, the paper computed the change in income inequality of a population by using Gini coefficient whose formula was proposed by Yitzhaki (1994) as follow:

$$G = \frac{2Covar(y, r_y)}{N\bar{y}}$$

where G denotes Gini index, Covar(y,r_y) is the covariance between income (y) and the ranks of all households in the sample according to their income (r_y) which ranges from the poorest household (rank=1) to the richest (rank=N). N is total number of observations and $\bar{y}$ represents mean income of the survey sample. The Gini coefficient will vary from 0 to 1, with 0 expressing perfect equality (meaning that every household has the same income level) and 1 representing perfect inequality (implying that only one household has all the income while remaining others have none).

Results and discussion

Probit model

With the aim of measuring propensity scores of the PFES scheme, the probit regression model was estimated with the explained variable as a dummy variable (1 if PES-participant and 0 otherwise). The independent variables included the surveyed households' social demographic characteristics: (1) The dummy for the main crop, (2) the dummy for years of settlement, (3) the dummy for ethnic groups, (4) ages of head of households, (5) average distance to forest, (6) pre-PES income, (7) income from agricultural activities, (8) years of schooling of respondents.

Table 3. Estimation results of the probit model for selection into the PFES scheme

	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig.
Dummy for main crop (=1 if rubber)	-0.402	0.165	-2.44	0.015	-0.724	-0.079	**
Dummy for years of settlement (=1 if >=20 years)	0.831	0.252	3.30	0.001	0.338	1.325	***
Dummy for ethnic groups (=1 if Kinh)	0.654	0.197	3.33	0.001	0.269	1.040	***
Age (years)	-0.022	0.006	-3.47	0.001	-0.034	-0.009	***
Average distance to forest (km)	-0.019	0.005	-3.51	0.000	-0.030	-0.008	***
PrePES income ($)	-0.0001177	0.0000186	-6.32	0.000	-0.0001542	-0.0000811	***
Agricultural income ($)	0.290	0.076	3.79	0.000	0.140	0.440	***
Years of schooling	0.037	0.020	1.89	0.059	-0.001	0.075	*
Constant	0.699	0.348	2.01	0.045	0.016	1.382	**

Mean dependent var	0.689	SD dependent var	0.464
Pseudo r-squared	0.157	Number of obs	469.000
Chi-square	91.338	Prob > chi2	0.000
Akaike crit. (AIC)	508.351	Bayesian crit. (BIC)	545.706

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Source: The calculation from the authors

The estimation results in Table 3 showed that the probit model was statistically significant because Chi-square equaled 91.338 and Prob > Chi-square equaled 0.000. Furthermore, the explanatory variables in the model had a sig.<5%, suggesting that they actually affected the PFES participation of households although the effect size was either positive or negative. The families planting rubber as the main crop was found to be less likely to take part in the PFES project, probably because the current PFES resulted in higher opportunity cost and fairly low payment rate, thereby decline total income of the household. This finding was in agreement with our prior expectation. Likewise, older people had the lower probability in PFES participation than younger people and the distance to forest discouraged the households participate the PFES program. The negative relationship between the pre-PFES income level and the likelihood of PFES argued that the households with the high pre-PFES income level did not tend to join the PFES because they were not motivated to get additional income from PFES program. This exploration was in line with the research of Wang et al. (2019) and Watson et al. (2018).

Treatment effects by propensity scores matching

The summary of the estimation results of the ATET by PSM regarding the difference in the total income in 2019 and DID was displayed in Table 4. With reference to analyzing results, Average Treatment Effect (ATE) was also estimated and showed in Table 4. In the matching procedure, ATET and ATE were estimated to prioritize the requirement of overlap assumption by calculating the kernel density of the predicted propensity scores

for PES-participants and nonparticipants. Figure 3 displayed a clear image that the plot showed little estimated probability mass near 0 or 1, and the two estimated densities had most of their respective masses in region of common support, thus, confirmed that the requirement of overlap assumption was met (Clements & Milner-Gulland, 2015; Leite, Aydin, & Gurel, 2019).

Table 4 demonstrated that the unmatched difference in the total income in 2019 between PES-participants and nonparticipants was minus 857.807 US dollar and statistically significant (|T-stat| > 1.96) while both ATET and ATE were not statistically significant (|T-stat| < 1.96), meaning that the implementation of PFES schemes did not lead to change of total income of participants under cross-sectional data. This finding was rather consistent with the results of Wang et al. (2019) and Hanauer and Canavire-Bacarreza (2015).

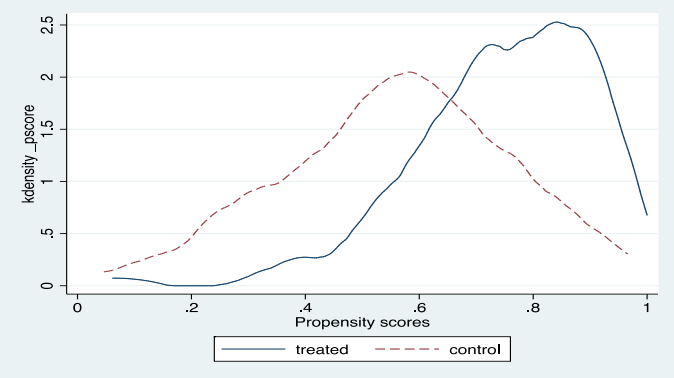
Table 4. Estimation results of ATET with PMS

		Treated	Controls	Coef.	St.Err.	T-stat
Cross-sectional (2019)	**Unmatched**	**110.941**	**968.748**	**-857.807**	**393.821**	**-2.180**
	ATET	**4110.941**	**4238.390**	**-127.449**	**714.134**	**-0.180**
	ATE	**-**	**-**	**262.442**	**320.117**	**0.82**
DID estimators (2010-2019)	**Unmatched**	**1212.942**	**-61.626**	**1274.569**	**250.388**	**5.090**
	ATET	**1212.942**	**328.917**	**884.025**	**556.060**	**1.590**
	ATE	**-**	**-**	**765.55**	**191.6678**	**3.99**

Source: The calculation from the authors

As mentioned previously, the DID estimator, which bases on the longitudinal data (2010-2019), provides the more robust estimates of treated effect of intervention actions. The most advantage of DID estimator is to control systematic differences in the household characteristics between the treated and controlled groups. As displayed in Table 4, the unmatched difference was positive (1274.569 US dollar) and highly significant while ATET and ATE estimators were 884.025 US dollar and 765.55 US dollar respectively with statistically significance of the 5% and 1% level. This finding pointed to the positive change in total income of participants, compared to that of nonparticipants and also collaborated the effectiveness of the PFES scheme in the long-term.

Figure 3. The distribution of estimated propensity scores



Source: The calculation from the authors

The change in income inequality

To analyze the change in income inequality and the distribution of income between the treated and controlled groups, this study computed the Gini index in 2010 and 2019. As can be seen in Table 5, the 2019 income distribution was more equal for PES-participants (Gini = 0.381) than nonparticipants (Gini = 0.413). The research of J. Li, Feldman, Li, and Daily (2011) in terms of the largest PES projects in China also displayed the same finding.

Before the introduction of PFES, Gini index for PES-participants and nonparticipants were 0.471 and 0.436 respectively, suggesting that the income distribution among PES-participants was more unequal than nonparticipants. However, this situation has varied substantially after seven years of PFES implementation. For the change in income inequality before and after the PFES introduction, Table 5 argued the 19.11% and 5.28% decline for PES-participants and nonparticipants, respectively. For whole sample, the results illustrated the nearly 18% decrease in income inequality (from 0.484 to 0.399). This finding confirmed the effectiveness of PFES in terms of the reduction in income inequality.

Table 5. The change in income inequality during period 2010-2019

	Gini	Std.Err.	t	P>t	[95%Conf.	Interval]
Total income in 2019						
PES participants	0.381	0.024	16.05	0.000	0.334	0.427
Nonparticipants	0.413	0.0196	21.07	0.000	0.375	0.452
Whole sample	0.399	0.016	24.970	0.000	0.368	0.430
Total income in 2010						
PES participants	0.471	0.035	13.55	0.000	0.403	0.5396
Nonparticipants	0.436	0.020	21.74	0.000	0.397	0.476
Whole sample	0.484	0.020	24.440	0.000	0.445	0.522

Source: The calculation from the authors

Conclusion, recommendations and limitations

Conclusion

Nowadays, the PES projects are been implementing across the world with the aim of improving both natural resources and mountainous community. As a consequence, so many PES-related researches have been conducting and rising attention from academics, practitioners and policymakers with the expanding scope in theory and practice. Along with this trend, the Vietnamese government have been mandating the local authorities to carry out the PFES scheme across the country since 2008 under Decision No. 380, yet the effectiveness of PFES implementation have been questioned and not many experimental studies evaluate the PFES effectiveness, especially in the context of tropical forests in Vietnam. So, the overall purpose of this paper was to explore and measure the effectiveness of the PFES scheme in Vietnam by using the propensity scores analysis which have not yet conducted in Vietnam before. To achieve the research objectives, the study randomly surveyed 469 households living in four districts across Quang Nam province of Vietnam by the questionnaire and used propensity scores to estimate the PFES program's effectiveness through ATET. In addition, to enhance the robustness of the matching procedure and decline the bias when the treated and controlled group differed systematically, the study also utilized DID approach to measure the change in the household income before and after the introduction of PFES. Several conclusions were summarized as follows:

With the cross-sectional data in 2019, the estimated results by the analysis of propensity scores demonstrated that the difference in total household income within and without PFES was found to be not statistically significant. This implied that PFES scheme did not affect the household income and no evidence to support the effectiveness of PFFES. Arriagada et al. (2015) explain that the main reason of this situation was considerable cost of PFES participation and contract compliance. The other quite important reason was that ineffective management of PFES projects in the developing countries limited livelihood opportunities for indigenous community (Clements & Milner□Gulland, 2015), thereby restricted to develop the types of crops and resulted in farmland abandonment (Clements, Suon, Wilkie, & Milner-Gulland, 2014). Conversely, the PES policy might provide so many important kinds of forest resources (i.e. resin, animals, wood) for beneficiaries who did not obey PES contracts (Clements et al., 2014).

However, the results from DID estimators showed that ATET and ATE were positive and statistically significant with 5% and 1% level, implying that PFES resulted in the higher income for participants. The difference in household income participants and nonparticipants were 884.025 US dollar and 765.55 US dollar, respectively. This conclusion is quite consistent with the report of Sharma, Cho, and Yu (2019).

In terms of the change in income inequality, the Gini coefficient illustrated the positive and substantial progress for reduction in income inequality after the implementation of PFES. In detail, the current income distribution was more equal for PES-participants (Gini = 0.381) than nonparticipants (Gini = 0.413). Additionally, the 19.11% and 5.28%

decline in income inequality for PES-participants and nonparticipants respectively resulted from the introduction of PFES. This conclusion was so relevant to the effectiveness of the PFES policy in Vietnam. The study of Q. Li and Zander (2019) and Treacy et al. (2018) also illustrated the same finding.

Recommendations

Based on the above results, for the purpose of improving the PFES effectiveness in the future, some recommendations for the PFES design may be proposed as follow:

Firstly, the first priority of design of the PFES project is the improvement of income and livelihood for mountainous community, especially for poor community and ethnic groups. This suggestion is also in agreement with arguments from previous literature, for example Treacy et al. (2018), Ito, Feuer, Kitano, and Asahi (2019), Ezzine-de-Blas, Corbera, and Lapeyre (2019) and Bremer et al. (2019). Kanchanaroek and Aslam (2018) argue that success and sustainability of any intervention policy like PFES will mainly rely on the participants' satisfaction. This survey results displayed the quite low average payment for participants, was just nearly 17$ per hectare, thus hardly meet fully for daily expenses of households as well as for production activities. Further, with such a low amount of payments, PES-participants will not be encouraged to protect allocated forests effectively.

Secondly, the direct payment should be replaced by a loan fund at the village level which is controlled and supervised by local community with the consultation of authorities. According to Costedoat (2017), this solution is able to help creditors use loan money on their expenses and production the most effectively.

Next, forest protection activities should be encouraged for participants to be paid the more income because so many households (roughly 15%) in the study region had capability to labor in agricultural sector but lack of land to plant crops leaded to decrease in agricultural productivity. This was demonstrated to be an efficient implication for designing PFES programs in the world (Austin, Schwantes, Gu, & Kasibhatla, 2019; Bremer et al., 2019; Steger et al., 2018). Besides, it is so important to support farmers in advancing agricultural extension skills, such as cultivation techniques, market information, and post-harvest product protection).

Finally, it is so essential to establish a monitoring mechanism to hinder non-compliance with the regulations.

Limitations

Firsly, it's worth noting that households are currently simultaneously receiving money from the different sources of subsidies, such as Program 661 (known as the Five Million Hectare Reforestation Program) and Program 30A (known as the Speedy and Sustainable Poverty Reduction Program for the 61 Poorest Districts). Thus, the effectiveness of intervention policy on community might be determined by the interaction of these

above programs rather than only the PFES scheme. As a result, to measure the separate impact of PFES program on each potential outcome is so hard. Hence, we strongly suggest that the further research need to separate the actual influence of the intervention actions for the purpose of estimating the real effectiveness of the PFES program on targeted groups.

Next, keep in mind that data for calculating ATE and ATET was collected from recalled information of respondents in the past, which is so difficult to testify due to the shortage of official records regarding household income and production activities. So, this leads to the magnitude of potential instability, unreliability and bias. Therefore, the further research should use both self-reported information and official records of authorities to ensure the accuracy of analysis. This recommendation is also discussed fairly carefully by López-Pintor, Salas, and Rescia (2018)

Last but not least, because this study was conducted in only one province implementing the PFES regime, thus it must be remembered that the analyzed data from the survey was full of representativeness for the study site while the estimation results was difficult to be applied for another study region due to the fact that there is the such considerable heterogeneity with respect to socio-economic characteristics of respondents and conditions for applied PFES activities. Therefore, more studies in the other areas with alternative methods should be conducted to confirm the results of this study for better policies.

Acknowledgements

The authors would like to thank colleagues for very thoughtful reviews and critical comments, which have led to significant improvements to the early versions of the manuscript.

Conflict of interests

The authors declare no conflict of interest.

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TERRITORIAL DISTRIBUTION OF PROJECTS CONTRACTED AT THE LEVEL OF COHESION POLICY 2014 – 2020

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ARTICLE INFO

Original Article

Received: *08 January 2020*

Accepted: *07 February 2020*

doi:10.5937/ekoPolj2001107M

UDC 342.15:339.9"2014-2020"

Keywords:

Cohesion Policy, operational programs, European funds, absorption, territoriality.

***JEL**: M20, M48, M49*

ABSTRACT

The article aims to identify the territorial distribution of the projects contracted within the operational programs that form an integral part of the Cohesion Policy 2014 - 2020. The analysis is performed in the context in which the territoriality of the investments financed by the Cohesion Policy represents an important variable for ensuring its success. In this article, we proceeded to identify the investment profile used by each county, profile exposed based on a methodology of calculation based on the themes financed by each operational program respectively of the projects contracted at the level of each operational program. Two variables were used in the analysis, namely the number and value of the projects contracted until 30.09.2019. The article highlights the existence of a significant territorial concentration of the projects contracted at the level of a small number of counties. Also, the infrastructure and regional development are the needs considered to be the most present at the level of the projects contracted at the level of Cohesion Policy.

Introduction

Cohesion policy is one of the most important policies of the European Union, it integrates one of the fundamental values of the European Union, namely cohesion. Eliminating development differences but also an unequal distribution of added value achieved at European level are the main motivations that justified the existence of Cohesion Policy. Although the need for such a policy is more than clear and necessary, this situation is mainly due to the extension of the European Union to Eastern Europe. The perception regarding the Cohesion Policy is different from one Member State to another or from one stakeholder to another. While some entities and Member States consider that Cohesion Policy aims at convergence, others consider that it aims at competitiveness, thus having significant perception difficulties regarding Cohesion Policy. However,

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Cohesion Policy benefits from one of the largest budgets, which is distributed among the Member States based on economic and social indicators. The 2014-2020 programming period targets an EU allocation for Cohesion Policy for Romania of just over 36 billion euro. Cohesion policy has become one of the main investors in the regional development processes at the level of Romania, the investments being realized through several operational programs managed in partnership by the Member State and the European Commission. How the operational programs are realized, administered but also correlated with the real needs of development determines the success of the Cohesion Policy, this statement precisely concerns the controversies regarding the capacity of the Cohesion Policy to reduce the regional disparities. While some experts consider that Cohesion Policy provides a defining contribution to the harmonious development of European regions, other experts do not consider that it influences the development processes considering its impact to be insignificant.

Cohesion policy is implemented by several institutions, each with its role, which ultimately assumes the responsibility of converting financial resources into concrete investment projects. The financial capacity, the existence of clear access and administration rules, the synergy between the financed projects and the real needs of the economic and social environment are some of the elements that influence the implementation of the operational programs, implicitly the success of the Cohesion Policy. To all these, we add a defining element for the characteristics of the Cohesion Policy, namely the access to investments financed under this policy or the territorial distribution of absorption. Cohesion policy must, first and foremost, ensure that absorption is directed to those regions that have a low level of development, the investments made from European funds aimed at reducing the level of development. The territorial distribution of absorption represents a study variable addressed in this article and which offers an answer regarding the implementation of Cohesion Policy in Romania.

Literature review

Integration is seen as a process of reducing disparities between regions and this approach can be attributed to a specific European model of integration (Garrido et all, 2007). Cohesion policy was built as a policy whose main objective is to reduce development disparities between the poor and rich regions of Europe. Cohesion policy is considered to be the EU's main investment instrument for achieving the "Europe 2020" objectives, which include: job creation and growth, combating climate change and energy dependence, and reducing poverty and social exclusion (European Commission, 2014). In the programming period 2014 - 2020, the development differences between the center and the periphery are very pronounced, and the Cohesion Policy must integrate a series of solutions to the problems that derive from these development differences (Jovančević, 2012). While some studies support a clear connection between cohesion and convergence such that some authors do find evidence of a positive impact of structural funds on economic growth (eg, Dall'erba, 2005; Ramajo et al., 2008), others state a series of malfunctions regarding the European project and the policies that

derive from it (Bostan et all, 2016). Numerous studies have shown that structural funds have a positive impact on economic growth (Mohl & Hagen, 2010; Eggert et al., 2007; Bouvet, 2005; Cappelen et al., 2003). At the same time, other analyzes conducted on the impact of structural funds, part of EU policies, including Cohesion Policy, have revealed that structural funds are irrelevant to economic growth (Percoco, 2005; Bussoletti & Esposti, 2004; Esposti & Bussoletti, 2008) or that there is no connection between economic growth and structural funds (Dallerba & Le Gallo, 2008; Garcýa-Mila & McGuire, 2001). The European Commission itself considers that there is a level of inefficiency in terms of structural funds, which is linked to the allocation of resources on different operational programs, sacrificing practically a tangible impact (European Commission, 2010). The thematic concentration of resources on several European priorities, as configured by the Cohesion Policy in the 2014-2020 programming period, is considered a positive step but will not solve the whole set of dilemmas regarding the cohesion concept, especially as regards the cohesion concept the antagonism between regional equity and the competitiveness of the European economy (Begg, 2010). The lack of a unanimously accepted opinion in the specialized literature imposes an analysis that takes into account the particularities existing at the level of each Member State because the context, the development needs but also the level of involvement of the stakeholders are different from one Member State to another so that it is impossible to illustrate a valid general rule.

Methodology

The analysis of the territoriality of the absorption of the European funds was carried out by sorting the projects approved at the level of the operational programs that constitute an integral part of the Cohesion Policy to identify the projects that benefit from territorial applicability at the level of a county. The reference unit for the analysis process is the county. After the process of sorting the projects, they were distributed on operational programs and mathematical and statistical formulas were applied, taking into account the particularities of the operational program and the strategic and programmatic architecture related to the programming period 2014 - 2020. The project sorting process was realized based on the implementation region respectively of the county declared in the projects submitted and approved until 30.09.2019. Programs included in the analyze are Operational Program for Large Infrastructure (OPLI), Regional Operational Program (ROP), Operational Program for Human Capital (OPHC), Operational Program for Competitiveness (OPC), Operational Program for Administrative Capacity (OPAC), Operational Program for Technical Assistance (OPTA).

Using the weight of the values of the projects contracted at the operational program level in conjunction with the theme and the needs financed by each operational program, the thematic influence at the level of each county was identified. Specifically, the needs were distributed to operational programs, following the provisions of the Partnership Agreement 2014 - 2020 and after that, the following formula was applied:

Infrastructure and regional development = $\frac{OPLI}{Total\ value\ of\ the\ projects}\% + \frac{ROP}{Total\ value\ of\ the\ projects}\%$

Human capital, education, poverty reduction = $\frac{OPHC}{Total\ value\ of\ the\ projects}\%$

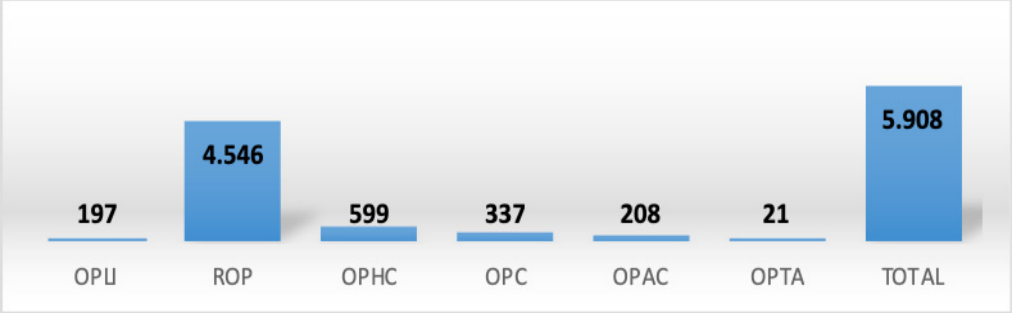
Innovation, research and development = $\frac{OPC}{Total\ value\ of\ the\ projects}\%$

Public administration and technical assistance = $\frac{OPAC}{Total\ value\ of\ the\ projects}\% + \frac{OPTA}{Total\ value\ of\ the\ projects}\%$

Contracting under the Cohesion Policy 2014 - 2020 - 30.09.2019

Contracting is a variable that provides an image of the level of absorption within an operational program or policy. Contracting is the first stage of the absorption process, which is extremely important because it integrates all the rules and responsibilities that a beneficiary of a project funded from European funds must fulfil. Contracting must be differentiated from absorption because it does not represent effective absorption but the level of contracting provides a predictable image regarding the level of absorption. The graph below illustrates the situation of Cohesion Policy contracting, on 30.09.2020.

Figure 1. The situation of the projects delimited territorially at county level – number of projects, 30.09.2020



Source: Ministry of European Funds, 2019

Projects with a delimited territorial variable, more precisely those projects that are implemented at the level of a single county, total 5.908 projects. This number concerns the programs related to the Cohesion Policy 2014 - 2020, respectively the programming period 2014 - 2020. The analysis of the number of projects at the level of each program is an important variable for the characterization of the territoriality because it provides

an image regarding the territoriality at the operational program level but also the centralization of the administration process used by the managing authority. OPLI is a program that assumes high values at the project level by financing large infrastructure so that projects financed by OPLI usually target several counties. 197 such projects explicitly target a certain county of Romania. OPHC integrates 599 projects that are territorially clear and related to one or more counties, OPC 337 of such projects, OPTA of 21 such projects. ROP is the program with the most projects with a clearly defined territorial variable, more precisely 4.546 such projects, about 76% of the projects related to the Cohesion Policy 2014 - 2020. It can be appreciated the existence of a more decentralized approach in the case ROP than for other operational programs, such as OPTA, for example.

Figure 2. The value of the projects delimited territorially at county level – lei, 30.09.2019

Source: Ministry of European Funds, 2019

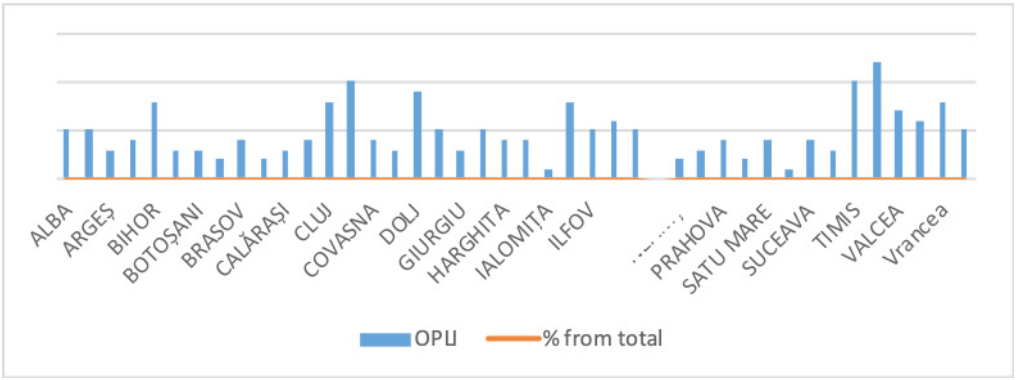
Analyzing the situation of the projects delimited territorially at the county level we can observe that OPLI has delivered consistent value to these types of projects, namely 34.363.360.032 lei. At the same time, the ROP financed projects with a territorial value of 37.938.076.399 lei. Both programs mentioned above concerned contracted values by 82,84% of the EU allocation for OPLI and 122,9% of the EU allocation for ROP. At the same time, OPHC, a program with a rather well-defined territorial applicability, financed projects with a territorial value of 4.165.153.429 lei, representing only 21,17% of the EU allocation for the programming period 2014 - 2020. A slightly higher value for these types of projects, value established based on signed contracts, we can find it at the OPC this being of 3.966.161.479 lei representing 66,28% of the EU allocation. OPAC targeted territorially delimited projects worth 342.425.209 lei and OPTA of 249.685.452 lei.

Operational Program for Large Infrastructure (OPLI)

OPLI aims to finance large infrastructure projects, benefiting from one of the largest allocations from the level of Cohesion Policy, in Romania. The EU allocation for OPLI is 9.218.524.484 euro, which is structured in 8 priority axes. The concrete topics addressed at the program level are transport, environment and climate change or energy

and energy efficiency. The effective absorption at 01.11.2019 at the program level was 19,31%, which includes projects from 2007 - 2013, respectively phased projects.

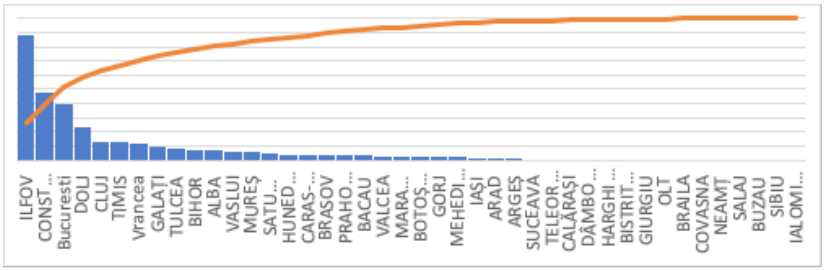
Figure 3. The situation of the territorially delimited projects financed from OPLI – number of projects, 30.09.2020



Source: Ministry of European Funds, 2019

The graph above illustrates the territorial distribution of the projects financed by OPLI. The graph shows that 7 counties cover 32,99% of the total number of projects financed from OPLI, each county having at least 8 projects contracted. At the same time, some counties have not contracted any project within this program, referring here to Mures. The Ialomita benefited from a single project and the counties of Braila, Buzau, Neamt or Salaj each benefited from 2 projects funded within the OPLI. The concern of the counties for the large infrastructure is present in most of the counties in Romania, this being considered one of the most important problems at the country level. The number of projects varies from county to county but except for one, all counties have benefited from at least one project funded by OPLI.

Figure 4. The situation of the territorially delimited projects financed from OPLI - lei, 30.09.2019



Source: Ministry of European Funds, 2019

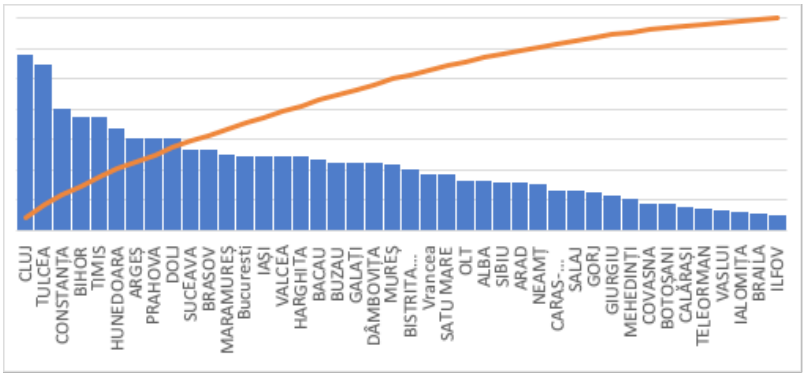
Analyzing the distribution of the value of the projects financed from OPLI we can observe a significant difference from the situation of the distribution of the number of projects. 4 counties weight 58,66% of the total value of the territorially delimited

projects contracted from OPLI. The Bucharest Ilfov region has realized projects that cover 37,6% of the value of the projects contracted and financed within the OPLI. An atypical example is the Tulcea county, which although it has a dedicated allocation and special selection procedures because it is under the Integral Territorial Investments instrument, it has realized projects worth only 865.893.101 lei, a value much lower than in counties such as Constanta. The value of the contracted projects is concentrated in a small number of counties, so that the projections regarding the absorption of the funds aimed at this program neglecting the development needs of the relatively poorer counties, such as Covasna or Dambovita.

Regional Operational Program (ROP)

ROP has an allocation of 6.860.000.000 euro in 2014-2020, representing the amount with which the EU contributes to the implementation of the program. On 01.11.2019 the payments to beneficiaries made under the program were 1.322.792.772 euro and the current absorption was 981.268.227 euro, representing 14,3%. The absorption at 5 years from the start of the implementation period is considered to be small. ROP is an extremely important program for the mix of economic and social development provided for in the Partnership Agreement 2014 - 2020, which aims at needs such as technology transfer, SME competitiveness, urban development, social and educational infrastructure, tourism development or urban regeneration. These needs are structured based on 15 priority axes, 3 of them taking over a series of investment needs and objectives during the 2007-2013 programming period

Figure 5. Situation of the territorially delimited projects financed from OPLI – number of projects, 30.09.2020

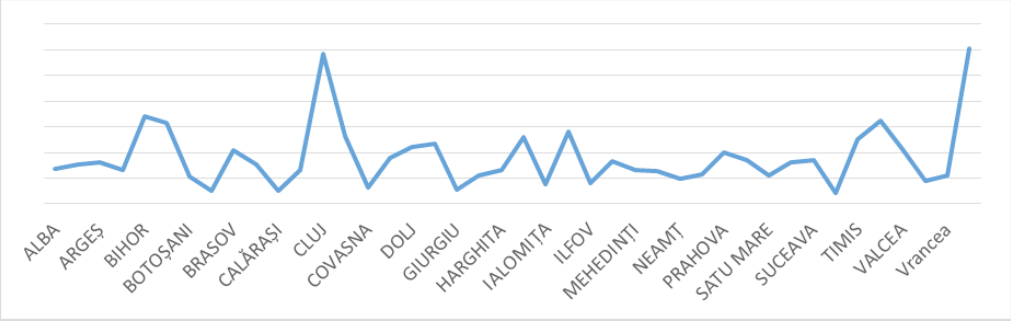


Source: Ministry of European Funds, 2019

Analyzing the situation of the territorially delimited projects contracted within the ROP we can observe a much more uniform distribution than in the case of OPLI. By 30.09.2019 ROP, 4.546 projects were contracted and financed by ROP, this being a large one. All the counties in Romania have benefited from projects funded within the ROP, this being one specific to this operational program. Their number differs from

one county to another. Three counties benefit from more than 200 contracted projects, these being Cluj (292 projects), Constanta (202 projects) and Tulcea (276 projects). On the other side, we can see counties with a much smaller number of projects contracted within the ROP, exemplifying here Ilfov (28 projects), Braila (29 projects), Ialomita (32 projects), Vaslui (36 projects). Two particular examples should be mentioned, namely Tulcea County and Bucharest Ilfov region. Tulcea County benefits from 276 projects representing 6,07% of the projects contracted within the ROP, this being allowed by the particularities aimed at the evaluation and selection of projects within the Integrated Territorial Investments instrument. Another example is the Bucharest Ilfov region, which benefits from only 153 projects, the number is modest considering the characteristics of this region. The justification for such a small number derives from the fact that the Bucharest Ilfov region has restricted access to the opportunities offered by the ROP, with a small number of priority axes in which this region is eligible.

Figure 6. The value of the territorially delimited projects financed from the ROP - lei, 30.09.2019



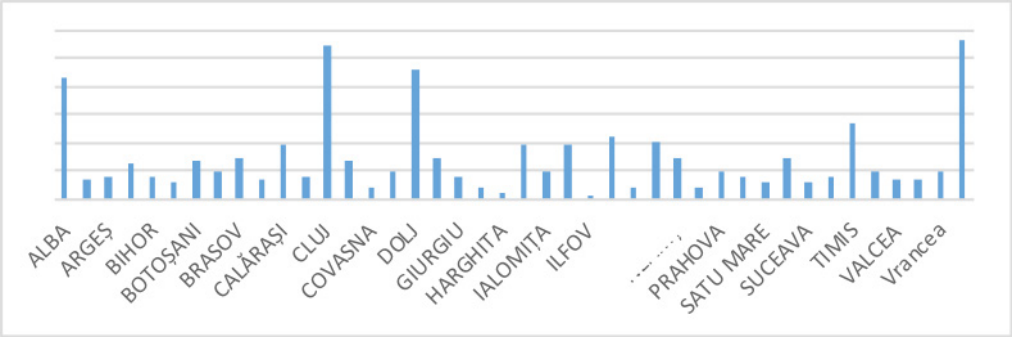
Source: Ministry of European Funds, 2019

The value situation of the projects financed from the ROP is different from that of the number of projects contracted. 3 counties benefit from 19,94% of the total value of the projects contracted within the ROP (Cluj – 2.912.718.734 lei, Bucharest – 3.031.937.557 lei, Tulcea – 1.619.478.733 lei). On the other side, we can identify a relatively large number of counties that do not exceed the weight of 1% of the total value of the projects contracted within the ROP, mentioning here the following counties: Braila (248.365.164 lei), Calarasi (258.738.697 lei), Covasna (329.218.623 lei), Giurgiu (282.630.033 lei) or Teleorman (218.654.838 lei). Notable performances can be seen in the case of the counties of Bihor (1.700.313.457 lei) and Bistrita Nasaud (1.582.581.477 lei). ROP is a program that benefits from different administration rules, which is implemented in a public-private way, more precisely through regional development agencies. The managerial flexibility but also the specific theme of this program allowed a much greater decentralization and a much more efficient adaptation to the regional and county particularities.

Operational Program for Human Capital (OPHC)

The OPHC is an extremely important program for the Europe 2020 Strategy because it targets mainly social issues. More specifically, the topics covered by this program are the labour market, the correlation of the demand with the supply on the labour market, the efficiency of the educational system but also the reduction of poverty. The topics are structured based on 7 priority axes, 6 of them having immediate thematic applicability and one is dedicated to technical assistance. OPHC is an extremely complex program, the assertion being based on the extremely large number of beneficiaries with which the program interacts. The EU allocation for this program is 4.371.963.027 euro, which is considered a big one. The current absorption at 01.11.2019 was 927.748.759 euro (21,22%) and the actual absorption was 776.875.827 euro (17,77%). One particular feature of this program is that the number of territorial projects does not exceed 50% of the total number of projects financed at the national level so that the level of centralization used by the managing authority is high.

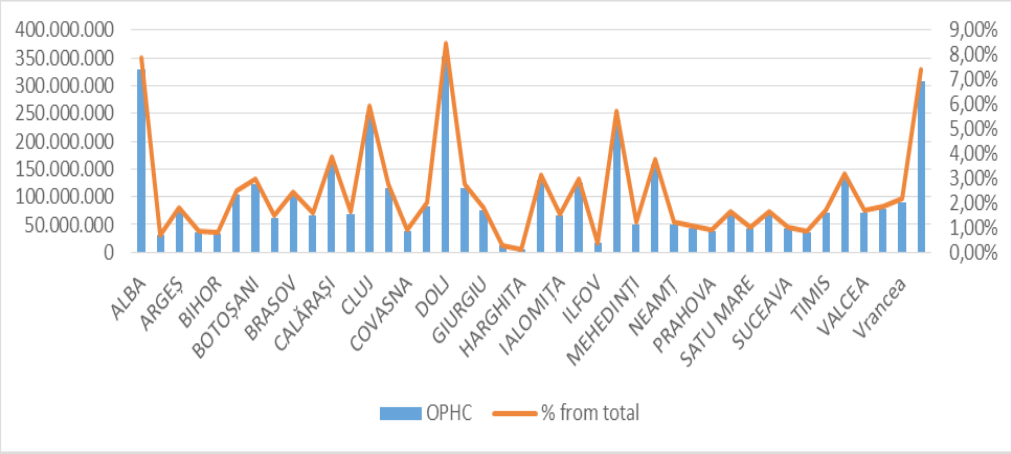
Figure 7 . Situation of the territorially delimited projects financed from OPHC – number of projects, 30.09.2020



Source: Ministry of European Funds, 2019

All the counties in Romania have benefited from at least one contract with a delimited territorial characteristic, a project financed within the OPHC. The graph above shows a concentration of the contracted projects in a small number of counties, referring here to Alba (43 contracts), Dolj (46 contracts), Cluj (54 contracts) or Bucharest (56 contracts). As with other operational programs, we can observe a concentration of absorption in a limited number of counties, so that 25,54% of the absorption is concentrated in 4 counties. At the same time, Ilfov County benefited from a single project with the territorial delimitation financed by OPHC, being the only county in such a situation. At the same time, Harghita contracted 2 projects from OPHC, Mehedinti, Gorj and Olt with 4 projects each, these being the counties with the least number of projects contracted within the OPHC.

Figure 8 . The value of the territorially delimited projects financed from OPHC - lei, 30.09.2019



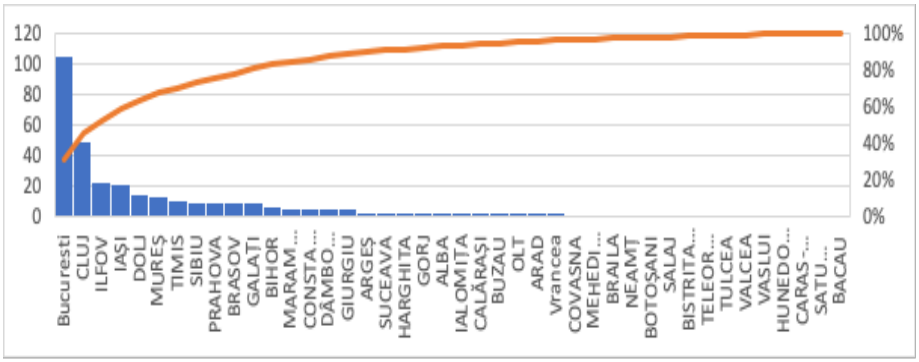
Source: Ministry of European Funds, 2019

Analyzing the distribution of the amounts contracted within the OPHC we can observe more efficient counties in attracting the amounts that come from the OPHC, these are Alba (329.528.042 lei), Dolj (352.654.917 lei), Maramures (237.805.154 lei) or Bucharest (308.957.552 lei). A particular example is Tulcea County, which benefits from contracts amounting to 133.703.101 lei. At the same time, the counties that have benefited from the smallest amounts contracted based on the projects financed from OPHC are the following: Arad (30.152.926 lei), Gorj (12.002.450 lei), Harghita (4.403.655 lei), Ilfov (16.553.115 lei), Prahova (38.145.266 lei) or Teleorman (36.014.030 lei). The graph above shows an unequal distribution of the contracted values based on the projects financed from OPHC.

Operational Program for Competitiveness (OPC)

The OPC, unlike other operational programs, is much more flexible, benefiting from only two priority axes, its needs being research, technological development and innovation in support of economic competitiveness and business development as well as e-governance or facilitating high-speed Internet access. The OPC benefits from an allocation from the EU of 1.329.787.234 euro, the current absorption at 01.11.2019 being 21,98% and the effective one 18,8%. The program is narrow, including thematically so that its implementation is much easier than in the case of other operational programs. The territorial distribution of absorption is shown in the graphs below:

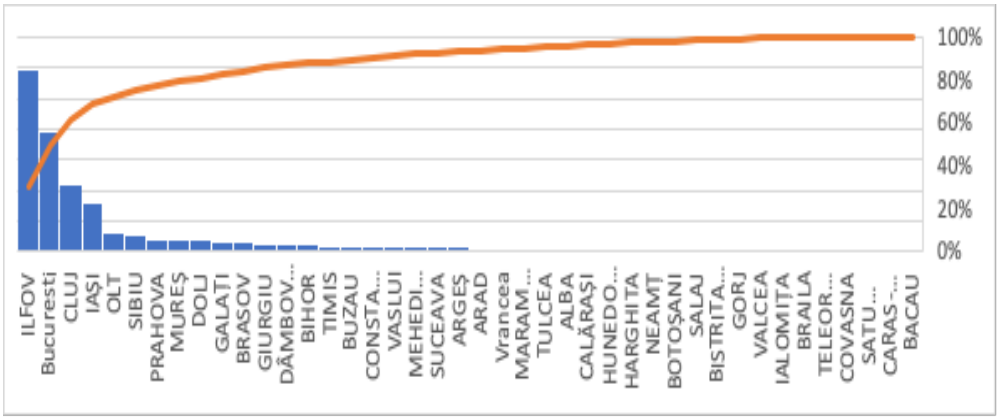
Figure 9 . The situation of the territorially delimited projects financed from the OPC – number of projects, 30.09.2020



Source: Ministry of European Funds, 2019

The territorial distribution of the projects financed within the OPC is deeply concentrated in a small number of counties, this is clearly illustrated by the graph above. Bucharest has the largest number of projects contracted at the national level, twice as many projects as Cluj County, for example. Specifically, the number of projects delimited territorially, projects that were contracted within the OPC by the Municipality of Bucharest was 106 projects while in Cluj county 49 projects were contracted. 5 counties benefited from 63,5% of the projects contracted within the OPC, these being as illustrated in the graph above Bucharest, Cluj, Ilfov, Iasi and Dolj. At the same time, about half of the counties of the country either did not benefit from any project or have at most 2 projects contracted within the UCI. OPC is the program that delivers one of the largest territorial concentrations in terms of territorial distribution of projects contracted within the OPC.

Figure 10. The value of the territorially delimited projects financed from the OPC - lei, 30.09.2019



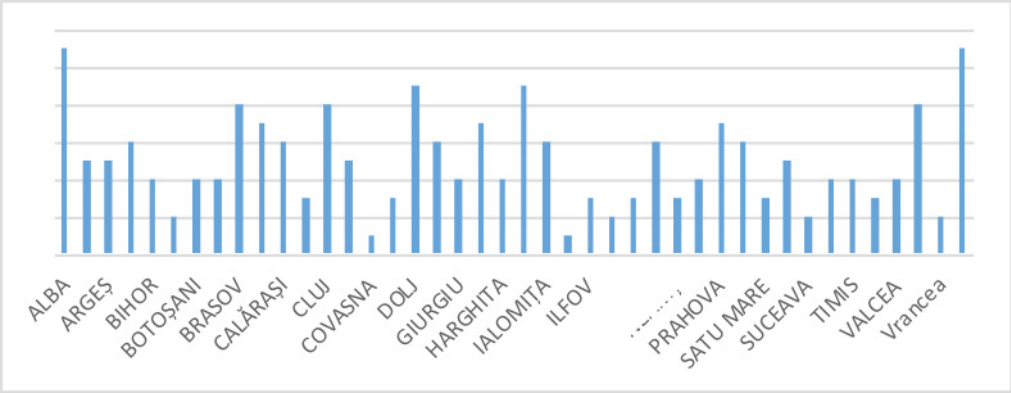
Source: Ministry of European Funds, 2019

Analyzing the value territorial distribution of the OPC we can find that the territorial concentration encountered at the level of the projects contracted within the OPC is maintained. A notable difference is Ilfov County, they benefit from a much smaller number of projects than Bucharest, but it has a contracted value of about 40% higher than Bucharest. This is due to the projects of major importance found at the program level, an example would be the laser from Magurele. The value distribution of the amounts contracted within the OPC ensures a significant concentration in 4 counties, totalling 68,96% of the absorption representing 2.734.887.656 lei. The territorial concentration of absorption is significant at the level of the OPC.

Operational Program Administrative Capacity (OPAC)

OPAC is an operational program that integrates 3 priority axes, these mainly targeting the public administration and the judicial system. The amount allocated to this operational program is 553.191.489 euro, the EU allocation. The current absorption at 01.11.2019 is 96.612.709 euro representing 17,46% of the total allocation and the actual absorption was 82.914.613 euro representing 14,99% of the total allocation. OPAC is an operational program aimed mainly at public authorities, the procedural synergy between the beneficiaries and the managing authority being much greater than in the case of other operational program. Also, the extremely limited thematic area but also the strategic framework dedicated exclusively to public administration make this program extremely attractive for the Romanian public authorities. This is proved by the territorial distribution of the contracts related to the projects financed from OPAC but also by the specific value distribution, these being presented in the graphs below.

Figure 11. The situation of the territorially delimited projects financed from OPAC – number of projects, 30.09.2020

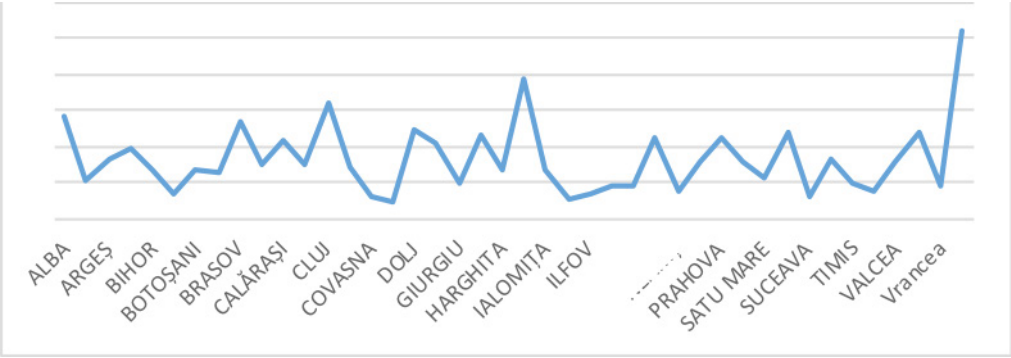


Source: Ministry of European Funds, 2019

The territorial distribution of projects with territorial applicability financed by OPAC is much more uniform compared to other operational programs. All the counties of the country have benefited from at least one project with the territorial delimitation financed

from OPAC. The counties with the most projects are Alba (11 projects), Hunedoara (9 projects), Bucharest (11 projects). On the other hand, the counties that have benefited only from a project are Iași and Covasna, while Maramures, Bistrita Nasaud, Suceava and Vrancea have benefited from 2 projects with territorial delimitation financed by OPAC. Access to OPAC is considered easy because the level of expertise required for such a project is not a complex one but also within the reach of the beneficiaries, in this case, public authorities.

Figure 12. The value of the territorially delimited projects financed from OPAC - lei, 30.09.2019



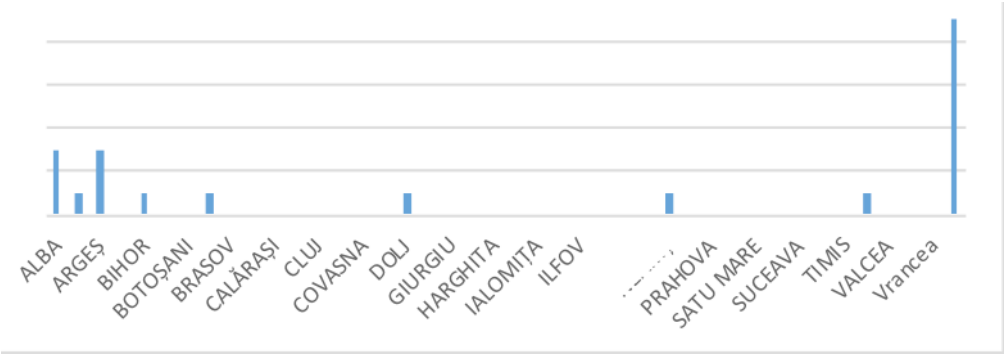
Source: Ministry of European Funds, 2019

In the case of the value distribution related to the projects with territorial delimitation contracted in the case of OPAC, we can observe differences from one county to another. Despite a much less territorial distribution of projects, in terms of value, we can see that 4 counties benefited by 21,44%, the percentage is a significant one. The counties we refer to are Cluj, Dolj, Hunedoara and Bucharest. The counties that have registered modest performances in attracting the amounts related to OPAC by contracting the projects with the territorial delimitation are Covasna (0,85% of the total value), Dambovita (0,66% of the total value), Iasi (0,77% of the total value) and Suceava (0,91% of the total value).

Operational Program for Technical Assistance (OPTA)

The EU allocation at the program level is 252.765.958 euro, this being the smallest allocation from the operational programs that can be found in the Cohesion Policy. The current absorption at 01.11.2019 was 128.071.144 euro representing 50,67% and the actual absorption was 109.206.327 euro representing 43,2% of the total allocation. OPTA is the program that delivers the highest absorption on 01.11.2019, the program is structured based on two priority axes, the first aimed at the system of European structural and investment funds and the second aimed at promoting the structural instruments to increase the absorption rate. OPTA is a program different from the rest of the operational programs because the thematic area covered directly concerns the implementation of the structural instruments and the functioning of the management system.

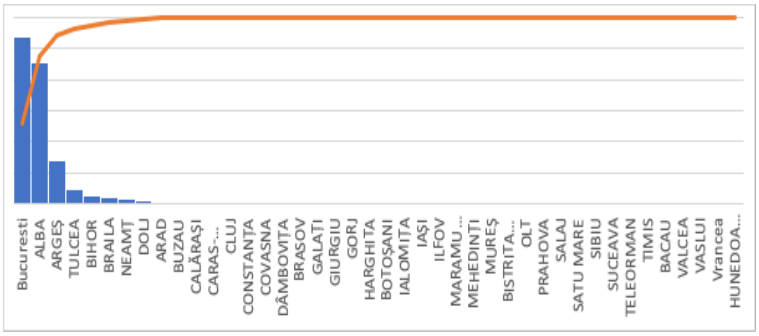
Figure 13. Situation of the territorially delimited projects financed from OPTA – number of projects, 30.09.2020



Source: Ministry of European Funds, 2019

The graph above illustrates that out of all the counties of Romania, only 9 have realized and contracted projects financed under OPTA. 9 of the 21 projects realized were realized in Bucharest and the only counties that have benefited from more than one OPTA funded project are Alba and Arges. The level of centralization that the program delivers is a significant one, as it has been observed the distribution of the contracted projects being an extremely territorial one. The situation of Bucharest derives from the fact that most of the central institutions are in Bucharest, this being the justification for a large number of territorially delimited projects found at the level of Bucharest.

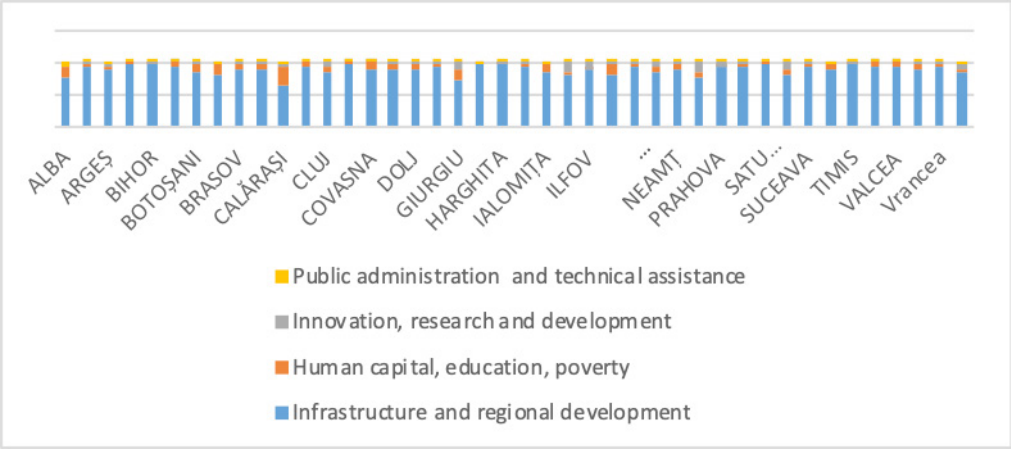
Figure 14. Value of territorially delimited projects financed from OPTA - lei, 30.09.2019



Source: Ministry of European Funds, 2019

The territorial distribution of the amounts proves a major concentration of the amounts contracted within the OPTA, more precisely we can find two counties that cover 79,74% of the total of the contracted amounts. OPTA is the program with the highest thematic concentration in the Cohesion Policy. The two counties we refer to are Bucharest (43,06%) and Alba (36,68%). Also, Arges County benefited from a contracted value of 27.433.829 lei, representing 10,99% of the total value of the projects contracted under OPTA on 30.09.2019.

Figure 15. Investment profile financed from European funds used at county level - %



Source: Own processing

Based on the calculation formula set out in the methodology, we proceeded to identify the needs covered by projects with territorial delimitation contracted within the Cohesion Policy on 30.09.2019. The graph above illustrates the thematic mix used at the level of Cohesion Policies, it takes into account the territorially delimited projects, projects contracted until 30.09.2019. As can be seen, most of the counties in Romania have contracted projects that directly targeted the regional development and infrastructure, these needs are widely financed during the programming period 2014 - 2020. The integration of the theme related to regional development and infrastructure it is a consequence of the needs felt at the county level because those are the most prominent but also the most requested by the beneficiaries and stakeholders of the programming period 2014 - 2020. Addressing the investment theme at the county level is also a consequence of the modality in which was administered and implemented ROP. It delivered the largest number of projects with territorial delimitation, which is possible due to the thematic approach at the program level but also the structure of beneficiaries, these targeting the territories and needs delimited and applicable at the county level. ROP has delivered 4.546 projects with territorial delimitation. The need for infrastructure and regional development was integrated on average at the county level in the proportion of 88,19%, a percentage calculated as the arithmetic average of all the percentages at the county level. Among the counties that have given the greatest interest to this topic, the interest manifested through the realized projects is Constanta (97,51%), Bihor (96,53%) or Bacau (95,77%). Except for Calarasi County, all counties integrated the need for infrastructure and regional development in the projects contracted over 70%, Calarasi county being the only one that addressed this need in a proportion of 63,86%.

Regarding the need related to human capital, education and poverty we can observe a much higher concentration at the territorial level than in the previous case. The territorial

concentration mainly concerns the counties of Alba (17,31%), Calarasi (30,49%), Giurgiu (16,06%), Maramures (16,83%) and Ialomita (13,92%). The counties that have addressed the issues related to human capital, education and poverty in a small proportion are Ilfov (0,16%), Harghita (0,58%) or Bihor (1,53%). Research development and innovation is a need that also delivers a significant level of territorial concentration so that the counties of Iasi (15,12%), Giurgiu (10,2%), Ilfov (11,2%), Olt (15,66%) and Sibiu (11,25%) are the counties with the highest weight in terms of the previously mentioned topic. The situation is similar even in the case of public administration and technical assistance so that Alba County integrates this need in a proportion of 5,69%, this being the county that has assigned the highest weight to this need.

Conclusions

The European funds have territorial applicability these generating effects at the level of a county respectively at the level of a region. The study of the mix of needs financed from the projects related to Cohesion Policy represents an endeavour to provide an image regarding the specific investment characteristics of a certain county, characteristics predefined by the beneficiaries from the respective county who have contracted projects financed from European funds. The managing authority but also other institutions that are an integral part of the system of European structural and investment funds can influence how the beneficiaries base their choices. Development needs are not the only elements that contribute to the substantiation of investment decisions at the level of a beneficiary, access to expertise or technical and operational capacity are also of utmost importance.

The analysis performed at the level of this article proves a different behaviour from one operational program to another regarding the territoriality of the funded projects. The most important operational program from this point of view is ROP, which has a thematic approach that best captures the development needs at the county level. It delivered 4.546 territorially delimited projects whose total value was 37.938.076.399 lei, EU allocation. OPLI is the program that has provided 197 territorially delimited projects whose EU allocation is 34.363.360.032 lei. We can see a significant difference between the two operational programs that finance the infrastructure. ROP targets small investments with county-level applicability, while OPLI is an investment-focused program targeting at least one or more counties or one or more regions. The differences regarding the number of projects are given including the fact that Romania is administered by counties while the funds are allocated and managed regionally. The complexity of an infrastructure project financed from OPLI is greater given a large number of institutions that intervene in the implementation and implementation of the respective project. From the number of projects, both OPLI and ROP are territorially dispersed so that most counties have benefited from at least one project funded from these programs. From the values of the contracted projects, we can observe a significant territorial concentration in the case of OPLI such that the Bucharest Ilfov region covered 37,6% of the total value of the projects contracted within the OPLI and 3 counties (Ilfov, Cluj, Constanta) and Bucharest Municipality. In the case of ROP, we can observe a less concentrated distribution such

that the Municipality of Bucharest together with two counties covered 19,94% of the total value of the contracted projects. A territorial concentration can be found even in the case of OPHC, this one concerning both the number of projects and the contracted values. More precisely 4 counties contracted 29,51% of the values contracted at the level of OPHC projects. The situation is similar in the case of OPTA, the territorial concentration being a much more pronounced one so that the Municipality of Bucharest together with Alba county contracted 79,74% of the total value of the contracted projects. OPAC is an operational program that has a lower territorial concentration than in the previous programs, its situation being approximately similar to that of the ROP. Specifically, 3 counties next to Bucharest Municipality concentrate 21,44% of the value of the contracted projects in the case of OPAC.

The implementation of the Cohesion Policy 2014 - 2020 is one that ensures a significant territorial concentration of absorption in a small number of counties. ROP and OPAC ensure a territorial concentration of about 20% in 3 or 4 counties while the rest of the programs deliver a concentration of at least 30%, reaching up to 79,74% in the case of OPTA. Regarding the portfolio of projects at the county level, we can see that infrastructure and regional development are the most widespread needs financed. The counties that concentrate most of the absorption deliver a diverse investment portfolio. An example of a county that delivers a significant territorial concentration for most operational programs is Cluj. It contracted projects that targeted the infrastructure and regional development by 85,87%, 4,92% of the value of the contracted projects concerned the human capital, education and poverty reduction, 8,88% of the value of the contracted projects aimed at research and development and innovation also 0,32% of the value of the contracted projects concerning the public administration and the technical assistance. In general, the needs that have benefited from investments in most counties are related to infrastructure, education, human capital and education.

The orientation of the investments financed under the operational programs that make up the Cohesion Policy is rather oriented, both in value based on the contracted projects and in terms of the number of projects contracted, towards those counties with a higher level of development such as Cluj, Ilfov or the Municipality of Bucharest. During this time, counties such as Braila, Vaslui, Ialomita, Botosani registered modest performances in terms of contracting projects. There are significant differences from one county to another in terms of the portfolio of projects contracted until 30.09.2019 within the Cohesion Policy. The differences are justified by several elements that were not included in the analysis methodology, such as financial capacity, access to expertise, rules at the program level or the programmatic framework for the programming period 2014 - 2020. For a justification of the causes which influence the territorial distribution of absorption, it is necessary to analyze at least the above-mentioned data.

Conflict of interests

The authors declare no conflict of interest.

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STRATEGY OF ORGANIZATIONAL-TECHNOLOGICAL SOLUTIONS ON PRODUCTION OF LAMB FOR SALE IN FARMS CONDITIONS

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A R T I C L E I N F O

Original Article

Received: *16 December 2019*

Accepted: *05 March 2020*

doi:10.5937/ekoPolj2001125M

UDC 363.3.03:338.43.01

Keywords:

economic results, production technology, lambs for sale, body weight

***JEL**: Q12, Q13, Q41*

A B S T R A C T

Surveys were conducted in the Nisava and Toplica districts in Serbia during 2018. The medium-sized private sheep farm (A) in Držanovac in the Toplica District and the small private sheep farm (B) in Orljan, in the Nisava District are being investigated. The volume and technology of sheep genotype production for lamb production for sale on both farms was monitored and economic results analyzed. During the study period, it was found that on farm A there were 150 heads of Merino breed and on farm B 75 heads. Total profit on Farm A without incentives in crop production: wheat 1,215.0 EUR, maize 1329.7 EUR, barley 1314.60 EUR, triticale 1561,50 EUR and in livestock breeding for 150 heads EUR 16,920, of which 13,500 EUR in lamb production. Also total profit on Farm B in crop production: wheat EUR 2,853.0, corn EUR 1329.6 and livestock production, by 75 heads, EUR 8,460, of which EUR 6,750 in lamb production.

Introduction

The importance of sheep production, among other things, is to enable it to make fuller use of agricultural resources and to realize a large part of crop production. In addition, due to the encompassing production process which has a slight influence of external factors, sheep production significantly affects the overall growth rate of agricultural production. Production of the breed of lambs for the production of lambs for sale has fallen over

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one third of the total production in Serbia, while this share in Vojvodina rises to almost half of the total production. Regardless of the natural indicators in intensively oriented production of Merino sheep, it is very important to provide a thorough insight in the cost of production, which is the basis of economy of the production process of lambs for sale. Unlike a farm that produces sheep for its own purposes and eventually sells the product. Farms or family farms that are permanently oriented to commodity production must pay close attention to the cost of production, and the products obtained must meet quality standards. Research on the economic parameters of sheep production is concerned with determining the cost of producing lambs and sheep in two stages. The analysis deals with the cost of production of sheep in the first stage of the production process, and the determination of the total cost of production of individual product categories by applying divisional calculation in the second stage of calculation Mičić et al., (2018). The cost correction aims to give the results obtained wider applicability to the farms surveyed. In this way, the results obtained are of general and not only local importance, Yusup et al., (2017). Quantity, as part of a strategic effort to provide the required quantities of lambs for sale, wool, and milk, continues to be an important element of production, although its primacy has long been overcome, Saatchi et al., (2010). To increase lamb production in the industry, science has made efforts to successfully manage the sheep breeding process. Today, in many countries, including ours, estrus Synchronization methods are used to control the reproductive properties of sheep, as well as to produce more female lambs at the same stage of estrus and ovulation. This method allowed two or three lambs a year for two years, with the goal of increasing lamb and meat production. Zapletal et al., (2010) point out that the use of proper hygiene in sheep reproduction, breeding, environmental conditions, nutrition, prevention and treatment are key factors. Estrus synchronization successful programs play a key role in lambing and profitability of sheep wearers in semi-intensive production systems, (Cividini et al., 2012; Kukovic, et al., 2013). Sheep farming in Serbia is generally extensive. In Serbia the sheep population is 80%, of which the following strains are: Pirot, Svrljiska, Sjenica, while the remaining 20% are Cigaj, Wirtember sheep, and Australian merino for wool production. Productivity in the population of other breeds is higher, but due to the low participation in the total number of sheep, the effects are insignificant at the national level. The annual weight of sheepmeat in the last decade is below 20,000 tonnes. In Serbia, the consumption of sheep meat is below 3.0 kg per capita, we are among the European countries with the lowest consumption. The basic orientation of farmers in lamb and meat production in Serbia seems to be in the first (F1) generation to achieve better quality of lamb production for sale, etc. According to the latest data from the Statistical Office of the Republic, about 1.7 million sheep are raised. Most, over one million, are grown in central and eastern Serbia, but on the other hand, the largest and most organized farms are located in Vojvodina (Matsushita et al., 2010; Marina et al., 2017).

The following authors have explored this issue, among others: (Kegalj et al., 2011; Mellado et al., 2016; Momoh et al., 2013; Rahimi et al., 2014; Siddalingamurthy et al., 2017; Simeonov et al. al., 2015; Tohidi et al., 2016; Catalan et al., 2018).

Materials and methods

The survey was conducted on a family farm on farm A in Držanovac and farm B in Orljan. Both farms have a closed production cycle. The middle farm (A) has 150 heads of sheep, and the small farm (B) 75 heads of sheep a year. Farm A employed 2 people and Farm B 1 people. Production costs for both households are based on natural indicators established on the basis of a survey conducted in 2018 and all categories of variable costs in accordance with the production process. Material costs refer to the consumption of nutrients and medicines used in the production process. Depreciation expense in 2018 based on space and equipment norms, we approach investment estimates, estimate depreciation costs based on which fixed cost categories are calculated. In determining the cost of production, we start from the price of lamb products for sale. Production parameters are monitored: on farms A and B, food consumption on both farms per 1 kg increment, total growth and food costs on both farms Gbangboche et al., (2006).

The significance of results in lamb production in 2018 was independently monitored on both farms during one research year.

Results

Research on the economic parameters of the production process for lambs for sale was carried out at Medium Sheep Farm A and Small Sheep Farm B. These farms have a closed production cycle which includes the production of lambs, sheep wool and milk. On farm A over 200 lambs a year and farm B about 100 lambs. Fama A produces the most important nutrients for the feeding of cereals. at 10 h and Fama B produces the most important nutrients for the feeding of the cereals, at 5 h. Farm A has two members and Farm B has one member. Based on the recording of production processes on farms A and B, the cost of materials was calculated, which included the consumption of food, medicines, other materials and water. Variable costs account for the bulk of material costs (Archimede et al., 2008; Zaharia et al., 2013).

Discussions

Farm A was monitored for the economics of producing the most important nutrients for the feeding of the cereal group. The economics of wheat, maize, triticale and barley production are still being monitored. The farmer has significant areas and favorable conditions for the said production. Corn covered 2 ha, triticale 3 ha, wheat 2 ha and barley 3 ha. Annual production of 50 tonnes of cereals on farm A farmland in 2018. The aforementioned middle sheep farm as well as crop production was investigated in order to provide nutrients for the feeding of herds on farm A. The natural and financial indicators of cereal production in 2018 are given in the following tables, as follows: calculation of production, maize (Table 1); triticale (Table 2); wheat (Table 3) and barley (Table 4).

Table 1: Calculation of realized economic indicators of maize production per 2 ha for farm A

Row. Number	Production year: 2018	Number of repetitions	Quantity	JM	The price	JM	Amount of EUR / ha / 2
I	Income						
1.	Corn	2	6,5	t/ha	130,0	EUR /t	1690,0 EUR
2.	Corn	2	9	t/ha	17,98	EUR /t	323,7 EUR
A)	Total revenue (1 to 2)						2.013,7 EUR
3.	Costs						
4.	Seeds	1	20	kg	1,50	EUR	30,0 EUR
5.	Fertilizer						
6.	Manure	25%	40	t	1,0	EUR /kg	40,0 EUR
7.	KAN (29% N)		400	kg	0,30	EUR /kg	120,0 EUR
8.	Pesticides						
9.	Guardian		6	L	4,0	EUR /kg	18,0 EUR
10.	Thesis		6	L	2,5	EUR /L	15,0 EUR
11.	Irrigation						
12.	Energent	2	15	L	1,40	EUR /L	42,0 EUR
13.	Diesel fuel		60	L	1,40	EUR /L	84,0 EUR
14.	Maintenance of mechanization		2	ha	15,0	EUR /ha	30,0 EUR
15.	Paid services. mechanization						
16.	Plowing		2	ha		EUR /ha	0 EUR
17.	Land preparation		2	ha		EUR /ha	0 EUR
18.	Sowing		2	ha	30.50	EUR /ha	61,0 EUR
19.	Harvest		2	ha	65,00	EUR /ha	130,0 EUR
20.	Paid labor		5	work day	15,0	EUR	75,0 EUR
21.	Other variable costs						
22.	Storage cost			kg		EUR /kg	0 EUR
23.	Transport to the customer		13	t	3,0	EUR /t	39,0 EUR
B)	Total Cost (3 to 23)						684,0 EUR
II	**PROFIT / LOSS**						
24.	Total No Incentives (A - B)						**1329,7** EUR
25.	Per ha without incentives (24:17)						**664,8** EUR
26.	Price of cereals kg (24: 1)						**0,1** EUR
27.	Economical production (A: B)						**2,94**
28.	Production profitability (24: B) x100						**194,40 %**

Source: Mičić, 2018

Results achieved: The average maize yield on farm A was 6.5 t / ha, ranging from 6.0 t / ha to 7.0 t / ha. Total profit per 2 ha is EUR 1,329.70, production efficiency is 2.94 and production profitability is 19.40%.

Table 2: Calculation of realized economic indicators of triticale production per 3 ha for farm A

Row. Number	**Production year: 2018**	**Number of repetitions**	**Quantity**	**JM**	**The price**	**JM**	**Amount of EUR/ha/3**
I	Income						
1.	Triticale	3	5,0	t /ha	150,0	EUR / t	2.250,0 EUR
2.	Straw	3	5	t/ha	19,5	EUR /t	292,5 EUR
A)	Total revenue (1 to 2)						2.542,5EUR
3	Costs						
4.	Seeds	1	750	kg	0,20	EUR	150,00 EUR
5.	Fertilizer						
6.	Manure	25%	60,0	kg	1,0	EUR/kg	60,00 EUR
7.	Urea		600	kg	0,30	EUR /kg	180,00 EUR
8.	Foliar savings		6	kg	3,0	EUR/kg	18,00 EUR
9.	Pesticides						
10.	Meteor		30	G	0,15	EUR /L	4,50 EUR
11.	Irrigation						
12.	Energent	3	15	L	1,40	EUR /L	63,00 EUR
13.	Diesel fuel		90	L	1,40	EUR /L	126,00 EUR.
14.	Maintenance of mechanization		3	ha	19,00	EUR /ha	57,00 EUR
15.	Paid services. mechanization						
16.	Plowing		3	ha		EUR /ha	0 EUR
17.	Land preparation		3	ha		EUR /ha	0 EUR
18.	Sowing		3	ha	30,5	EUR /ha	91,50 EUR
19.	Harvest		3	ha	52,00	EUR/ha	156,00 EUR
20.	Paid seasonal labor		20	work day	1,50	EUR	30,00 EUR
21.	Other variable costs						
22.	Storage cost			kg		EUR/kg	0 EUR
23.	Transport to the customer		15,0	t	3,0	EUR/kg	45 EUR
B)	Total Cost (3 to 23)						981,0 EUR
II	**PROFIT / LOSS**						
24.	Total No Incentives (A - B)						**1561,50** EUR
25.	Per ha without incentives (24:17)						**520,50** EUR
26.	Price of cereals kg (24: 1)						**0,10** EUR
27.	Economical production (A: B)						**2,59**
28.	Production profitability (24: B) x100						**159,17 %**

Source: Mičić, 2018

Achieved results: The average yield of triticale on the tested farm A was 5.0 t / ha, and ranged from 4.5 t / ha to 5.5 t / ha. Total profit per 3 ha is EUR 1,561.50, production efficiency is 2.59 and production profitability is 159.17%.

Table 3: Calculation of realized economic indicators of wheat production per 2 ha for farm A

Row. Number	Production year: 2018	Number of repetitions	Quantity	JM	The price	JM	Amount of EUR/ha/2
I	Income						
1.	Wheat	2	5,0	t/ha	170,0	EUR / t	1700,0 EUR
2.	Straw	2	5.0	t/ha	16,9	EUR /t	169,0 EUR
A)	Total revenue (1 to 2)						1.869,0 EUR
3	Costs						
4.	Seeds	1	500	kg	0,20	EUR	100,00 EUR
5.	Fertilizer						
6.	Manure	25%	40	t	1,0	EUR / kg	40,00 EUR
7.	Urea		400	kg	0,30	EUR / kg	120,00 EUR
8.	Foliar savings		4	kg	3,0	EUR / kg	12,00 EUR
9.	Pesticides						
10.	Meteor		20	g	0,15	EUR /L	3,0 EUR
11.	Irrigation						
12.	Energent	2	15	L	1,40	EUR /L	42,00 EUR
13.	Diesel fuel		60	L	1,40	EUR /L	84,00 EUR
14.	Maintenance of mechanization		2	ha	19,0	EUR / ha	38,00 EUR
15.	Paid services. mechanization						
16.	Plowing		2	ha		EUR /g	0 EUR
17.	Land preparation		2	ha		EUR / ha	0 EUR
18.	Sowing		2	ha	30,0	EUR / ha	60,0 EUR
19.	Harvest		2	ha	55,0	EUR / ha	110,00 EUR

Row. Number	Production year: 2018	Number of repetitions	Quantity	JM	The price	JM	Amount of EUR/ha/2
I	Income						
20.	Paid season. work-force		10	work day	1,50	EUR	15,0 EUR
21.	Other variable costs						
22.	Storage cost			kg		EUR / kg	0 EUR
23.	Transport to the customer		10	t	0,3	EUR / kg	30,0 EUR
B)	Total Cost (3 to 23)						654,0 EUR
II	**PROFIT / LOSS**						
24.	Total No Incentives (A - B)						**1.215,0** EUR
25.	Per ha out of reach (24:17)						**607,50** EUR
26.	Price of cereals kg (24: 1)						**0,12** EUR
27.	Economical production (A: B)						**2,86**
28.	Production profitability (24: B) x 100						**185,78 %**

Source: Mičić, 2018

Results achieved: The average wheat yield on farm A tested was 5.0 t / ha, ranging from 4.5 t / ha to 5.5 t / ha. Total profit per 2 ha is EUR 1,215.0, production efficiency is 2.86 and production profitability is 185.78%.

Table 4: Calculation of economic indicators of barley production per 3 ha for farm A

Row. Number	Production year: 2018	Number of repetitions	Quantity	JM	The price	JM	Amount of EUR/ha/3
I	Income						
1.	Barley	3	4,0	t/ha	170,0	EUR / t	2.040,0 EUR
2.	Straw	3	5	t/ha	17,04	EUR /t	255,6 EUR
A)	Total revenue (1 to 2)						2.295,6 EUR
3	Costs						
4.	Seeds	1	750	kg	0,20	EUR	150,00 EUR
5.	Fertilizer						
6.	Manure	25%	60,0	t	1,0	EUR /kg	60,00 EUR
7.	Urea		600	kg	0,3	EUR /kg	180,00 EUR
8.	Foliar savings		6	kg	3,0	EUR /kg	18,0 EUR
9.	Pesticides						

Row. Number	Production year: 2018	Number of repetitions	Quantity	JM	The price	JM	Amount of EUR/ha/3
I	Income						
10.	Meteor		30	g	0,15	EUR /L	4,50 EUR
11.	Irrigation						
12.	Energent	3	15	L	1,40	EUR /L	63,0 EUR
13.	Diesel fuel		90	L	1,40	EUR /L	126,00 EUR
14.	Maintenance of mechanization		3	ha	19,0	EUR /ha	57,0 EUR
15.	Paid services. mechanization						
16.	Plowing			ha		EUR /ha	0 EUR
17.	Land preparation		3	ha		EUR /ha	0 EUR
18.	Sowing		3	ha	30,50	EUR /ha	91,50 EUR
19.	Harvest		3	ha	55,00	EUR /ha	165,0 EUR
20.	Paid season. workforce		20	work day	1,50	EUR	30,0 EUR
21.	Other variable costs						
22.	Storage cost			kg		EUR /kg	0 EUR
23.	Transport to the customer		12	t	3,0	EUR /kg	36,0 EUR
B)	Total Cost (3 to 23)						981,0 EUR
II	**PROFIT / LOSS**						
24.	Total No Incentives (A - B)						**1314,60** EUR
25.	Per ha without incentives (24:17)						**438,20** EUR
Row. Number	**Production year: 2018**		**Number of repetitions**	**Quantity**	**JM**	**The price**	**JM**
26.	Price of cereals kg (24: 1)						**0,11** EUR
27.	Economical production (A: B)						**2,34**
28.	Production profitability (24: B) x 100						**134,00 %**

Source: Mičić, 2018

Results achieved: The average yield of barley on farm A was 4.0 t / ha, ranging from 3.5 t / ha to 4.5 t / ha. Total profit on 3 ha is EUR 1,314.60, production efficiency is 2.34 and profitability of production is 134.0%

The economics of feed production for the herd feed were also monitored on the sheep farm B from the cereals group: maize and wheat. The farm has the conditions and areas for crop production. Corn covers 2 ha and wheat 3 ha. Farm B's annual cereal production is 35.5 t in 2018.

The natural and financial indicators are presented in the table below: the calculation of realized economic production, maize (Table 5) and wheat (Table 6).

Table 5: Calculation of realized economic indicators of maize production per 2 ha for farm B

Row. Number	Production year: 2018	Number of repetitions	Quantity	JM	The price	JM	Amount of EUR/ha/2
I	Income						
1.	Corn	2	6,5	t/ha	130,0	EUR /t	1690,0 EUR
2.	Corn	2	9	t/ha	17,98	EUR /t	323,6 EUR
A)	Total revenue (1 to 2)						2.013,6 EUR
3.	Costs						
4.	Seeds	1	20	kg	1,50	EUR	30,0 EUR
5.	Fertilizer						
6.	Manure	25%	40	t	1,0	EUR /kg	40,0 EUR
7.	KAN (29% N)		400	kg	0,30	EUR /kg	120,0 EUR
8.	Pesticides						
9.	Guardian		6	L	4,0	EUR /kg	18,0 EUR
10.	Thesis		6	L	2,5	EUR /L	15,0 EUR
11.	Irrigation						
12.	Energent	2	15	L	1,40	EUR /L	42,0 EUR
13.	Diesel fuel		60	L	1,40	EUR /L	84,0 EUR
14.	Maintenance of mechanization		2	ha	15,0	EUR /ha	30,0 EUR
15.	Paid usl. mechanization						
Row. Number	**Production year: 2018**	**Number of repetitions**	**Quantity**	**JM**	**The price**	**JM**	**Amount of EUR/ha/3**
16.	Plowing		2	ha		EUR /ha	0 EUR
17.	Land preparation		2	ha		EUR /ha	0 EUR
18.	Sowing		2	ha	30.50	EUR /ha	61,0 EUR
19.	Harvest		2	ha	65,0	EUR /ha	130,0 EUR
20.	Paid labor		5	work day	15,0	EUR	75,0 EUR
21.	Other variable costs			kg		EUR /kg	
22.	Storage cost						
23.	Transport to the customer		13	t	3,0	EUR /t	39,0 EUR
B)	Total Cost (3 to 23)						684,0 EUR
II	PROFIT / LOSS						
24.	Total No Incentives (A - B)						**1329,6** EUR
25.	Per ha without incentives (24:17)						**664,8** EUR
26.	Price of cereals kg (24: 1)						**0,1** EUR
27.	Economical production (A: B)						**2,94**
28.	Production profitability (24: B) x100						**194,40 %**

Source: Mičić, 2018

Results achieved: The average maize yield on farm B tested was 6.5 t / ha, ranging from 6.0 t / ha to 7.0 t / ha.

Total profit per 2 ha is EUR 1,329.70, production efficiency is 2.94 and production profitability is 19.40%.

Table 6: Calculation of realized economic indicators of wheat production per 3 ha for farm B

Row. Number	**Production year 2018**	**Number of repetitions**	**Quantity**	**JM**	**The price**	**JM**	**Amount of EUR/ha/2**
I	Income						
1.	Simonida wheat of 3 ha	3	7,5	t/ha	170,0	€/ t	3.825,0
2.	3 ha straw	3	4	t/ha	8,75	€/ t	105,0
3	RS incentives for crop production		3	ha	50,00	€/ ha	150,0
A)	Total income (1 to 2) for 3 ha						4.080,0
4	Costs						
5.	Seed for 3 ha	1	750	kg	0,20	kg	150,0
6.	Fertilizer						
7.	Manure for 3 ha		15	t	4,00	t	60,0
8.	KAN (29% N) 50% + Urea 50%		1500	kg	0,30	kg	450,0
9.	Foliar savings		6	kg	3,00	kg	18,0
Row. Number	**Production year: 2018**	**Number of repetitions**	**Quantity**	**JM**	**The price**	**JM**	**Amount of EUR/ha/3**
10	Pesticides						
11	Meteor		30	g	0,20	€/L	6,0
12	Irrigation						
13	Energy for 3 ha	3	15	L	1,20	€/L	54,0
14	Diesel fuel		90	L	1,20	€/L	108,0
15	Maintenance of mechanization		3	ha	19,00	€/ha	57,0
16	Paid services			ha			
17	Plowing		3	ha		€/ha	0
18	Land preparation		3	ha		€/ha	0
19	Sowing		3/		30,00	€/ha	90,0
20	Harvest		3	ha	55,00	€/ha	165,0
21	Paid seasonal labor		46	work day	1,50	€/h	69,0
22	Other variable costs						
23	Storage cost			€/t		€/t	0
24	Transport to the customer			t		€/t	0
B)	Total Cost (3 to 24)						**1.227,0**
II	**PROFIT / LOSS**						
25	Total with Incentive (A - B)						**2.853,0**
26	Per ha from incentives (25:17)						**951,0**

27	Cost per kg of grain grain (B: 1)					**0,0545**
28	Economical production (A: B)					**3,33**
29	Income Profitability (25: A) x 100					**69,92 %**

Source: Mičić, 2018

Results achieved: The average wheat yield on Farm B was 7.5 t / ha, ranging from 7.0 t / ha to 8.0 t / ha.

The realized profit on 3 ha is 2853,00 €, production economy is 3,33 and profitability of revenue is 69,92%.

Birth weight of lambs in the month of birth showed that most lambs were born in March, with the smallest and highest birth weights, while the smallest lambs were born in April (Table 7).

Table 7. Lamb birth weight, standard deviation, standard average error and deviations in four different months

Month of birth	**Mean**	**N**	**Std. Deviation**	**Std. Error of Mean**	**Minimum**	**Maxi mum**	**Variance**
January	4.88	58	.892	.118	3.12	6.58	.798
March	4.47	238	.978	.065	2.12	6.88	.955
Month of birth	**Mean**	**N**	**Std. Deviation**	**Std. Error of Mean**	**Minimum**	**Maxi mum**	**Variance**
April	4.68	25	.785	.165	3.62	6.12	.615
October	4.32	68	.942	.115	2.52	6.73	.885
Total	4.48	388	.963	.049	2.12	6.82	.927

Source: Mičić, 2018

The mean lambs average weight was the highest in January and the lowest average birth weight in October.

The differences for the average birth weight were 0.44 kg, 0.21 kg and 0.58 kg from January to March, January to April and January to October the month of birth of the lambs.

Analysis of variance showed that birth month had a significant effect on lamb birth weight ($P < .005$).

Based on the presented result for 2018, we can conclude that the production of lambs, on farms A and B is economically justified, the financial indicators are given in tabular form, production of lambs and others. on medium ovary farm A and small ovarian farm B in Serbia (Table 8), Mičić et al., (2017).

Table 8: Economics of production of lambs for sale on medium A and small B sheep farms in Serbia for 2018.

Elements	**THE FARM A**	**THE FARM B**
A) Number of sheep on the farm	150	75
PRODUCTION SCOPE		
1. Total volume	6.750	3.375
2. After a sheep	45	45
REVENUE		
3. Lambs for sale	13.500	6.750
4. Milk incentives	0	0
5. Incentives to die. rejuvenated	3.000	1.500
6. Sheep wool	2.250	1125
7. Lambs for overhauling herds (scraps)	2.250	1.125
6. Wrap milk	9.000	4.500
9. Manure	3.000	1.500
10. Sheep hatched	6.000	3.000
B) Total revenue	38.970	19.485
COSTS		
11. Food	12.000	6.000
12. Veterinary services and medicines	750	375
13. Died	1.500	750
14. Human work	4.500	2.250
15. Energy and fuel	1.500	750
16. Depreciation of facilities and equipment	1.000	500
17. Other	800	400
C) Total cost	22.050	11.025
Elements	**THE FARM A**	**THE FARM B**
INCOME / LOSS		
D) On the farm	16.920	8.460
18. Down the throat D:A	112,80	112,79
19. Economy of production B:C	1,77	1,76
20. Production Profitability D:Bx100	43,42%	43,41%

Source: Mičić, 2018

Based on the result shown, we can conclude that the production of lambs for sale on both farms is economically justified in 2018. (Ripoll et al., 2018).

Conclusions

Based on the analysis of the situation in our economy, and especially in the livestock breeding industry, specifically lambs for sale, it is necessary to draw some conclusions when it comes to access to this type of production. This primarily refers to the food industry in Serbia.

This research came to the following conclusions: a more complex analytical review of the conditions and results of development of the aforementioned industry of Serbia in the last two decades, required a preliminary conceptual (re) definition and systematic classification of the activities covered, as well as methodological problems of their informative monitoring.

Two branches of industrial production (food and livestock) based on the processing of primary agricultural products are linked in the supply chain, ie primary production under farm conditions to farms A and B (wheat, maize, barley, triticale and other fodder), farms A and B are engaged in the production and production of lambs, and around 700,000 farms bring about 40% of gross domestic product in Serbia.

The data presented show that the income from the products, plus the incentives, covered the costs of production and gave the rest of the income on the sheep farm A and B.

The total profit realized in the livestock production on farm A for 150 sheep amounts to EUR 22,340.8.

Economy of production 1,77 and profitability of production 43,42%.

Also on Farm B, the total profit in the livestock production for 75 sheep is EUR 12,624.6.

Economy of production 1.76 and profitability of production 43.41%.

An analysis of variance showed that the month of birth had a significant effect on lamb mass, from the point of view of the influence of the season, the highest body mass was in spring and winter and the lowest in autumn, but despite differences in weight, the season did not show a significant effect on lamb weight (P> .005).

The highest body weight are have single, then twins and triplets.

Conflict of interests

The authors declare no conflict of interest.

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ANALYSIS OF SOYBEAN PRODUCTION AND BIOGAS YIELD TO IMPROVE ECO-MARKETING AND CIRCULAR ECONOMY

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A R T I C L E I N F O

Original Article

Received: *19 January 2020*

Accepted: *02 February 2020*

doi:10.5937/ekoPolj2001141M

UDC 635.655:338.12

Keywords:

soybean production, trade, biomass yield, biogas yield, correlations, circular economy

JEL*: J01, L21, O13*

A B S T R A C T

In the study attempts to analyze soybean production and possibility obtaining biogas from soybean biomass, in order to obtain energy inputs into the profit function and realized a circular economy. This paper presents the results of five-year studies of soybean production analysis in the world and in Serbia, and was also examined soybeans morpho-productive characteristics and on the biogas yield, of the Favorit variety, produced in Pancevo, Serbia. Serbia has excellent conditions for soybeans production. The maximum soybean biomass yield of soybean variety Favorit was 5 t ha-1. The average biogas yield, for tested five years, was 368 m3ha-1. The biogas yield was in positive statistically significant correlations on the plant height (r=0.65*) and in positive correlations with biomass yield. Soybean cultivar with their characteristics justify the sowing and can be used as a raw material in bio-fuels production.

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Introduction

Soybeans are of great economic importance due to the high nutritional, energy and vitamin value of grain used in human, domestic and farmed animal nutrition, as well as in various branches of industrial processing. Harvesting residues have high energy value and are increasingly used as a renewable energy source. The simplest way is by combustion in boiler plants. To produce liquid biofuels in some countries, they use grain (oil) as well as used oil from large food chains (*Jankovic et al.,* 2017). About 200 million tonnes of soybean meal are produced worldwide, or about 63% of the total amount of all oil plants (*Jankovic et al*., 2019; *Popović et al.* 2018a; 2019). The largest soybean selection house in Serbia is the Institute of Field and Vegetable Crops. Soybean producers have at their disposal a wide variety of native NS soybean varieties; high-yield varieties of quality grain; varieties that are not genetically modified (*Popovic,* 2010; Popović et al., 2012a, 2012b, 2013a; b, 2015; 2016; 2019; Stevanovic et al., 2017; Lakic et al., 2018).

Management in agricultural activity must be considered with a particular degree of attention, in which many authors point out in their work (Popović et al., 2018b, Novaković et al., 2018; Radović et al., 2019). Management and specific management are of particular importance in the conditions governing agricultural production, where essentially all factors of production come to terms such as soil, field crops, machinery, labor (Kolarić et al., 2014; Živanović & Popović, 2016; Živanović et al., 2017; Maksimović et al., 2018; Lakić et al., 2018; Terzić et al., 2018; 2019; Rajičić et al., 2019; Bojović at al., 2019). Eco marketing or green marketing emphasizes management according with environmental protection. Eco marketing promotes the products and technologies that they are in accordance with the concept of sustainable development. Eco marketing will play a crucial role in the coming years in many ways: by its influence on companies to tailor their production and business as a whole in a more sustainable way, and on conveying consumer concerns into concrete work - the purchase of environmentally friendly products.

The European Commission has set a long-term goal to develop a competitive, resource efficient and low carbon economy by 2050. Bio-economy is expected to play an important role in the low carbon economy. We estimate that the current bio economy market is about € 2.4 billion, including agriculture, food and beverage, agro-industrial products, fisherines, forestry, wood-based industry, biochemical, enzymes, biopharmaceutical, biofuls and bioenergy, uses about 2 billion tonnes and employing 22 million persons. New sectors are emerging, such as biomaterials and green chemistry. The transition toward a bio-economy will rely on the advancement in technology of a range of processes, on the achievement of a breakthrough in terms of technical performances and cost effectiveness and will depend on the availability of sustainable biomass (Scarlat et al., 2015).

According to UNEP (2011), a green economy is defined as ´low-carbon, resource efficient, and socially inclusive', whose overall objective is ´improved human well-

being and social equity, while significantly reducing environmental risks and ecological scarcities'. It aims at 'getting the economy right' by reducing polluting emissions, increasing resource efficiency, preventing the loss of biodiversity and valuing ecosystem services (UNEP, 2014).

The waste from agricultural crops accounts for 23 million tonnes (not considering crop residues such as straw, leaves from sugar beet and residues from food processing), or just below 2% of total consumption of agricultural crops (Faostat, 2014). In addition, about 110mill. t of vegetal and animal waste are generated from food processing, households and other sectors (Eurostat, 2014). For the total biomass coming from agriculture (thus including various crop residues) we estimate that about 1.5 billion tonnes were used in 2011, of which 15% for food, 58% for feed, 18% for processing and almost 5% for energy (bio-fuels, heat and electricity) production.

In the EU, we estimate bio-fuel market at about € 15.7 billion in 2012. Considering the expected use of bio-fuels in 2020 in the transport sector, we estimate, based on the projections for price developments (Charles et al., 2013), that the bio-fuel market could increase to about € 30 billion in 2020 in the EU. Today, bio-fuels are produced largely from food-crops (sugar and starch crops for bio-ethanol and oil crops for biodiesel). A recent European Council decision limited the use of conventional bio-fuels to 7% of the energy use in transport for 2020 (European Council, 2014); the rest should come from 2nd generation lingo-cellulosic bio-fuels. In the EU, bio-ethanol is produced from wheat (3.9 mill. t), maize (4.1 mill. t), sugar beet (12.1 mill. t), barley (0.4 mill. t) and rye (0.4 mill. t). The bio-ethanol production capacity increased to about 8.5 billion liters per year in 2012, with an actual annual production of about 4.8 billion liters (2.4 Mtoe) or 57% of the total capacity. Biodiesel is the main bio-fuel used in the EU in transport, being produced from rapeseed (15.3 mill. t), soybean (3.5 mill. t), imported palm oil, recycled vegetable oil and animal fat. The biodiesel production capacity increased to about 26.3 billion liters, with an annual production of about 10.5 billion liters (8.3 Mtoe) or 40% of the total capacity (EC, 2014q, USDA, 2013). A significant share of the feedstock for domestically produced biodiesel (rapeseed, soybean) came from import together with vegetable oil (mainly palm oil) is also used. Due to the cap on food crop-based bio-fuels, a further expansion of first generation bio-fuels is not expected while lingo-cellulosic bio-fuels have not yet achieved commercial maturity.

Increase of world energy demands is in connection with world population grow. According to IIASA model it is predicted that the world energy consumption by the year 2030 will be 306,6 1012 kWh. Development of energy sector is the basis for development of society and demand for different sources of energy is constant and very urgent. Energy strategy of EU "20-20-20" has a long term goal of high energy production with low emission of glasshouse gases. Within this strategy EU countries have to reduce glasshouse gases emission for 20%, raise energy efficiency for 20% and, 20% of energy consumption should be from renewable resources. Biomass from agriculture is one of the renewable energy resources that is not enough exploited (Kis et al., 2011).

The harvesting residues are suitable for composting because they contain a higher percentage of nitrogen compounds. These secondary products can be used as mulch, then for the production of compost and earthworms, or distributed on the field immediately before basic tillage is performed (Collins and Moore, 1995; Glamočlija et al. 2015). More recently, they are increasingly serving as feedstock for bio-fuel production.

Biomass is the most commonly used renewable energy source in the United States. It is a naturally occurring, widely spread carbon resource and a logical choice of raw material for the production of a broad range of substitutes of fossil fuel. Bio-fuels are energy sources derived from biological materials. They can be solid, liquid, or gaseous and all three forms of energy are sustainable and renewable because they are produced from plants and animals. More than half of the fossil fuels people uses are burned in vehicles and to reduce the usage of fossil fuels, companies have started manufacturing vehicles that run on bio-fuels. Many bio-fuels are used in place of gasoline and diesel to run current technology. Unlike fossil fuels, bio-fuels are renewable energy sources that could last indefinitely. There are five main types of bio-fuel: methanol, biodiesel, butanol, ethanol, and bio-oil (Khillar, 2019; Rakaščan et al., 2019a; 2019b). Bio-fuels, on the other hand, are energy sources derived from biological materials, which separate them from other non-fossil fuel energy sources such as wind and wave energy.

In the study attempts to analyze soybean production and possibility obtaining biogas from soybean biomass, in order to obtain energy (renewable) inputs into the profit function and realization of circular economy.

Material and methods used

Production parameters of soybean in period 2013-2017 are analyzed in this paper. Data on soybean production are taken from the FAO website 2019. At the second part of the research, in 2015-2019. period, the three-year trials were performed by a random block system in three repetitions with the size of the basic plots of 10 m^2 on the site Dolovo (N 44° 54 ‘, E 20°52’, 110 a.l.s.), Pancevo, South Banat, Serbia. The experiments were carried out on chernozem type soil. The subject of the study was the soybean variety - Favorit (Variety selected at the Institute of Field and Vegetable Crops, Novi Sad). Soybean productivity parameters were examined: plant height, biomass yield and biogas yield. Standard agricultural technology for soybean cultivation has been applied. Samples from mowed biomass were taken to analyze plant height and biomass yield. The biogas yield was determined by soybean silage analysis in the laboratory of the Technical Faculty in Novi Sad and converted to cubic per tonnes. The technology for producing biogas from soybean biomass was carried out in the biodigestor. First, biomass is milling and then insert into the biodigestor where fermentation and biogas production is carried out. Company - Biogas Energy, since its inception, has been involved in exploring the possibilities of improving the supplying of biomass for its needs in an environmentally, economically and energy-sustainable manner.

Soybean biomass can be used to produce briquettes and pellets, solid fuels suitable for use in smaller boiler plants, for example for heating residential buildings. It can also be used to produce liquid biofuels (ethanol) because it has high amounts of carbohydrates. The technological process of processing into ethanol is carried out in stages. In the first phase, the biomass is chopped and treated with sodium hydroxide to break down the lignin, then, it is hydrolyzing by ferments that break down the complex sugars to hexoses. During the fermentation process, the hexose sugars are converted into ethyl alcohol by the glucoamylase ferment, releasing carbon dioxide ($C_6H_{12}O_6 \rightarrow 2\ C_2H_5OH + 2\ CO_2$). In the distillation process, ethanol is separated from other by-products. Approximately 2 kg of glucose is required to obtain 1 kg of ethanol (Richards et al., 1994).

Data analysis

The experimental data obtained were analyzed by using descriptive and analytical statistics with the statistical package STATISTICA 12 for Windows *(StatSoft)*. Testing the significance of the differences between the calculated mean values of the examined factors (years) was done by using a one-factor model of variance analysis. The defined variance analysis model with one variability factor is presented by a linear model of shape (Mihailović, 2005):

$$Y_{ij} = \mu + \alpha_i + \varepsilon_j \ , \quad i=1,2,...,k; \quad j=1,2,...,n.$$

as the result of sum of three additive components: arithmetic means of the jointly set,

$$\mu = \frac{1}{k}\sum_{i=1}^{n}\mu_i$$

All significance ratings were derived from the F-test and LSD test for a significance level of 5% and 1%. The relative dependence of the tested parameters for soybean was determined by the method of correlation analysis (Pearson's correlation coefficients), and the obtained coefficients tested by t-test for significance level of 5% and 1%. A coefficient of variation was applied to calculate the degree of variation. The coefficient of variation (Cv) is a relative measure of variability, and is used to estimate the variability of a statistical series, by comparing standard deviation and arithmetic mean. It is expressed as a percentage, by the formula: $CV = b \bullet 100 / \overline{X}$

The data on the Quantity and distribution of precipitation in the area of Pančevo, Serbia, 2015-2019 are shown, graph. 2. The all results obtained are presented in tables and graphs.

Meteorological data for Pančevo, Serbia

Serbia belongs to climatic area in which the weather conditions are variable, unstable and unpredictable, primarily precipitation, both by quantity and by schedule (Popović, 2010; Popović et al., 2015; 2016; Maksimović *et al.,* 2018). Almost all soybean production is under natural water regime, so yields depend to a large extent on the amount and

distribution of rainfall during the growing season (Bošnjak, 2008; Glamočlija et al., 2015). Soybeans are very sensitive to summer droughts, so grain yield and quality vary significantly by year, making this production very unsafe (Glamočlija et al. 2015; 2019).

The average multi-year temperature in Dolovo was 19.9 °C and the total precipitation was 369.7 mm. In first year, 2015, the average temperature was 20.1 °C, in second 19.4°C, in third 18.6 °C, fourth year 18.7 °C, and in fifth year 18.7 °C (2019) and total precipitation were 427.1 mm, 493.9 mm, 437.5 mm, 397.1 mm and 324.3 mm, per year. In 2019, precipitation was 45.4 mm lower than the perennial average, while in the first four years, precipitation was higher by 57.4 mm, 124.2 mm, 67.8 mm and 27.4 mm, Figure 1a. Climate change and the regime of soil waters and their interrelationships, which are highly variable and complex, define the success of crop production, since much of our agricultural production is located in areas with occasional droughts (Šimunić et al., 2014; Popović et al., 2019).

Results and Discussion

Analysis of soybean production

After the introduction of the preliminary reviews, the authors presented the results of the research for the research period 2013-2017. The average area under soybean in the World in tested period was 118.97 mill. ha, yield was 2.67 t ha^{-1}. World's current average of soybean production is 319,017,790 tons, Table 1.

The variability of the examined parameters, average area and grain yield in the world, measured by the coefficient of variation, ranged from 4.15% <Cv <5.16% and recorded a growth trend at the rate of 2.52% and 3.32%, Table 1.

The average area under soybean in the Republic of Serbia, in period 2013-2017, was 176,577 ha and varied 159,749 (2013) to 201,712 ha (2017). The average grain yield of soybean in Republic of Serbia was 2.78 t ha^{-1} and varied 2.29 t ha^{-1} (2017) to 3.54 t ha^{-1} (2014) (Table 1). The variability of the examined parameters, average area and grain yield in Republic of Serbia, measured by the coefficient of variation, ranged from 11.03% <Cv <19.97%. Soybean areas in Serbia show an growth trend of 6.55%. The average yields were higher, compared to World yield, by 0.11 t. World's average yield has stability, Cv =5.16%. Serbia's average soybean production was 480,620 tons and varied 358,214 t (2013) to 576,446 t (2015), Tab.1.

Table 1. Soybean production in Words and in the Republic of Serbia, 2013-2017.

Parameter	Average value	Min	Max	Rate of change, %	Cv, %
Soybean production in word					
Area, ha	118,969,192	111,018,797	123,551,146	2.52	4.15
Yield, t ha^{-1}	2.67	2.49	2.85	3.32	5.16
Production, t	319,017,790	277,533,908	352,643,548	5.87	9.01

Parameter	Average value	Min	Max	Rate of change, %	Cv, %
Trade - Crops and livestock products in word					
Export, t	128,804,999	106,168,848	151,838,168	8.93	13.50
Import, t	126,531,131	103,016,317	148,277,947	9.12	13.74
Difference, t	2.273.868	-	-	-	-
Soybean production in the Republic of Serbia					
Area, ha	176,577	159,724	201,712	6.55	11.03
Yield, t ha^{-1}	2.78	2.29	3.54	-2.01	19.97
Production, t	480,620	358,214	576,446	3.43	17.77
Trade - Crops and livestock products in the Republic of Serbia					
Export, t	46,261	16,946	135,843	28.51	86.46
Import, t	84,115	11,723	97,335	65.64	69.03
Difference, t	-46,177	-	-	-	-

Source: FAO 2019, available 11.12.2019; Authors' calculations

The average Export under soybean in the World in 2013-2017 was 128,804,999 t and the average Import of soybean was 126,531,131 t (Tab. 1). Thus, difference of Export and Import of soybean grain was 2,273,868 t, Table 1.

The average Export of soybean from the Rep. of Serbia in 2013-2017 was 46,261 t. The average Import of soybean in Republic of Serbia was 84,115 t . Thus, Serbia's difference of Export and Import was -46,117 t of soybean grain, Table 1.

Serbia has excellent conditions for soybeans production (Terzic et al., 2017; 2018). Soybeans in the world and in Serbia, in recent years, have recorded a permanent tendency of area growth (Popovic, 2010). The average area under soybean in the world was 121.53 million ha, yield was 2.76 t ha^{-1} and production 334.89 million t. The largest areas in the world were in the Americas, followed by Asia, Europe and Africa. The America is the leading continent in soybean producing and it provides 87.1% of global soybean production (Terzic et al., 2018; Popović et al., 2020). Grain yield significantly depends on the water supply of the plants, especially in the critical stages of plant growth (Glamočlija et al., 2019).

Productivity parameters of soybean variety - Favorit in Pančevo, Serbia

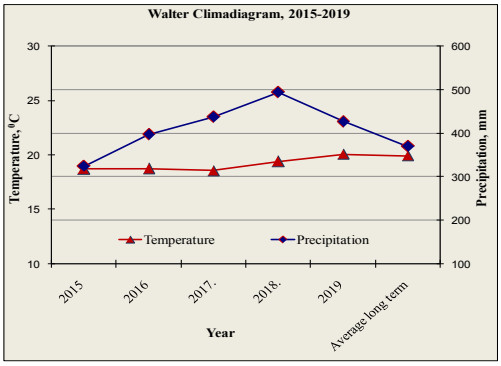
The average soybean plant height for variety Favorit in tested period, 2015-2019, was 96 cm. Year had a statistically significant effect on the values of the parameter tested. The most favourable years for plant height were 2018 and 2019 (101 cm) while the most unfavourable year was 2015 (87 cm). In 2018 and 2019 the values were statistically significantly higher than in 2015, Tables 2, Figure 1b. Variability of examined parameter, measured by the coefficient of variation, averaged 5.94% with the rate of change 3.13%. Weather variations significantly affect plant height as cited by Shamsi and Kobraee (2011); De Lucai and Hungría (2014).

Table 2. Productivity parameters of soybean varietyFavorit, Pančevo, R.of Serbia, 2015-2019.

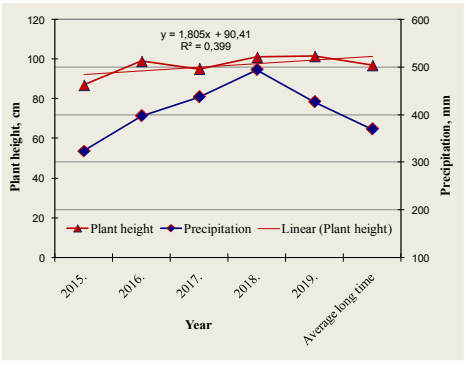
Parameter	Average value	Min	Max	Rate of change, %	Cv %
Plant height, cm	96	87	101	3.13	5.94
Biomass yield, t ha^{-1}	4.59	3.99	4.92	3.93	8.36
Biogas yield, m^3 ha^{-1}	368	345	382	5.87	9.01
Source:					

Source: Biogas Energy; Authors´ calculations

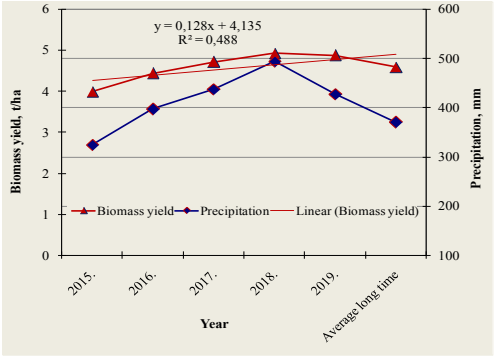
Figure 1. Average temperature, °C, and total precipitation, mm, in soybean growing period, Pančevo, Serbia (a), Effect of precipitation, mm, on soybean productivity parameters: b) plant height, cm, c) biomass yield, kg ha^{-1}, and d) biogas yield, m^3kg^{-1}; 2015-2019



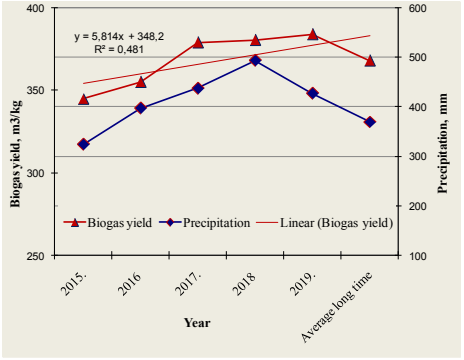
a.



b.



c.



d.

Source: Author´s calculations

The average soybean biomass yield of variety - Favorit, for tested five years, was 4.59 t ha^{-1}. Average biomass yield varied from 3.99 t ha^{-1} (2015) to 4.92 t ha^{-1} (2018), Table 2, Figure 1c. The variability of the investigated parameters, plant height and biomass yield, ranged from 5.94% <Cv <8.36%.

The average biogas yield of soybean variety - Favorit, for tested five years, was 368 m^3 ha^{-1}. Average biogas yield varied from 345 m^3 ha^{-1} (2015) to 382 m^3 ha^{-1} (2019), Table 2, Figure 1d. The variability of the investigated parameter, measured by the coefficient of variation, averaged 9.01%, Table 2.

Therefore, the areas vary significantly from year to year, from 160,000 ha to 230,000 ha. Yield variations by years are even more pronounced. Success in dry farming of soybean depends on the application of agro-technical measures adapted to agro-ecological and soil conditions. One of the measures is the selection of the variety that is best adapted to local environmental conditions (Popović et al. 2013a, 2020).

Soybean harvest residues are increasingly used for energy purposes today. According to numerous authors, straw will represent the most important non-food crop material due to its chemical composition and relatively simple biofuel production process (Bulgariu and Bulgariu, 2018).

Scientists in countries with large areas under soybeans over the past decades were working to improve methods of producing bio fuels from soybean plant material. Commercial production should be economically and environmentally friendly so that renewable fuels could be an adequate substitute for fossil fuels. This would reduce the use of liquid and solid fuels from oil and coal, which by combustion emit significantly higher amounts of gases that have adverse effects on the ecosystem (greenhouse effect). The importance of using bio-fuels also lies in the fact that many countries do not have large reserves of fossil fuels for their own needs and are forced to procure them in an unstable market. Soybean straw is a very accepted solid fuel in our country as an inexpensive form of energy and without significant environmental impact. It is most commonly used for combustion in boiler plants, as baled biomass. Straw combustion systems are so sophisticated today that the burning process is as simple as using solid and liquid fossil fuels. In naturally dry straw, it has about 90% combustible substance, 7-8% water and 2.5-3% mineral salts (ash). By combustion of soybean straw in boiler plants with lattice firebox for bale, it gets more than 17 kJ of energy per kilogram of biomass, or from one hectare (80% of the collected straw) about 60,000 MJ (Janković et al., 2019). This value corresponds to 1,100 kg of diesel fuel, or 1,300 N m^3 of natural gas. Facilities plants using briquetted soybean straw (and other crops) have been accepted by both large industrial plants and small businesses and households.

Correlations with tested parameters

The biomass yield was in positive and statistically very significant dependence on the biogas yield (0.94**) and on the plant height (0.80**) and the negative very significant dependence with the temperature (0.93**), Table 3, Graph. 2.

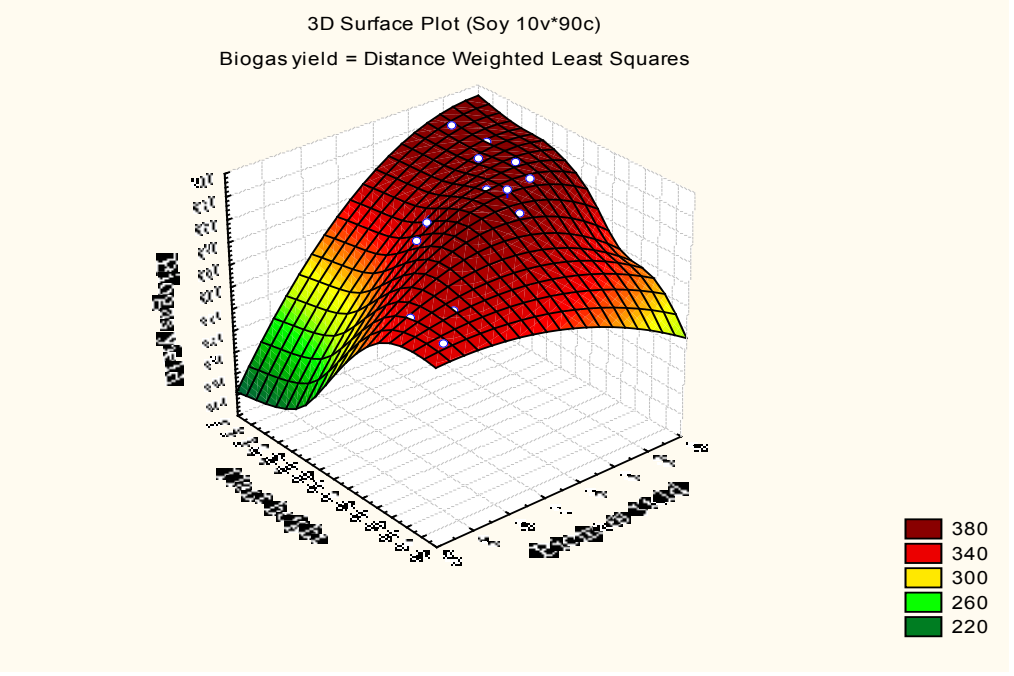
Table 3. Correlations of tested parameters

Parameter	Plant height	Biomass yield	Biogas yield	Temperature	Precipitation
Plant height	1.00	0.80**	0.65*	-0.65*	-0.27 ns
Biomass yield	0.80**	1.00	0.94**	-0.93**	-0.49ns
Biogas yield	0.65*	0.94**	1.00	-0.95**	-0.60*

Source: Author´s calculations; ns - non significant; * and ** significant at 0.5 and 0.1

The biogas yield was in positive statistically significant dependence on the plant height (0.65*) and in the negative very significant dependence with the temperature (0.95**) and significant dependence with precipitation (0.60*), Table 3.

Figure 2. 3D Surface plot for plant height, biogas and biomass yield, 2015-2019.



Source: Author´s calculations

After harvesting soybean grain, over 5 t ha^{-1} of vegetative biomass of stalk and leaf residues remains, twice the average yield of the main product, the grain. Thanks to the development of new technologies for the treatment of bio-waste into energy, the rate of increase in the use of alternative fuels is increasing significantly. Biomass soybean is a very accepted solid fuel in our country, as a cheap form of energy and without significant environmental impact. It is most commonly used for combustion in boiler plants, as baled biomass. In naturally dry straw, there is about 90% combustible substance, 7-8% water and 2.5-3% mineral salts (ash). Combustion of soybean straw in boiler plants with lattice firebox for bales, yields more than 17 kJ of energy per

kilogram of biomass, or from one hectare (80% of the collected straw) about 60.000 MJ. This value corresponds to 1.100 kg of diesel fuel, or 1.300 N m^3 of natural gas.

Facilities plants using briquetted soybean straw (and other crops) have been accepted by both large industrial plants and small businesses and households.

Soybean varieties with their characteristics justify the sowing and can be used as a raw material in bio-fuels production and efficient fertilizer (Kis et al., 2011). In order to make the bio-sorption process more suitable for industrial applications, biomass of soy waste (a low-cost waste, resulted after oil extraction) was functionalized with industrial sulphur based chelating agent, which is a precipitation agent used in industrial wastewater treatment, and used for the removal of some heavy metals from aqueous solution. The exhausted bio-sorbent can be easily regenerated with 0.1μM HNO_3 solution, and the regenerated functionalized soy waste biomass (SCA-SWB) bio-sorbent can be used in at least five bio-sorption/desorption cycles. The tests performed with real wastewater samples and some economic considerations indicate the potential of SCA-SWB as suitable alternative bio-sorbent for the removal of heavy metal ions with industrial applications.

Biomass is a renewable energy source derived from all plants and materials derived from plants, including forestry residues, pulp and paper mills waste, animal manure, urban wood waste and so on (Khillar, 2019).

Commercial production should be economically and environmentally friendly so that renewable fuels could be an adequate replacement for fossil fuels.

Conclusion

According to the obtained results of research, the following conclusions were made:

Soybean production in the world and in Serbia has a steady upward trend, primarily due to increased areas and yields. World's current average soybean production is 319.017.790 tons. Serbia has excellent conditions for soybeans production. The average area under soybean in the Serbia, varied from 159.724 ha to 201712 ha. The average grain yield of soybean of Serbia varied 2.41 to 3.54 t ha^{-1}. The variability of the examined parameters, surface area and grain yield in Serbia, measured by the coefficient of variation, ranged from 11.03% <Cv <19.97%

The average biogas yield of soybean variety - Favorit, for tested five years, was 368 m^3 ha^{-1}. Average biogas yield varied from 345 m^3 ha^{-1} (2015) to 382 m^3 ha^{-1} (2019). The variability of the tested parameter, measured by the coefficient of variation, averaged 9.01%. The biogas yield was in positive statistically significant dependence on the plant height (0.65*).

Soybean varieties with their characteristics justify the sowing and can be used as a raw material in biofuels production.

Acknowledgement

Research was supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia (Projects: TR 31022; 2011-2020) and bilateral project (Montenegro-Serbia; 2019-2020): Alternative cereals and oil crops as a source of healthcare food and an important raw material for the production of biofuel.

Conflict of interests

The authors declare no conflict of interest.

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SUSTAINABLE DEVELOPMENT DIRECTIONS OF RURAL TOURISM OF TIMOK REGION

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ARTICLE INFO

Original Article

Received: *27 January 2020*

Accepted: *04 March 2020*

doi:10.5937/ekoPolj2001157I

UDC 502.131.1:338.48-44(497.11 Timočka Krajina)

Keywords:

rural tourism, sustainability, Timok region, MCDM, ELECTRE, AHP

JEL*: 018, Q013, Z32*

ABSTRACT

In Eastern Serbia in the Timok Region, the cult of household hospitality is still fostered. The Timok region belongs to the underdeveloped parts of Serbia and starting from the fact that the growth of local economy capacity also leads to overall regional development, the development of rural tourism could contribute to the well-being of the region. The paper examines sustainable development directions of rural tourism, taking into account the economic, environmental and social components, which are elements of sustainability. The authors apply Multi-Criteria-Decision-Making methods, ELECTRE as main, and AHP as an auxiliary method in the selection of an adequate and optimal solution. The aim of the paper is choosing the optimal projects for the development of rural tourism in the Timok region, based on well-defined criteria, among the several proposed projects.

Introduction

Considering the views of many authors (Pearce at al., 1989; Bramwell, 1994; Seaton et al., 1994), rural tourism destinations can be defined as broader areas with natural and forested environments where particular natural, economic and socio-cultural features exist, such as tradition, local co-operation, trust, and good relationships and agriculture represents an economic branch with specificities and developments that do not comply with the classical economic laws (Drăgoi et al., 2018). These elements create a special tourism product that is primarily based on a small-scale economy, friendly to the

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environment, "colored" by ethnic elements, in other words, it is the "sustainable" form of tourism. Bremwell & Lane (1994) describe rural tourism as a multiple activity, not just rural tourism.

Rural tourism represents tourism in rural households, but also certain vacations and places of residence like rural areas, as well as manifestations, festivals, recreations, production and sale of handicrafts and agricultural products (Košić, 2009). Rural tourism is therefore seen as a means of addressing the problem of weakening the agricultural potentials of agricultural areas to provide additional income (OECD, 1994; Davies & Gilbert, 1992; Alexander & McKenna, 1998).

Serbia, especially its rural regions, is a country extremely rich in colorful flora and fauna, geothermal springs, healing mud, organic product production, and cultivation, as well as diverse folklore and cultural heritage. Therefore, it is necessary to implement a sustainable rural tourism policy in the future to maximize the positive and minimize the negative effects (Gajić, T., 2010). Rural areas in Serbia differ in economic, socio-cultural and demographic terms. The differences are conditioned by their geomorphological characteristics, population, economic structure, infrastructural equipment, as well as development potentials. Based on the fact that rural tourism in Serbia is still in development, the authors identified potentials for development and highlighted the disadvantages that hinder the rapid development of this large primary tourism in Serbia, especially the less developed regions of the country like the Timok region.

The first part of the paper deals with the study of relevant literature and description of the general characteristics of the Timok region, while the second presents the analysis and selection of one of the proposed development directions, i.e. projects that would most assist in solving the current situation regarding certain development elements of rural tourism in the Timok region. The methodology used in this paper is the application of Multi-Criteria Decision Making, namely the ELECTRE method in its basic version and the AHP method as ancillary (to calculating the criteria weights). Finally, the authors propose a concrete application and give reasons why the chosen development direction is most suitable for the development of rural tourism in Eastern Serbia, in particular, the Timok region.

Timok region – general characteristics and tourism potential

The Timok region is located in the eastern part of Serbia. It borders with Romania to the North and Bulgaria to the East. It stretches between the Danube with two corridors: Corridor X (Serbia) and Corridor IV (Bulgaria) (Štetić, S., Cvijanović, D. & Šimičević, D. (2014). The Timok region lies in an area of 7.133 km² and covers two districts - Zajecar and Bor, i.e. the municipalities of Zajecar, Knjazevac, Boljevac, Sokobanja, Bor, Negotin, Majdanpek, and Kladovo. The area of the Timok region occupies 8,07% of the total area of entire Serbia (88.361 km²). The territory is populated by 284.112 inhabitants, which represents 3% of the total population of Serbia. Taking

into account the fact that the growth of local economy capacities also leads to overall regional development, the Strategy of Regional Economic Development of the Timok region was drafted which is a basic component of the process of present and future work of RARIS's– Regional Development Agencies of East Serbia. The goal of local development is to unify the changes that are planned for the future and that creates a sustainable business environment. A sustainable business environment would provide predictability of factors relevant to business, opportunities for attracting direct investment and increasing employment, attractiveness for investing and making profit, for both existing and new market entrants, opportunities for personal and professional affirmation, incentive for domestic and foreign investments in the local community, new quality of life in the local community, with effects on the whole region but also the possibility of developing rural tourism in this part of the country (Ilić, B. & Stojanović, D., 2019). To narrow down / refine the thematic focus of each strategic development priority, the directions of development with the highest potential have been identified. The regional development strategy of the Timok region will achieve the overall objective through the priority areas of development, strategic and cross-sectoral or horizontal priorities. The strategic development priorities include agriculture and food processing, energy based on renewable energy sources, tourism as well as the exploitation and processing of mineral resources. Horizontal priorities linking these sectors are transported in the region, support for investment and entrepreneurial spirit, the region's human resources (which are increasingly depleted) and a healthy environment (Ilić, B., 2016). Development can be achieved by sustainable consumption (Sima & Gheorghe, 2015) and country of origin serves as a very important basis for this consumption (Šapić et al., 2018). All that that require an integrated approach to the social, economic, environmental, and technological environment (Nica et al., 2018).

The tourism potential of the Timok region is unevenly developed. From relatively developed - Sokobanja, archeological sites "Felix Romuliana" and Lepenski Vir, Stara Planina Nature Park (Babin zub), Djerdap National Park, Gamzigrad Spa, Brestovac Spa, to underdeveloped cities - Zajecar and Bor and other municipal centers, with over 50 cultural, artistic and sporting events, natural and cultural-historical sights, hunting grounds, tourist spots in the neighborhood and the beginnings of rural tourism in a small number of surrounding villages.

The existing tourists and recreational offer of the whole Timok region are not sufficiently recognized and developed (Ilić, B., 2020). Considering the facts, based on the Regional Development Strategy, five directions of development have been identified within this Strategic Development Priority. Three of them are of the first category: cultural tourism - there are a large number of cultural monuments, archaeological sites, historical monuments and natural sites in the Timok region. Sports - recreational and health (spa) tourism - there is a long tradition in this type of tourism (more than 170 years), and there is great potential in existing hydro-geothermal sources, which are used for various therapeutic purposes. Mountain tourism, due to the terrain of Stara Planina with the highest mountain peak in Serbia (Midžor, 2,169 m), which is suitable for hiking and

skiing (it has the highest number of snow days per year in Serbia). The following priorities have been identified as priorities of the second category: Rural tourism - in the region, there are still preserved authentic rural areas with traditional rural life, including unique wine cellars in Rajac, Rogljevo, and Smedovac. Specialized forms of tourism, such as hunting tourism and speleology - one of the best hunting grounds in Serbia (Dubašnica) is located on the territory of Bor Municipality, and in this area, there are three very attractive caves, which are considered the most beautiful and the longest in Serbia. The development of tourism as a strategic development priority under the Regional Development Plan could be based on two elements: 1. adaptability, to maintain long-term profitability, by continually adapting to the competitive environment and needs of tourists and enhancing the attractiveness and originality of the destination, 2. sustainability, as an ability to profitability is achieved and maintained with minimal negative impacts on society and the environment. ELECTRE and AHP Multi-Criteria Decision Making methods were used to select the optimal development direction of rural tourism in the Timok region.

Multicriteria Decision Making - MCDM

The concept of MCDM refers to situations where there are several conflicting criteria (Čupić, M., Tummala, R. & Suknovic, M., 2001). According to many authors, MCDM is divided into multi-objective (MODM – VCO) and multi-attribute decision making (MADM – VAO) (Zimmermann, N. E., 1996). MCDM methodology based on the analysis of criteria and alternatives so that one alternative is better than the other (Durkalić et al., 2019). A typical example of this decision-making is the mathematical programming of the problem of multi-objective functions, known as the "Vector-maximum" problem (Kuhn, H.W. & Tucker, A.W., 1951). The decision-making process consists of two components: the objectively defined projects component and the subjectively defined criteria component. The relationship between projects and criteria is established through attributes that are characterized as project characteristics, relevant to decision making and through the choice of the right solution. Decision-makers' preferences are subjective, and examining attribute-based on criteria is a subjective process (Vanderpooten, D., 1990). Although the area of MCDM has a very diverse set of methods that differ from one another, common characteristics of problems can be separated and solved by their application (Hwang, C.L. & Yoon, K. 1981): 1. The abundance of criteria or attributes that the decision-maker must emphasize; 2. Criterion conflict; 3. The indivisibility of individual units of measurement (a particular property or requirement); 4. Selection of the best actions from a set of predefined ones. The research in the paper is based on finding adequate development projects of a tourist resort, Timok region using the multiple criteria ELECTRE method for determining priorities between particular alternatives i.e. criteria. Therefore, this way of examining offered development projects, giving the new approach to the problem of improving tourism in the Timok region, based on the results obtained in the wider area. The ELECTRE method provides a solution to the problem of project ranking, taking into account various criteria. Some of the selected criteria could be quantified and some only

presented qualitatively, and for the application of the ELECTRE and AHP methods, several opposing criteria that evaluated the development of Timok region projects were crucial. This means that certain criteria, such as distance (from the city), the number of geothermal wales, activity, and (negative) impact on environmental protection, were related to immeasurable units. The AHP method was used as an auxiliary method for determining the weighted values of the criteria, which certainly contributes to the objectivity of project selection. The concept of applying multi-criteria decision-making goes through several stages, which will be explained in more detail.

ELECTRE and AHP methods

The **ELECTRE** (*Elimination and Choice Translating Reality*) method was developed by Bernard Lee Roy (1968) as a response to the existing decision-making methods and as part of the Multicriteria Decision Theory. This method occupies a very significant place in the theory of Multi-Criteria Decision Making and in the papers of Vincke, Roy, Vanderpooten and other authors who researched the field of MCDM (Vincke, P., 1992., & Roy, B., Vanderpooten, D.,1996). The ELECTRE method has several versions (ELECTRE I-IV). In practice, the most commonly encountered is the ELECTRE I method for determining the partial ordering of alternatives, as well as the ELECTRE II method for completely arranging a set of alternatives (Nikolić, M., 2009a). ELECTRE I was created between 1993 and 1996 (Roy, B., 1993). In the further evolution, ELECTRE II, ELECTRE III, ELECTRE IV, as well as two further upgrades, ELECTRE IS and ELECTRE TRI, were created (Hokkanen, J. & Salminen, P., 1997). They differ in the way they are applied and in the type of problems they solve (Simpson, L., 1996). Simpson compared the SMART method to the ELECTRE method and concluded that "there are no major differences between these methods, however, that it is obvious that one method is stronger than the other", favoring the ELECTRE method (Simpson, L., 1996). The ELECTRE method could be viewed as a philosophy of a decision aid (Mousseau, V., Roy, B. & Sommerlatt, I., 2000). The following section describes the main 9-step ELECTRE method and the auxiliary AHP method. The main steps of the ELECTRE method include: First, establish a decision matrix. Criteria shown as qualitative values need to be changed into quantitative values. The authors used the following criteria: 1- very low, 3- low, 5 – average, 7 – high, and 9 – very high. A numerical scale, which is using for this purpose, is shown in **Table 1:**

Table 1. Transformation of linguistic scales into quantitative values

Linguistic scale	Quantitative value	
	Benefit - max	**Cost - min**
Very high	9	1
High	7	3
Average	5	5
Low	3	7
Very low	1	9

Step 1. Calculate the normalized decision matrix. The normalized value r_{ij} is calculated as (Roy, B., Présent, M., Silhol, D. 1986)

$$r_{ij} = x_j / \sqrt{\sum_{k=1}^{m} x_{jk}^2}, \quad (1)$$

where x_{ij} is the rating of alternative A_i concerning the criteria C_j, $i = 1,...,m,$ m is the number of alternatives, and $j = 1,...,n,$ n is the number of criteria (Roy, B., Présent, M. & Silhol, D. 1986, Nikolić, M., 2009c).

Step 2. Create the weighted normalized decision matrix. The weighted normalized value v_{ij} is calculated as(Roy, B., Présent, M. & Silhol, D. 1986)

$$v_{ij} = w_j r_j. \quad (2)$$

Step 3. Determine concordance C_{pr} and discordance D_{pr} sets by using followsformulae(Roy, B., Présent, M. & Silhol, D. 1986):

$$C_{pr} = \{j \mid x_{pj} \geq x_{rj}\}, \quad (3)$$

$$D_{pr} = J - C_{pr} = \{j \mid x_{pj} < x_{rj}\}. \quad (4)$$

where$J = \{j \mid j=1,...,n\}$ (all criteria).

Step 4. Define the concordance matrix (Cpr) based on the concordance sets. The elements of this matrix are the concordance indices and they are calculated as (Roy, B., Présent, M. & Silhol, D. 1986):

$$c_{pr} = \sum_{j \in Cpr} w_j. \quad (5)$$

Step 5. Determine the discordance matrix (Dpr)based on the discordance sets. The elements of this matrix are the discordance indices determined by the following formula (Roy, B., Présent, M. & Silhol, D. 1986):

$$d_{pr} = \frac{\max_{j \in Dpr} \left[v_{pj} - v_{rj} \right]}{\max_{j \in J} \left[v_{pj} - v_{rj} \right]}, \quad (6)$$

wherev_{er} v_{rj} are elements of the weighted normalized decision matrix.

Step 6. Determine the matrix of concordance domination (Mcd), based on the average index of concordance - *AIC* by using formula (Roy, B., Présent, M. & Silhol, D. 1986):

$$AIC = \sum_{p=1}^{m}\sum_{r=1}^{m} \frac{c_p}{m(m-1)}, \tag{7}$$

"Elements of concordance domination matrix are calculated on the basis of criteria: $mcd_{pr}=1$, *for* $c_{pr} \geq AIC$; $mcd_{pr}=0$, *for* $c_{pr}<AIC$" (Roy, B., Présent, M. & Silhol, D. 1986).

Step 7. Analogously to the matrix of concordance domination, there is a need for determination of the matrix of discordance domination (Ddm) based on the average index of discordance - *AID*, as follows (Roy, B., & Vanderpooten, D., 1996):

$$AID = \sum_{p=1}^{m}\sum_{r=1}^{m} \frac{d_p}{m(m-1)}, \tag{8}$$

Matrix of discordance domination is calculated on criteria: $mdd_{pr}=1$, *for* $d_{pr} \leq AID$; $mdd_{pr}=0$, *for* $d_{pr}>AID$.

Step 8. Determine the matrix of aggregate domination whose elements are equal to the product of the elements on a certain position in matrices of concordance (Mcd) and Matrix of discordance (Mdd) domination (Roy, B., & Vanderpooten, D., 1996):

$$mad_p = mcd_p \cdot mdd_p . \tag{9}$$

Step 9. Less desirable actions are eliminated, while one or more alternatives are separated as most desirable (Roy, B., & Vanderpooten, D., 1996). Therefore, the ELECTRE I method provides a partial order of actions (Adamovic, Z, Nadrljanski, Dj. & Tomasevic, M.,2008).

AHP method **(***Analytical Hierarchy Process*) was proposed by Saaty, T. L. (1977,1980) to model subjective decision-making processes based on multiple criteria in a hierarchical system. This method is very convenient for determining the relative criteria weights (Saaty, T. L. (1990). Three of the most used methods for determining the weights in AHP are the average of normalized columns (ANC), normalization of row average (NRA), and normalization of the geometric mean of the rows(Huang Y.S., Liao J.T. & Lin, Z.L., 2009), (Čupić, M., Tummala, R. &Suknovic, M., 2001). The AHP method includes the following steps:

Step 1. Construct a pairwise comparison matrix using the fundamental scale of the AHP **(Table 2).**

Table 2. Fundamental scale of AHP

The evaluation scale	Definition
1	Equal imported
3	Slightly more importance
5	Strongly more importance
7	Demonstrably more importance
9	Absolutely more importance
2,4,6,8	The medium value of the adjacent scale

Source: Saaty, T.L. (1980).

Table 3. Pairwise comparison matrix

	C_1	C_2	C_3	...	C_n
C_1	a_{11}	a_{12}	a_{13}	...	a_{1n}
C_2	a_{21}	a_{22}	a_{23}	...	a_{2n}
.	.	.	.	.	.
C_n	a_{n1}	a_{n2}	a_{n3}	...	a_{nn}

Source: Saaty, T.L. (1980).

In the pairwise comparison matrix (Table 3) where a_{ij} denotes the comparative importance of criterion C_i concerning to criterion C_j. In the matrix $a_{ij} = 1$, when $i = j$ and $a_{ji} = a_j$, while *n* denotes the number of criteria (Saaty, T. L., 1994).

Step 2. Calculate the relative normalized weight w_j of each criterion by using the following formulae (Saaty, T. L., 1994):

$$GM_i = \sqrt[N]{\prod_{i=1}^{N} a_{ij}} \tag{10}$$

$$W_j = \frac{GM_i}{\sum_{i=1}^{N} GM_i} \tag{11}$$

where *GM* is a geometric mean.

Step 3. Determine the maximum eigenvalue $\lambda_{\max}$ of the comparison matrix and calculate the consistency index $\boldsymbol{C}$ (Saaty, T. L. (1994):

$\boldsymbol{C} = (\lambda_{\max} - n)/(n-1)$, for n>1. (12)

Step 4. Obtain the random index R for the number of criteria used in decision making **(Table 4).** Table 3 shows the values of the random consistency index for different matrix sizes.

Table 4. Random consistency index for different matrix sizes

Matrix size (n)	1	2	3	4	5	6	7	8	9
RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45

Source: (Saaty, T.L., 2014)

Step 5. For n>2 calculate the consistency ratio $\boldsymbol{R}$ by using the following formula (Saaty, T.L., 1980).

$$CR = CI/RI. \quad (13)$$

where RI is the random consistency index, and its value is determined based on the matrix size(Saaty, T.L., 1980).

and

$$msd_{ip} = 0, \text{ for } s_{ip} < PIS. \quad (14)$$

Applying ELECTRE and AHP methods for ranking the sustainable directions projects of the Timok region

For the optimal selection of rural tourism development directions of the Timok region, a group of experts in the RARIS development agency is made up of financial consultants, accountants, as well as prominent managers of companies that do well in this area, suggested rural tourism development directions. Directions that were taken into account were financially acceptable and environmentally had little impact on the natural environment. Based on the geographical location and tourism development potential of the Timok region, five development directions have been identified, ie. the following five tourism projects are in the field of rural tourism:

- *Mountain tourism,*
- *Hunting and fishing tourism,*
- *Eco-tourism,*
- *Health - sports and recreational tourism,*
- *Cultural tourism.*

Each project, i.e. alternative of the future development of the region, is defined by certain attributes, ie. by the criteria. After talking to a team of experts from the RARIS for development of the Timok region, the following criteria for projects evaluation (with attributes in brackets) were defined:

1. FIN -Investing in existing or new capacities (values in Euros),
2. P- Profit –a benefit to the rural community as income (tourism revenue expressed in Euros),
3. D - Distance - distance from the city distance - (average in kilometers from the cities of Bor, Zajecar, Negotin and Kladovo, this distance should be shorter),
4. GW - Geothermal Wales - concentration of sources of geothermal energy and clean water (determined to be as high as possible),
5. A - Activity - the opportunity to participate in the activities, traditions, and way of life of the local population, (it has been found necessary that the involvement should be greater),
6. ENP - Environmental protection - Impact on the conservation of the environment,

history, and location (it has been determined that maximum environmental management is required).

The criteria are set on unique measures of defined attributes, measures for each development direction. Investing in existing or new capacities (FIN) and profit for the rural community as income are expressed in the form of cash investments with additional parameters (taxes, donations, discounts, fees). The remaining four criteria, based on the team of experts, gained importance in relation to other's ratings from one to ten. The process of summarizing attributes into criteria involves the first level of subjectivity. At this level, the criteria must be accepted by decision-makers. The second level processes preference data, reflecting the relative importance of each criterion. At this level, decision-makers have the opportunity to express their views on their value systems. The initial matrix is composed of the selected development directions and their inputs, based on the given criteria and given in **Table 5.**

Table 5. Performance matrix for five projects and five criteria

Criteria	**FIN**	**P**	**D**	**GW**	**A**	**ENP**
Projects	min	max	min	max	max	max
(Mountain tourism PRO_1)	500,000	900,000	very high	medium	medium	medium
Hunting and fishing tourism (PRO_2)	450,000	300,000	high	low	very high	high
Eco-tourism (PRO_3)	170,000	700,000	high	medium	high	medium
Health and sport recreation (PRO_4)	650,000	950,000	very high	high	low	medium
Cultural tourism (PRO_5)	120,000	350,000	high	low	very high	medium

Source: Author's research

The proposed projects were evaluated based on the given criteria, while their evaluation was carried out with maximum objectivity and with the opinion of experts. Based on Table 5, an initial decision matrix, shown in **Table 6**, was formed.

Table 6. Initial decision matrix

Criteria	FIN	P	D	GW	A	ENP
Projects	min	max	min	max	max	max
PRO_1	500,000	900,000	9	5	5	5
PRO_2	450,000	300,000	7	3	9	7
PRO_3	170,000	700,000	7	5	7	5
PRO_4	650,000	950,000	9	7	3	5
PRO_5	120,000	350,000	7	3	9	5

Source: Author's research

Using formula 1, based on the values in Tables 5 and 6, the normalized decision matrix was calculated **(Table 7).** This is the *first step* of the ELECTRE.

Table 7. Normalized decision matrix

	FIN	P	D	GW	A	ENP
PRO1	0.521	0.579	0.511	0.462	0.319	0.409
PRO2	0.469	0.193	0.398	0.277	0.574	0.573
PRO3	0.177	0.450	0.398	0.462	0.447	0.409
PRO4	0.678	0.611	0.511	0.647	0.191	0.409
PRO5	0.125	0.225	0.398	0.277	0.574	0.409

Source: Author's research

Based on the opinion of two research associates and on the opinion of the one trainee researcher (fields: Economy, Sociology, and Ecology), the weight of criteria was determined by applying the AHP method. The criteria were compared in pairs, and the final values were obtained using the arithmetic mean. The final results of the weighting criteria are as follows (**Tables 8, 9, 10 and 11**).

Table 8. Criterion Weights - Associate Researcher 1 (CR) = 7.76%

	FIN	P	D	GW	A	ENP	**Cr**	**Wt**
FIN	0,05	0,33	0,14	0,20	0,33	1,00	FIN	0.044
P	3,000	1,00	3,00	1,00	5,00	7,00	P	0.330
D	7,000	0.333	1,00	1,00	5,00	5,00	D	0.251
GW	5,000	1,000	1,000	1,00	3,00	3,00	GW	0.231
A	3,000	0.200	0.200	0,333	1,00	3,00	A	0.094
ENP	1,000	0,143	0,200	0,333	0,333	1,00	ENP	0,049

CR - Consistency Ratio

Source: Author's research

Table 9. Criterion Weights - Associate Researcher 2 (CR) =8,58%

	FIN	**P**	**D**	**GW**	**A**	**ENP**	**Cr**	**Wt**
FIN	0,05	0,33	0,33	0,14	0,33	1,00	FIN	0.052
P	3,000	1,00	1,00	3,00	3,00	9,00	P	0.311
D	3,030	1,000	1,00	5,00	3,00	3,00	D	0.312
GW	7,143	0.333	0.200	1,00	1,00	5,00	GW	0.156
A	3,030	0.333	0.333	1,000	1,00	3,00	A	0.123
ENP	1,000	0,111	0,200	0,333	0,333	1,00	ENP	0,046

Source: Author's research

Table 10. Criterion Weights - Trainee Researcher 3 (CR) =9,84%

	FIN	P	D	GW	A	ENP	Cr	Wt
FIN	0,05	0,14	0,14	0,14	0,33	0,33	FIN	0,027
P	7,143	1,00	7,00	5,00	7,00	9,00	P	0.541
D	7,143	0.143	1,00	1,00	0,33	1,00	D	0.105
GW	7,143	0.200	1,000	1,00	1,00	1,00	GW	0.121
A	3,030	0.143	3,030	1,000	1,00	1,00	A	0.117
ENP	3,030	0,111	1,000	1,000	1,000	1,00	ENP	0,088

Source: Author's research

Table 11. The arithmetic mean of the criteria weights

Criterion	Weight
FIN	0.042
P	0.395
D	0.222
GW	0.169
A	0.111
ENP	0,061
Σ	1

Source: Author's research

Step 2 is creating the weighted normalized decision matrix using formula 2. The values of the elements of the weighted normalized matrix are given in **Table 12.**

Table12. The Weighted normalized matrix

	FIN	P	D	GW	A	ENP
$\mathbf{P_1}$	0.021	0.228	0.113	0.078	0.035	0.024
$\mathbf{P_2}$	0.019	0.076	0.088	0.046	0.063	0.034
$\mathbf{P_3}$	0.007	0.177	0.088	0.078	0.049	0.024
$\mathbf{P_4}$	0.028	0.241	0.113	0.109	0.021	0.024
$\mathbf{P_5}$	0.005	0.088	0.088	0.046	0.063	0.024
Cr Weights	0.042	0.395	0.222	0.169	0.111	0,061

Source: Author's research

ELECTRE is determining concordance and discordance sets by using formulae 3 and 4 (Roy, B., Présent, M. & Silhol, D. 1986). The next *fourth step* is defining the concordance matrix (Cpr) based on the concordance sets. The elements of this matrix are calculated by formula 5 and presented in **Table 13**. Determining the discordance matrix (Dpr) based on the discordance sets is *step five* of the ELECTRE method, while the elements of this matrix are determined by formula 6 and there are shown in

Table 14. *Step six* is determining the matrix of concordance domination (Mcd, **Table 15)**, based on the average index of concordance (using formula 7). Determination of the matrix of discordance domination (Ddm) based on the average index of discordance is *step seven* of the ELECTRE (using formula 8) and these elements are shown in **Table 16.**

Table 13. The concordance matrix - Cpr

0	0.564	0.625	0.436	0.625
0.436	0	0.394	0.436	0.563
0.605	0.828	0	0.436	0.847
0.847	0.564	0.625	0	0.625
0.436	0.939	0.436	0.436	0

*Source:*Author's research

Table 14. The discordance matrix - Dpr

0	0.185	0.496	1	0.202
1	0	1	1	1
1	0.139	0	1	0.159
0.454	0.257	0.446	0	0.279
1	0.690	1	1	0

*Source:*Author's research

Table 15. The Matrix of concordance dominance - Mcd

0	0	1	0	1
0	0	0	0	0
1	1	0	0	1
1	0	1	0	1
0	1	1	0	0

Source: Author's research

Table 16. The Discordance Dominance Matrix -Ddm

0	1	1	0	1
0	0	0	0	0
0	1	0	0	1
0	1	1	0	1
1	0	0	0	0

Source: Author's research

The next step eight involves determining the matrix of aggregate dominance - MAD. In this example, the aggregate dominance matrix has the values shown in **Table 17** obtained by applying formula 9.

Table17. The aggregate dominance matrix – MAD

P_1	0	1	0	1
0	P_2	0	0	0
0	1	P_3	0	1
1	0	1	P_4	1
1	0	0	0	P_5

Source: Author's research

In the last, the ninth step of the ELECTRE method, less desirable actions, alternatives - projects, i.e. development directions are eliminated(„→" = „dominates over").

Table 18. shows the ranks of development directions (projects) and as can be seen, the projects that are not dominated are P2 and P5. Alternative i.e. project P1 dominates under the projects P3 and P5, while the project P4 also has an advantage over the projects P2 and P5.

Table 18. Final project rankings

$P_4 \rightarrow P_1, P_2, P_3, P_5$	**Domination over P_1, P_3, P_5**
$P_1 \rightarrow P_3, P_5$	Domination over P_3, P_5
P_2	Without domination
$P_3 \rightarrow$ **P_2 P_5**	Domination over **P_2 P_5**
P_5	Without domination

Source: Author's research

The best project is P4 –a project of Health - Sports and Recreational tourism. The research in this paper is a logical continuation of the authors' research and the breakdown of rural tourism projects into subcategories in terms of the concrete best development direction for the Timok region.

Discussion

The aim of the research focuses on the development of the Timok region of Eastern Serbia by choosing the best development direction of rural tourism. To choose the best alternative, it was necessary to objectively apply a method that would rank the alternatives and help in the decision of future investors and certain organizations (such as RARIS) in choosing the optimal solution. A team of experts from RARIS took into account and proposed rural tourism projects using the Brainstorming method. Out of all 14 proposals, a team of experts considered five that could be optimal. In its basic version, the ELECTRE method was applied to reduce costs, in other words saving time and to partially compare the proposed projects. After selecting development projects i.e. directions, the expert team of RARIS composed of research associates and trainee researchers in the fields of economics, ecology, and sociology proposed and evaluated

the weights of the criteria, comparing the criteria in pairs. According to the ELECTRE method, one out of the five proposed was one that satisfied the choice of the optimal and best solution. The rural tourism project selected by the ELECTRE method is a health and sports and recreational tourism project. This alternative is also very logical given the fact that the Timok region abounds with hydro-geothermal energy sources that are underutilized or very little utilized.

Conclusion

The Strategy of the Timok region in Eastern Serbia should be based on Healthy- sports and recreational tourism because the investments in this project are lower than the investment of other projects of tourism. Therefore, the authors came up with the results that the project P4 is economically better than others. Taking into account the opinion of experts, together with the ranking method, the results indicate the optimum best option for multi-criteria decision-making (MCDM) and the future directions of tourism development. In the experts' opinions and on its rank in the selected methods, besides the least investment, the project of tourism requires the shortest time for realization. So, it can be said that the project of the paper presents ranking projects of the Timok region in Eastern Serbia, applying two methods of MCDM, ELECTRE I and AHP. The results demonstrate, based on these methods and after the project has been calculated that the projects of Healthy- sports and recreational tourism dominate, ie. the best project in P4. If we take into account the financial criterion, the recommendation development tourism is the most important for sustainable development of the Timok region that includes the needs of people, but also to preserve nature in the region of Eastern Serbia. This research is based on the rich nature of the Timok Region, the needs of the citizens and authors are trying to make the support of the local leaders of the region but also to be supported by the state.

Conflict of interests

The authors declare no conflict of interest.

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ECONOMIC EFFICIENCY OF BREEDING TSIGAI SHEEP IN THE CENTRAL AND SOUTH – EAST EUROPE

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ARTICLE INFO

Original Article

Received: *03 February 2020*

Accepted: *01 March 2020*

doi:10.5937/ekoPolj2001175N

UDC 65.011.44:636.371
(4-191.2)(4-14)

Keywords:

Tsigai breed, profit, subsidies, NPV, decision tree

***JEL**: Q12, Q13, Q18*

ABSTRACT

Tsigai is an indigenous sheep breed present in entire Central and South-East Europe. Due to its low meat and milk production number of Tsigai sheep is in a sharp decline. But, there is a strong need to preserve valuable genetic resources of this breed. Therefore, the goal of this research is to evaluate economic performance of Tsigai breeding and to define strategies for its future use. In the paper profitability of Tsigai breeding is determined as well as economic efficiency of investments in Tsigai farms (using Net Present Value and Internal Rate of Return). To perform the analysis in risky circumstances authors applied sensitivity and decision tree approach. The results indicated that breeding of Tsigai sheep requires state subsidies to be profitable and economically efficient. Decision tree approach resulted in calculation of expected NPV. Investments in Tsigai farms proved to be economically efficient, but associated with high level of risk.

Introduction

Tsigai breed originates from Asiatic Ural, and it is "triple-purpose breed reared for wool, milk and meat" (Savić et al., 2000). Origin and relations between Tsigai and some other indigenous Balkan sheep breeds are discussed in details by Draganescu (2007), as well. Tsigai breed is present in many countries in the Central and South – East Europe but the most important breeder countries are Serbia, Romania, Hungary and Slovakia.

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Taking into account variability of Tsigai sheep, it is very important to study genetic differences among various Tsigai populations, in order to determine and maintain their genetic diversity. Such type of research was performed by Savić et al. (2000) and Ćinkulov et al. (2008) for Tsigai sheep in Serbia, by Kusza et al. (2009) for Slovak population of Tsigai, by Kusza et al. (2010) and Annus et al. (2015) for Tsigai sheep population in Hungary, and by Zăhan et al. (2011) for Tsigai sheep in Romania. The same issue was discussed by Kusza et al. (2011) for local sheep breeds in Southern and Eastern Europe (Romania, Albania, Croatia, Turkey and Serbia). Research carried out by Vlaic et al. (2015) emphasized importance of preservation of genetic Tsigai sheep resources because of possible increased demand concerning international exchange of sheep genetic resources due to climate changes. Petrović et al. (2011) emphasized importance of traditional breeds noticing that genetic improvement increased productivity of domestic animals, but "animals selected for high and efficient production are exposed to greater risk" which primarily assumes "physiological and immunological problems".

Although Romanian word Tsigai means soft, fine wool, nowadays production of wool is not the main goal of Tsigai breeders. The reason is low price of wool and decreasing trend in total wool production worldwide. According to Lescheva and Ivolga (2015) as a result of such a negative trend, proportion of wool in the manufacture of all textile fibers in the world in 2012 was only 1.3%, while proportion of artificial fibers was 67.1%. According to the results of European Food Safety Authority (EFSA) panel (2014) Tsigai breed is "selected for survival and production under local environmental circumstance" and it is "often multi-purpose traditional breed", while wool production is "seldom primary breed criteria". Although Tsigai sheep is an indigenous breed with rather low productivity there were some cases in which Tsigai sheep was successfully used to improve the traits of some other local sheep breeds, for example in Ukraine (Sedilo et al., 2016).

Despite the fact that Tsigai sheep could be used for production of wool, milk and meat, Vrdoljak et al. (2007) stated that in Croatia meat production is the most important one. Similarly, due to low wool prices Tsigai breeders in Romania shifted their interest from wool production to meat or milk production (Ilişiu et al., 2013). In Serbia, general trend in sheep production is also oriented towards meat production (Petrović et al., 2011), while the same trends are noticeable in Hungarian sheep production (Kukovics, Németh, 2011).

Because the Tsigai is a traditional multipurpose sheep breed with rather low level of productivity, the question arises how to stop decreasing trend in number of Tsigai sheep and preserve valuable genetic resources. Besides, it should be mentioned that there are other significant benefits for the entire society from Tsigai breeding (not only preservation of genetic resources). Considering importance of preservation of Tsigai breed, but at the same time bearing in mind very low level of its productivity, the goal of this paper is to analyze economic efficiency of production using Tsigai breed as well as to determine possible directions of future use of this breed.

Materials and methods

Tsigai sheep is present in number of countries across Central and South – East Europe, but each country has a bit different production environment. To conduct the research authors primarily used data describing real production conditions in Serbia. Nevertheless, production potential of Tsigai breed is estimated not only on the basis of research conducted in Serbia (Gutić et al., 2006; Mekić et al., 2007; Petrović et al., 2009) but also in Romania (Dărăban, 2008; Ghita et al., 2010; Cighi, 2016; Ilisiu et al., 2018) in Slovak Republic (Makovický et al., 2013; Margetin et al., 2013; Polák et al., 2013) in Hungary (Budai et al., 2013; Marley, 2014; Gavojdian et al., 2015) and in Croatia (Antunović et al., 2008; Mioč et al., 2011; Antunović et al, 2012; Antunović et al., 2013).

Additional data were gathered through interviews and monitoring of 20 farms specialized in Tsigai sheep breeding in Serbia, which flock size was between 50 and 200 ewes. All the producers are situated in the Province of Vojvodina where Tsigai breed is commonly used. The area is located in the northern part of Serbia bordering Romania, Hungary and Croatia where breeding of Tsigai sheep is also traditionally present. Data related to production performance of Tsigai breed are also acquired through interviews with employees of Serbian agricultural advisory service.

Revenues and costs are calculated on bio-economic model of Serbian family farm specialized in Tsigai sheep production having 150 ewes. The farm is performing meat – wool type of production, which is in line with results presented by Petrović et al. (2009) who stated that in future Tsigai breed in Serbia should be used for meat production (due to body mass of adult animals and body mass of lambs). The size of state subsidies for quality breeding ewes and sold lambs is determined on the basis of appropriate Serbian regulations. Relevant information regarding prices of outputs and inputs are provided by STIPS database (System of Agricultural Market Information of Serbia) which is operated by Serbian Ministry of Agriculture, Forestry and Water Management.

To discover economic efficiency of investments, authors used the most important capital budgeting indicators such as Net Present Value (NPV) and Internal Rate of Return (IRR). Sensitivity analysis is performed to determine crucial factors affecting profit, NPV and IRR. Decision tree method for evaluation of investments in risky circumstances was applied to calculate expected NPV.

Results and Discussions

The research is based on an assumption that a farmer invests in modern building and equipment for accommodation of 150 ewes and appropriate number of other categories of sheep. The highest percentage of initial cash outlay is related to the construction of a completely new building (*Table 1*). Financing of the investment is supposed to be 50% from equity funds (interest rate for opportunity costs is 1%) and 50% from loan (interest rate is 6.5%). Therefore weighted average cost of capital (WACC) used for discounting is 3.75%

Table 1. Investment for establishment of Tsigai farm

Item	Total investment (EUR)	Participation in total investment (%)
Buildings	29,750.00	44.75
Equipment	3,150.00	4.74
Breeding heard	22,500.00	33.84
Working assets	11,080.00	16.67
Total	66,480.00	100.00

Source: Authors' calculations

Profit in sheep production (based on data from year 2019 regarding prices of final products, prices of raw material and level of subsidies) is calculated starting from two possibilities (*Table 2*). First possibility is that farmer uses all available subsidies for Tsigai production in Serbia, while other possibility is that farmer does not use subsidies at all (because he is not registered with the appropriate agency which is in charge of payment of state subsidies). In both cases the most important revenue originates from sold lambs (52.35% or 85.47% if subsidies are not used). On the other hand, costs are dominated by feed costs (73.63% if farmer uses subsidies or 78.07% without use of subsidies). Having in mind difficulties to estimate opportunity costs for labor of family members at the farm, labor costs are not included in the calculation. Instead, reimbursement for family labor and management skills would be made from profit (all labor is performed by family members as regular or custom labor). The results indicate that sheep farms dealing with Tsigai breed are profitable only if they are subsidized.

These results are in line with findings reported by other authors. Investigating economic efficiency of extensive sheep and goat farming in Serbian conditions using indigenous breeds (not only Tsigai sheep but also Pramenka sheep and Balkan goat breed) Ivanović (2018) determined that such production is economically efficient, but it is less profitable than intensive livestock production. It was also determined that this type of production is not profitable without state subsidies. Similar conclusion was made by Krupová et al. (2014) for multi-purpose extensive local sheep breeds in Slovakia, determining that such production was profitable only with existing governmental subsidies and EU payments. Data reported by Niżnikowski et al. (2006) indicated that sheep production in majority of countries of Central and Eastern Europe has low or mediate profitability, or that they are even not profitable (depending on type of costs involved in calculations). De Rancourt et al. (2006) reported similar results concerning economic efficiency of sheep production in Mediterranean area. Authors found out that dependence of meat production systems and extensive production systems on subsidies is higher than dependence of milk production systems on subsidies. On the other hand, milk production systems have higher income, but they are more sensitive to changes of market prices of milk products. Discussing relations between Common Agricultural Policy and conservation of rare sheep and goat breeds, Canali (2006) stated that some breeds are rare because in short run they provide lower level of profitability, and that their survival is essentially dependant on the level of EU subsidies.

Table 2. Profit in sheep production using Tsigai breed (EUR)

Item	With subsidies	Without subsidies
Total revenue	28,915.00	17,710.00
Sold lambs	15,137.50	15,137.50
Culled ewes	2,310.00	2,310.00
Wool	262.50	262.50
Subsidies for quality breeding ewes	8,700.00	-
Subsidies for sold lambs	2,505.00	-
Total expenses	26,343.88	24,843.88
Feed costs	19,394.86	19,394.86
Bedding	1,400.00	1,400.00
Other material costs	760.00	760.00
Veterinary services, medicine and hygiene costs	550.00	550.00
Registration costs for sheep	1,500.00	-
Maintenance of buildings and equipment	91.00	59.50
Depreciation	1,058.75	1,058.75
Interest	1,589.27	1,589.27
Profit	2,571.12	-7,133.88
Profit per ewe	17.14	-47.56

Source: Authors' calculations

It is evident that existence and level of subsidies is the key issue for profitability of Tsigai sheep breeding. In this case, total amount of state subsidies paid to farmer is 11,205.00 EUR (sum of subsidies for quality breeding ewes and subsidies for sold lambs), while participation of subsidies in total revenue is very high (38.75%). Minimal amount of subsidies needed to break-even is 8,633.88 EUR, which means that present level of subsidies could decrease only 22.95%. Otherwise the production would not be profitable, which is an important indicator for policy makers.

On the other hand, the state has no influence on the level of lamb prices (in the calculation authors used lamb price 2.5 EUR/kg of live weight), because they are formed on free market. But it is necessary to bear in mind that revenue from sold lambs dominates in total revenue (52.35% of total revenue), and that price decrease of only 16.80% leads to zero profit, which means that the lower acceptable lamb price (assuming that the level of other elements of calculation is unchanged) is 2.08 EUR/kg. It is also necessary to point out that the state has no influence on the level of production costs, which are dominated by feed costs, so that the increase of feed costs of only 13.26% would lead to zero profit. These results indicate that, although without state subsidies Tsigai production is not sustainable, even greater risks for this production originate from variability of lamb prices and feed costs (*Table 3*). The same conclusion could be reached if change of 10% for each factor is analyzed (*Table 4*).

Table 3. Sensitivity of profit in Tsigai production to the most important factors

Factor affecting profitability	Maximal acceptable change (increase or decrease) of the factor
Feed costs	Increase 13.26%
Lamb price	Decrease 16.80%
Total subsidies	Decrease 22.95%

Source: Authors' calculations

Table 4. Sensitivity of profit in Tsigai production assuming 10% factor variation

Factor affecting profitability	Factor variation	Output (profit) variation
Feed costs	10%	75.43%
Lamb price	10%	58.88%
Total subsidies	10%	43.58%

Source: Authors' calculations

In such a situation farmers should keep their costs as low as possible, searching at the same time for the ways of lamb price increase. Taking into consideration that Tsigai is an indigenous and endangered breed, there are following ways for improvement of its revenues:

- Production of premium (organic) products, production of products with geographic origin, improvement of marketing based on the use of endangered local breed (Ilişiu et al., 2013).
- Integration of production, processing and marketing in cooperative associations (Drăgănescu, 1998).
- Krupová et al. (2014) suggested that "economic sustainability of multi-purpose sheep farms in marginal areas can be reached mainly by the exhaustion of the reserves in the biological potential of the current breeds". Authors also considered that an "increase of the proportion of milk processed to cheese on farms" could improve profitability, while possible problems regarding possibility to sell additional quantities of cheese should be taken into account.
- Niżnikowski et al. (2006) enlisted solutions such as development of local market for sheep products, improvement of direct sale to reduce related costs, common approach of several countries to European market and alike.

To get the better insight into economic performance of Tsigai breeding further analysis addresses economic efficiency of investments in Tsigai farms. On the basis of an average net cash flow and appropriate discount rate (3.75%), it was determined that the investment in establishment of Tsigai farm is economically efficient (net present value is positive and internal rate of return is higher than the discount rate) only if subsidies are used (*Table 5*). On the other hand, without subsidies an average yearly net cash flow is negative as well as net present value and internal rate of return.

Table 5. Economic efficiency of investments in Tsigai farm (EUR)

Item	With subsidies	Without subsidies
Initial investment (cash outlay)	66,480.00	66,480.00
Cash inflow	28,915.00	17,710.00
Cash outflow	23,695.86	22,195.86
Net cash flow	5,219.14	-4,485.86
Salvage value after 10 years	55,892.50	55,892.50
Net present value	15,062.43	-64,642.67
Internal rate of return	6.68%	negative

Source: Authors' calculations

Having in mind that the NPV is the most important indicator of economic efficiency of investments, it is analyzed how certain factors influence NPV of farms that receive subsidies. The results led to the conclusion that (similarly to sensitivity analysis of profit) the most influential factor on NPV is feed costs (*Table 6*). It is also important to point out that the NPV is more sensitive (comparing to profit) to changes in the observed factors. Therefore, minimal lamb price needed to have zero profit is 2.08 EUR/kg while minimal lamb price which leads to zero NPV is 2.20 EUR/kg.

Table 6. Sensitivity of NPV in Tsigai production to the most important factors

Factor affecting NPV	Maximal acceptable change (increase or decrease) of the factor
Feed costs	Increase 9.46%
Lamb price	Decrease 12.00%
Total subsidies	Decrease 16.37%

Source: Authors' calculations

Analysis could be extended to other factors influencing NPV (such as discount rate and amount of initial investment – cash outlay) and IRR (while height of discount rate does not affect IRR). The results indicated that amount of NPV is less influenced by initial investment and discount rate, comparing to other factors (*Table 7*). Changes of discount rate (cost of capital) have the smallest effect on the size of NPV. Besides, variation of observed factors has greater effect on NPV than on IRR.

Table 7. Sensitivity of NPV and IRR in Tsigai production to the most important factors

Factor affecting profitability	Input variation	Output (NPV) variation	Output (IRR) variation
Feed costs	10%	105.75%	46.05%
Lamb price	10%	82.54%	36.18%
Total subsidies	10%	61.10%	26.76%
Initial investment	10%	44.14%	20.84%
Discount rate	10%	14.89%	No influence

Source: Authors' calculations

Taking into consideration that investments in Tsigai breeding are very risky (rather small changes of observed factors are causing negative NPV), it is necessary to discuss

possibilities to lower required investments in this production. The most convenient solution is to avoid investments in new housing capacities. Instead, existing premises (buildings) could be used which would lead to a significant decrease of total level of investments. This approach is based on results of research presented by Radivojević (2014), as well as Marković et al. (2014) who determined that existing capacities for livestock housing in Serbia are not used enough in the production, and the same conclusion could be made for feed storages for livestock production.

This is a result of many factors such as a long term decreasing trend in number of livestock in Serbia, depopulation of villages, downfall of big agricultural enterprises which existed in socialism etc. If farmers used existing premises (buildings) instead of investing in the new ones, total investment would decrease by 44.75% (from 66,480 EUR to 36,730 EUR). Such an approach is possible because Tsigai sheep is an indigenous sheep breed adapted to local conditions and does not require up to date accommodation facilities. The effects of such business decision (with and without subsidies) are presented in *Table 8*.

Table 8. Economic effects of decreased investments in Tsigai farm (EUR)

Item	With subsidies	Without subsidies
Initial investment (cash outlay)	36,730.00	36,730.00
Cash inflow	28,915.00	17,710.00
Cash outflow	23,695.86	22,195.86
Net cash flow	5,219.14	-4,485.86
Salvage value after 10 years	33,580.00	33,580.00
Net present value	29,371.73	-50,333.37
Internal rate of return	13.76%	negative

Source: Authors' calculations

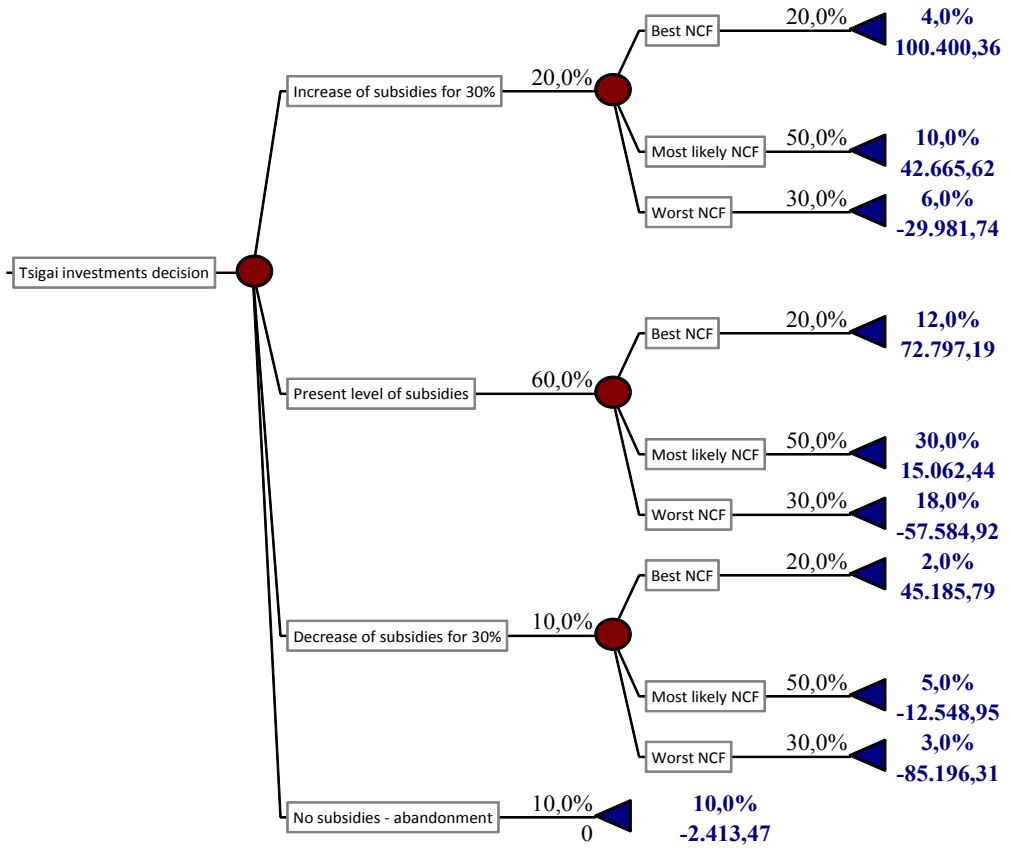
As a result of total investments decrease NPV and IRR significantly increased if subsidies are used (value of these indicators approximately doubled). On the other hand, if subsidies are not used investment in sheep production remains economically inefficient, due to negative net cash flow which has not been affected by the decreased level of total investment.

Sheep production faces many risks related to all above mentioned factors, so it is possible to predict a lot of scenarios for future business environment, which could be presented by the use of a decision tree (*Figure 1*). The analysis started from the following assumptions:

- After the initial investment has been made, in the first year of the project it is possible to predict level of revenues and costs with certainty. On the other hand, it is not possible to know the level of subsidies with certainty. Therefore, four scenarios (with appropriate probabilities) for state subsidies are assumed. If there is no subsidies the investments will be abandoned after the first year (the project will be sold according to its accounting value).

- From year two to the end of the observed period (total analyzed period is 10 years) three levels of net cash flow (NCF) are predicted. They are the best, the most likely and the worst scenario. In these scenarios NCF is influenced not only by the level of subsidies but also by more or less favorable values of lamb prices and feed costs.
- For each scenario probability of occurrence is estimated and NPV is calculated.

Figure 1. Decision tree for evaluation of investment in Tsigai breeding



Source: Authors' calculations

Taking into account NPVs of all ten scenarios and their probabilities, expected NPV for this investment is calculated. The expected NPV of the investment is positive (6,851.81 EUR), so it could be concluded that the investment is economically efficient, although expected NPV is lower than initially calculated NPV (which was determined for expected business condition, without taking risk into account). Nevertheless, there is 42% probability that this investment will have negative NPV.

At the same time, standard deviation of expected NPV is 46,477.46 EUR, which provides an idea of how far above or below the expected value the actual value of NPV is likely to be. Coefficient of variation of this investment is determined to be 6.78 indicating risk per unit of NPV and considering at the same time level of risk and effects of the investment. Therefore, it should be considered that this is a high risk investment, but final decision (whether to invest in Tsigai breeding or not) depends primarily on farmers' risk preference.

Conclusions

This analysis, as well as other research conducted to evaluate economic efficiency of Tsigai sheep production (or other indigenous multi-purpose traditional sheep breeds), proved that it is not profitable without subsidies. Similarly, investments in Tsigai breeding are economically efficient only if farmers use subsidies. Also, such investments are related to high level of risk caused by fluctuations of feed costs and lamb prices. Therefore, policy makers in all the states of South – East Europe have great responsibility when deciding on the level of appropriate subsidies. It is determined that farmers' actions should be directed towards costs reduction followed by efforts to improve marketing of Tsigai products resulting in an increase of their prices. General conclusions of this analysis could be used in all countries across the region dealing with Tsigai sheep production.

Acknowledgements

This study is financed by the Ministry of Education, Science and Technological Development of the Republic of Serbia.

Conflict of interests

The authors declare no conflict of interest.

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THE INFLUENCE OF TEAMWORK AS AN INTERNAL MARKETING FACTOR ON THE QUALITY OF THE SERVICE OF INSURANCE COMPANIES IN SERBIA'S AGRICULTURAL SECTOR

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A R T I C L E I N F O

Original Article

Received: *26 February 2020*

Accepted: *03 March 2020*

doi:10.5937/ekoPolj2001189P

UDC 338.43:368]:005.743

Keywords:

teamwork, market success, internal marketing, common goal, agriculture

***JEL**: G22, Q14*

A B S T R A C T

The subject matter of this paper is the analysis of the quality of the services and the sustainability of the business operations of insurance companies in the agricultural sector in the Republic of Serbia, depending on the teamwork concept. Teamwork belongs to the internal marketing factors in companies' business doing. Teams should have a common goal which the members may only achieve through joint work and a combination of the knowledge and abilities pertaining to different areas. Client satisfaction is a teamwork efficiency measure. Apart from a large number of satisfied users, a large number of new insurance programs innovated from year to year and offering its users an increasingly big range of possible types of insurance are also the indicators of the successful business doing of insurance companies in the agricultural sector. The research study was done on a suitable sample of 250 respondents, employed in 10 insurance companies.

Introduction

Contemporary life brings man many risks, which on their part bring big consequences. In order for the consequences that have occurred to be facilitated, there is an increasingly frequent need in people for using insurance. Insurance companies have devised different business systems to accompany needs for insurance, offering their insured clients different insurance services, giving them a compensation for the incurred damage,

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which was incurred due to an unexpected event. Within their business operations, insurance companies offer their clients insurance against different risks.

Not all of that would be possible if insurance companies did not have good business associates, who solve problems and newly-emerged specific situations from one client to another on a team basis. Team cooperation within an insurance company is one of the factors for the successful business doing of any insurance. In that sense, we observed teamwork as a factor of internal marketing in Serbia's agriculture.

The team concept of work has been existing for hundreds of years now, throughout centuries, and has its place in different environments and cultures. Man has always known that there are so many things he cannot do on his own. It is important to highlight the fact that teamwork is very important for the highest management authorities inside an organization, as well as managers at all levels and workers as a whole. In the case of a lack of teamwork at any level, that leads to limiting the organization's efficiency. If teamwork is well-devised, it will lead to the improvement of the overall business operations of the organization and the achievement of the basic goal of every business policy of the enterprise.

Team members may achieve much more through joint work than they would otherwise be able to accomplish by themselves, using their potentials to the greatest possible extent. This joint work, framed by a common mission, is teamwork.

Materials and methods

In this paper, the methods that best reflect the character of the analysis given in the title of the paper were used. In researching the quality of the services rendered by insurance companies in the context of the significance of teamwork as a factor of internal marketing in the agriculture of Serbia, quantitative methods of economic analysis were dominant. In the first place, those are the various texts, statistical data and literature sources related to the application of teamwork. During the research, the analysis of the content of the secondary data sources was also used. The secondary data, information about teamwork were taken from the relevant literature. It should be mentioned that numerous and significant Internet information was also used. Empirical research in the efficiency of the application of teamwork in insurance companies is especially highlighted.

The contribution of this paper reflects in the review and analysis of the efficiency of the application of teamwork as a factor of internal marketing in insurance companies in the Republic of Serbia. The fact that there is a need for insurance companies to dedicate to teamwork is indicated. Only in that manner is it possible for them to be more efficient by applying teamwork in the Republic of Serbia, which we believe is confirmed by this paper.

The paper demonstrates the fact that well-organized teamwork as a factor of internal marketing is an advantage, which on its part means that it should be treated as such, especially bearing in mind the contemporary understanding of the development of

insurance companies. As can be seen from the wording of the paper, the result of this research study is perceiving the full role and full significance of teamwork as a potential model for a better organization of insurance companies.

A special contribution is made in the part of the research work dealt with based on the empirical research and related to teamwork. In that sense, the authors have concluded that the quality of services and the successfulness of the business doing of insurance companies depend on the emotional and intellectual statuses of team members. That will contribute to the buyer's choice of an appropriate product to a significant extent.

In this paper, an effort was made by the authors to present the reader with an insight into the current state of the matters in the insurance companies that provide insurances to the agrarian sector. They consider it necessary today, when it is necessary to encourage agricultural producers to insure their estates, as well as their mechanization.

Results and Discussions

Service Quality in the Context of Teamwork Significance

The quality of a service is considered to be the key determinant of the achieved level of client satisfaction, where a higher level of the service quality leads to a greater client satisfaction degree.

Quality is the key element of service value since it enables an organization to position itself in the market and its greater market share based on buyer and employee mutual satisfaction. Service quality reflects through the level of the satisfaction of users' needs and demands and compliance with growing needs and expectations. (Stepanov, et al., 2017).

The notion "team" implies an organized group of people dedicatedly working on the achievement of the organization's common goals. Everybody is responsible for that goal, everybody does the best they can to reach it, achieve it, try to overcome their own expectations as well. Of special significance is the fact that all members of a team understand each other and respect one another. (Petkovic, et al., 2012).

This century has brought with itself numerous changes when speaking about the implementation of set plans and goals of organizations throughout the world, not only here, in our country. In this time, any business doing deprived of teamwork seems to be unimaginable. In the 21st century, a "team" has an enormous influence on the overall success of an organization, simultaneously also implying one of certainly the best manners of work organization. (Piljan, et al., 2015).

The characteristics of modern organizations' unstable external environment exert a significant impact on finding out new ways of business doing, aimed at attracting new clients, achieving and maintaining competitiveness and sustainable development. (Ze, et al., 2018).The last economic crisis, accompanied by political, cultural, social and moral pressures, led to new conditions for organizations and many of them were unable to survive. (Berber, et al., 2019).

The following reasons are highlighted as the most significant:

1. the positive experiences and the positive effects of teamwork achieved so far;
2. the ability to quickly adapt to newly-emerged situations;
3. the attachment of team members, the team and the management and the team and the organization as a whole to one another and loyalty between them;
4. increased motivation;
5. improved communication and improved interpersonal relationships;
6. a rational use of human resources in the organization;
7. a reduction in the costs of manufacturing, etc. (Ovčina, 2015).

Teamwork and internal interaction are considered as one of the factors of companies' internal marketing. In addition to the internal marketing factors, the following can also be listed: workers' competence and skill, employee satisfaction, the dissemination of marketing information among employees, participation in decision-making, as well as service culture. Hereby, internal marketing can be defined as: "a planned effort using a marketing-like approach to overcome organizational resistance to change and to align, motivate and inter functionally co-ordinate and integrate employees towards the effective implementation of corporate and functional strategies in order to deliver customer satisfaction through a process of creating motivated and customer orientated employees. (Ahmed, et al., 2003). The role of internal marketing in the context of service quality can be formulated as "a means of creating customer-conscious frontline employees as a means to ensuring high service quality for customers of service organizations." (Amangala, et al., 2013).

Workgroup and Team – Similarities and Differences

A workgroup and a team are the notions that are mainly always identified with one another. These are similar, but not the same notions. A workgroup is the notion implying a structure of a kind, which has its specific features, not only being a mere set, pool of individual persons. A workgroup implies their joint work.

A workgroup is primarily formed with the aim of exchanging information and making decisions in order to help every single member to do the job more effectively and more efficiently. (Božović, et al., 2014).

When speaking about teams, the fact that the manufacturing of goods of social significance is the main reason why teams exist in small workgroups in organizations is highlighted as their main characteristic. When comparing these two notions, we must bear in mind the fact that all teams in the world are certain groups, but not all groups are, nor can all groups be, teams. Some group of people may, but does not have to, be a team, but a team must be one, fully functional, active and organized group of people that has set a common goal. It is only then that ever member individually aspires to achieve that goal, which is the main characteristic of every team.

Differently from a group, team members have complementary types of knowledge and skills that they direct towards their common goal, whose achievement they are considered to be responsible for – both individually and collectively. Teamwork creates a synergy, because the result of the work of the team members does only represent a mere sum of the individual results of the work done by each team member, as is the case with a group. The effects of teamwork depend both on individual and on joint work, whereas the effects of groupwork exclusively depend on the individual performance of each group member. A difference is also evident in the degree of their autonomy. Groups may, but do not have to be autonomous in their acting to have the work done, whereas teams enjoy a high degree of such autonomy in work and decision-making. It is characteristic of groups to promulgate decision by voting, whereas inside teams, solutions are, as a rule, reached through a consensus (Pavičić, 2012).

Contrary to individuals belonging to a group, all those team members have complementary knowledge and skills by means of which they aspire to achieve some common goal, whose implementation they are considered to be responsible for, both individually and collectively. It is significant to all members that their work should be successful and that it should generate positive results. What is the result of their cooperation is not only the summing-up of their individual work results, but the accomplishments resulting from such teamwork also depend both on individual and on collective action inside the team, whereas the effects of the work performed by a group exclusively depend on the personal performance of each single member of the group.

Workgroups always have a formal leader, who has a certain power and certain rights towards other workers. Work teams are the groups whose members intensively work on a certain joint task (achieving a goal) by using their positive synergy, the individual and joint responsibilities and additional skills through a coordinated effort. (Radivojević, 2011).

The sources of occupational stress (stressors) may be individual – arising from a work role; at a group level – caused by the dynamics and conduct of managers inside the group; or organizational – arising from the characteristic of the organization. (Katić, et al., 2019).

Now it is possible to reach a conclusion, according to which team work implies every activity performed by individuals within a given group, which is intentionally organized, with a certain goal, and work distribution inside it is founded on different experts' cooperation-based work, trust, helping each other and competitiveness.

Factors Influencing Teamwork Efficiency

Organizations' very essence implies an incessant search for a new way that would help and make it easier for them to cope with competition, the requirements imposed by innovations in work. The quality of teamwork is founded on the outcome which team members aspire to while performing their work and on the satisfaction of all those working on that team as well.

Satisfaction is founded on the possibility of working in a team-like manner to satisfy the personal needs of the members, thus increasing loyalty to the team for that purpose. The factors such as types of teams, the structure, composition, then homogeneity (or heterogeneity) of the team with respect to the team members' years of age, sex, skills, knowledge and attitudes influence the internal processes in teams that ultimately determine the satisfaction of the team members and the final result. (Malić, 2014).

Ever since the labor process exists, there is no record of the fact that one of teamwork models in business operations has ever been more significant for the business doing of the organization itself than it is the case in the 21st century. All potential reasons for which teams are increasingly frequently applied in business doing arise from that.

One of the most significant factors for a team's successful work and functioning is the determination of a work strategy. A team must have clearly defined goals, and in compliance with them – a clearly developed strategy and concept of work. A strategy defines the issues concerning the work of the team, internal relationships on the team, the relationship of the team towards the environment, and so forth. Therefore, it is desirable that, particularly so at the beginning of their work, team members should make a work plan and strategy. (Vasić, 2014).

The final result is determined through qualitative and quantitative achievements made by the team, defined through team goals. The foundations of satisfaction rest on the possibility of work in a team-like manner to satisfy the personal needs of the team members, thus increasing their loyalty to the team for that purpose. The factors such as types of teams, the structure, composition, homogeneity, or heterogeneity of the team with respect to the team members' maturity, sex, skills, types of knowledge and attitudes have an influence on the internal processes in teams, which ultimately determine the satisfaction of the team members and the final result. Efficiency is important because it represents a determinant of an organization's success and pertains to satisfying the organizational valley. Efficiency is a degree of the connectedness between the real and the wanted results. (Lunau, et al., 2018).

Teams should have a common goal, which the members of the team can only achieve through their joint work and a combination of the knowledge and capabilities from within different areas. That is how each member will have an opportunity to make their own contribution to problem solving. Client satisfaction is a teamwork efficiency measure.

Feedback on joint successes, or failures, the knowledge of the joint result, as well as the rewarding system which values the team, not its individual members, encourages motivation for joint work.

Communication is a two-way process between the message sender and the message recipient, where the message recipient must not only receive a message, but understand it as well. Successful communication implies that a piece of information has accurately been received in respect of the content and meaning intended by the sender. (Pavić, 2011).

Their manager, who sends feedback on the results of the work performed by the team as a whole, plays an important role in that. He also stimulates communication amongst teams, thus influencing the development of a competitive spirit amongst them. Processes inside teams, such as a conflict, group norm development, cohesion and members' beliefs in the efficiency of their own team also exert a big influence on team efficiency.

Successful communication is the basis for good and quality teamwork. As a joint form of work performed by a greater or smaller number of people, teamwork depends to a great extent on the manner of the dissemination of information between the members of the team. If the information dissemination system is adequate, the team members' efficiency is greater. Inadequately conveyed information may lead to a collapse in teamwork and distancing from the set goals. In order for team members to be able to successfully communicate, they need to master the basic skills pertaining to the communicating area. (Hadžipešić, et al., 2012).

Team Roles as a Factor for Employees' Emotional and Intellectual Statuses

As an answer to the question: how it is possible that some teams perform successful work while some do not, numerous theoreticians have observed organizations so as to give a quality answer to this question. Their research studies have shown that teams work much more successfully when companies combine roles in them. In order for a team to work successfully, simultaneously achieving envious results, it should be equally focused on the tasks entrusted to the team and the emotional and intellectual statuses of its members as well.

Apart from a joint approach and mutual role complementation, the complementarity of knowledge and skills and dedication to the mutual purpose of action, which gives teamwork an identity, teamwork must also be characterized by a joint responsibility, both the feeling of the responsibility of each team member towards the team and of the team towards each single member of the team. Teamwork can be said to be the key component of productivity, efficiency, job satisfaction and results. (Piljan, et al., 2018).

The composition of any team in a company, as well as their tasks, depend in a large degree on the form of profession and the goal to be pursued by the team. The role of psychology is also significant. Various groups of cognitive psychologists and economists have presented a large body of evidence over the last few years indicating that the gap between psychology and economics has narrowed significantly. (Krstić, Radivojevič, 2019)

Teamwork has become a necessary element in the successful business doing of any organization. Every kind of teamwork is important for the development of the personnel potential of an organization. Independently of the problems and obstacles that may appear in teamwork, results are far better and decisions are more adequate if several people work on a single task. All of them are based and focused on the benefit of the team. The development of a team is a dynamic process. The majority of teams incessantly undergo changes. In order for their team to be as efficient as possible, it must become a team in the first place. (Kossek, et al., 2014).

The success of business organizations and institutions is strongly connected with their ability to establish mutual work and to efficiently manage teamwork. A new synergy requires different teams and groups working together on the creation of a new corporate responsibility through different kinds of activities, such as permanent learning, an increase in the innovativeness of the enterprise, and problem-solving skills. (Zubanov, et al., 2017).

Members' mood ranges from excitement to depression. Every stage is equally valuable as a part of the planned journey towards team maturity, whereas only that at which a team is insufficiently developed or at which a team stays too long is bad. (Krstić, Krstić, 2016) The first team development stage should indicate what is yet to be realized, whereas the last stage indicates what has been achieved of what was planned, what has been done more than envisaged, what has not been achieved, and so on.

Insurance Companies in the Republic of Serbia

The insurance market significantly influences the development of the economy of every country and is the important factor of the stability of the financial sector. The insurance market in Serbia is undeveloped and, according to the development degree, it ranks considerably below the average of the European Union member countries. (Ćurčić, et al., 2019).

In the Serbian life insurance market, the leading role is played by life insurance products, that is, insurance with a precisely defined payment period, life insurance, death insurance and mixed life insurance. (Vojinović et al., 2018)

At the end of the year 2018, there were 20 insurance companies operating in the Republic of Serbia, which is one company less than in the previous year. A total of 16 companies are exclusively engaged in insurance jobs, whereas there are four companies engaged in reinsurance jobs. Of the companies engaged in insurance jobs, there are four companies exclusively engaged in life insurance, and a total of six companies exclusively engaged in nonlife insurance and six in both life and nonlife insurance.

Multinational companies generally have more developed and more efficient management practice than local enterprises. (Poor, et al., 2017).

Observed as per the capital ownership structure, out of the 20 insurance companies at the end of the year 2018, a total of 15 were in a majority foreign ownership. The insurance companies in a majority foreign ownership at the end of 2018 recorded a prevalent share in the life insurance premium (90.7%), nonlife insurance premium (62.0%), the total assets (77.6%), as well as the number of employees (68.4%). (NBS, 2019).

Sustainable development goals have the potential to accelerate innovations and economic growth. Sustainable development ambitious goals will, however, require new models of cooperation between companies, sectors, states and regions. (Radukić, et al., 2019).

The forthcoming digitalization era, which equally affects both the banking sector and the insurance industry sector, will bring with itself new conveniences primarily for clients, then for insurance companies as well. Clients will come to all needed services more quickly and in a simpler way, whereas insurance companies will be making significant savings, in connection with which their profitability will also be greater. Of course, all this should be accompanied by an adequate legal regulation, which will enable the free flow of capital and services. (Piljan, et al., 2016).

In 2018, the insurance companies achieved a total premium in the amount of 99.9 billion dinars (i.e. 845 million euros or 966 million dollars), which represents a nominal increase and a real increase of 7.3% and 5.2%, respectively. (NBS, 2019).

In the agricultural sector, insurance has a big potential to develop on the Serbian market, because only 9-10% of arable agricultural areas are now insured. Because of increasingly frequent weather hazards, a need has emerged for new insurance types, too, which is simultaneously a new business opportunity for insurance companies as well.(https://www.svijetosiguranja.eu/poljoprivredno-osiguranje-u-srbiji/)

Analysis of Service Quality Depending on the Teamwork Concept in Insurance Companies

The final section of an IMRAD paper. Its purpose is to fit the results from the current study into the preexisting fabric of knowledge. The important points will be expressed as conclusions. This should explore the significance of the results of the work, not repeat them. A combined *Results and Discussion* section is often appropriate. Avoid extensive citations and discussion of published literature.

The research study was carried out on a suitable sample of 250 respondents out of 10 insurance companies in the Republic of Serbia (Generali, GRAWE, Millennium, SAVA Nonlife Insurance, SAVA Life Insurance, Danube, AMS, Triglav, DDOR, WIENER STADTISCHE). A survey questionnaire in the form of a Likert Scale for measuring attitudes, specially constructed for the given research study, was used to collect the data. The defined Likert Scale has five gradation levels: (1) I don't agree, not at all; (2) I mainly don't agree; (3) I neither agree nor disagree – I have no clear attitude; (4) I mainly agree, and (5) I absolutely agree. The survey questionnaire had four parts, with the offered attitudes, namely:

1. Team Synergy in Insurance Companies;
2. The Quality of the Work Done by Team Members of Insurance Companies;
3. Innovativeness in the Business Operations of Insurance Companies' Teams; and
4. The Quality of Business Operations Inside Insurance Companies' Teams.

Problem and Subject Matter of the Conducted Research Study

The problem of this research study is: the efficiency of the application of teamwork in insurance companies.

In compliance with the established problem of the research study, we focused our interest on discovering what the relationship between and among teams in a company is like. The subject matter of the mentioned research study is established in compliance with the defined problem. As the subject matter of this research study, we shall mention the degree of the efficiency of the application of teamwork in insurance companies.

Goal and Tasks of the Research Study

An increase in the number of insurance companies in the Republic of Serbia, their expansion, their greater placement of services in the market, the expansion of their capacities, as well as the complexity of their organization – they all indicate that having teams in place in business operations has become the necessary link in the chain of their business doing. Teamwork is, among other things, necessary in companies for the reason of the fact that insurance companies have experienced an abrupt expansion in the past decade. In order for them to operate in parallel with the needs of the contemporary client, the expanding of their own business operations also increases the number of the necessary teams so as to make their business doing as successful as possible and generate positive results. Accordingly, the goal of our research study is defined as follows: to determine the significance of team business doing in insurance companies.

The following research tasks are formed out of the set goal:

1. to determine whether there is synergy in teams or not;
2. to determine whether team members have appropriate skills in business operations;
3. to determine how high the degree of teams' innovative achievements is; and
4. to determine whether the teams operating in the company perform the duties entrusted
5. to them in a quality manner.

Hypotheses of the Research Study

The hypotheses of the research study were determined according to the set goal and tasks. The main hypothesis was formed according to the set goal, and the ancillary hypotheses were formed according to the set tasks. The main hypothesis reads as follows: Service quality is assumed to depend on the emotional and intellectual statuses of the business team and is of great significance to the successful business doing of insurance companies.

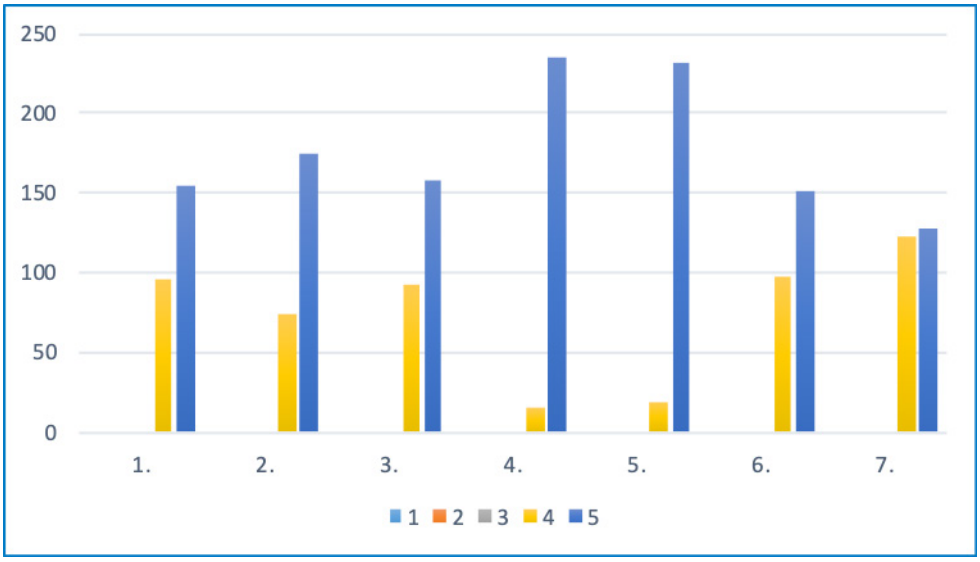
The ancillary hypotheses read as follows: 1. Synergy is assumed to be existent in teams; 2. Team members are assumed to have appropriate skills in business doing; 3. The

degree of teams' innovative achievements is assumed to be high; and 4. The teams operating in the company are assumed to be performing the duties they are entrusted with in a quality manner.

Interpretation of the Research Results

The analysis of the results will be carried out individually as per each question, in the way how they appeared in the survey questionnaire. The questions are presented in the form of groups, or sets. The first group pertains to the first research task with the aim of confirming/rejecting the set hypothesis. The degree of synergy in the insurance companies' teams should be determined, i.e. whether synergy itself does exist in teams or not should be determined. The term synergy implies the feeling of belongingness to the team. The answers we received are presented graphically and textually.

Figure 1. Synergy in the insurance companies' teams



Offered assertions: 1. Belongingness to the team in which I work is clearly defined; 2. The needs for teamwork are clearly determined; 3. We all efficiently communicate inside the team; 4. I consider myself to be a very responsible team member; 5. I am very satisfied with the team I do business in; 6. The goal that the team aspires to is concretized and clearly determined; 7. All members of the team in which I do business do their best to achieve the team goal and do business efficiently.

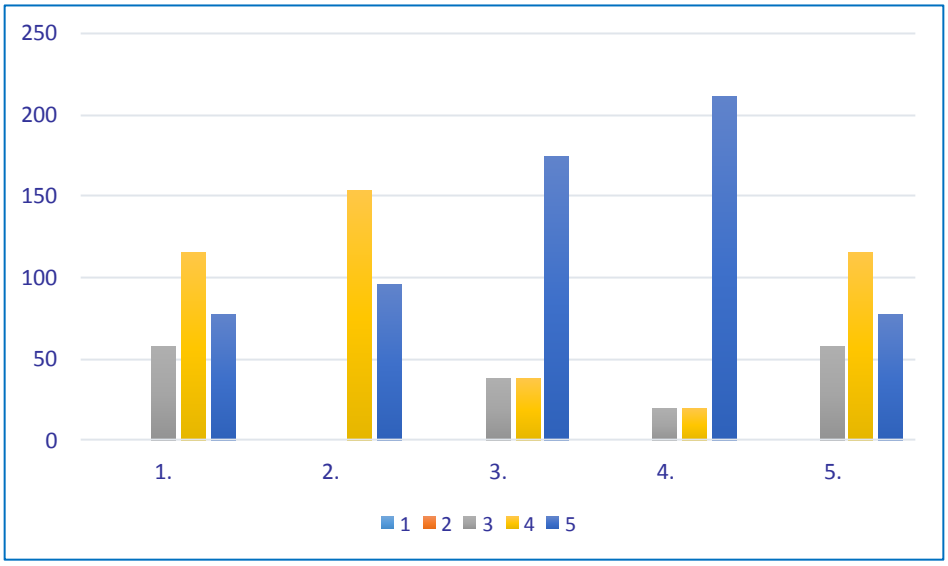
Source: Authors' calculations

When speaking about syne.rgy in the teams, we observe that all the respondents assert that they feel they are very valuable members of their respective teams. This is of exceptionally great importance both to the team and to the overall business operations of the insurance companies. It is important for companies to provide their employees with favorable work conditions so that they could feel comfortable. The very feeling of

comfortableness at work leads to positive results. The needs for teamwork are clearly determined, and the members inside the team establish normal communication. In order for a team to be efficient and make progress, it is important that the connection between the team goals and the company goals should be established. Only in this way will the team achievements reach their highest level.

The second group of the offered assertions, out of which assertions the respondents should select that which is the most competent to describe the current state, pertain to the skills of the team members, the quality of each team member individually, the level of the qualification(s) of the team members for the quality performance of the tasks they are entrusted with, all aimed at achieving planned results.

Figure 2. The quality of the work performed by the insurance companies' team members



Offered assertions: 1. The team members are interested in testing new forms of work inside the team; 2. The team's innovative activities are highly appreciated by the company, and the same are also rewarded as often as not; 3. All problems inside the team are solved promptly and timely; 4. Solving problems inside the team is a new motivation for making progress, learning and development; 5. All team members very often autonomously make proposals for the introduction of innovations in work.

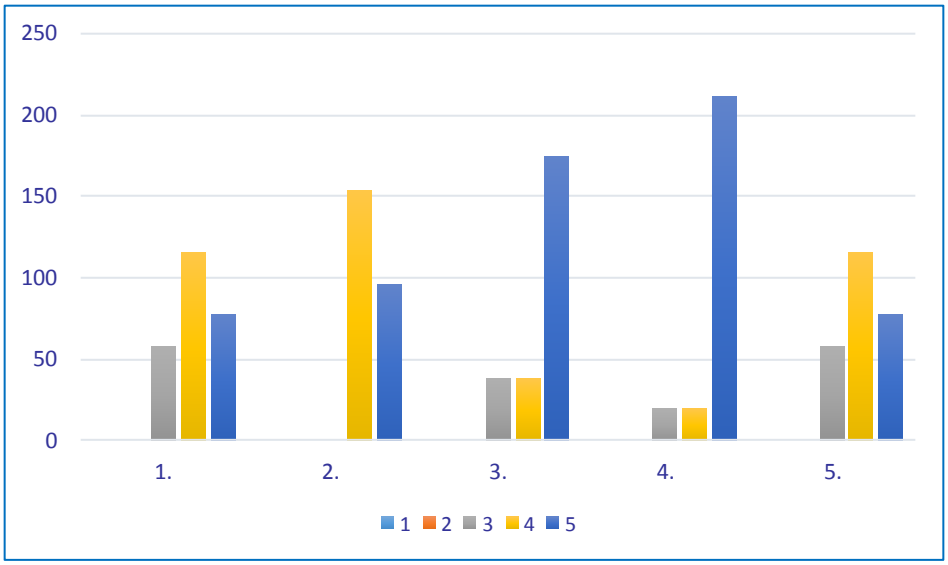
Source: Authors' calculations

When speaking about the quality of the work done by the team members individually, what must be noticed is that the members professionally perform the duties they have been entrusted with so that their team could be successful and in order to achieve the set goal. The fact that a company recognizes not only its clients' roles, but also its employees' roles, is of exceptional significance. According to the answers given by the employees who took part in the research study, it is possible to see that the companies aspire to the

constant improvement of the capabilities of their employees both through professional training courses and through their additional education which will enable the members to constantly be knowledgeable of innovative approaches in work. The companies recognize their employees' possibilities and affinities, so they accordingly also organize additional training courses for the members on the teams. In order to realize the very goal to which a team may be aspiring at a given moment, it is important that all team members should fulfill the duties entrusted to them, i.e. what they are required to do. Team members are ready to learn more, to advance, to primarily work on themselves, which later also reflects on the quality of the business operations of the company itself. All team members adapt to innovations in the business process very quickly.

The third set of the questions pertain to innovativeness in business doing.

Figure 3. Innovativeness in the business operations of the insurance companies' teams



Offered assertions: 1. The team members are interested in testing new forms of work inside the team; 2. The team's innovative activities are highly appreciated by the company, and the same are also rewarded as often as not; 3. All problems inside the team are solved promptly and timely; 4. Solving problems inside the team is a new motivation for making progress, learning and development; 5. All team members very often autonomously make proposals for the introduction of innovations in work.

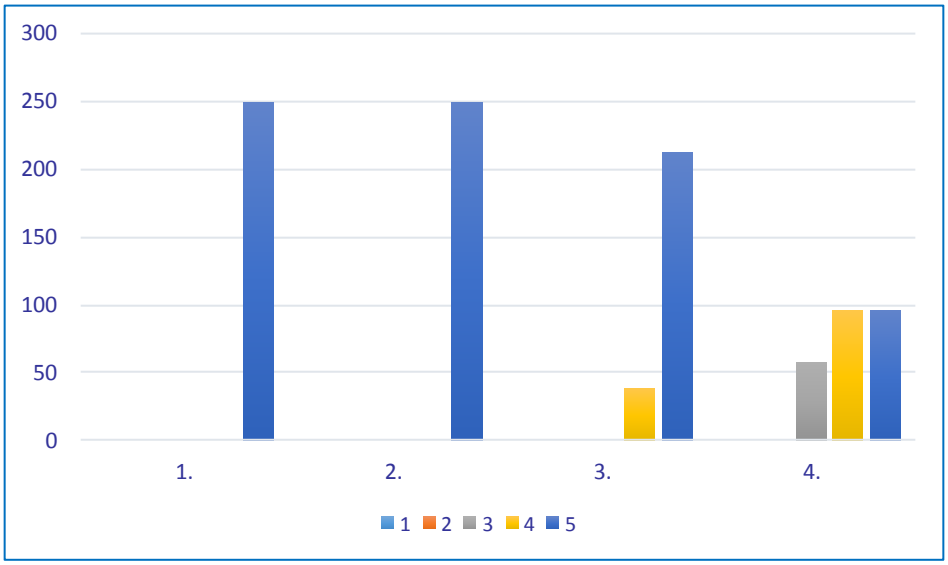
Source: Authors' calculations

When speaking about innovations in companies' business operations, it is first of all needed to emphasize the fact that the introduction of innovations in work is of very great importance. We have come to the conclusion that the team members in the companies are very motivated to apply innovations in their business operations. Innovations are mainly appreciated and rewarded, which can only be an incentive for employees in

their future work. The employees consider problem solving to be learning and making progress independently. The team members frequently make proposals on their own for the introduction of certain innovative ways to achieve the team goal, and they also accept the innovation that the companies consider as suitable for business doing and the quality performance of the set task.

The fourth group of questions pertain to the quality of business operations.

Figure 4. The quality of business operations inside the insurance companies' teams



Offered assertions: 1. The members are sensitive to client needs; 2. The goal of business operations on the team is defined and clearly precisely presented; 3. The work performed by all the team members is regularly monitored, assessed, corrected and rewarded; 4. Clients' potential complaints are considered and timely reacted to by the team members.

Source: Authors' calculations

In this group of questions, we obtain the data about the quality of business operations inside the insurance companies. The team members who were included in the research sample are made familiar with their clients' needs, appetites and wishes, have empathy with them, and the business doing standards of a team are clearly defined through the very goal the team aspires to. The fact that the employees regularly receive feedback on their work is very important. By doing so, the employee, not only the client, is also put in the focus of interest. Their work is monitored, assessed, corrected and rewarded. By doing so, employees are also additionally motivated to continue that work pace, potentially correct particularities related to their work so that the team could make even greater progress and position itself high on the ladder of its company's teams.

Conclusions

According to the research study we conducted, we came to the conclusion that the quality of the services and the successfulness of the business operations of insurance companies in the agricultural sector depend on team members' emotional and intellectual statuses, which will to a significant extent contribute to the selection of the buyer for a particular product.

Team efficiency also reflects on the overall business operations of the insurance companies. The results we obtained through conducting an anonymous survey of the 250 employees of the insurance companies we presented graphically and textually. As a condensed conclusion on this phenomenon, we state the following:

All the team members have their clearly defined roles, and inside the team, the members establish normal communication. Therefore, the research hypothesis reading: *Synergy is assumed to be existent in teams* has been confirmed.

When speaking about the quality of the work performed by the team members individually, what must be noticed is the fact that the members professionally perform the duties entrusted to them so that the team could be successful and in order to achieve the set goal. Through the answers about the quality of the work done by the team members, yet another ancillary hypothesis has been confirmed, namely the one reading: *Team members are assumed to have appropriate skills in business doing*.

In the insurance companies, the team members are very motivated to apply innovations in their business operations. Innovations are mainly appreciated and rewarded, which can only be an incentive for the employees in their future work. By confirming that there are innovative activities in the business doing of the insurance companies' teams, the ancillary hypothesis reading: *The degree of teams' innovative achievements is assumed to be high* has also been confirmed.

In the fourth group of questions, we generate the data about the quality of the business operations inside the insurance companies. The team members who made up the research sample are familiar with their clients' needs, appetites and wishes, have empathy with them, and the business doing standards of a team are clearly defined through the very goal aspired to by the team. By analyzing the fourth group of the respondents' answers, we came to the conclusion that the last ancillary hypothesis reading: *The teams operating in the company are assumed to be performing the duties they are entrusted with in a quality manner* has also been confirmed.

Through the answers to the posed questions, we have come to the conclusion that the hypotheses we set have been confirmed.

We have also made a reference to the factors that influence team efficiency, and we have also checked the manners in which this efficiency is measured. Team work is evidently needed in the cases of large and complex tasks requiring different capabilities and types of knowledge or consisting of a series of the operations that must be carried

out simultaneously. It is difficult to imagine organizations based on their employees' individual work and rigid management. The management of an organization is more than ever before interested in maximally using up their employees' knowledge, which is realized within the frameworks of teamwork, where the personnel resources and the potentials for the achievement of the organization's goals are united. All the members consider that it is significant for their work to be successful and generate positive results. The result of teamwork depends both on the individual work done by every member individually and on their joint work, whereas the effects of the work done by a group exclusively depend on the personal performance of every single member of the group. In order for a team to efficiently work, the team needs to be equally focused on the task and on the social-emotional conduct of its members. So, it is important to conclude that teams in insurance companies are very efficient. Insurance companies have people oriented towards their respective jobs. Team members achieve good results, but they are motivated and ready to learn more about their job. By maintaining a state like this in continuity, every team will be successful, and team members will be satisfied, which further leads to such a situation in which the company itself will only be going from one strength to another in the future. All of the foregoing should also be highlighted in the context of internal marketing, one of whose factors is teamwork, which has been presented in the paper in more detail.

Acknowledgements

Article as research is financed by the Ministry of Education, Science and Technological Development of the Republic of Serbia.

Conflict of interests

The authors declare no conflict of interest.

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DIRECT INVESTMENTS IN SPA TOURISM OF UNDEVELOPED RURAL REGIONS: CASE STUDY OF THE MUNICIPALITY OF KURŠUMLIJA

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ARTICLE INFO

Original Article

Received: *21 February 2020*

Accepted: *09 March 2020*

doi:10.5937/ekoPolj2001207L

UDC 338.48-44(497.11 Kuršumlija)

Keywords:

Direct investments, incentives, privatization, business environment, spa tourism, Municipality of Kursumlija

***JEL**: E22, H54, Z32*

ABSTRACT

In this paper we analyze the role of direct investments in spa tourism in undeveloped rural regions on the example of the Municipality of Kuršumlija. Namely, the Municipality of Kuršumlija belongs to the group of undeveloped regions. On its territory, three spa resorts are located. In order to explore the role of direct investments in the development of these spa resorts, qualitative survey was conducted using the technique of semi-structured in-depth interviews with the representatives of relevant institutions and organizations in the Municipality of Kuršumlija. Obtained results showed that the completion of the privatization process of the spa facilities along with the use of investment incentives and creation of favorable business environment for investors would lead to the increase of direct investments aimed for the development of the spa resorts. Direct investments, through better utilization of natural healing factors and human resources, would create the conditions for the development of health tourism and thus would lead to the development of the undeveloped rural area where the spa complex is located.

Introduction

Spa tourism, as part of health tourism, means travelling for the treatment of certain diseases in order to recover. Under medical supervision, people recover with help of natural healing factors such as thermo-mineral springs, salty lakes, mud, radioactive sand and climate.

In accordance with the Law on Spas ("Official Gazette of RS", No. 80/92 and 67/93 - other law), „a spa is an area where one or more natural healing factors exist and meet

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the requirements regarding conditions and equipment for its use" (p. 1). In Law on Spas, Article 3, inter alia, the identification of area to be considered as spa is defined. The Government of the Republic of Serbia, by adopting individual regulations on the designation of spa resorts, determined the exact area and cadastral parcels on which the spa areas are located. The municipality where spa is located gives the right to domestic legal or natural person to use the natural healing factor in the spa. There are 28 regulations adopted on the designation of spa areas. All 28 spas as well as 19 climatic sites are listed in Annex 1 of the Regulation on the definition of incentive granting criteria in order to attract direct investment in the sector of hotel accommodation services ("Official Gazette of the RS", No. 33/2019).

On the territory of the Municiplaity of Kuršumlija there are thre spa resprts: Spa Resort „Lukovska Banja" (Regulation on the designation of the area „Lukovska Banja", „Official Gazette of RS", No. 104/2018) and two spa resorts labelled as climatic sites: Spa Resort „Kursumlijska Banja" and Spa Resort „Prolom Banja".

According to the level of development, the Municipality of Kuršumlija is classified in the group of undeveloped areas, in accordance with Article 3 of the Regulation on establishing unique list of development of regions and local administrative units for 2014 („Official Gazette of RS", No. 104/2014), having income per capita more than 50% lower than the national average. According to the Statistical Office of the Republic of Serbia (2019), Municipality of Kuršumlija has been facing the problems of depopulation and unemployment for many years. In 2011, the Municipality had 19,243 inhabitants, and in 2018, this number was reduced to 17,545 inhabitants. Also, the unemployment rate in this local administrative unit amounted to 36.9% in 2018.

Private company "Planinka", with headquarters on the territory of the Minicipality of Kuršumlija, owns Spa Resprts "Prolom Banja" and "Lukovska Banja", the Factory "Prolom voda", as well as the Nature Park "Djavolja Varoš". Also, this company has recently become the owner of the Spa Resort "Kuršumlijska Banja". The Municipality of Kuršumlija is an example of a local administrative unit where the privatization process of all three spa resorts has been pursued. Also, with the help of the state incentives, the construction of a new hotel in "Lukovska Banja" has been started. Considering all these facts, we have conducted a research, presented in this paper, to explain what factors must be fulfilled in practice, in order to induce the development of the undeveloped rural region rich with natural healing factors. The aim of the research was to collect data from primary sources obtained through interviews with the representatives of local authorities of the Municipality of Kuršumlija, the managers of the Company "Planinka" and representatives of Tourist Organizations of the Municipality of Kuršumlija. Four main research questions related to the economic specifics of the municipality where the spa area is located, unfinished privatization of the spa complex, the importance of attracting direct investment for the development of the spa area and the activities in the field of creating an environment for attracting direct investments in the spa area.

Policy framework for direct investments in spa tourism

In order to encourage direct investments in underdeveloped regions of the economy (Stojanović, Stanišić, 2015), the state can act in two ways. One approach is to appropriate subsidies, as a form of government expenditure, and the other is to improve the legal framework that would allow smooth inflow of capital. The Republic of Serbia has opted to combine the two approaches in order to attract direct investments to selected sectors in the underdeveloped regions of the economy as effectively as possible. Sustainable development of rural undeveloped regions is one of the key priorities of the EU Member States and other countries that are in the process of stabilization and association, among which is also the Republic of Serbia (Balaban, et al., 2019), also the tourism sector is one of the drivers of the country's economic development today (Lakićević, Sagić, 2019; Sagić et al., 2019; Gavrilović, Maksimović, 2018).

Law on Investment ("Official Gazette of the RS", No. 89/2015 and 95/2018) was adopted with the aim of improving the investment climate in the Republic of Serbia and encouraging direct investments in order to strengthen economic development and increase employment. This Law equates the treatment of domestic and foreign investors, unlike the previous Law on Foreign Investments ("Official Gazette of FRY", No. 3/2002 and 5/2003, "Official Gazette of SM", No. 1/2003 - Constitutional Charter and "Official Gazette of the RS", No. 107/2014 - other law), that provided incentives only for foreign investors.

According to the data of the National Alliance for Local Economic Development (NALED, 2019), from 2000 to 2019, out of a total of 680 FDI, in the total amount of RSD 27,011 million, only eight FDI were allocated in tourism. Seven of them were allocated in developed regions and only one in an underdeveloped region of the Republic of Serbia. Namely, five FDI were realized in Belgrade, in the total amount of RSD 310 million; one in Bački Petrovac, in the amount of RSD 21 million; one in Vršac, in the amount of RSD 2.4 million; and one in Medvedja, in the amount of RSD 6 million. It can be concluded that, in the observed period, Medvedja was the only LAU in an underdeveloped region in which FDI was realized in tourism.

In the Republic of Serbia, direct investments in spa areas are realized through the process of privatization, through the sale of capital of existing spa complexes, then through investment incentives for the revitalization of existing and construction of new accommodation facilities and, finally, through the creation of favorable business environment for direct investments.

By the policy of attracting direct investments in spa areas, long-term strategic commitments related to tourism development of the Republic of Serbia are operationalized. In 2016, the Government of the Republic of Serbia adopted the Tourism Development Strategy for the period 2016 - 2025, which aims to approach tourism systematically, and that tourism needs to occupy a significant place in economic policy. According to this strategy, the purpose of tourism policy is to create an environment that maximizes the benefits for all interested parties, that is, to minimize negative impacts in

the processes and activities of creating a valuable experience for visitors (Government of the Republic of Serbia 2016).

State incentives for investments in spa resorts are a novelty in the economic system of the Republic of Serbia (Pantić, Milojević, 2019), stipulated by the Regulation on conditions and methods of attracting direct investments ("Official Gazette of RS", No. 37/2018), which was adopted in accordance with the Investment Law. Article 4 of this Regulation, which stipulates the sources and purpose of funds for attracting direct investments, defines that "funds may be used to finance investment projects in the hotel accommodation sector on the territory of the LAU where the spa area is established" (p. 4). Incentives funds for attracting direct investments are provided in the budget of Republic of Serbia. Article 9, Paragraph 1, Point 4 of the above mentioned Regulation stipulates that funds may be allocated for investment projects in the sector of hotel accommodation in spa areas with a minimum value of EUR 2,000,000 and by providing employment for at least 70 new permanent employees related to the investment project.

The investment policy for the construction of new accommodation capacities in the areas of spas, stipulated by this Regulation, is based on the policy of balanced regional development of the Republic of Serbia. Namely, the conditions for obtaining state incentives directly depend on the level of development of the municipality in which potential investor choose to invest. The Republic of Serbia could mitigate the concentration of FDI in developed regions and accelerate the development of rural, undeveloped regions by state incentives for investments (Ionut Laurentiu, Raluca Andreea, 2019).

Above mentioned criteria stipulated in Article 9 of the Regulation did not change when in 2019 the Regulation on setting the criteria for incentives in order to attract direct investments in the sector of hotel accommodation services („Official Gazette of the RS", No. 33/2019) was adopted. The reason for adopting the new Regulation was to separate the conditions for the state incentives for investments in the manufacturing, food processing and hotel accommodation sectors. According to the data of the Ministry of Economy (2020), out of a total of 108 investment projects co-financed by incentive funds (contracts concluded after the Law on Investment came into force) seven of them are related to investment projects in the sector of hotel accommodation services in LAU in which the spa resorts have been located; construction of the Hotel Complex „Vrdnička Kula" in Vrdnik, in the Municipality of Irig; Hotel „Sunce" in Sokobanja; Hotel „Fontana", Hotel and Recreation Complex „Vrnjačke Terme", Hotel „Park" and Hotel Complex „Tonanti" in Vrnjačka Banja; Hotel „Bela Jela" in Lukovska Banja, in the Municipality of Kuršumlija.

Article 15 of the Law on Investment defines, inter alia, that the municipalities are the units of local economic development thus the subjects of investment support. Relevant literature points out that local authorities are expected to have the resources and competencies to apply policy of direct investments attraction and, broadly, the policy of regional development (Dorožynski et al., 2014). In other words, it is the responsibility

of local authorities to meet the criteria regarding providing an adequate business environment for attracting direct investment (Linde, Marković, 2017).

Research methodology

In order to explore the possibilities and limitations of direct investments attraction in spa tourism in undeveloped rural areas, the qualitative research based on a case study of the Municipality of Kuršumlija was conducted. The research started from the hypothesis that attracting direct investments in spa tourism of this Municipality is necessary condition for its development. To that, the impact of three basic instruments of investment attraction policy was analyzed: the completion of the privatization process, the use of investment incentives and the improvement of the business environment for investors.

In the field of economic sciences, qualitative research methods are applied when, based on the perceptions, attitudes and opinions of a limited number of relevant respondents, it is necessary to perceive more deeply and comprehensively particular phenomenon (Muntean Jemna, 2016). This happens when valid explanation about the possible implications of a particular phenomenon is necessary, when it is not feasible to apply quantitative research methods (Mohajan, 2018). This is particularly related to researches on potential effects of new economic policy solutions, such as solutions in investment policy innovations (Çalışkan, 2019). In the Republic of Serbia, the implementation of the policy of attracting direct investments in spa areas is at initial stage. Therefore, there is also relatively limited knowledge of its adequacy. Considering that it is not yet possible to quantify the developmental effects of the implementation of the instruments of this policy, the research was conducted using qualitative method.

The case study is one of the qualitative research methods that is widespread in the economic sciences. The implementation of the case study method leads to the knowledge on certain phenomenon "at the level of description and explication. In the case study, different procedures can be combined ... (observation, interviews), and different available sources of existing data (statistics, various types of documentation, historical data, etc.) can be used" (p. 11) (Pejanović, 2009).

According to Branković (2014), a semi-structured in-depth interview is suitable to use when, broadly, there is a basic prior knowledge of some social phenomenon, when that phenomenon has been partially investigated based on the analysis of relevant empirical research, documents and statistics. The technique of semi-structured in-depth interview (Đokić, Milićević, 2017) in qualitative, hypothetically deductive research implies that all respondents are asked prepared, identical questions, defined broadly enough that the respondents can answer in a comprehensive way, looking at the examined phenomenon in a broader social context.

The examiner has the flexibility to ask any questions that he or she deems relevant for a deeper and more systematic clarification of the respondent opinions. Specific sub-questions may be pre-prepared or initiated during the interview itself (Kvale, 1996).

In this paper, research methodology was applied, similar to the methodology applied by Johnston, Crooks and Ormond (2015) in their exploration on Jamaica's medical tourism planning and development problems. The authors presented their research methodology in a scientific work published in the influential international journal Globalization and Health. The interview questions were divided in four broader groups and adapted to the specific case study. The questions were related to Jamaica's existing health care system, medical tourism development initiatives, expected economic and systemic adjustments, and to expected macroeconomic repercussions of medical tourism development. Also, the researchers had prepared specific questions for individual respondents of certain professions and vocations.

Johnston, Crooks and Ormond conducted 18 interviews with representatives of relevant Jamaican institutions and organizations. Institutions included relevant ministries and organizations included public and private medical institutions, health monitoring organizations and professional associations in the field of health and tourism. In order to formulate the questions for the interviews with the representatives of relevant institutions and organizations in the Municipality of Kuršumlija, we had to adapt their content and meaning to the specific socio-economic background of the researched locality. This step was necessary to undertake especially since the methodological guidelines were taken from the study that was conducted in the context of socio-economic distant geographical area, such as Jamaica. In this regard, on the side of institutions, in our research that was conducted and whose results are presented in this paper, on the side of institutions, the respondents were representatives of local authorities of the Municipality of Kuršumlija, and on the side of organizations were the managers of the Company "Planinka" and representatives of Tourist Organizations of the Municipality of Kuršumlija.

Interviews made for the exploration of opinions of representatives of the above mentioned institutions and organizations were conducted in February 2020. Each interview lasted between 30 and 45 minutes. Respondents' answers were stored in the examiner's notes. Respondents were numbered 1, 2 and 3. Respondents' statements were grammatically corrected, without change of their meaning.

The questions were grouped into four broad thematic areas. Starting from the methods applied by Johnston, Crooks and Ormond, the broader thematic areas were:

- economic specifics of the LAU where the spa area is located
- process of the privatization of the spa complex
- importance of the incentives for attracting direct investment for the development of the spa area
- activities in the field of creating an environment for attracting direct investments in the spa area

Opinions, attitudes and perceptions of the respondents regarding the adequacy of attracting direct investments policy in spa areas located in the territory of the Municipality of Kuršumlija were analyzed by deductive thematic analysis method. The deductive thematic analysis method is applied when the purpose of in-depth interview is to obtain answers to pre-prepared questions, of particular importance for investigating a phenomenon about which certain theoretical and empirical knowledge already exist (Nowell et al., 2017).

Results and discussions

In the following part of the paper the responses on each research question have been presented and discussed.

Economic specifics of the LAU where the spa area is located

The territory of the Municipality of Kuršumlija is one of the best positioned tourist destinations in Serbia. All respondents, from their points of view, agreed that tourism is the key untapped economic potential of the area. The Municipality of Kuršumlija "as a unique and attractive tourist destination in recent years, has been actively improving all local economic capacities in order to provide a comfortable and quality life for its citizens while preserving a healthy environment" (Respondent 3). Tourism is more developed in border areas of the Municipality, but also, "people come to the city center with many historical monuments" (Respondent 1), such as churches, monasteries, restaurant "Europe" where Branislav Nušić wrote "Sumnjivo lice", and then House Koste Pećanca, which is ruined, but can be reconstructed." The opinion of the Respondent 2 is that in "Prolom Banja" there is a possibility for better utilization of accommodation capacities in winter period, from December to the end of March. Namely, the occupancy has been significantly improved since the wellness center was put into operation in 2017. On the other hand, the problem with "Lukovska Banja" is the lack of accommodation capacities, and according to Respondent 2, it is good that another hotel is under construction, which will have "4 stars and this will be something unseen in this area."

According to the respondents, the utilization of the healing factors available in the Municipality of Kuršumlija is insufficient, there are possibilities for their greater utilization. "Prolom Banja" has three healing factors: healing water, healing mud and climate, while "Lukovska Banja has four healing factors: healing water, healing mud, climate and gas. "Kuršumlijska Banja" was "known in Roman times. It was very healing spa that treated infertility, fractures, skin diseases, etc." (Respondent 1). These healing factors are still being examined and researched. According to Respondent 2, mud tests were performed, especially mud in "Prolom Banja", and also "doctors are involved and write works related to these healing factors" (Respondent 2). Another underutilized medicinal factor is the Radan Nature Park. "The Radan Nature Park, for the most part of its territory, belongs to the Municipality of Kuršumlija, and is a significant segment for connection of two districts and enhancement of tourism potential of the entire Toplica

Region. Insufficient utilization of this site implies unused health and medicinal plants, opportunities for development of recreational and sports tourism as well as hunting tourism, cultural and historical tourism" (Respondent 3).

The conclusion is that the Municipality of Kuršumlija has untapped potentials, but that it still works on better use of the healing factor. The program of local economic development of the Municipality can contribute to increase of utilization of the potentials of the spa areas. Respondent 1 believes that adopting a Strategy would be a first step towards moving closer to EU institutions, foreign donors and new sources of funding. Respondent 2, from the point of view of a company that has been involved in tourism for many years, states that they have development plan that determines their future direction and that the realization of that plan would contribute to the development of "Kuršumlijska Banja", which has not been operating for fifteen years. According to Respondent 3, in order to develop this region, it is necessary for all parties to contribute: the Municipality, Tourism Organization, and also the private sector. "The local economic plan and its specific measures should define directly and indirectly the participation of all social groups of our society in terms of improving and developing the area where spas are located" (Respondent 3).

Process of the privatization of the spa complex

By applying the policy instruments of attracting direct investments, the state would create conditions for economic development of spa areas. The instruments of direct investments attracting policy that we examined in this research were: the process of privatization of the spa complex, allocation of investment incentives and creation of business environment for attracting direct investments.

The privatization of spas resorts in the Municipality of Kuršumlija started in 1999, when the Company "Planinka" was privatized. This Company was founded on January 9, 1964 (Planinka Kuršumlija, 2020). "Prolom Banja"and "Lukovska Banja" were part of the privatized company from the beginning of its property transformation. After it was privatized, only in 2019, "Kuršimlijska Banja" became also a part of "Planinka".

Our respondents told us about their experience in spa privatization. Respondent 2 pointed out that the privatization of "Lukovska Banja" and "Prolom Banja" is an example of successful privatization and that today "Planinka" is a joint stock company owned by small shareholders, and thus the workers have the motivation to work and to know that if the company is more successful, they will benefit, as owners, from it. Privatization of Hotel "Žubor" in "Kuršumlijska Banja" was completed in 2019, after the sale of the property of the Spa Complex, in accordance with the announcement of the Property Directorate of the Republic of Serbia and the Republican Pension and Disability Insurance Fund (Property Directorate, 2019), and after the court proceedings between the PDI Fund and the privatization entity, Special Hospital for Rehabilitation "Žubor" were completed. One of the respondents stated that this litigation is the reason for the delayed privatization of the complex, while the other stated that the incomplete privatization was due to economic instability in the domestic market.

All respondents agreed that the issue of resolving the privatization process was directly related to attracting direct investments in the spa areas. The arrival of investors "will happen at that moment when they see that something well is done for doing business. It is only at this point that investors decide to invest." (Respondent 2). Namely, privatization of spa complexes is in the final stages in this municipality, so they hope that investors will come because there is a great interest in "Kuršumlijska Banja" and the land at this moment. "The launch of this spa complex represents a new life for not so many locals who stayed here to live, new job opportunity for young people from Kuršumlija and the surrounding area, and enhancement of the complete offer of spa tourism in the territory of the Municipality of Kursumlija" (Respondent 2).

Importance of the incentives for attracting direct investment

Other instruments of attracting investment policy that we observed with our respondents were investment incentives. In fact, according to the "Regulation on the criteria for the incentive assignment in order to attract direct investment in hotel accommodation sector", the scope of the incentive is inversely dependent on the level of development of the spa areas. All respondents agreed that this should be the case, that is, the more underdeveloped the area where spas are, the higher the incentives from the budget should be. Considering that the Municipality of Kuršumlija is undeveloped area, according to our respondents, this fact should be taken into account to obtain incentives. Municipality of Kuršumlija is by the side of administrative line. "The policy of the state should be to make conditions for the growth of undeveloped areas, especially because we are on the administrative line. We are an area that should remain populated, we should retain young population and increase number of inhabitants, not decrease it" (Respondent 1).

Investment incentives are necessary condition for attracting direct investments in spa areas in the territory of the Municipality of Kuršumlija. Respondent 2 pointed out that the development of the area is reflected in new employment, the arrival of new people who will invest in the area. Representatives of the Municipality of Kuršumlija observe the development of the area with the help of incentives through an increase in municipal revenues, an increase in the number of guests, the number of beds, newly constructed facilities, newly employed workers. Respondent 3 gave sublimation of these answers, which is that "investment incentives by the Government of the Republic of Serbia have crucial importance and would certainly have a positive effect on increasing the level of development of the spa areas, but not only spa, then also complete Kuršumlija region. This is the way to stop depopulation of the territory, prevent young people from going to larger cities and abroad, attract new investments and foreign capital, create a favorable business climate and stable conditions for the life of our citizens".

Investment incentives lead to attracting direct investments, but two respondents said that this is not the only condition, but there are others such as building road infrastructure, improving demographic policy of the entire municipality. They find that incentives

are very useful tool, but do not have to be crucial ones for investors when deciding to invest in some area or not. Respondent 2, who represents the company that obtained the investment incentives, believes that they are necessary condition, because they represent a good motive.

As the municipality that is located in undeveloped area, Kuršumlija has an unemployment problem. Incentives regarding spa areas would reduce the problem of unemployment, because each investment incentive involves employment of certain number of people. Respondent 1 pointed out that other branches of the economy also need to be developed. Respondent 3 announced that the incentives "will be planned in the municipal budget, as part of more general program of stimulating investment in the territory of the Municipality of Kuršumlija. Within this measure, Municipality of Kuršumlija will decide on introduction of incentives for new and existing agricultural farms, determine the funds for the purchase of equipment, machinery and funds for work, organize in cooperation with higher levels of government and sectoral republican training and education organizations and provide necessary legal, economic and technical assistance to improve the work of cooperatives and farms." This leads to the conclusion that the Municipality of Kuršumlija has taken an active part in solving the problem of unemployment.

The development of health tourism depends on the revitalization of existing and construction of new hotel facilities in spa areas, and investment incentives are intended to revitalize existing and build new hotel facilities in spa areas, in accordance with "Regulation on the criteria for incentives assignment in order to attract direct investment in the hotel accommodation services sector". This leads to the conclusion that investment incentives are positively correlated with the development of health tourism. Two respondents agreed with this statement. Namely, the incentives received in 2019 by the company "Planinka" will be used to build Hotel "Bela Jela" in "Lukovska Banja". Representative of "Planinka", Respondent 2, explained that development of health tourism has always been their primary goal and that all incentives are directly related to the development of health tourism. "Prolom Banja" and "Lukovska Banja" also have wellness centers in their offer, but that is an addition to the tourist offer.

Activities in the field of creating an environment for attracting direct investment

In addition to the explained investment policy instruments, local units have an important role in creating an environment for attracting direct investment in the spa areas. The Municipality of Kuršumlija belongs to the group of undeveloped municipalities, with a small budget and a large surface area. Municipality spends lot of its money on building roads and on providing basic living conditions for its citizens, and because of all above mentioned, they are directed to the higher levels of authorities. The respondents

pointed out that the level of development of the Municipality influences the possibility of creating business environment for attracting direct investments in the area of the spa, but in their case, "greater involvement of Government of the Republic of Serbia, concrete measures of social policy and other necessary preconditions would increase the level of development of the Municipality and thus create conditions for favorable business environment and attracting direct investments (establishment of industrial zone, proximity of a new highway will greatly influence that the Municipality of Kuršumlija becomes an attractive location for building fruit processing plant, opening mini factories for processing healthy food, milk, fruit, medicinal plants, in order to preserve national tradition, culture and history of the Toplica region)" (Respondent 3).

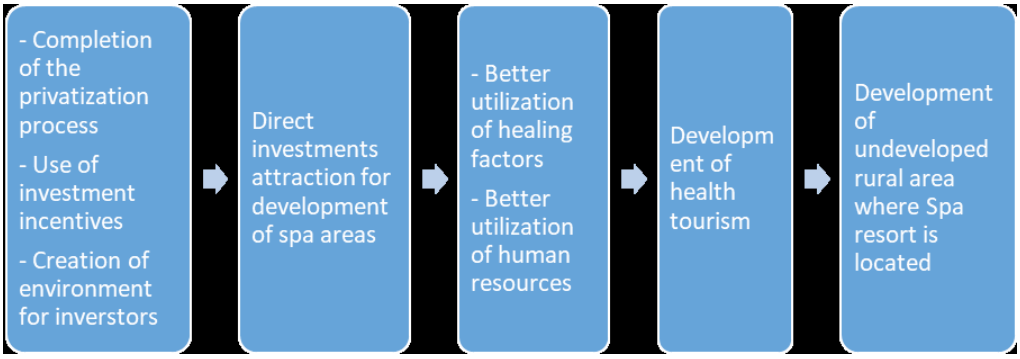
The Municipality of Kuršumlija has experience with both Greenfield and Brownfield investments (the opening of a solid wood furniture factory from Israel is in final phase, construction works on a purpose-built industrial plant have begun and the construction of a new hotel in "Lukovska Banja" is underway), but respondents are aware that local authorities must take the lead in providing the resources necessary to build the infrastructure in order for investments to be conducted. They find funds for its realization in coordination with the state and higher levels of authorities. "Only by concrete measures and significant financial support of the state in Kuršumlija region, young people can be prevented from leaving, credit incentives should help them to find job after graduation, in order to live from their work, form families, because as they say at home it is the most beautiful!" (Respondent 3).

Conclusions

The Municipality of Kuršumlija belongs to the group of undeveloped municipalities, but in recent years intensive efforts have been made to improve all economic conditions in order to provide better living standard for citizens. Wealth of natural healing factors and tradition of spa tourism provide perspective of its development. Thanks to the completion of the privatization process, investment incentives for hotel capacity building and the efforts of the local authorities to provide good business environment, conditions for stopping depopulation process and alleviation of the unemployment problem are created. Research on the role of investment in the development of spa tourism in the Municipality of Kuršumlija showed that, by synergetic effect of all the above factors, long-term and sustainable development of undeveloped rural regions can be achieved on territories where spa resorts are located.

Based on the results of the conducted research, the development model of the undeveloped rural area where Spa resort is located has been constructed (Figure 1)

Figure 1. Development model of undeveloped rural area where the Spa Resort is located



Namely, development requires better utilization of all economic potentials of the municipality on the territory where spa area is located, primarily healing factors and the unemployed workforce. Then, local economic development programs that the municipalities enact should be implemented. By completing the privatization process of the spa complex, in addition to investors who will invest through the privatization process, it is expected that other investors will be interested in investing. Attracting direct investment for the development of the spa area through incentives can contribute to the revitalization of existing and construction of new accommodation facilities and also partially solve the unemployment problem in these municipalities. Last but not least, the role of local government units is to create an environment for attracting direct investment in spa areas located on their territory.

Further research on the role of direct investment in spa tourism of undeveloped rural regions of the Republic of Serbia should include all Spa resorts located in these regions. Including them in the research would contribute to deeper understanding of the adequacy of policy instruments for attracting direct investments.

The presented development model of undeveloped rural area where the Spa resort is located could serve as methodological guideline for researches relating to other geographical areas respecting the following condition. Namely, the qualitative research presented in this paper has been conducted based on the perceptions of the respondents from the Spa resorts located on the territory of an undeveloped rural region in the Republic of Serbia. For that reason, the presented development model might serve as the basis for the research related to the Spa resorts located in other geographical areas only if adapted to its specific socio-economic conditions.

When the spa tourism of the Republic of Serbia is considered, major limitation for further research relates to possible changes in economic policy regarding the process of property transformation of the facilities located in the Spa resorts. New Regulation announced concerning privatization models of individual Spa resorts could significantly affect the opinions and perceptions of the respondents from relevant institutions and organizations.

Conflict of interests

The authors declare there are no conflict of interest.

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RESEARCH ON TOURISTS' ATTITUDES ON THE POTENTIAL OF GOČ MOUNTAIN FOR THE DEVELOPMENT OF ECO-TOURISM

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ARTICLE INFO

Review Article

Received: *31 October 2019*

Accepted: *26 November 2019*

doi:10.5937/ekoPolj2001223M

UDC 338.486.41(497.11 Goč)

Keywords:

Goč mountain, ecotourism, eco-accommodation, tourists attitudes

***JEL**: L83, Z32*

ABSTRACT

Goč Mountain has a wealth of natural resources, which represent the most important prerequisite for the development of ecotourism. However, the natural resources of this mountain are inadequately utilized for tourism. The aim of the research is to examine the views of tourists on the possibilities for the development of ecotourism on the mountain Goč, with a view to the more intensive tourist development of this mountain. Special attention is paid to the analysis of possibilities for expanding the existing tourist offer, additional attractive contents and activities, which would contribute to the greater competitiveness of this mountain in the ecotourism market. The survey method was used to collect primary data in the research and it included 174 respondents. The results of the descriptive statistical analysis showed that Goč Mountain has the potential for ecotourism development and that the construction of eco-accommodation facilities would contribute to the greater competitiveness of Goč Mountain.

Introduction

Mountain Goč is located near the leading spa in Serbia, Vrnjačka Banja. The comparative advantage of Goč Mountain is reflected primarily in its natural predispositions. An ecologically preserved environment, characterized by distinct forestedness, natural landscapes and rich flora and fauna, distinguish Mountain Goč as still insufficiently explored and included in tourist flows (Podovac, Đorđević, Milićević, 2018). Owing

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to its natural features, first of all biodiversity conservation and forest communities, as well as the beauty of the countryside, favourable climate, richness of rivers and created values, Mountain Goč fully meets the requirements for protection as the Institute for Nature Conservation of Serbia, 2019). The whole area of the Goč Mountain is characterized by tourist potentials with dominant health and sports and recreational character, which unfortunately have not yet been adequately utilized. Existing natural resources should be a significant factor in the intensive tourism development of this mountain, with particular emphasis on the development of ecotourism.

In recent years, tourists have been coming to Goč Mountain in the summer when the main motive is exploring nature, walking through natural areas and relaxing in the clear mountain air. However, the tourist offer of this mountain is not sufficiently developed, and therefore not attractive to potential tourists, which is confirmed by tourist traffic. Mountain Goč recorded an extremely small number of tourists. In 2017, 8,350 tourists visited this mountain, including domestic tourists, who realized 46,265 overnight stays (Statistical Office of the Republic of Serbia, 2019).

Considering the strong impact on the environment and a wide range of positive and negative effects on rural communities, long-term sustainability of agricultural activities must be taken into account (Đokić, 2019). Each rural area has natural and anthropogenic values, which can serve as a basis for creating an attractive tourist product. However, particularly insisted on lately is ecology and sustainable development. Tourists of today want an environmentally friendly environment in which to spend their free time (Vuković, Arsić, Cvijanović, 2010; Milićević, Podovac, Jovanović, 2013). Ecotourism is a form of tourism that emphasizes natural and ecological attractions. This type of tourism aims at "returning to nature", learning about nature and respecting the connection between people and the country. It takes place in undisturbed natural areas and is a form of tourism that seeks to protect the environment, improve the quality of life of the local population, and educate tourists (Milićević, Štetić, 2017).

Many mountain communities around the world have promoted ecotourism ventures to ameliorate problems of environmental degradation and underdevelopment. It is generally believed that this form of tourism in the mountains will foster responsible tourist behavior, conservation of important wildlife habitats and ecosystems, appreciation of local cultures and traditional life styles, and provision of sustainable forms of livelihood for people living in remote areas and communities (Nepal, 2002). Based on the fundamental functions of ecotourism we can say that its success at a destination is reflected by the extent to which it satisfies these key requirements: preserves natural resources and biodiversity; generates money to finance conservation; contributes to the local economy; promotes community partnership; and educates visitors and members of local communities (Batta, 2006).

The aim of the paper is to examine the views of tourists on the possibilities for the development of ecotourism on the mountain Goč, with a view to the more intensive tourist development of this mountain. Special attention is paid to the analysis of

possibilities for expanding the existing tourist offer, additional attractive contents and activities, which would contribute to the greater competitiveness of this mountain in the ecotourism market. The survey was conducted among tourists of Goč Mountain.

Literature review

The concept of sustainable development is faced with great interest both in theory, by scientific researchers, and in practice, by managers and policy makers in many countries (Sudarević, Milovanov, 2015). The development of environmental awareness of the threat of the natural environment leads to a new nature of tourism and essential changes in relation to the environment (Šušić, Đorđević, 2019). The term ecotourism has often been equated with a number of terms like alternative tourism, green tourism, sustainable tourism (Butler 1991), or nature tourism, even though these are distinct forms of tourism (Nepal, 2002). The lack of a precise definition of the term ecotourism has encouraged increasing free use of the term to gain competitive advantage (Batta, 2006).

According to Ceballos-Lascuráin (1987), ecotourism is defined as travelling to relatively undisturbed or uncontaminated natural areas with the specific objective of studying, admiring, and enjoying the scenery and its wild plants and animals, as well as any existing cultural manifestations found in these areas. Ecotourism is a form of tourism that fosters learning experiences and appreciation of the natural environment, or some component thereof, within its associated cultural context' (Weaver, 2008). The most important motivations for travel by ecotourists are to enjoy the natural environment, have an "experiential" vacation, and learn while traveling. Typically, the most popular ecotourism activities in all surveys are visiting national parks and protected areas, hiking, water-based activities (especially rafting), admiring nature, camping and touring. Additionally, cultural experiences may be of interest (Wight, 2001). Activity preferences vary from destination to destination. For example, diving is rated highly in the Pacific, while jungle/rainforest trekking and birdwatching are rated highly in Latin America and Southeast Asia, and game viewing is popular in Africa (IFC, 2004). Tourists learning is central to all forms of ecotourism (Weaver, Lawton, 2007), and one expressed goal of ecotourism is the self-formation of tourists towards more pro-environmental attitudes and behaviour (Buckley, 2009). Ecotourists are simply interested in natural places and experiences for the benefits of enjoyment and learning, physical activity and adventure (Beaumont, 2011). Recent ecotourism research has found that ecotourism markets prefer more than the conventional hotel options. They desire more rustic, adventure-type accommodation (such as ecolodges, campings, backpacker hostels, ranches, etc.) which is a growing market trend. The overall vacation experience seems to determine the accommodation choice (Wight, 2001).

Achieving ecotourism requires certain activities including the production of ecologically safe, recyclable and biodegradable products, using energy efficient operations with minimal or no pollution, efficient waste management, con-serving cultural and natural assets, etc. (Gavrilović, Maksimović, 2018). According to UNWTO (2019), ecotourism refers to forms of tourism which have the following characteristics:

1. All nature-based forms of tourism in which the main motivation of the tourists is the observation and appreciation of nature as well as the traditional cultures prevailing in natural areas.
2. It contains educational and interpretation features.
3. It is generally, but not exclusively organised by specialised tour operators for small groups. Service provider partners at the destinations tend to be small locally owned businesses.
4. It minimises negative impacts upon the natural and socio-cultural environment.
5. It supports the maintenance of natural areas which are used as ecotourism attractions by:
   - Generating economic benefits for host communities, organisations and authorities managing natural areas with conservation purposes;
   - Providing alternative employment and income opportunities for local communities;
   - Increasing awareness towards the conservation of natural and cultural assets, both among locals and tourists.

From the above it is clear that ecotourism can be defined by three core criteria: nature, learning and sustainability (Beaumont, 2011), ie, (1) attractions should be predominantly nature based, (2) visitor interactions with those attractions should be focused on learning or education, and (3) experience and product management should follow the principles and practices associated with ecological, socio-cultural and economic sustainability (Blamey, 2001).

Many mountain tourist destinations have become major players in the local economy. Hiking, camping, mountain and rock climbing, mountain biking, wildlife viewing, and other forms of non-consumptive recreation are in growing demand. However, there are dangers in promoting mountain destinations for ecotourism, especially if there is no strategic focus on the type and intensity of activities to be promoted, the benefits and the beneficiaries, and the decisions related to governance, control and regulations. Some of the major environmental impacts with direct implications for local mountain communities include overcrowding, noise pollution, garbage pollution, extraction of valuable resources (for example, collection of firewood and rare plant specimens), fire hazard, and a sewage outflow (Nepal, 2002).

Environmental anxiety about tourism impacts has increased and the accommodation sector in tourism has identified the necessity to improve its sustainable management and process (Trauer, 1998). The development of eco-accommodation is an example of this change to more sustainable tourism accommodations. Eco-accommodations are environmentally friendly establishments where hospitality services are provided to the eco-tourists while practicing ecotourism principles, such as saving water and

energy as well as reducing solid waste – while saving money – to help protect earth (Manaktola, Jauhari, 2007; Arachchi, Yajid, Khatibi, 2015; Milićević, 2016; Green Hotels Association, 2019). They can be found in nature tourism destinations around the world. There are different types of eco-accommodations: Ecohotels, Ecoresorts, Ecoguesthouses, Ecolodges, Ecoapartments, Ecocampings, Glampings, etc. The primary difference between these eco-accommodations is generally the amount of services that are provided on site. For example, ecoresorts tend to be located on larger properties, and may offer more amenities, such as spas, a choice of restaurants, and/or a variety of local tours. One thing all of these eco-accommodation options have in common is that they emphasize elements such as environmental responsibility and minimizing the negative impact (Green Global Travel, 2019). Ecotourism is rapidly evolving, so accommodation facilities should use this as a chance to improve their business (Milićević, Petrović, Šuleić, 2017).

Regional nature parks of France have developed specific trade marks for environmentally friendly accommodations - Ecogîtes. The Ecogîtes are part of a way of life based on preserving natural resources, using the renewable energies, the use of natural, local and recyclable material with no harmful effects on health. Ecogîtes properties have facilities and equipment for saving energy, sorting rubbish and economising water (Gites de France, 2019). These self-catering accommodations provide visitors information about the local fauna and flora, direct access by foot to nature sites, and provide materials intended to increase visitor awareness of the areas visited (Blangy, Vautier, 2001).

An excellent example of ecolodge is Eden Lodge Madagascar, which is several times selected in the Top 10 ecolodges in the World (elected 2014 World's best sustainable lodge). Eden Lodge is also the first Green Globe certified lodge in Madagascar. Eden Lodge co-exists in harmony with the natural environment and wildlife that surrounds it. The area is renowned for its very high rate of endemism that includes Boab trees over 500 year's old, marine turtles, lemurs, birdlife, reptiles and amphibians. The property uses 100% solar power. Eden Lodge was exclusively built with local natural renewable materials (stone walls, local wood, ravinala roofs) and construction is based on traditional building principles that suit the climate. Eden Lodge is part of a tight knit community and has formed strong relationships with local villagers, many of whom are employed at the Lodge (Eden Lodge, 2019).

Analysis of the tourist offer of the mountain Goč

Goč is a mountain in central Serbia, located 200 km from Belgrade. In its immediate surroundings are Vrnjačka Banja (15 km), Kraljevo (31 km), Aleksandrovac and Brus (22 km). It is part of the north-Kopaonik range and belongs to the category of lower mountains. The highest peak of Goč is the Krnja jela, with an altitude of 1,127 m. On the Kraljevo side of the mountain Goč there is a tourist center "Good Water ", on the spa side there are settlements "Horizont" and "Stanišinci", while from the Aleksandrovac side of Goč, i.e. on its southern slope, there is a settlement "Mitrovo Polje" (Goč Mountain, 2019a).

Due to its geographical location, climatic characteristics, and especially relief and geological background, this area has a versatile plants coverage, which has so far identified about 650 plant species, of which 250 are medicinal species (Institute for nature conservation of Serbia, 2019). Pursuant to the Decree of the Government of the Republic of Serbia, in 2014, the forest complex "Goč-Gvozdac" was proclaimed a Special Nature Reserve of category II. The protected area is 3.957ha 17a 39m². The most common species of trees in the protected natural resource is beech, which accounts for 52.4% of the total volume. The forest complex consists of 25 species of trees, some of which are under a special regime of protection (maple, Pančić's spruce- placed, Turkish hazel (a relic), black rake (a relic), wild cherry, wild apple, etc.) (Faculty of Forestry Belgrade, 2019a).

In the area 129 bird species have been recorded, of which 108 are breeding birds. A large number of these birds are of particular national importance. According to the Decree on the Protection of Natural Rarities of Serbia, 75 bird species have been recorded so far as natural rarities. The presence of 317 species of insects was also recorded, of which 56 species are rare and endangered at national and international levels. 27 species of mammals have been identified in the wider Goč area. Certainly of the highest value is the otter (*Lutra lutra*), which is protected by law as a natural rarity. This species is an indicator of water pollution (Institute for nature conservation of Serbia, 2019). There are also 20 species of amphibians and reptiles (Faculty of Forestry Belgrade, 2019a). In the forest area of the mountain Goč, there are different kinds of game: deer, roe deer, wild boar, rabbit, wolf, fox and others.

This whole area is extremely rich in water resources. It has numerous springs and clear mountain rivers flowing towards the West Morava River in the north and the Rasina River in the south. The hydrographic network also includes the artificial reservoir Selište, built on the river Zagrža, which covers an area of about 8 ha (Rsovac, 2008). Swimming and fishing are prohibited on the artificial lake, as well as any other activities because Vrnjačka Banja is supplied with water from this lake.

Goč also has cultural and historical monuments, the most interesting of which is the "Roman Cemetery", that is, the place where the Saxons, miners who mined and smelt iron during the period of the Nemanjić were buried (National Tourism Organization of Serbia, 2019). There are a couple of sacral objects on the territory of Goč Mountain and the foothills: the Church of the Blessed Virgin Mary in Stanišinci and the Church of St. John in Vukošica, which is unique because it belongs to the type of smallest chalet churches in Serbia (Borović Dimić, 2008). The entire surroundings of Goč Mountain abound in medieval monasteries (Studenica, Ljubostinja, Žiča, etc.) and the remains of medieval cities and fortifications (Ras, Maglič, Koznik, etc.).

Ethnographic values exist, but are not sufficiently valorised. They are found in the gastronomic offer, which is characterized by cheese, kajmak and brandy from Goč, as well as raspberry and blackberry products. A special experience is the trout ponds, where visitors can enjoy a meal and an unspoiled nature on site (Milićević, Đorđević, 2015).

When it comes to the receptive elements necessary for the development of tourism on the Goč Mountain, it must be said that they are underdeveloped. The existing accommodation on Mount Goč is modest. The accommodation offer includes primarily holiday homes ("Kaćunak", "Goč", "Gočka kuća"), mountain houses ("Goč", "Pecić", "Radulović"), apartments ("Horizont", "Velja", "Djurovski", "Nikola and Barbara") and a villa ("Slavica"). From Kraljevo side of Goč there is a resort "Good Water", as well as two ethno log cabins (Podovac, Đorđević, Milicević, 2018). The Center for Teaching and Scientific Facilities of the Faculty of Forestry in Belgrade is located in this settlement, which has five accommodation facilities: "Novi Studenac", "Piramida", "Villa Vlasta", "Villa Planinka" and "Depadans". Fieldwork for students of the Faculty of Forestry in Belgrade is organized in them, as well as for students of other faculties in Serbia. The facilities offer accommodation for individual tourists as well as organized groups (Faculty of Forestry Belgrade, 2019b). To the list of accommodation, facilities should be added the resorts in Mitrovsko Polje, on the Aleksandrovac side of Goč, namely the "Red Cross" resort from Aleksandrovac and the "Cvetna dolina" resort belonging to the Ministry of Internal Affairs of the Republic of Serbia (Ministry of Internal Affairs of the Republic of Serbia, 2019) . A great problem on the Goč mountain is the cottages that are being built without a permit, which initiates communal problems, but also affects the disturbance of natural landscapes (Milićević, Đorđević, 2015). Goč Mountain provides numerous opportunities for improving the existing accommodation offer, through the construction of various eco-accommodation capacities, which would be in harmony with the natural environment.

When it comes to sports, recreational and entertainment facilities, several locations on Mount Goč have outdoor sports grounds for basketball, handball, volleyball, football and tennis. Within the children's resort "Good Water" (Dobre vode in Serbian), there are several outdoor sports fields, as well as a sports balloon hall of 1000m², which contains three volleyball courts, handball (mini football), basketball, tennis court and gym. The natural beauties of Goč Mountain combined with these sports facilities are ideal for the preparation of athletes of all types and categories (Resort Goč, 2019a). There are also small sports fields, three sand volleyball courts and an outdoor pool in Mitrovo Polje. The pool is with thermomineral water in Mitrovo Polje (Mitar's Field), which operates within the Red Cross resort of Aleksandrovac (Mitrovo Polje, 2019).

Goč Mountain also has several marked recreational walking trails, which give tourists and one-day visitors the opportunity to take long walks and pleasant aromatherapy while picking the various plants and teas that this mountain abounds in. More and more tourists and one-day visitors come to Goč in the summer when the main motive is walking and resting in the clear mountain air. For this purpose, 5 walking trails have been established and marked from Kraljevo side of the Goč Mountain. The trails are of different lengths (from 5,000 m to 18,500 m) and different ascent (from 100 meters to 700 meters) and are marked with different colours: yellow, green, brown, blue and red (Resort Goč, 2019b). From Aleksandrovac side of Mount Goč, there are marked hiking trails that lead to the top of Mount Željin and Ljukten (one of the peaks on Mount Goč).

After hiking on the slopes of Goč Mountain and the surrounding mountains, tourists can relax in the open-air swimming pool with thermo-mineral water in Mitrovo Polje, which operates within the Red Cross Resort in Aleksandrovac (Mitrovo Polje, 2019).

Goč has mountaineering associations operating in its area, namely the mountaineering sports association Ljukten from Trstenik and the mountaineering association Goč from Vrnjačka Banja. These associations also deal with the marking of walking trails, and thanks to them, most of the mountain is marked and facilitates movement for visitors to the mountain (Goč Mountain, 2019b).

In addition to the walking paths, Goč offers five excursion points and four lookout points. The checkpoints are used for holidaying tourists in the countryside and picnics, that is, the possibility for preparing and consuming food. The viewpoint offers a unique view of Vrnjačka Banja, the West Morava valley and the surrounding mountains: Kopaonik, Željin and the Gledić Mountains (Ruđinčanin, 2008).

Research methodology and hypothesis

The subject of this paper deals with the analysis of the potential of the Goč Mountain for the development of ecotourism, which would have the effect of increasing the number of tourists, i.e. the competitiveness of this mountain in the ecotourism market. The survey method was used to collect primary data in the research. The survey was conducted during July and August of 2019 on Goč Mountain. The survey was preceded by the preparation of a questionnaire consisting of 10 closed-ended questions. The questionnaire was divided into two parts. The first part of the questionnaire deals with the socio-demographic profile of tourists: gender of respondents, age and level of education. In the second part of the questionnaire, the respondents gave an assessment of the existing tourism offer of Goč Mountain, as well as answered questions related to the potential of this mountain for the development of ecotourism, with special emphasis on additional contents that would contribute to the faster development of this type of tourism. The questionnaire was completed by 174 respondents, that is, tourists of the Goč Mountain. The obtained data were processed by *Statistical Package for Social Sciences Version 23 – SPSS*.

Descriptive statistical analysis was used in the paper. The basic hypotheses on which the research is based are the following:

H1 - Goč Mountain has the potential to develop ecotourism

H2 - Eco-accommodation facilities would contribute to greater competitiveness of mountain Goč in the ecotourism market.

The main objective of the conducted research is to examine the possibilities for the development of ecotourism on the mountain Goč. Special attention was paid to the analysis of possibilities for expanding the existing tourist offer through the construction of eco-accommodation capacities, all with the aim of increasing the competitiveness of this mountain in the ecotourism market.

Results and discussion

The survey included 174 respondents, of whom 98 were female (56.3%) and 76 were male (43.7%). The largest number of respondents is 36-50 years old (33.3%), followed by 26-35 years old respondents (28.7%). Regarding the level of education, the most represented are respondents with university education (50.6%), while the least are those with a high school degree (14.9%). When asked *Have you ever been to Goč Mountain*, as many as 173 respondents answered positively (99.4%), while only 1 respondent (0.6%) had never been to Goč (Table 1).

Table 1. Socio-demographic characteristics of respondents

		Frequency	Percent	Mean	Std. dev.
Gender	Male	76	43,7	1,56	,497
	Female	98	56,3		
Age	20-25	31	17,8	2,56	1,006
	26-35	50	28,7		
	36-50	58	33,3		
	More than 50	35	20,1		
Level of education	High school	28	16,1	2,71	,948
	College	26	14,9		
	University degree	88	50,6		
	Master/Magistar/PhD	32	18,4		
Have you ever been to Goč Mountain	Yes	173	99,4	1,01	0,76
	No	1	0,6		

Source: Authors, based on research

When asked for an *Assessment of the current state of certain elements of Goč Mountain tourism offer*, the respondents gave a rating on the Likert scale, ranging from 1 (the worst rating) to 5 (the best rating). After analyzing the responses shown in Table 2, it is evident that the average ratings of individual elements of the tourist offer of this mountain range from 3.47 to 4.58. The highest average marks were given by the following elements of the tourist offer: *The natural beauties of Goč Mountain (4.58), the tidiness and cleanliness of Goč Mountain (4.51),* as well as *The conservation of rural areas and rural architecture (4.30)*. Tourists are the most satisfied with the natural resources of Goč Mountains, which is a good basis for the development of eco-tourism. On the other hand, the worst rated elements are *Local Tourist Signalling* (3.47) and *Traffic Access* (3.51). With an average mark of 3.72, the tourists rated *Accommodation facilities* on this mountain, indicating that there is a need to improve the quality of existing tourist accommodation facilities, but also to introduce new, attractive accommodation facilities, which would increase the level of tourist satisfaction.

Table 2. Tourists' satisfaction with certain elements of Goč mountain tourist offer

		Min mark	Max mark	Mean	Std. dev.
1	The natural beauties of Goč mountain	2.00	5.00	4,58	,777
2	The arrangement and cleanliness of mountain Goč	2.00	5.00	4,51	,788
3	Preservation of rural area and rural architecture	2.00	5.00	4,30	,773
4	Cultural and historical heritage	2.00	5.00	4,21	,681
5	Places for picnic and camping	1.00	5.00	4,11	,788
6	The offer of the restaurants	2.00	5.00	4,10	,732
7	Sports and recreational offer	1.00	5.00	3,81	,821
8	Accommodation facilities	1.00	5.00	3,72	,778
9	Traffic accessibility	1.00	5.00	3,51	,854
10	Local tourist signage	1.00	5.00	3,47	,687

Source: Authors, based on the research

To the next question, *Has Mount Goč got the potential to develop ecotourism?,* as many as 169 respondents (97.1%) answered affirmatively, while only 5 (2.9%) answered in the negatively (Table 3).

Table 3. Has Mount Goč got the potential to develop ecotourism?

		Frequency	Percent	Valid percent	Cumulative percent	Mean	Std. dev.
Valid	Yes	169	97,1	97,1	97,1		
	No	5	2,9	2,9	100,0	1,03	,168
	Total	174	100,0	100,0			

Source: Authors, based on research

Next, the respondents were asked *What additional facilities and activities would contribute to the development of ecotourism on Mount Goč*? For this question 10 answers were and the possibility for respondents to opt for only one answer (Table 4). The largest number of respondents opted for *Horseback riding opportunities*, as well as for the *Marked mountain biking trails* (30 respondents each, i.e. 17.2% each). For *better-marked hiking trails,* 29 respondents (16.7%) opted, while 26 respondents (14.9%) opted for *Eco-accommodation facilities*. The answers for which the least respondents opted were *Picking Mushrooms and herbs accompanied by local guides* and *Eco-workshops* (5 respondents, i.e. 2.9% respondents). It can be concluded that all the answers offered to tourists are interesting and that the mentioned additional facilities and activities would contribute to the faster development of eco tourism on the mountain Goč.

Table 4. What additional facilities and activities would contribute to the development of ecotourism on Goč?

Answers	Frequency	Percent	Valid percent	Cumulative percent
Horseback riding opportunities	30	17,2	17,2	17,2
Marked trails for mountain biking	30	17,2	17,2	34,5
Better marked trails for recreational hiking	29	16,7	16,7	51,1
Eco-Accommodation facilities	26	14,9	14,9	66,1
Additional recreational and entertainment offer: Zip line, Adventure park, Paragliding, Cable car from Vrnjačka Banja to Goč	24	13,8	13,8	79,9
More marked hiking trails	13	7,5	7,5	87,4
Cultural manifestations on the traditions and customs of the local population	6	3,4	3,4	90,8
Bird watching	6	3,4	3,4	94,3
Picking mushrooms and herbs accompanied by local guides	5	2,9	2,9	97,1
Eco-workshops	5	2,9	2,9	100,0
Total	174	100		

Source: Authors, based on the research

Since less environmentally harmful accommodation facilities that bring human beings closer to nature can be an important element in the supply of an eco-destination, survey questions regarding eco-accommodation facilities are defined. To the question *Have you ever been housed in an eco-accommodation facility* (Eco camping, Eco apartments, Eco lodge, Eco hotel, Glamping)?, more than half (52.3%) said they had used this type of accommodation, while 47.7% did not (Table 5).

Table 5. Have you ever been housed in an eco-accommodation facility?

		Frequency	Percent	Valid percent	Cumulative percent	Mean	Std. dev.
Valid	Yes	91	52,3	52,3	52,3		
	No	83	47,7	47,7	100,0	1,48	,501
	Total	174	100,0	100,0			

Source: Authors, based on research

Respondents were also asked *What kind of eco-accommodation facilities would you like Goč to offer?*. For this question 6 answers were offered and the possibility for respondents to opt for only one answer. The largest number of respondents opted for *Eco hotel* (33.3%), while 21.8% of respondents opted for *Eco apartments* (*Table 6*). This is followed by *Eco Lodge* (20.1%), *Eco Camping* (19.5%), as well as *Glamping*, with 5.2% of respondents. It is interesting that none of the respondents opted for the sixth offered answers that reads *None of the offered ones - Mountain Goč does not need this type of accommodation*. Such answers indicate the great environmental awareness of the respondents, and the desire to contribute in this way to the protection of the environment of Goč Mountain.

Table 6. What kind of eco-accommodation facilities would you like Goč to offer?

Answers	Frequency	Percent	Valid percent	Cumulative percent
Eco hotel	58	33,3	33,3	33,3
Eco apartments	38	21,8	21,8	55,2
Eco lodge	35	20,1	20,1	75,3
Eco camping	34	19,5	19,5	94,8
Glamping	9	5,2	5,2	100,0
Total	174	100	100	

Source: Authors, based on research

The last question referred to the respondents' position on *Would eco-accommodation facilities affect the arrival of more tourists to Goč Mountain?*. As many as 97.1% of respondents answered affirmatively, while 2.9% said that eco-accommodations would not affect the arrival of more tourists to this mountain (Table 7).

Table 7. Would eco-accommodation facilities affect the arrival of more tourists to Goč Mountain?

Answers		Frequency	Percent	Valid percent	Cumulative percent
Valid	Yes	169	97,1	97,1	97,1
	No	5	2,9	2,9	100,0
	Total	174	100,0	100,0	

Source: Authors, based on research

Conclusions

In this paper, two hypotheses were set. The accuracy of both hypotheses was verified using descriptive statistical analysis. The first hypothesis that reads *Goč Mountain has the potential for the development of ecotourism*, is considered to be confirmed given that as many as 169 respondents (97.1%) gave a positive answer to this question. In addition, the respondents were given the opportunity to choose among the 10 offered answers one additional content or activity that they felt would be most conducive to the development of eco-tourism on Goč Mountain. Based on the respondents' answers, it can be concluded that these additional facilities and activities would indeed contribute to the faster development of eco-tourism on Goč Mountain, given that all the answers offered to the respondents were interesting. However, the contents opted by the largest number of respondents are: *Horseback riding opportunities* (17.2%), *Marked mountain biking trails* (17.2%), *Better marked hiking trails* (16.7%), *Eco- accommodation facilities* (14.9%), as well as *additional recreational and entertainment offer (Zip line, Adventure park, Paragliding, Cable car from Vrnjačka Banja to Goč, etc.)* (13.8%).

The second hypothesis is *Eco-accommodation facilities would contribute to the increased competitiveness of Goč Mountain in the ecotourism market* was also confirmed by the respondents' answers. Specifically, 169 respondents (97.1%) confirmed that the eco-accommodation facilities would affect the arrival of more tourists to Goč Mountain.

The fact that more than half of the surveyed respondents (52.3%) were already housed in one of the eco-accommodation facilities is in favour of confirming the hypothesis, which suggests that they would use this type of accommodation on Goč Mountain in the future. In addition, when asked about the type of eco-accommodation facilities that tourists would like Goč to have in their offer, the respondents showed interest in all the eco-accommodation facilities offered: *Eco hotel* (33.3%), *Eco apartments* (21.8%), *Eco lodge* (20.1%), *Eco camping* (19.5%) and *Glamping* (5.2%), with the important note that none of the respondents indicated that Goč Mountain does not need such type of accommodation. Since there is obviously an interest of tourists for eco-accommodation facilities, and given that they do not exist on this mountain, in the future it is necessary to direct business activities to enrich the existing accommodation offer by building attractive eco-accommodation facilities. All this would contribute to faster development of eco-tourism as well as greater competitiveness of Mount Goč in the eco-tourism market.

Acknowledgements

Paper is a part of research within the project no. III 46006 - Sustainable agriculture and rural development in the function of accomplishing strategic objectives of the Republic of Serbia in the Danube region, financed by the Ministry of Education, Science and Technological Development of the Republic of Serbia.

Conflict of interests

The authors declare no conflict of interest.

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PARTICIPATION OF THE ACTIVITY CLASSIFICATION SECTORS IN THE EMISSION OF POLLUTANTS, WITH REGARD TO CRIMINAL LEGISLATION

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ARTICLE INFO

Review Article

Received: *04 November 2019*

Accepted: *26 February 2020*

doi:10.5937/ekoPolj2001239M

UDC 343.2/.7:502/504

Keywords:

Activity classification sectors, Pollutant emission, Gross Domestic Product, Environmental protection, Criminal legislation

***JEL**: E52, L11, K32, Q52, Q53, Q56*

ABSTRACT

Emissions of pollutants into the air are increasingly affecting the environment. In this context, it is particularly interesting to consider the ratio of the participation of individual pollutants in environmental damage and their participation in contributing to the economic development and economic stability of the country. The research of the ratio of participation of the activity classification sectors in the emission of pollutants and in the gross domestic product covered 2013 and 2017, while a survey of total pollutant emissions, regardless of sectors of activity classification, was made for 2015 and 2016. By analyzing the results of the research, the authors conclude that the sectors with the highest share in the gross domestic product do not fall into the categories of the most important emitters of air pollution or greenhouse gases, hence, they explain the results of each research segment in this paper. Special attention was paid to criminal law regulations in the field of environmental protection.

Introduction

In the sense of Art. 3 of the Law on Air Protection („Official Gazette of the Republic of Serbia", no. 36/2009 and 10/2013), pollutant is every substance (introduced directly or indirectly by man into the air) present in the air, which has harmful effects on human health and the environment as a whole, while the emission process is the discharge of pollutants in a gaseous, liquid or solid state from sources of pollution into the air. Greenhouse gas emissions are the release of greenhouse gases from individual and/or diffuse sources into the air. Air is considered to be air in the open-air troposphere

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which does not include indoor air. As Besermenji states (2007), air means a mixture of gases, consisting mainly of nitrogen and oxygen (in the total volume of air, nitrogen and oxygen make up about 99%, argon 0.9% and carbon dioxide 0.03%).

Having in mind the increasing emissions of pollutants into the air, which represent a kind of pressure on the environment, and are a consequence of intensive development of industrial activities, traffic and other, and understanding the importance of environmental protection for the modern society, it is very important to pay attention to certain, highly represented aspects of air pollutants. In this context, it is especially interesting to consider the relationship between the participation of individual pollutants in environmental damage and their participation in contributing to the economic development and economic stability of the country.

In accordance with the aforesaid, the paper, after reviewing the relevant contemporary views in theory, deals with the analysis of the ratio of the activity classification sector participation in pollutant emissions and in the gross domestic product, whereby according to Article 1 of the Law on the Classification of Activities of the Republic of Serbia („Official Gazette of the Republic of Serbia", no. 54/2010), it was determined that the classification is the general standard according to which the classification of the activity classification units is performed, while the gross domestic product, as the most important macroeconomic aggregate, indicates the strength and stability of the economy of a country (Statistical Yearbook of the Republic of Serbia, 2017). The research into the participation ratio of the activity classification sectors in the emission of pollutants and in the gross domestic product will cover 2013 and 2017, while the survey of the total pollutant emissions, regardless of the activity classification sectors, will be done for 2015 and 2016.

A special review after discussion on the research results will be addressed to the criminal law regulations in the field of environmental protection, as a significant response of society to the activities which violate the basic principles of survival, functioning and progress of ecosystems (if we look at the issue in the narrow sense) and the environment in general (if we look at the issue in the broad sense). The paper will be methodologically based on a theoretical analysis of relevant contemporary views in theory, a normative analysis of basic domestic and international legislative sources and a quantitative analysis of statistical indicators of the ratio of participation of the activity classification sectors in pollutant emissions and in the gross domestic product.

Literature review

In the last two decades, contemporary society has been facing major environmental problems. Given that one of the human rights is the right to a healthy environment, it immediately becomes clear that there is a discrepancy between the legislative standards (the right to a healthy environment is guaranteed by the Constitution, legal and sublegal acts) and factual knowledge, which regards a continued and daily impairment of the environment by both misdemeanor acts and criminal offences, and the infringement of citizens' environmental rights.

The environment is basically one of the pillars of sustainable development, so that it is worth pointing out in this context that sustainable development implies finding a balance between social development, economic progress and environmental protection.

The environment is everything that surrounds us, i.e. everything that man's living environment and production activity are either directly or indirectly associated with (Hamidović, 2012). As pointed out by Krvavac and Jovanetić (2010), the living environment represents the inhabited part of the Earth's surface where human beings can survive.

Modern conditions of living and doing business have brought about many problems relating to degradation of the environment. Namely, the accelerated technological development has inevitably resulted in numerous changes to the natural environment, which adversely affect the balance of individual ecosystems. According to Krvavac and Jovanetić (2010), any change of the environment which has an adverse effect on the life, activities and values of the modern man, is considered to be pollution (the notion of pollution usually includes the introduction of chemical substances, biological matter or microorganisms into a certain environment). For example, Nowadays energy has been transformed in to a veritable production factor,with a straight influence on the economic growth (Andrei et al., 2017). Contemporary societal development is closely related to existing energy sources based on fossil fuels (Dusmanescu et al., 2016).

Problems in this area are most often related to impairment of the quality of air, i.e. its pollution.

The quality of air is a very important parameter for both humans and all other living beings on Earth. The air quality indicators are the following: air temperature, the direction and intensity of air currents, the basic ozone level, the nitrogen dioxide level, the level, structure and size of fine particles, the benzene level, the levels of other chemical substances, changes to the stratospheric ozone, and the rise in ultraviolet radiation (Kokić Arsić, Milivojević and Savović, 2009). The quality of air is generally considered to be impaired at the moment of emission of harmful substances which otherwise did not exist in the air composition, and in case of an enormous rise in the substances which already exist in the air in certain, negligible quantities (e.g. carbon-dioxide, methane, etc.), and which become harmful only with an enormous rise in their quantity. As stated by Pejić (2015), changes in the chemical balance and air quality impairment are caused by emissions of air pollutants, which increase their air concentration.

We could say that gas emissions with the greenhouse effect result in very serious environmental problems. Human activities in the last 150 years have surely been the generator of these problems (Fazekaš, Bobera and Ćirić, 2017).

According to article 1 of the Convention on Long-range Transboundary Air Pollution, adopted in Geneve on 13 November 1979, the term "air pollution" signifies introduction into the atmosphere by man, directly or indirectly, of substances or energy with damaging effect, which by their nature can endanger the health of humans, cause damage to biological resources and ecosystems, as well as material goods, and threaten or impair

esthetic values and other legal functions of man's environment, so that the term air polluting substances should be understood in that sense (The Law on the Ratification of the Convention on Long-range Transboundary Air Pollution, Official Gazette of SFR Yugoslavia – International Agreements, No. 11/86). According to Besermenji (2007), air pollution means the presence in the air of different substances and gases, which pose health risks. Air pollutants are: nitrogen oxides – sulphur-dioxide, carbondioxide, solid matter particles, volatile organic substances and various toxic substances. A combination of nitrogen oxides and volatile organic compounds in the air, in the presence of ozone, is the main ingredient of smog. As Pejić (2015) points out, besides these substances, other polluting matter can be found in the air, which mainly results from certain industrial production processes. These pollutants, i.e. substances which have a considerably negative effect on the quality of air, include: heavy metals and metalloids, such as lead, arsenic, nickel, zinc, cadmium, mercury, etc., then inorganic gases like fluorides, chloride, and organic compounds such as carbohydrates, dioxins and other polluting matter. As pointed out by Stojanović, Regodić and Jovanović (2015), in addition to static sources, there are also mobile sources of air pollution. According to this classification, static air pollution sources usually refer to industrial plants, agriculture, forestry, fishing, electrical power and gas supply, etc., while the transportation sector is usually considered to be the mobile air pollution source.

Environmental degradation in the Republic of Serbia is very pronounced in different areas. According to Besermenji (2007), one of the main problems is the problem of air pollution, which is primarily the consequence of an extremely low level of environmental awareness, and a lack of professional education in the field of the environment. According to Cvijanović, Matijašević-Obradović and Škorić (2017), during 2015 58.5% of the Republic of Serbia population had clean or slightly polluted air. This means that 41.5% of the population of the Republic of Serbia was during 2015 exposed to polluted air, or air the composition of which included a number of harmful substances (air pollutants). Article 7 of the Regulation on monitoring conditions and air quality requirements stipulates that the air pollution level in the territory of Serbia should be monitored by measuring concentrations of sulphur dioxide, nitrogen dioxide, and nitrogen oxides, suspended particles (PM10, PM2.5), lead, benzene, carbon monoxide, earth ozone, arsenic, cadmium, mercury nickel and benzo(a)pyrene in the air by automatic measurement instruments and/or by taking and analysing samples. According to Počuča, Matijašević-Obradović and Drašković (2017), air quality assessment in general, and in the Republic of Serbia territory, is conducted by applying the air quality index, defined by harmonizing local regulations with the EU regulations relating to this area.

According to the National Strategy for Sustainable Development (Official Gazette of the Republic of Serbia, No. 57/2008), the ambience air quality in urban areas depends on the emissions of SO2, NOx, SO, soot, powdery, organic and inorganic substances originating from thermal power supply plants, industry, transportation, incineration in individual boiler rooms, etc. Major pollutants are the thermal power plants in Obrenovac,

Kolubara and Kostolac, the refineries in Pančevo and Novi Sad, chemical industry and the metallurgical complexes located in Pančevo, Kruševac, Šabac, Bor and Smederevo. As a result of the concentration of the petrochemical and refinery complexes and the nitrogen processing plant, Pančevo has a cumulative air pollution. The quality of air in urban areas is also affected by a rise in the number of motor vehicles and industrial production, as well as the kind and number of pollution sources. Significant pollution of air is also caused by the use of petrol with the addition of lead, and diesel with a high percentage of sulphur.

Materials and methods

The subject of analysis in this paper is the participation ratio of different activity classification sectors in harmful substance emissions, and their shares in the gross domestic product, given that it is interesting to observe the relation of the shares of individual pollutants in environmental damage and their relation in contributing to economic development and a country's economic stability. The work is methodologically founded on the theoretical analysis of relevant contemporary opinions in theory, the normative analysis of the basic local and international legislative sources, and the quantitative analysis of the statistical indicators of the relation of the share of the activity classification sector in pollutant emissions to its share in the gross domestic product.

The research has been based on the official statistical data of the Statistical Office of the Republic of Serbia.

The investigation into the share ratio of different activity classification sectors in pollution emissions, and their shares in the gross domestic product will cover the years 2013 and 2017, while an overview of the total pollutant emissions regardless of the activity classification sectors will be made for the years 2015 and 2016.

Research results and discussion

In consideration of the available data of the Statistical Office of the Republic of Serbia, the gas emissions with the greenhouse effect were analysed for 2013 according to their sources, i.e. according to the activity classification sector, and at the same time the importance of the relevant activity classification sectors for economic development and the country's economic stability, expressed through their share in the gross domestic product.

The highest of the gas emissions with the greenhouse effect in 2013 was the emission of CO2 which amounted to 42,272.6 kilotonnes (Gg) in total, for all the presented activity classification sectors. The gas emissions with the greenhouse effect include the gases CO2, N2O, CH4, HFC, PFC, SF6, but in this research we have only presented the emission for CO2, given its scope of representation (the Environmental Statistics Group, 2017). The shares of each individual activity classification sector in the gas emissions with the greenhouse effect and in the gross domestic product (the current prices) in the Republic of Serbia for the year 2013 have been presented in the table below.

Table 1. Participation of classification of activities (CA) sectors in gas emissions with the greenhouse effect and in the gross domestic product (GDP) in the Republic of Serbia, in 2013

CA sectors	CO2 (Gg)		GDP (current prices)	
CA sectors - total	42272.6	%	3876403.4	%
Agriculture, forestry and fishing	479.2	1.13	305519.7	7.9
Mining and quarrying	1404.7	3.32	58834.6	1.5
Manufacturing	6171.5	14.60	623325.6	16.1
Electricity, gas, steam and air conditioning supply	32290.8	76.39	138806.1	3.6
Transportation and storage	786.9	1.86	161874.3	4.2
Other sectors	1139.5	2.70	2588043.1	66.7

Source: Environmental Statistics Group, 2017; Statistical Yearbook of the Republic of Serbia, 2017.

Note: Percentage values: calculated by the authors.

In consideration of the available data of the Statistical Office of the Republic of Serbia, the emissions of pollutants in the air were analysed for 2017 according to their sources, i.e. according to the activity classification sector and, as in the table above, the participation of the activity classification sectors in the gross domestic product for the same year.

Pollutant emissions in the air include the gases NOx, SOx, NH3, NMVOC, CO, PM10 and PM 2.5, with reported emissions for NOx, SOx and CO (Department of Statistics and Environmental Accounts, 2019). The participation of each individual activity classification sector in pollutant emissions in the air and in the gross domestic product (the current prices) in the Republic of Serbia in 2017 have been shown in the table below.

Table 2. Participation of classification of activities (CA) sectors in pollutant emissions in the air and in the gross domestic product (GDP) in the Republic of Serbia, in 2017

CA sectors	NO□ (Gg)		SO□ (Gg)		CO (Gg)		GDP (current prices)	
CA sectors - total	147.6	%	420.2	%	268.4	%	4754368.4	%
Agriculture, forestry and fishing	12.0	8.13	0.1	0.02	0.8	0.30	286244.6	6.02
Mining and quarrying	0.9	0.61	1.9	0.45	0.3	0.11	101197.1	2.13
Manufacturing	18.7	12.67	18.5	4.40	37.7	14.05	717434.7	15.09
Electricity, gas, steam and air conditioning supply	72.8	49.32	384.1	91.41	3.6	1.34	171370.7	3.60
Transportation and storage	3.2	2.17	0.3	0.07	1.9	0.71	186060.3	3.91
Other sectors	9.2	6.23	5.4	1.29	5.9	2.20	3292661	69.26

Source: Environmental Statistics Group, 2019; Statistical Yearbook of the Republic of Serbia, 2018

Note: Percentage values: calculated by the authors.

In consideration of the available data of the Statistical Office of the Republic of Serbia, the following table will present an overview of the total pollutant emissions including all the classification of activities sectors in 2015 and 2016.

Table 3. An overview of total pollutant emissions in 2015 and 2016

Pollutants	Unit of measure	2015	2016
Nox	Gg	142.1	144.6
NMVOC	Gg	123.1	127.3
SOx	Gg	405.4	408.3
NH3	Gg	64.6	64.6
PM2.5	Gg	37.59	40.6
PM10	Gg	51.4	55.1
TSP	Gg	271.6	85.0
CO	Gg	271.6	275.9
Pb	Mg	38.4	38.6
Cd	Mg	2.1	2.4
Hg	Mg	1.7	1.9
As	Mg	5.4	5.3
Cr	Mg	10.3	9.5
Cu	Mg	13.7	15.3
Ni	Mg	12.7	15.1
Se	Mg	13.0	13.0
Zn	Mg	51.4	52.7
PCDD	g l-Teq	50.3	50.2
Benzo (a) pyrene	Mg	6.3	7.2
Benzo (b) fluoranthene	Mg	6.9	8.1
Benzo (k) fluoranthene	Mg	2.7	3.2
Indeno (1,2,3-cd) pyrene	Mg	3.5	3.9
4 PAH (total)	Mg	22.0	25.8
HCB	kg	2.2	2.2
PCB	kg	726.9	722.9

Source: Statistical Yearbook of the Republic of Serbia, 2018.

The data from table 1 point to the fact that the highest share in the emission of gases with the greenhouse effect in 2013 was that of the sector of electrical power, gas and steam supply (76.39%), while it was only the forth based on its participation in the gross domestic product, expressed in the form of current prices, out of the five presented classification of activities sectors in total. The sector with the lowest share in the emission of gases with the greenhouse effect is the sector of agriculture, forestry and fishing, which holds the second position out of the five presented activity classification sectors based on its share in the gross domestic product, expressed in the current prices. The sector with the highest gross domestic product share is the processing industry sector, which is in the second place (14.6%) based on its participation in the emission of gases with the greenhouse effect, out of the five presented activity classification sectors. Finally, the sector with the lowest share in the gross domestic product is the sector of mining, which holds the third place (3.3%) based on its participation in the emission of gases with the greenhouse effect, out of the five presented activity classification sectors.

The data from table 2 point to the fact that the highest participation in the emission of pollutants in the air in 2017, based on the source, or the activity classification sector, was that of the sector of electrical energy, gas and steam supply (49.32% for NOx and 91.41% for SOx), while this sector was only the fourth out of the five presented activity classification sectors, based on its share in the gross domestic product, expressed in the current prices (3.60%). The sector with the highest share in the emission of the CO pollutant into the air is the processing industry sector (14.5%), which holds the leading position among the five presented activity classification sectors by its share in the gross domestic product (15.09%), expressed in the current prices. The sectors with the lowest shares of pollutant emissions into the air classified by their sources, or the activity classification sectors in 2017 are the sector of mining (0.61% for NOx and 0.11% for CO) and the sector of agriculture, forestry and fishing (0.02% for SOx), while the mining sector holds the fifth position (2.13%), and the sector of agriculture, forestry and fishing the second (6.02%) among the five presented activity classification sectors, in terms of their participation in the gross domestic product. Thus, the sector with the highest share in the gross domestic product in 2017 is the processing industry sector (15.09%), while the sector of mining has the lowest share (2.13%).

The data from Table 3 indicate the fact that the emission of pollutants for 2016, generally speaking, is marked by progressive tendencies. In 2015 higher emissions were recorded for the following pollutants: tetradeuteropropionic acid - TSP (2015: 271.6 Gg, compared to 2016: 85.0 Gg), arsenic - As (2015: 5.4 Mg, compared to 2016: 5.3 Mg), chromium - Cr (2015:10.3 Mg, compared to 2016: 9.5 Mg), Polychlorinated dibenzodioxin - PCDD (2015: 50.3 g l-Teq, compared to 2016: 50.2 g l-Teq) and Polychlorinated biphenyls - PCB (2015: 726.9 kg, compared to 2016: 722.9 kg).

The structure and importance of criminal law regulations in the field of environmental protection

The need for taking legal measures in the field of environmental protection is based on the assessment that the endangerment of the environment by criminal acts is an ever growing problem which causes significant environmental damage. The mankind has become aware of the fact that without the healthy environment there is no sustainable development, which guarantees the appropriate conditions for the survival of man (Hamidović, 2012). In view of the fact that every criminal act has consequences, i.e. that there is no criminal act without a consequence for the protected object, it is indisputable that the consequences for individual elements of the environment as a general object of protection are very difficult to remedy (if that possibility exists at all), and that a certain reaction of the social community is required, both in the field of prevention, and in the field of repressive action relative to the already taken actions of the criminal act.

The human right to a healthy environment is one of the basic human rights, and the environment must be protected by all possible, including criminal-law measures.

The basic legal text in the Republic of Serbia which defines criminal acts, i.e. by which certain behaviours qualify as criminal acts, is the Criminal Code.

The Criminal Code has systematized eighteen criminal acts, thus primarily protecting the environment, in the 24th chapter, entitled Criminal Acts against the Environment. Through this specification in the Criminal Code, as the basic legal text in the field of criminal law regulations, the environment has become an independent object of protection.

The question raised in legal theory is what the primary aim is of the protection of environmental goods. In other words, what really constitutes the object of protection in criminal acts against the environment. The leading opinion is that "the primary aim of protecting environmental goods should be the protection of man's right to a living environment" (Stojanović and Perić, 2002).

The consequence of the aforesaid criminal acts consists in the impairment or endangerment of the environment. The consequence in the form of impairment consists of destroying or damaging the environment, while the consequence in the form of endangerment consists of posing dangers to the environment, provided that we should draw a distinction between concrete and abstract dangers. Namely, as Hamidović (2012) points out, "a concrete danger endangers the environment, but the impairment does not occur, while an abstract danger only creates a possibility for endangering the environment, without that really happening. The consequences relating to impairment of the environment must be proved by providing particular evidence, while concrete and abstract dangers are not proved, they are irrefutably presumed, by the very fact that the action taken is a typical example of danger to the environment".

On the other hand, it must be noted that all acts against the environment in our country are not included in a single regulation (Vig and Gajinov, 2010), so that besides the primary, proper or "pure" acts contained in the Criminal Code, there are other acts as well, which are usually called improper, secondary or "impure" criminal acts against the environment, contained in the criminal provisions of other regulations relating to protection of the environment. So that, e.g. the Law on Plant Health (Official Gazette of the Republic of Serbia, No. 41/2009) defines as a criminal act the introduction and expansion of harmful organisms, or plants, plant products and certain objects, contrary to the regulations on banning their introduction, expansion and import into our country, or a protected area within it (article 95.), the Law on Waters (Official Gazette of the Republic of Serbia, Nos. 30/2010 and 93/2012) stipulates two criminal acts: unauthorized filling or use of water from accumulations, thus causing danger to the life and health of people and the environment, and damage in the exploitation of river aggradations (articles 209. and 210.) (Gajinov and Vig, 2012), while on the other hand the Law on Air Protection only provides for economic offences and misdemeanour acts which, in the terminology of torts in criminal law, are only a minor category of torts compared to the category of criminal offences.

In addition, according to Gajinov and Vig (2012), we could say that the "large number and diversity of incriminations point to the fact that the Criminal Code and secondary

legislation protect almost all the individual parts of the ecos, which are in a close interrelation which constitutes the environment as their unity, that certain incriminations also refer to. Besides that, by protecting the environment and its individual entities, we indirectly protect human life, health, the right to timely information on the imminent risks, which makes these incriminations very important in terms of protecting the principal human values".

Conclusions

The quality of air is a very important parameter for both humans and all other living beings on Earth. The subject of analysis in this paper was the participation ratio of different activity classification sectors in harmful substance emissions, and their shares in the gross domestic product. The research has been based on the official statistical data of the Statistical Office of the Republic of Serbia. Some of the most important conclusions reached by the research are as follows.

In the context of analysing the relations of the shares of individual pollutants in impairing the environment and their shares in contributing to economic development and economic stability of the country, we may conclude that the sectors with the highest shares in the gross domestic product do not belong to the categories of the most significant emittors of pollutants into the air, or gases with the greenhouse effect.

In particular, in 2013, the highest shares in the gross domestic product were recorded in the sectors of processing industry and agriculture, forestry and fishing, while their participation in emitting gases with greenhouse effect was secondary in nature compared to the sector of electrical energy, gas and steam supply.

In 2017, the highest share in emitting pollutants into the air by their sources, or activity classification sectors was recorded in the sector of electrical energy, gas and steam supply, while the sector with the highest share in emitting the CO pollutant in the air was the processing industry. In addition to the aforesaid, the sector with the highest share in the gross domestic product in 2017 is the processing industry sector, while the mining sector ranks the lowest.

Finally, by analysing the total emission of pollutants in the air, for the period 2015-2016, we came to the conclusion that the emission of pollutants in 2016 in general showed progressive tendencies. A higher emission of the following pollutants was recorded in 2015: TSP, As, Cr, PCDD and PCB.

A particular issue in the paper was related to the structure and importance of criminal law regulations in the field of environmental protection, which was specifically pointed out by the authors Hamidović, Stojanović and Perić, Vig and Gajinov. The subject of analysis in this part of the paper were also current normative acts. In this section it is important to emphasize the following conclusion. The need for taking legal measures in the field of environmental protection is based on the assessment that the endangerment of the environment by criminal acts is an ever growing problem which

causes significant environmental damage. The human right to a healthy environment is one of the basic human rights, and the environment must be protected by all possible, including criminal-law measures.

Conflict of interests

The authors declare no conflict of interest.

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CONSUMERS' INTENTIONS TO USE OF ORGANICALLY PRODUCED FOOD IN THE SUMADIJA REGION

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ARTICLE INFO

Review Article

Received: *03 December 2019*

Accepted: *11 March 2020*

doi:10.5937/ekoPolj2001253S

UDC 366.1:631.147(497.11 Šumadija)

Keywords:

consumers' behavior, consumers' intentions, organic food

***JEL**: Q013*

ABSTRACT

Organic agriculture is a significant factor in sustainable development, and the production and marketing of organic products tend to grow steadily. The main goal of organic farming is to produce high quality food in precisely defined conditions. There are great untapped potentials for the development of organic production in Šumadija, thanking to suitable climatic and agro-ecological conditions, knowledge and tradition. The aim of the paper is to investigate the importance and value of organic products according to the opinion of consumers of the Šumadija region, their buying habits, and the source of information about organic products. The results show that the consumers are not buying enough organic food, but understand its role in reducing health risks. The general conclusion is that the development of organic production depends on knowledge, awareness of the need to conserve natural resources and the environment, as well as economic factors and incentives for organic production.

Introduction

Quality food is a basic requirement of the modern consumer. Specific agro-technical measures in organic production create conditions for the plants to synthesize and accumulate, under the optimal production conditions, for the type and variety of characteristic matter. The development of organic production and other forms of sustainable agriculture depends on knowledge, awareness of the need to conserve natural resources and the environment, as well as economic factors, markets and incentives for organic production and environmental protection.

The term sustainable agriculture refers to an integrated system of plant and livestock

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production practices that will, in the long term: meet people's food needs, improve the quality of the environment and natural resources on which the agricultural economy depends, enable the efficient use of non-renewable and renewable resources, enable the natural biological cycles to unfold, sustain the economic value of production, and improve the quality of life of farmers and society as a whole.

Consumers also play an important role in creating a sustainable food production system. Through demand, they send a strong message to manufacturers, sellers, and other supply chain actors about what is important to them. The price of agricultural products, as well as their nutritional value and quality have always had a decisive influence on consumer choice. The challenge today is to find a strategy that will develop customer awareness, so that preserving resources, the environment and social justice are one of the decisive motives for buying. At the same time, new regulations, laws and interventions by state institutions must enable sustainable agricultural production to have adequate market operations and access to the general public.

Research objectives are:

1. Determine whether, when purchasing food, consumers take into account its organic origin;
2. Explore the reasons why residents of the Šumadija region use organically produced food;
3. Determine the degree of familiarity of the residents of the Šumadija region with the difference between organically produced food and food produced in the conventional way;
4. Examine how residents of the Šumadija region are informed about the benefits of using organically produced food;
5. Examine residents' motives for purchasing organically produced food;
6. Explore where residents buy organically produced food in the Šumadija region;
7. Examine the degree of satisfaction of the people from the Šumadija region with the range of organically produced food in their region.

Research hypotheses are defined as:

1. Residents of the Šumadija region prefer to buy organic products, with particular buying habits, information and satisfaction regarding these products.
2. Consumers' behavior in the Šumadija region in relation to organic products is conditioned by their socio-demographic characteristics.

Literature Review

The Šumadija region is located in the central part of the Republic of Serbia, between rivers Sava and Danube in the north, Velika Morava in the east, West Morava in the

south and Kolubara in the west. The area of the region is 2.387 km^2, of which 835 km^2 is the territory of the City of Kragujevac, which is also the largest city in the entire region. The population of the Šumadija region is 298.778 people and the average population density is 125 inhabitants/km^2. The city of Kragujevac is the largest city on the territory of Šumadija, and it is also the administrative, economic, cultural, educational and health center of the entire region of Šumadija and central Serbia. It is located in the central part of the Republic of Serbia and the Šumadija region, 140 km southeast of Belgrade.

Šumadija region is located in the central part of Serbia, in the area of numerous local watercourses. Natural conditions favor the development of different agricultural systems. The alluvial plains in the river valleys favor the development of arable crops and vegetable gardens, and are more favorable to the development of viticulture and fruit growing. The land is mostly used for arable land, orchards and vineyards, but there are also meadows, pastures and forest areas.

If we look at the structure of agricultural land in the Šumadija region, we can conclude that the most dominant are arable land and gardens, which cover 69% of the total agricultural area. Here, the area under cereals, which accounts for 40.8% of the total agricultural area of the region, should be singled out. In the overall structure of agricultural land in the region, orchards cover 9.2% of the area. A negligibly small percentage in the structure of agricultural land covers areas under vineyards - 2% of the agricultural area of the entire region.

According to the latest official census conducted in 2012, 64062 inhabitants live in the municipalities of Sumadija related to agricultural activities, or 12.2% of the total population of the region. Of this number, two thirds of the population is active agricultural population. Comparing this data with data at the republican level, it can be observed that the percentage share in the region is slightly higher than the republican one. Namely, the agricultural population in the total population of the Republic of Serbia participates with 10.9%, of which the active agricultural population makes 64.8%.

Šumadija has abundant natural capacities, which are a good basis for the future development of organic agriculture, since natural resources are scarce. The composition and structure of natural resources are very favorable. Šumadija has relatively unpolluted land, favorable climate and rich water potential and preserved biodiversity, which all together are basic prerequisites for dealing with organic agriculture.

Organic food production is an extremely promising activity that is receiving considerable attention in the developed countries. It is embedded in national strategies and the demand for healthy food is intensifying year by year. Increasing consumption of organic agri-food products leads to the preservation of health, and environmental protection.

There are numerous studies on the reasons for using organically produced food in the world. Thus, Magetts et al (1997) placed special emphasis on research into the impact of respondents' educational attainment on healthy food choices, and the result indicated that this was the strongest influence factor. The authors also pointed to a significant

number of respondents who knew nothing about healthy food, which clearly indicated the need for their education. In contrast, Grunert and Juhl (1995) presented research findings with Danish school teachers regarding their values, environmental attitudes, and organic food purchasing. The aim was to examine the application of value theory and measurement approaches in explaining specific aspects of consumer behavior.

Hendrik et al (1998) compared the determinants of organic food consumption, based on a sample of shoppers from health food stores versus those in a nationally representative household. Organic food customers are considered to be more responsible for their own health and to have taken preventative health measures more often than the general population. The absence of pesticides, the environment and better taste were the main reasons for buying organic food. Discriminant analyses have shown that the difference between these two customer groups indicates that organic food consumption is in fact part of a lifestyle that results from a specific ideology, linked to a particular value system. A similar survey was conducted by Cowan (1998), on a large sample of European Union consumers, with 60% of them saying that they were very concerned about the quality of the meat they were offered. The majority of respondents stated that the price of meat does not play a decisive role in the purchase, but a confidence in the health safety of food. The same research also pointed to the encouraging fact that more than half of younger respondents are aware of the health hazards that the consumption of meat produced by intensive agriculture can have.

Results of the study by Fotopoulos et al. (1999) have shown that a lack of knowledge is a key problem hampering the momentum of health food development in the future, and education at all levels suggested by competent educators is suggested. as the first and basic measure of improvement. In contrast, Toriusen et al (2001), exploring the potential of organic agriculture, are convinced that it is very important to inform consumers and producers about food quality and systemic issues. Their analysis showed that traditional aspects of food quality, such as freshness and taste, were very important to consumers, and those buying organic food were more concerned with environmental and health issues and identified consumer orientations in the food market. Survey results in the UK indicated the reasons of respondents to buy or not to buy healthy food. It has been found that 36% of consumers consider the promotion of personal health as the primary motive for purchasing healthy food, 31% opt for better taste and 25% consider food origin (Hallam, 2002).

Stolz et al (2011) conducted a survey aimed at isolating casual organic consumers given their preferences for organic and conventional products. In addition, the aim was to analyze differences between consumption in segments in terms of their sensitivity to prices and attitudes towards food. Different segments were identified and the conclusion was that communicating quality product features is a promising marketing tool for product differentiation for both organic and conventional foods.

By analyzing the attitudes, motivations, demographics and consumer behavior factors that influence food choices among Australian consumers who have consumed at least

some organic food in the previous 12 months, Stevart Lockie et al (2004) found that organic food quality and emotional consumer experience were the main determinants of increasing organic food consumption. Increasing consumption is also related to other behaviors of the so-called green spending such as recycling and, at lower levels, concerns about buying and preparing food itself. Most of these factors, in turn, are strongly influenced by gender and the responsibility of women for providing food in their households. Education has even had a negative impact on this behavior due to the lower level of education of women, and - interestingly - income, age, political views and environmental values and willingness to pay for safe and organic food have had very little effect. A study by Tsakiridou et al (2008) concluded that Greeks as consumers are informed about environmental and health issues. They seek information on the nutritional value of foods and require products that are free of chemical additives. The results showed that the majority of consumers perceive organic food as fruits and vegetables and that, although certain demographic characteristics indicate a link with the consumption of these foods, in this study their interrelationships were not significant.

Regarding research in Serbia, Dašić et al (2019) conducted a study on the importance and value of organic products in the opinion of customers, their buying habits, their source of information or their level of knowledge and satisfaction with organic products. The results showed that there are different buying habits of organic products. The differences between the customers are expressed on the basis of their way of informing about organic products, the reasons for buying organic products, their needs for product quality in the market and according to the place of purchase of organic products. Consumer habits of different gender and age, status, education and place of residence were also found to be very different. Women are more likely to use information from the electronic media, other people, and professional literature, while men are more likely to use the journal for information on the characteristics of organic products. Also, customers under the age of 30 and those between 41 and 50 mainly use the Internet and other electronic media. The authors also concluded that most consumers in Serbia preferred to use organic products over conventional products. They buy organic products in various places: supermarkets, markets and specialty stores. A significantly small number of customers buy organic products directly from producers or online. Customers' decision to buy organic products was influenced the most by the reliability of the producers, and the least by the locations.

Zaric & Vasiljevic (2007) pointed out that in the Western European countries most of the organic products are sold through supermarkets, while it is estimated that specialized stores are the most important for traffic in Serbia. There are conditions for organic production in Serbia, but producers are currently showing little interest. Domestic demand is low, primarily due to the lack of consumer information, but also due to the lack of confidence in quality.

By researching consumers' attitudes about organic food consumption in Serbia, Vlahovic et al (2011) concluded that three quarters of the respondents are not familiar with the organic food law. In addition, more significant consumer education is needed

in this direction in order for them to be better informed and for the demand to be increased. Most respondents (40%) have confidence in domestic organic products, which is a good basis for increasing market supply. The majority of respondents buy organic agricultural products from the markets (40%). It was noted that the importance of specialized organic food shops is decreasing. Half of the respondents believe that organic agricultural products have a high price, which is a significant limiting factor in increasing demand and consumption. Almost half of those surveyed are willing to pay more to buy organic products.

Vlahovic & Sojic (2016) concluded that in the Republic of Serbia there is an increasing interest in organic agri-food products. Respondents' good information and health concerns largely determine the decision to allocate more resources to the purchase and consumption of organic food. The price and the level of income of the respondents represent the basic limiting factors of demand for organic agri-food products. The low purchasing power of the population makes it difficult for consumers to increase their high nutrition expenditures by purchasing more expensive organic products. Organic food producers need to make branding a marketing activity that will have a competitive edge in the market. In this way, customer loyalty is created and sales are increased and thus better financial results are achieved.

Methodology of the Research

The following methods were used to investigate the use of organically produced food by the inhabitants of the Šumadija region: theoretical analysis and synthesis method and descriptive method. The method of theoretical analysis and synthesis generalizes and formulates the most important findings from empirical research, and it is best suited to set the framework and basis of any research. This method determines the goal, tasks and other elements of empirical research. The descriptive method is used to describe the obtained results, based on the stated opinions of the respondents. It is the most commonly used method in social science research, as it describes the phenomena under study and thus introduces them more closely to their essence, the interdependence with other phenomena. It was used here to collect process and interpret data. The data obtained by the survey were processed qualitatively and quantitatively in percentages, and the results of the survey were given in textual and graphical form.

The popularity of organic food is measured by the increase in sales, which has increased by over 5% annually in recent years. Larger global markets such as the US estimate that organic food accounts for about 4% of total annual food sales, and forecasts for next year suggest organic fruit and vegetable sales could grow by a fantastic 14%. In Western Europe and the Americas, surveys show that consumers' main reasons for using organic food are its potential contamination, cost and environmental protection during production. For the purpose of researching the use of organically produced food in the inhabitants of the Šumadija region, the target group were the citizens of Kragujevac. The survey included 100 citizens of the city of Kragujevac of all age. The survey was conducted through a systematic questionnaire, which was filled in by the citizens on the spot.

Based on the gender structure of the participants in this survey, we can conclude that there were more female respondents (52%) than male respondents (48%). As this research included the use of organically produced food in the inhabitants of the Šumadija region, the age structure of the respondents as well as gender was a relevant indicator for this research, so the citizens of all age groups participated in the survey.

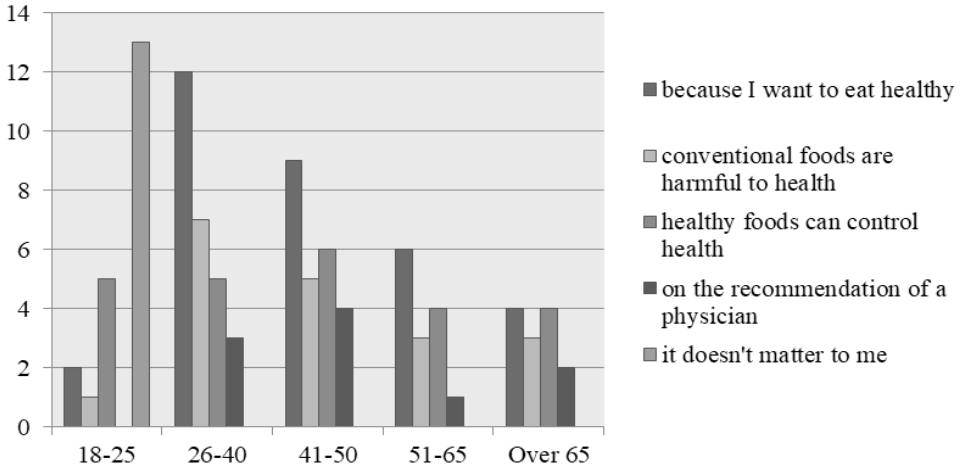
The results on the age of the respondents showed that the majority of citizens were aged 26 to 40 (28%), followed by the respondents between 41 and 50 – (24%). The youngest respondents, between 18 and 25, made 21%, followed by respondents between 51 and 65, (14%), while the smallest number of respondents were in the oldest age group over 65 (13%). We can also conclude that the younger population was most happy with this survey, so that a larger number of respondents belongs to the younger population.

Results

The first question asked to the people of the Šumadija region was whether they were considering organic origin when buying food. The answers were presented by gender and age of the survey participants. The data obtained suggested that many more female residents take care of organic origin when shopping compared to male residents, because only 12 of male residents stated that they took care of organic origin. The results showed that when buying food, most organic consumption is taken into account by consumers between the ages of 26 and 40, while the youngest residents, or the youngest participants in the survey, take the least care, since more than 60% of the youngest respondents make no difference and never care. The oldest surveyed residents usually always or sometimes worry about the organic origin of the food they buy.

The next thesis of this research was to examine the reasons why it is important that the foods we consume are of organic origin. Based on the results of this part of the research, we can conclude that female respondents generally have a positive opinion about organically produced food compared to male respondents; that is, most female respondents stated that they want to eat healthy and that they can control their healthy diet, and that conventional food production is detrimental to health due to the addition of additives and preservatives.

Figure 1. Reasons for consuming organic food by age



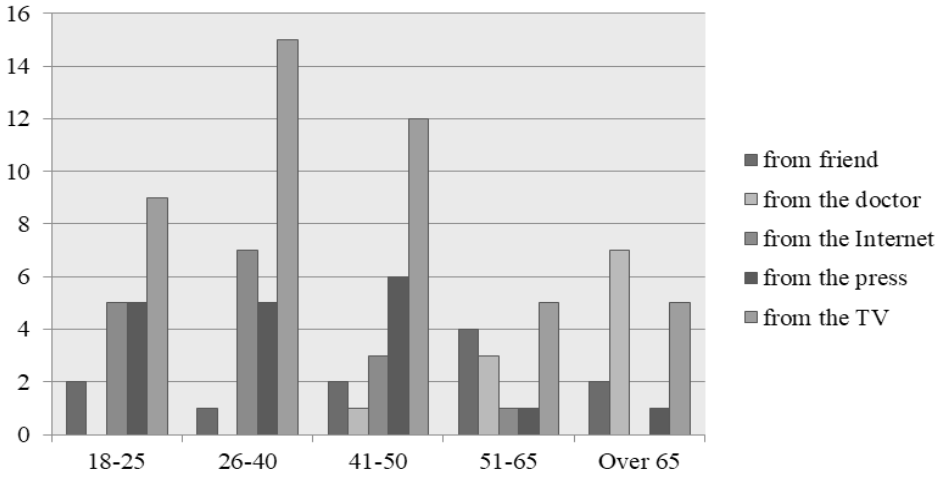
Source: Author's calculation

Male respondents have the most answers that it does not matter if the food they consumed was of organic origin. The most important thing to the residents between 26 and 40 as well as to the oldest survey participants is that their food is of organic origin while the youngest participants (belonging to the age between 18 and 25) do not care whether the food they consume is of organic origin. The oldest survey participants, as well as those between 51 and 65, generally take care of consuming organic foods.

The next hypothesis was about exploring the extent to which respondents are aware of the difference between organically produced food and food produced in the conventional way. The majority of respondents (predominantly female) were aware of the differences between organically produced food and food produced in a conventional way and the majority of those who were not aware were among the youngest among the male population surveyed.

Respondents between 41 and 50 years of age, and largely residents between 26 and 40, are fully aware of the differences. The majority of those unfamiliar with the differences between organically produced food and food produced in the conventional way belong to the age group between 18 and 25, while the older population surveyed is largely aware of the differences.

Figure 2. Method of informing the respondents about the benefits of using organically produced food by age



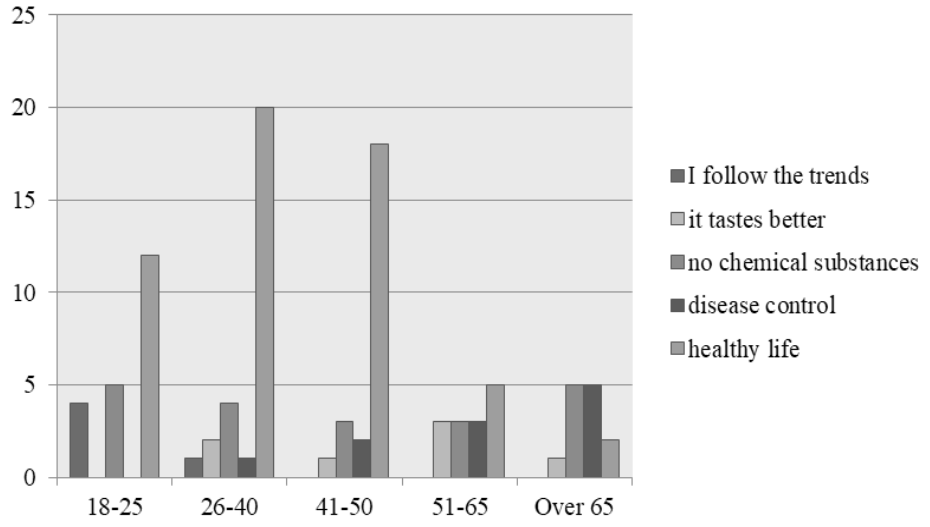
Source: Author's calculation

The next aim of the survey was to examine how the surveyed citizens are informed about the benefits of using organically produced food. Almost half of the respondents received information about healthy food and the benefits of healthy nutrition through television (46%), then through the press, referring to daily and weekly press (18%), then via the Internet or electronic media (14%), health clinics, i.e. from doctors (11%) and from friends (11%).

When it comes to informing on the health benefits of respondents by age, the results show that the youngest surveyed population accesses information most often via television and the Internet, as do residents between the ages of 26 and 40. In addition to television, the elderly population most often uses print media or friendly advice in addition to television, and the oldest population, over 65 years of age, receive most information in health care dispensaries, by doctors. Overall, television is the most popular medium through which the population receives all the necessary information about the benefits of using organically produced food.

The next hypothesis was to examine the motives of the inhabitants of the Sumadijaregion for the use of organically produced food. More than half of them (57%) cite a healthy life as their primary motive, then a fact that there are no chemical substances (20%), and that they want to control the disease through organic nutrition. There is no difference in the gender response of the interviewed citizens. The youngest residents cite healthy living as the main motive for using healthy food, the same as the other age groups of the respondents, while 4% of them indicate that using healthy nutrition follows current world trends.

Figure 3. Motives for buying organically produced food by age



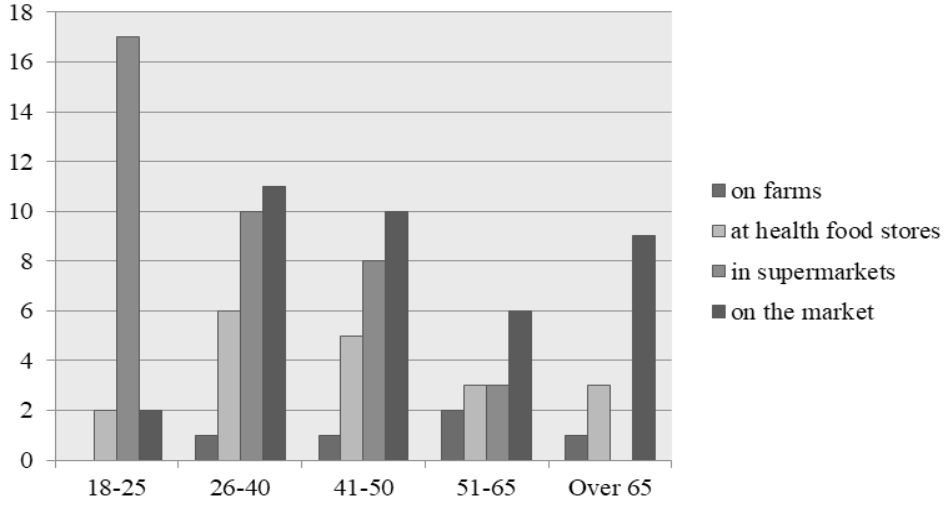
Source: Author's calculation

The next hypothesis of the research concerned the places of purchase of organically produced food. The results show that the surveyed citizens mostly buy their food at markets and supermarkets - 38%, then in health food stores, and on farms. It is noticeable that men buy healthier food much more in supermarkets, while women buy it at markets.

The youngest population mostly purchases organically produced food in supermarkets, unlike the oldest population who purchases this kind of food mainly at markets and health food stores. Health food stores are mostly visited by the population between 26 and 40 years of age, as well as between 41 and 50 years of age.

The next question we wanted to explore is whether the citizens of the Šumadija region are satisfied with the presence and availability of organically produced food on the domestic market and the results show that 28% of respondents are completely satisfied, 14% are largely satisfied, 30% are mostly satisfied. No noticeable differences were observed in the responses examined by gender. The highest level of dissatisfaction with the availability and representation in the healthy food market was recorded among the 26 to 40-year-old population, while the least dissatisfied was the older population of the surveyed citizens. The most satisfied were the residents of the Šumadija region between 41 and 50, as well as between 51 and 65 years of age.

Figure 4. Place of purchase of organically produced food by age



Source: Author's calculation

The last hypothesis of the research concerned the level of satisfaction with the range of organically produced food in the domestic market. The obtained results show that most of them stated that they were dissatisfied with the range (31%), 27% were partially satisfied with the range, and 23% were very satisfied. The most dissatisfied were females, while the male respondents were partially satisfied. Citizens of the younger population as well as the population between 26 and 40 were the least satisfied with the assortment, while those aged 41 to 50 were the most satisfied with the assortment.

Discussion

According to the results of the survey, residents of the Šumadija region buy organic food mainly because they understand its role in reducing health risks (33%), as confirmed by the findings of a 2002 study by Hallam (2002), which indicate that 36% of consumers have the promotion of personal health as the primary motive for buying healthy food. Similar results were obtained by Magnusson et al (2003) in a study regarding attitudes and behavior towards organic food, environmental behavior and estimated consequences of organic food choices in terms of human health, environment and animal welfare in a sample of 2000 Swedish citizens, aged 18 to 65. Similar to the UK study (2002) mentioned above, the strongest link between buying organic food is due to the perceived benefit to human health. A 2016 survey by Vlahovic & Sojic showed that, among the surveyed consumers, the first concern is health. 44% of respondents stated that this was their most important reason, 15% emphasized health as an important factor, and only 2% considered that health was not important factor when buying organic agri-food products.

The next most important reason to buy was the belief that food tastes better, followed by those who consider organic food more natural and those who want to avoid genetically modified products. Similar results were shown by a study by Wier et al (2008) in which the authors examine organic food markets in the UK and Denmark, identifying major differences and similarities in consumer perceptions and priorities. The authors found that organic food purchasing decisions were primarily motivated by attributes such as freshness, taste, and health.

The results showed that the surveyed citizens mostly buy food at markets and supermarkets - 38%, then in health food stores and on farms. Zaric & Vasiljevic (2007) stated that in Western European countries most organic products are sold through supermarkets, while the assessment is that specialized stores are the most important in Serbia. A significantly lower proportion of respondents (14.7%) stated that they would acquire the same directly from the manufacturer (on the farm or home delivery), while online shopping had a negligible share of 0.2%.

The youngest residents cite healthy living as the main motive for using healthy food, the same as the other age groups of the respondents, while 4% of them indicate that using healthy nutrition follows current world trends. A study by Vlahović & Šojić (2016) found that there was no significant correlation between organic food purchases and respondents' age categories, meaning that respondents of all age categories were equally buying organic foods. There is a significant correlation between the amount of income and the purchase of organic agri-food products: higher income respondents buy organic agri-food products more. With rising living standards, demand for organic products can be expected. Also, a significant correlation between educational attainment and purchase of organic agri-food products has been found in the study.

Given the dominance of price and quality in the decision to purchase these products, it is imperative that manufacturers focus more on consumers who are already "more environmentally conscious and more concerned about health" because of proven product provenance, attractive packaging and the fact that the product is more environmentally friendly. Respondents who have tried organic food products are more concerned about calories, prefer to buy home-made food products, eat mostly fresh foods compared to respondents who have not tried organic food products, and are likely informed about a healthy lifestyle.

Consumption of organic agri-food products is based on public awareness of the increasing pressures of environmental problems. The introduction of an incentive strategy to consume organic products is thought to contribute to their increased use (Grant, 2007).

Supermarkets have made a major contribution to the promotion of the organic sector, because it is only when supermarkets have included organic products in their product range that sales of these products have become popular. The domestic organic market is small and underdeveloped. Organic products can be purchased in a small number of specialized stores, farms and wholesale.

The characteristics of the Šumadija organic product market are: the largest number of imported products, retail sector underdevelopment, uninformed consumers, unrecognizable labels organic product, fake products.

The Sumadija market was selling products that were promoted as organic, and they were not at all. As a result, consumers have become skeptical when it comes to purchasing organic products. This should be tackled by introducing more frequent inspection controls and paying high fines for impersonation of products, in order to protect consumers and organic food producers. Organic food will not become popular in our country for many reasons: consumer ignorance, low purchasing power, low availability of organic products in the domestic market that are not sufficiently represented through sales channels, higher prices for some products, relatively healthy conventional food, etc.

Conclusion

Šumadija has rich natural capacities which are a good basis for the future development of organic agriculture. The composition and structure of natural resources is very favorable. Šumadija has relatively unpolluted land, a favorable climate and rich water potential and preserved biodiversity, which all together are basic prerequisites for dealing with organic agriculture. Organic production is not possible if there is no minimum required conservation of natural resources in the areas where production is organized, while on the other hand, the organic production process has a positive effect on the conservation and improvement of the environmental quality of these areas.

Given that the organic market in Šumadija is underdeveloped, the role of marketing is of paramount importance. In this context, marketing in our conditions should be understood not only as activities undertaken by one producer or group of producers in order to bring their products closer to as many customers as possible, but as one of the general measures to support the development of the entire organic sector in Serbia. In this context, marketing can be seen as a way of developing the awareness of the general population as potential consumers about the importance of organic production and the characteristics of organic products.

Increasing demand for organic products is directly conditioned by consumers' eating and shopping habits. Changing habits is directly conditioned by the level of consciousness development. Food producers and distributors, with the help of government, faculty, organic food associations, the media, can influence the behavior and culture of consuming organic food. An important element in developing consumer awareness of organic production and products concerns their recognition. At the same time, recognizability means both a clearly visible and specific sign marking of an organic product, as well as a distinctive point of sale. Another important point in enhancing the consumption of organic products in our country concerns the guarantee of product quality; that is, consumer confidence in producers and control systems. Also, market supply is a significant factor in boosting demand for organic produce. Namely, the wider distribution of these products, as well as their more diverse offerings, with clear

recognition, provides better accessibility to consumers, and thus has the potential to boost their demand.

The main retail outlets are markets, health food stores and supermarkets. Supermarkets have a small share of sales today; however, it is certain that organic food will increasingly be sold in large supermarket chains that are likely to target customers who consume organic food for health reasons, while smaller regional stores will focus on shoppers of organic food for philosophical reasons.

Conflict of interests

The authors declare no conflict of interest.

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PROPERTY INSURANCE AND INNOVATIVE BUILDING TECHNIQUES - REDUCING THE CONSEQUENCES OF CLIMATE CHANGE

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A R T I C L E I N F O

Review Article

Received: *17 January 2020*

Accepted: *08 March 2020*

doi:10.5937/ekoPolj2001269M

UDC 368.1+624]:551.583

Keywords:

Climate change, property insurance, MC2 construction system

***JEL**: G22, Q5*

A B S T R A C T

Climate changes are recognized as a matter of global importance. They can have a long term monetary and non-monetary influence on the lives and prosperity of people. Almost all industries are affected by climate change, but insurance companies and the construction industry suffer particularly high pressure. Due to the unpredictability of climate changes and increased risk, the possibility of withdrawing insurance against natural disasters has been considered. From the construction industry, it is required to adapt to changes, by building less polluting buildings, resistant to destructive effects of climate changes. The insurance industry has recognized the direct connection between green - sustainable practices and reduced risk, which in recent years has been the reason, for becoming a leader in creating, energy and resource efficiency. The contribution of this paper is in the demonstration how innovative construction solution can contribute to sustainable insurance and reducing the consequences of climate change.

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Introduction

Climate changes are recognized as a matter of global importance, which effects can be observed on all continents. Continuous growth of average global temperatures leads to frequent and severe natural disasters, which are causing loss of lives and high financial losses due to the property damage. Almost all industries are affected by climate change, but insurance companies and the construction industry suffer particularly high pressure. Insurance is a measure that reduces risk and compensates for damages. The higher the risk is, the higher the insurance premium will be. But if the natural disasters continue to increase unpredictably, the property insurance could be withdrawn. Millions of Euros and dollars that the insurance industry had to compensate to the insured around the world and the uncertain future motivated the insurance industry to promote sustainable energy technologies. Although fighting climate change is considered to be a reduction of greenhouse gases, equal attention has been given to the possibility of adapting existing and building new buildings, so that they are more stable and more resistant to the natural disasters. Extreme climatic conditions are becoming a norm that the construction industry needs to adapt to by using renewable energy sources and investing in innovative building solutions. The aim of this adjustment is the construction of buildings that can withstand storm winds, floods, extremely low and high temperatures, earthquakes and fires, with no or minimal damage. The construction of such structures could be considered as a measure of prevention, which would provide accessible and sustainable insurance in the coming years. In this paper, an innovative way of constructing an object resistant to climate change has been shown - MC^2 construction system.

Methodology

With respect to the climate changes, sustainable insurance and innovative MC^2 construction system using relevant literature following methods were applied: induction deduction, synthesis, analysis of the content. In this respect, the research methodology aims to analyze how the innovative construction solution - MC2 construction system can contribute to sustainable insurance and reducing the consequences of climate change. Also, it covers the in-depth content analysis of available literature on this matter of national and foreign scholars. By using this methodology and practical methods described in this paper could provide affordable and sustainable insurance in the coming years, increase the quality of buildings and the well-being of people.

Results of research and discussion

Climate change

Climate change refers to the increase in average surface temperatures on Earth. The scientific consensus agrees that climate change is primarily a consequence of the human use of fossil fuels, which releases carbon dioxide, methane and other greenhouse gases in the air. These gases can absorb a spectrum of infrared light, preventing a part of the thermal radiation coming to the earth's surface, to be reflected and returned to

space, thus contributing to the warming of our atmosphere. Produced, these gases can remain "stuck" in the atmosphere for tens or hundreds of years. Climate change over the past 35 years has led to a rise in temperatures of about 1.1º C on Earth, resulting in melting of glaciers, an increase in ocean levels and the overflow of coastal areas (European Commission, 2017). Warm air can hold large amounts of water, due to higher evaporation rates, causing abundant rains and floods to become more frequent. With increasing global temperatures, a process such as desertification transforms formerly fertile areas into drought environments. Storm winds, floods, earthquakes, etc. resulted in a loss of human life and severe property damage. An overview of the natural disasters caused by the climate change as well as the damage they caused to the economy in the last thirteen years is given in Table 1.

Table 1. Natural disasters caused by climate change and the damage they caused to the economy

Year	NATURAL DISASTER					
2005	Hurricane "Katrina" in USA, 125 bil. $ damage					
2006	Cyclone "Larry" Australia 1.1 bil. $ damage					
2007	Floods: Mexico India 120 bil. $ damage			Wildfires USA 1.9 bil. $ damage		Drought USA
2008	Hurricane "Ike" USA 25 bil. $ damage & caused the increase in gas prices "Gustav" SAD 25 bil. $ damage		Typhoon on the Philippines	Cyclone "Nargis" Burma	Floods SAD 12% crops destroyed, prices of food were increased	Floods in China
2009	Hurricanes "Ida" USA, El Salvador, Mexico, Nicaragua 1.5 bil. $ damage	Typhoon "Morakot" Philippines Taiwan, China 1.7 bil .$ damage	Cyclone over Switzerland, Austria, Germany, Poland and Czech, 1.6 bil. $ damage	Numerous tornadoes in the USA from Feb. to Jun caused 5.7 bil. $ damage	Floods in India 2.2 bil. $ damage	Winter storm „Klaus" caused 5.1bil. $ damage in France Italy and Spain
2010	Floods in China 18 bil. $, in Pakistan 9.5 bil. $ damage			Earthquake in Chile 30 bil. $, Haiti earthquake & tsunami 8.5 bil. $ damage		
2011	Hurricane "Irena" in USA 20 bil. $ damage & 45 bil. $ damage in total to the economy		305 tornadoes in the USA, estimated 3 bil.$ damage	Flooding of Mississippi river in the USA caused 2 bil. $ damage	Earthquake in Japan & tsunami caused 300 bil. $ damage	The eruption of the volcano on Island caused 1.2 bil. $ loss to air traffic companies
2012	Hurricane "Sandy" in USA 50 bil. $ economy damage		Typhoon on the Philippines	Floods in China	Earthquake in Indonesia and Myanmar	Drought in the USA caused an increase in food prices

Year	NATURAL DISASTER				
2013	Typhoons, "Haiyan" in the Philippines, "Phallin" in India, "Ingrid" and "Manuel" in Mexico	Tornado "Oklahoma" in USA 2 bil. $ damage	Earthquake on Philippines and Solomon islands		
2014	"Hagupit" Philippines	Floods, in Serbia 2 bil. $, in India and Pakistan	Extremely cold weather in the USA		
2015	Floods in India 190 bil. $	Earthquake in Nepal destroyed over 900.000 buildings	The culmination of a six-year drought in California emptied underground reservoirs caused $2.7 billion damage and left 21.000 people without jobs.		
2016	Hurricane "Matthew" Caribbean 1.5 bil. $ damage	Typhoon "Lionrock" in the Philippines left thousands of people without homes	Floods in China left millions of people without homes	Earthquake in Italy and Ecuador	Australia extreme heat caused coral reef to fade
2017	Hurricanes: "Harvey" in USA 180 bil. $ and "Irma" 100 bil. $ damage			Floods in Bangladesh	Earthquake in Mexico
2018	Extremely cold weather, USA -38°C Russia -65°C				

Source: The international disaster database (EM-DAT)

Insurance of property as a measure of protection against consequences of climate change

Insurance is an effective measure which has a purpose of reducing the risk of unexpected financial losses caused by natural disasters. Purchasing an insurance policy for the insured may be useful especially since the budget, available to the Governments to compensate for damage are limited, and the effects of natural disasters are increasing over time. Natural disasters are events that turn into a natural catastrophe when their consequences cannot be easily compensated, such as loss of life or severe damage to the properties. Such accidents threaten humankind and stability of its economic system. They can lead to a long-lasting monetary and non-monetary influence on the lives and prosperity of people, especially in what is considered to be high-risk areas such as floodplains and coastal areas (Wolfgang, Ritzberger-Grünwald, 2019).

Climate change is the cause of many weather conditions such as hurricanes, typhoons, floods, fires that carry the destruction of entire cities as well as enormous material damage (Gizzi, Potenza, Zotta, 2016).

The insurance industry plays a double role in society: guarding society's assets and funding the economy. Its main task is to reduce the risk of financial uncertainty to a minimum. Insurance industry includes policy holders, (primary) insurers, reinsurers, brokers and the financial market.

Climate change is one of the leading risks which global insurance industry is facing. Extreme damage to property due to natural disasters caused by global warming made a lot of pressure on insurance companies that had to pay off the insured (Müller-Fürstenberger, Schumacher, 2015; Nicholson, 2019).

It is believed that 2017. was the most expensive year for the insurance industry since the cost of natural disasters was $337 billion (Swiss RE, Institute Sigma, 2018). Ignorance of climate change is the biggest threat to the socio-economic stability of our society (World Economic Forum, 2016, 2017).

Munich Re Reinsurance Company founded a research institution called the "Corporate Climate Center" (CCI) that studies climate change and its effects since 1974. CCI researchers reported that if measures are not taken to reduce CO2 emissions, the risk of natural disasters will become impossible to predict, and the property will become impossible to insure or the price of insurance will be become too high for most of the customers. The consequence of an inaccurate risk assessment of natural disasters is that the insurance companies could have unexpected losses. One can argue that this unpredictable trend has already started. In 2016, Munich Re (Reinsurance Department) spent 929 million euro, (Munich Re, 2017) to help restore damage to property caused by natural disasters. Munich Re also announced to shareholders that it would reduce its annual projected profit thanks to higher losses caused by hurricanes Harvey, Irma and Maria (Munich Re, 2017).

Therefore, the industry has taken an active role in the promotion of renewable energy sources and green construction by implementing green insurance products.

Green insurance products include reduced premiums and improved insurance coverage of buildings built to withstand extreme weather conditions; legal responsibility for pollution; special insurance for renewable energy projects (Savitz, Gavriletea, 2019). The insurance sector responds to the challenges of sustainability with strategic actions and through insurance and investment, including them in the principles of sustainable insurance supported by the United Nations (UN Environment, 2017).

Despite the high risk of natural disasters that comes with climate change and gloomy predictions that catastrophes in the future could intensify, the number of people that buy insurance against natural disasters is not significant (Starominski-Uehara, Keskitalo, 2016).

The reason is financial inability especially in poorer countries such as the Republic of Serbia and expectations that in the event of a disaster, the State will compensate for the damages. In addition to financial inability, people tend to purchase insurance only for the risks that they are most likely to be exposed to.

In the Republic of Serbia after floods in 2014, only 2.4% of people who suffered damage were insured and got compensation from insurance (Adamandios, 2015). Neither the economy nor the population was insured. Compensation and reparation are funded from the state budget, foreign funds, and loans but it didn't reach all the people affected by the floods...

So far a little attention was paid to the home building industry and the building codes that are influencing the construction and reconstruction of thousands homes per year. The change is introduced rather slowly (Riley, Cotrgave, 2018).

After the Paris Agreement in 2015., construction industry was pressured to start building energy efficient, less pollutant buildings but homes are still left vulnerable to the hurricanes, floods and the price of insurance policies continue to rise. In order to analyze the influence of climate change on the cost of homeowners insurance, in this paper, we have closely look at the United States of America as this state is spread through several climate zones, available data are up to date and its considered to be economically liberal market.

Table 2. Average premiums of insurance for homeowners, percent change and inflation rate per year

Year	Average Premiums For Homeowners $	Percent change	Inflation rate per year
2007	822	2.2%	2.8%
2008	830	1.0%	3.8%
2009	880	6.0%	-0.4%
2010	909	3.3%	1.6%
2011	979	7.7%	3.2%
2012	1,034	5.5%	2.1%
2013	1,096	6.0%	1.5%
2014	1,132	3.3%	1.6%
2015	1,173	3.6%	0.1%
2016	1,192	1.6%	1.3%

Source: Insurance Information Institute. Federal, Reserve bank of Minneapolis

From table 2. it can be seen that the increase in prices of insurance policies was direct consequences of weather related disasters caused by global warming and climate change.

Table 3. Average homeowners rates by states

State	National Average: $1.727	% difference	$ difference
Florida	$5.,207	200%	$3,471
Louisiana	$4,474	158%	$2,737
Oklahoma	$3,599	107%	$1,862
Alabama	$3,383	95%	$1,646
Arkansas	$3,040	75%	$1,303
Kansas	$2,606	50%	$870
Missouri	$2,392	38%	$655
South Dakota	$1,946	12%	$209
North Dakota	$1,850	7%	$114
Minnesota	$1,776	2%	$39
Iowa	$1,661	-4%	-$76
Indiana	$1,630	-6%	-$106

State	National Average: $1.727	% difference	$ difference
Michigan	$1,533	-12%	-$203
Wyoming	$1,412	-19%	-$325
Ohio	$1,186	-32%	-$551
New Jersey	$1,012	-42%	-$725
Oregon	$892	-49%	-$845
Utah	$879	-49%	-$858
Vermont	$816	-53%	-$920
Hawaii	$510	-71%	-$1,226

Source: Insurance Information Institute

Looking at the data presented in table 3. it can be seen that in Florida, which is commonly heavily hit with hurricanes and floods, insurance policy for homeowners is 200% higher than national average, while Idaho, Oregon and the states with continental climate pay 50% less then national average. It shows that difference is over six times in price over USA, mostly according to exposure to weather influences.

Influence of the climate change on the homeowners insurance also can be observed on the number of claims for damages. In total number of policies, 5,12% of homeowners are seeking for compensation is for damages. Almost 80% of total requests for compensation are for damages emerged from devastating effects of water and wind (Insurance Information Institute, 2018). The newest change in homeowners insurance is direct impact of the house framing, construction method and used materials on the price of insurance policy what shows the beginning of direct influence of construction and used materials in insurance policies prices, data are presented in table 4.

Table 4. Influence of the house framing on the insurance rates

Siding Type	Annual Rate	% Change vs Average
Frame	$1,365	1%
Brick/Masonry	$1,216	-10%
Masonry Veneer/Brick Veneer	$1,282	-5%
Log/Wood	$1,520	13%

Source: Insurance Information Institute

Data shown in table 4. are based on the analyses at four different framings of 250.000 homes in the states of Oregon, Texas and California.

More research is needed on this subject as well as proactive measures in promoting disaster resilient homes, stronger construction materials and new building techniques. The prices of insurance policies for houses are influenced with the risk they are likely to be exposed to, and by the price of house itself. Higher price of the house will lead to the higher insurance policy (Alzahrani, Boussabaine, Almarri, 2018).

Price of the house depends on the materials price and construction process costs which is directly connected with the speed of construction. The idea behind building disaster resilient homes should be use of resistant and durable materials while keeping construction process as simple and short as possible.

Climate factors as a cause of deterioration of construction materials

Construction materials components and constructions must fulfill many functional requirements throughout the entire life cycle of the building and must have adequate endurance especially concerning changing weather conditions (Ki Pyung, 2019). In practice, many building materials after a short period of use show signs of damage and deterioration resulting in high maintenance costs and damage due to weather conditions such as extreme temperatures, increase humidity, solar radiation, wind and other (Camilleri, Jaques & Isaacs, 2001). Individually and in combination, these factors affect building structures and materials, leading to their faster decay.

The temperature affects the decay of the material very gradually and in different ways. Changes in temperature lead to a thermal gradient between the surface and the inner layer of the material (especially in materials with lower thermal conductivity), which can lead to degradation of the mechanical properties of the material and the formation of fine cracks, causing loss of strength, the increase in material porosity, and the reduction in chemical resistance of the material. Climate change is causing extreme warm summers, but also extremely cold winters increased moisture and water damage due to increasingly frequent floods. Water is considered one of the critical elements in the decay of building materials.

Water may weaken the building structures when it is in constant contact with it and can affect the surface damage of the material. It is estimated that more than three-quarters of all registered damage to buildings and houses is caused by water (Moncmanová, 2007). Water damage includes the consequences of floods, roof leaking, rain… The leakage occurs due to physical damage to roofs and roof structures as well as from damage to construction materials caused by climatic influences. Moisture and high temperatures in combination affect chemical, biological and mechanical decomposition processes. Decaying the exterior walls made of porous materials is caused by high humidity in the air as well as exposure to long periods of rain. In most materials, the increase in relative humidity leads to the creation of conditions for the occurrence of the mold. Also, humidity promotes the decay of metals causing corrosion.

Solar radiation plays an essential role in photochemical reactions because the intensity of solar radiation at appropriate wavelengths is a critical condition in photochemical reactions that affect the degradation of various building materials. Of the total energy that strikes the earth, about 10% is ultraviolet radiation, 45% is visible light, and 45% is infrared (Moncmanová, 2007). Synthetic polymers such as plastics, but also natural polymeric materials such as wood, are widely used in construction where they are routinely exposed to sunlight. It is known that the UV-B spectrum of solar radiation

adversely affects the mechanical properties of these materials, limiting their lifetime and increasing maintenance costs. Only concrete and glass are utterly resistant to these influences.

Wind, strong wind promotes penetration of rainwater and aqueous solutions into porous materials. The wind also has a direct mechanical effect and leads to the destruction of roofs and sometimes entire objects.

Properties of commonly used building material

For a building to be resistant to climate change, it is necessary to select the building materials and construction methods that will provide durability regardless of climate conditions and geographical position of the building. By adapting building and construction methods to the local climatic conditions, a high level of protection cannot be achieved, because fluctuations in the local weather conditions are significant, especially concerning low temperatures, rain, wind, solar radiation, and others (Zarzycki, Decker, 2019).

It is therefore essential to choose strong and durable materials or materials with adequate protection since poor materials can cause damage to building components and in some cases disturb the stability of the construction structure (Ezema, 2019).

Durability and resistance to the effects of climate change have a direct impact on the economic and security aspects throughout the entire life cycle of the building. It is essential to consider climate changes in the adaptation of the existing, and especially in the construction of new buildings. Every dollar invested in preventing and reducing damage caused by weather disasters of the nation saves 4 dollars in future costs (National Institute of Building Science, 2005).

Wood as a natural material contains a certain degree of moisture (even if it is treated). Wood strength and density depend on the percentage of water in it. More water it contains the weaker and porous it will be. Exposures to different temperatures, as well as the relative humidity of the ambient air, causes these changes such as distortion swelling shrinkage and are severely weakening the wood (Teodorescu et al., 2017). Entirely stopping the movement of moisture in the outer wood structure is not possible, but there are ways to slow it down, by applying finishing coatings and thus preventing the decay of wood as a building material but only for a limited period of time.

Wood is the most prevalent building material in America because there, it is an inexpensive building material, and it takes fewer people and hours to build a house. Houses made of wood are not resistant to flooding, stormy winds especially hurricanes and tornadoes that appear more often due to climate change. Also, wood absorbs water and is susceptible to rotting. Brick is a product of the ceramic industry. It is a composite construction material consisting of several different materials (clay, water and sand), which is dried and baked.

Porous materials, such as bricks, have excellent water absorption capability. When the temperature drops below freezing, the water inside the block turns into ice. The process

of hardening leads to a change in the shape and spread of water. If there is no room for expansion, it will lead them to crack (Netinger et el., 2014). The same problem occurs when the frozen water dissolves. Since the process is repeated, whole bricks can begin to fall, which threaten the structural integrity of the building. Bricks exposed to frequent changes in sunlight throughout the day are also at high risk of damage (Hecroodt, 2002). Bricks are used as building materials in some parts of America, the European Union, and England.

Concrete is another material used in construction industry. The properties of concrete are conditioned with the proportions of the mixture it is made of (cement, aggregates, water and various additives). Its durability directly depends on the percentage of each component in the mixture. Concrete with the high water content is less resistant to ice than concrete with lower water content. Deterioration of concrete due to the freezing and thawing cycle can occur when the concrete is critically saturated, or when about 91% of its pores are filled with water. When water freezes and turns into ice, it has a 9% higher volume (Ravi, Karvekar, 2014).

Shrinking and expanding of concrete due to freezing and defrosting occurs during the winter season, which results in the cracking of the concrete surface. To avoid these problems in the construction industry, especially design waterproofed concrete is used especially in the areas exposed to corrosion. In construction, waterproof concrete and reinforced concrete are present in the territory of the European Union (Disarufino, 2015), and much of Asia. In the European Union, concrete is relatively inexpensive and highly durable building material.

Ferrocement can be described as a special type of reinforced concrete. When compared to reinforced cement concrete (RCC) ferrocement is thinner material, it has higher tensile-strength-to-weight ratio then RCC, ideal to use in zones prone to hurricanes earthquakes, fire and floods. (Salgia, Panganti, 2018). Ferrocement is relatively new and promising material. In recent years there was increased use of ferrocement in construction industry especially in the developing countries such as India (Sharma, 2016).

Florida is one of the states in U.S well known as hurricane prone area, where hurricanes like Irma left 25% of houses destroyed according to Federal Emergency Management Agency (FEMA, 2018). Instead the replacement and building new houses practice in Florida is to repair the damaged ones. Because of the structural integrity and the reparability, ferrocement can be an appropriate substitute to commonly used construction materials in Florida that were less resistant to hurricane forces (Adajar, Hogue, Jordan, 2006).

There are several methods of building low rise buildings using ferrocement. In this paper we presented MC^2 system as it represents inexpensive solution of construction that can reduce the time of building, maintenance costs and insurance cost of the house. Houses build using this system are resistant toward changing weather conditions caused by climate change. System is very flexible and it can be used to construct house of any shape and size. Most elements of the house are prefabricated and assembled directly on the

construction site. Compared to other construction systems, MC^2 system is considerably cheaper requires less manpower and working hours, it is prefabricated and it doesn't require extensive training for the workers. Construction objects have low maintenance costs and are energy efficient. MC^2 system is relatively new but internationally recognized construction system (Milinkovic 2001). Predecessor, version in development of MC^2 construction system and the house built to develop the system was used as inspiration for famous Florida mansion "Dome of a home" in Pensacola Florida which withstand many hurricanes since 2008 when it was built (Adajar, Hogue, Jordan, 2006).

MC system, based on prefabricated ferrocement elements won many awards among them: IFIA scientific gold medal, 6th International exhibition of Inventors, Suzhou China, 2008; Gold Prize, 1st International Exhibition of Inventions Slovenia, Celje, Slovenia, 2009; SEEBBE New Vision, 35th International building trade fair (UFI), Belgrade, Serbia 2009; IIPNF Leading Innovation Award, 7th International Invention show & Technomart, TaiPei, Taiwan, 2011; Energy Globe national award, Winner - Republic of Serbia, Traunkirhen – Austria, 2012.

MC^2 construction system

New construction system by prefabricated reinforced concrete elements, both wall and roof elements. MC^2 eliminate most of the disadvantages of concrete structures. Wall elements are three-layered, insulated without any thermal bridge. Inner and outer composite reinforced ferrocement layers are thin (2,5 and 4cm) providing that the entire element is lightweight with lower material consumption, making system user-friendly and easy to assemble. It makes concrete houses inexpensive, and it takes fewer people and hours to build a house. The inner layer of elements is separated from the static system of the object what eliminates the possibility of the appearance of cracks due to the sagging of the ground below the foundation and the building, and shrinking of onsite casted concrete, as well of outer concrete due to high temperature differences. Elements, both inner and outer layer, are precast in controlled factory conditions made of high-quality waterproof reinforced concrete. The compressive strength of such thin concrete, ferrocement is over 40MPa making it extremely difficult to damage. Elements are already waterproof facade so final coatings are aesthetic and materials are choice of the owner. One wall element is high as designed ceiling height, so there is no overlapping of elements or possibility of water damage of facade.

Roofing is made of "U" shaped waterproof thin composite reinforced ferrocement beams. Unique roofing elements are in the same time both structural and finishing roof elements which form all weather resistant structure. Joint brackets of elements in the same time present the structure for suspended ceilings and roof insulation enabling standard finishing materials and decoration.

MC^2 houses are resistant to any hurricane, typhoon, hail, rain etc. making object resistant to water damage includes the leakage occurred due to physical damage, while concrete is UV resistant. High-quality finishing of elements provides a variety

of possible aesthetic finishing of the house without applying of mortar facade over insulating boards which is commonly first ruined due to weather and natural influence. Decorative plasters, natural stone tiling or any finishing layer can be easily applied by adhesives or mechanical connections with steel anchors or similar without protruding the insulating layer in the element itself *(*Milinkovic Company, 2017*)*.

Conclusion

Climate change represents a challenge for the insurance and construction industry. Traditionally, the risk is calculated based on an analysis of the past events. The more accurate the study is, the more accurate the calculation of the risk will be. However, due to climate change, the analysis of past events can no longer be used to accurately assess the risk because the climate is continually changing. Instead one has to look into the future to predict and mitigate the risk. If the trend of unpredictability continues, insurance companies will have no choice but to withdraw the insurance against natural disasters. Reducing the availability of insurance can hurt the construction industry and the financial market. A better optimistic scenario includes a proactive approach to directly addressing climate change issues with synergy of development new construction systems and materials.

Much of the damage done to property due to the hurricane, floods, earthquakes and other natural disasters pulls its roots in poor design and weak materials used in the construction of the building. The chance for a hurricane to damage a ferrocement house is negligible compared to the damage he can make on wooden or brick houses. By using innovative construction methods such as the MC^2 construction system, damage to the property, caused by extreme climatic conditions can be significantly reduced. Continual growth of insurance premiums for homeowners and all real estate owners in general is not economically justified, nor possible without impact on global economy. Since it is impossible to have a positive impact on global warming and cancel the consequences of climate change in upcoming years it will be almost impossible to predict weather conditions which lead to natural disasters, and one must invest in constructing buildings that are more resistant to these events. This practice would provide affordable and sustainable insurance in the future, increase the quality of buildings and make a positive impact on society and global finance.

Conflict of interests

The authors declare no conflict of interest.

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STUDY ON CONSUMER PREFERENCES TOWARDS ORGANIC FOOD IN THE MARKET OF SPLIT

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ARTICLE INFO

Review Article

Received:15 *October 2019*

Accepted: *05 January2020*

doi:10.5937/ekoPolj2001285C

UDC 339.372.5:631.147(497.13 Split)

Keywords:

organic food, consumer preferences, Split market, Croatia

***JEL**: D12, D20*

ABSTRACT

Since the nineties of the last century, ecological products have become increasingly important in the market, and given that scientists have pro and contra arguments of ecological breeding, the main purpose of this paper was to determine the consumer's preferences towards ecological food; the importance of certain characteristics and deterrents on the purchase of organic food; in the market of Split. For this survey we randomly recruited 113 participants in Split, Croatia. Surveyed consumers when purchasing organic food of the greatest importance consider protection of the environment, and at the least important they retain the taste. The most significant constraint on purchasing organic food of surveyed consumers is the high cost of the product, and the least important is the lack of marketing. Given the size of the sample, surveyed consumers are a typical target group of consumers of organic food.

Introduction

Since the 1990's, organic produces have occupied a more and more important place in the market. Organic farming is growing out of the niche. From now on it receives political supports and it includes industrially processes. The current expansion of organic farming and its recognition as one of the main forms of sustainable agriculture (its image is often idealized among people) raises many controversial debates among scientists about pro and contra arguments of organic agriculture. The most obvious advantage of the organic farming, among many benefits, over the other agricultural production methods is usage of environmentally sustainable systems in crop and livestock production. Advantage is usage of farmers' traditional knowledge in their

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natural environment (Closter *et al.,* 2004). Avoid of chemical inputs in production is another advantage of organic farming (Laird, 2001). Several studies found that organic farming reduces health risks (Foley, 2006; Azadi and Ho, 2010). One of the reasons of purchasing organically produced food is perception that organic food possesses a better quality (Randerson, 2004: Azadi and Ho, 2010) than the food products produced with other farming methods. Study (Foley, 2006) found that organically produced food do not contain residues of the pesticides. Another several studies found that organically produced food possesses intense and realistic taste and flavors (Foley, 2006). Other advantages of organic farming such as reduction of pollution (Lampkin and Midmore, 1999), conservation of insects (Azadi and Ho, 2010), creation of new jobs (Holden, 2004), enhancement of soil fertility (Azadi and Ho, 2010; Lampkin and Midmore, 1999), improvement of animal welfare (Holden, 2004), conservation and promotion of biodiversity (Lampkin and Midmore, 1999; Balfour, 2003), lower cost production method (Foley, 2006) were found in literature review of organic farming.

Conversely of pro arguments, in literature review were found contra arguments of organic farming. No serious study has succeeded in demonstrating scientifically that organic food is healthier (Houdebine, 2010; Durand-Parenti, 2011; Johnston, 2008). Reviews show that the chemical and biochemical composition of organic produces differs only very little from the same conventional produces (Houdebine, 2010), concerning the nutritional differences and taste. Houdebine (2010) found that most of the time an organic produce does not taste better than its conventional namesake as a lot of blind tests show. From environmental safety and sustainability point of view there are also arguments against organic farming. Concerning pesticides and pollution, a major issue is the use of energy in organic farming. Mechanical weeding, which is a significant alternative to pesticides used by organic farmers, consumes a lot of petrol (Durand-Parenti, 2011). Moreover, Johnston (2008) reports the example of the production of a liter of organic milk, which requires 80% more land than conventional milk to produce. Thus, the production of a type of organic tomatoes in the United-Kingdom uses 25% more water than conventional production. Important issue that appears in organic farming is area needed to produce natural pesticides and fertilizers. In his paper, Houdebine (2010) observes that there is no answer to the question whether it is possible to produce huge quantities of natural pesticides and organic fertilizers without using important areas at the expense of food crops. In contrast the use of intermediate crops and the biological pest control with beneficial organisms are really good innovations.

Concerning the mentioned pro and contra arguments of organic farming, the main purpose of this work was to find out preferences of Croatian consumers towards organic food. Another objective of particular interest was to find out knowledge in organic farming; importance in buying organic food, and deterrents of buying organically produced food among buyers at market in Split.

Materials and methods

For this survey we randomly recruited 113 participants in Split, Croatia. Data collection took place from September to November 2017. Participants in this research were chosen randomly following "each second consumer approach". Among those willing to participate in the research, dropout rate was 17.1%. One of the restrictions for this survey and recruitment of participants was that they are over 18 years old. Reason why we decided for this restriction was that only adult participant has income, knowledge and makes purchasing decision independently. Places of recruitment of participants for survey were grocery stores, open-air market of fresh fruits and vegetables and supermarkets. Our sample is large enough and contains all adult participants with different socio-economic backgrounds (income, education, knowledge about organic food). Participants in this survey were asked to fill in the questionnaire. Questionnaire was given to the participants to collect some socioeconomic background information about our sample. Questionnaire contains open-ended questions (completely unstructured questions and word-association questions) and closed –ended questions (dichotomous or two-point questions, multiple choice questions and scaled questions). We used Likert five-point scale with responses ranged from a group of categories— least (1) to most (5) — asking participants to indicate how much they agree or disagree, approve or disapprove with statements. All statistical analysis of collected data was done by the statistic program "R" (R Core Team, 2012), version 2.14.1.

Results and Discussion

The sample demographics were captured in the questionnaire. Sample characteristics are summarized in the Table 1. The places of survey were selected to meet the target group of buyers of organic products. In research (Martic-Kuran and Mihic, 2014) on consumer behavior in purchasing organic food in Croatia authors concluded that the subjective standards (consumers' surrounding) have great intention on purchase of organic food products. The average age of respondents in this survey was 34. The high share of students among interviewed consumers explains the lower average age. The percentage of women in this survey was 57,9% being woman. Highest share of the participants (54,7%) in this survey had a University degree. Participants with finished high school was 40,9%, and 3,0% finished with elementary school. More than half of the participants (50,3%) had household's income above 15,000€ per year, 37.2% had an income between 10,000€ and 15,000€ and only 9.8% below 10,000€. In our sample, 42.0% of participants were formally employed, 29.1% were students, 11.3% were retired, 11.6% self-employed and 6,0% participants were farmers. As a part of questionnaire we asked participants if they had children in their household. Results revealed that 46.5 % participants have children in their household.

Table 1. Sample characteristics (N=113)

Variable	Categories	
	Mean	**St. Dev.**
Age (years)	34.83	11.01
Gender	%	
Male	42.1	
Female	57.9	
Education	%	
Elementary school	3.0	
High school	40.9	
University	54.7	
None	1.4	
Household income (€ /year)	%	
Low income= less than 10,000€	9.8	
Mid income= between 10,000€ and 15,000€	37.2	
High income= more than 15,000€	50.3	
No answer	2.7	
	Mean	**St. Dev.**
Planned to buy organic food on the day of interview	0.71	0.27

Participants in our sample are younger, with a higher income and were better educated than the average Croatian consumer. Concerning the sample size we concluded that this is the typical target group for organic food, while not representative for the whole Croatian population.

The large majority of participants in this survey knew about organic food products (94.1%) and had bought organic food at least once (87.6%). In this research 52.3% participants heard/read about organic food from media (TV, radio, Internet, newspaper), 21.9% read in books about organic food, 24.2% heard/read at the school/university and 1.6% participants from other sources heard/read about organic food. Results of this survey revealed that the large majority of respondents (94.1%) knew about organic food. This finding is much greater finding for knowledge about organic food among Croatian consumers than reported (34%) in another study (Stefanic *et al.,* 2001) from Croatia.

To reveal the frequency of buying organic food, interviewed participants were asked about the frequency of buying organic food. In questionnaire answers on this question were divided into groups; "Heavy buyers"- buying every day, "Medium buyers"- buying every week, "Light buyers"- buying once a month and group "Never"- never buying organic food products. Results revealed that 40.3% of participants are buying organic food every week, 36.1% once a month and 22.5% every day, and 1.1% have never bought organic food.

Participants in this survey were also asked how many organically produced food (quantity) they have in their household. Large majority of 63.0% participants have at least 1 organically produced food products in household, 23.5% more than 2 organically produced food products, 2.1% participants have more than 3 organically produced food products and 11.4% didn't have any organically produced food product in their household on the day of the interview.

To reveal what is important why the participants buy organic food, we asked participants to sort and begin from what the most important to them (5) and finish with less important (1) following statements (Likert scale): protection of environment; healthy; better taste; free of chemicals from pesticides and herbicides; prevention of diseases; and higher quality.

Results revealed (Table 2.) that 47,7% participants consider protection of environment as most important, on the second place 15.8% is free of chemicals, on the third place 11,1% healthy, on the fourth place 11,0% higher product quality, on the fifth place 7,6% prevention of diseases and in the end 6,8% participants with taste. Results revealed in this study are contrary from other studies (Kovacic *et al.,* 2002; Stefanic *et al.,* 2001; Martic-Kuran and Mihic, 2014; Cerjak *et al.,* 2010) in Croatia towards most important motive of purchasing organic food products, where it was found that Croatian consumers see health as most important motive.

Table 2. Importance in buying organic food (N=113)

	M	SD
Protection of environment	4.34	0.908
Healthy	3.79	0.977
Better taste	2.88	1.061
Free of chemicals	3.89	1.071
Prevention of diseases	3.54	0.985
Higher quality	3.68	1.145

As deterrents of buying organic food participants have the six statements (high price premiums; lack of organic food availability; low trust in certification boards and organic labels; insufficient marketing; satisfaction with current food choice and sensory defects) to choose three most important (Table 3.) using Likert scale (1- less important to 5- most important).

The results revealed (Table 3.) that 32,4% participants as the most important deterrent in buying organic food consider high price premium, 30,7% participants consider current food choice, 24,1% participants consider lack of organic food availability, 10,8% participants consider low trust in certification boards and organic labels, 2,0% participants consider insufficient marketing. Interesting is that no one of participants in this research consider sensory defect as deterrent of purchasing organic food.

Table 3. Deterrents of buying organic food (N=113)

	M	SD
High price premiums	4.37	0.790
lack of organic food availability	3.91	0.958
Low trust in certification	3.18	1.231
Insufficient marketing	2.95	1.061
Satisfaction with current food choice	4.14	0.927
Sensory defects	0	0

Conclusions

In the last decade, especially after Croatia become a EU Member State (2013) significant increase in the area and the number of farms involved in organic farming are recorded. In Croatia certified organic food production is substantially lower than in higher income EU countries, even though Croatia implemented all EU regulations concerning Organic Food production and labeling. Though, many products in Croatia which are produced as organic are not certified and labeled. For producers, processors and marketing overall, this causes difficulties because many of the benefits of organically produced food thus cannot be communicated and are hidden to the consumer when buying or consuming organic food. Beside the market development and increase in demand for organic food products, reason for high interest of farmers to involve in this sector lie in the fact of support and subsidies for organic food production. Another reason is also higher price premiums for this kind of food products. Croatia still has environmental resources, such as uncultivated arable land, especially in rural areas to increase the volume of organic food production volume. Another potential is Mediterranean climate at the whole Croatian coastal area. The domestic organic food market is unfortunately still not properly organized and controlled (scandal with largest organic producer and retailer in 2015), and this is the reason for additional efforts that need to be made in the development of market infrastructure, marketing activities and monitoring of organic food products to increase the consumers' confidence in organic labels. Tourism as one of the key element of Croatian economy is another potential for organic food sector. Substantially younger consumers at the market worldwide, as well at Croatian market recognize the benefits of organic farming and one of the key elements of Croatian institutions are to educate and inform population, especially children of all benefits of organic farming on environment, biodiversity, animal welfare and health. Beside the education of consumers, it is important to educate the farmers in organic farming to not only produce the organic food because the subsidies those are actually higher than in conventional farming.

Conflict of interests

The authors declare no conflict of interest.

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Received: *xx May 2018*

Accepted: *xx September 2018*

doi:xxx

UDC xxx

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Example:

Table 1. The distribution cost of packaged goods from Subotica to retail-store objects

Indicators	Period			Total
	Month 1	Month 2	Month 3	
Distance crossed (km)	12.926	11.295	13.208	37.429
Fuel consumption (litre)	3.231	2.823	3.302	9.356
Value of fuel consumption (RSD)	242.378	211.790	247.653	701.821
Total time spend on touring (hour)	314	266	417	997
Value of total time spend on touring (RSD)	47.048	39.890	62.570	149.508
Number of tours	98	77	102	277
Toll value (RSD)	0	0	0	0
Number of pallets transported (piece)	1.179	976	1358	3.513
Total weight transported (kg)	602.600	429.225	711.116	1.742.941
Vehicle maintenance costs (RSD)	203.858	164.970	224.806	593.634
Lease costs (RSD)	480.938	454.214	565.784	1.500.936
Total sum (RSD)	974.222	870.864	1.100.813	2.945.899

Source: Petrović, 2012

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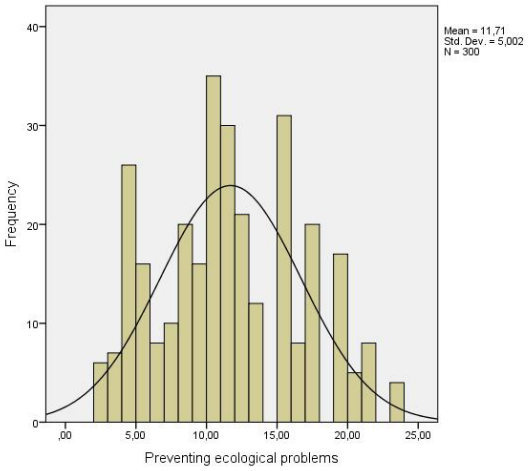
Figure 1. Agriculture, value added (% of GDP)



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Technical preparation, prepress and printing:
DIS PUBLIC D.O.O., Braće Jerković 111-25, Belgrade, phone/fax: 011/39-79-789

Number of copies:
300 copies

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33:63(497.11)

ЕКОНОМИКА пољопривреде = Economics of Agriculture / editor-in-chief Drago Cvijanović. - Год. 26, бр. 5 (1979)- . - Београд : Научно друштво аграрних економиста Балкана : Институт за економику пољопривреде ; Букурешт : Академија економских наука, 1979- (Belgrade : Dis Public). - 24 cm

Тромесечно. - Је наставак: Економика производње хране = ISSN 0352-3454. - Друго издање на другом медијуму: Економика пољопривреде (Online) = ISSN 2334-8453
ISSN 0352-3462 = Економика пољопривреде (1979)
COBISS.SR-ID 27671

The Ministry of Education, Science and Technological Development of the Republic of Serbia provides financial support for publishing of the quarterly journal ECONOMICS OF AGRICULTURE