International Review of Management and Marketing

ISSN: 2146-4405

available at http: www.econjournals.com

International Review of Management and Marketing, 2020, 10(4), 78-82.

Evaluation of the Economic Criteria for the Survival of Small Farms in Serbia

Vladimir Ristanović[1]*, Aleksandra Tošović-Stevanović[2]

[1]Institute of European Studies, 11000 Belgrade, Serbia, [2]Department of Economy and Finance, Faculty of Business, Economics and Entrepreneurship, 11000 Belgrade, Serbia. *Email: vmristanovic@gmail.com

Received: 04 May 2020 **Accepted:** 27 June 2020 **DOI:** https://doi.org/10.32479/irmm.10032

ABSTRACT

Agriculture is an important economic sector in Serbia with the largest percentage of small and family farms. In order to improve this business and the survival of small farms in Serbia, the goal of the paper is to select the criteria for the survival of small farms in Serbia by applying the concept of analytical hierarchical processes (the AHP method). The research was conducted in Serbia on the sample of 550 small farms, comparing economic indicators based on the criteria that can contribute to achieving the goals of agricultural enterprises. Each indicator was evaluated and considered in relation to the set criteria, such as investments in farms, information available to farms, distribution channels of agricultural products, and the quality of agricultural products. The results of the survey showed that the best ranked indicator of the survival of small farms in Serbia is the level of education and knowledge of farmers, holders of farms.

Keywords: Agro-business, The Analytical Hierarchical Processes Method, Economic Indicators, Analysis and Decision Making
JEL Classifications: D710, Q120, Q130

1. INTRODUCTION

Agriculture is a specific industry with distinctive competitive environment, susceptibility to seasonality, value of the European Union (EU) support, and entrepreneurship in this business sector (Besusparienė and Miceikienė, 2020). Serbia has a great natural potential for agriculture; however, whether it has been used and to what extent is indicated by the fact that Serbia has no competitive advantage in the agricultural sector. Although it has natural potentials, lots of strategic decisions and investments need to be implemented for the potential to be actively used.

According to the data of the Statistical Office of the Republic of Serbia (Survey 2018), the average economic size of an agricultural farm amounts to 8610 euros and is 45% higher than in 2012. This increase is the result of a simultaneous decrease in the number of farms and the increase in their economic value in the analysed period. Nevertheless, despite this increase, the average economic size of farms in Serbia is still 4 times smaller than the average one in the EU. It is deemed that agricultural output depends on different factors. Agricultural land, fixed assets, and labour are just some of them (Zwolak, 2016; Ivanov, 2020).

Given the fact that small farms (up to 10 acres) are mostly present in Serbia, we will focus on the analysis and characteristics of small and family farms, so that we could find and evaluate adequate criteria for solving the issue of the survival of small farms in Serbia, as well as improving their business.

One of the characteristics of family farms is that they represent a lifestyle in which family business is passed down in a family for generations, along with the knowledge, experience, tradition, and special practices (FAO, 2013; Matthews, 2013; European Commission, 2014).

Economically speaking, one of the advantages of family farms is the fact that family members are hired as labour force. It is crucial because employment opportunities, stronger interest and commitment in maintaining the production process and more efficient end result directly depend on them. That is why it is very important to consider the level of their education as an important criterion when evaluating small farms. In this regard, according to the data (Survey 2018), 48.6% of farms in Serbia have managers (persons who make decisions on the operation of farms on a daily basis) who have only agricultural experience gained in their practice, and in family farms on every eighth manager having only agricultural experience comes one with a college or university degree.

Besides education, the most complex problem of agricultural products is a proper and adequate distribution system (Miljković and Alčaković, 2015) because producers have a limited choice of possible solutions. Furthermore, the specifics of the distribution channel derive, above all, from the special features of agriculture, as well as the existence of a large number of entities that are tied to it and exist from it.

According to Sloof et al. (1996), quality is a very elusive concept, depending on several factors, the most important one being a product itself and its intended use (Moreda and Ruiz-Altisent, 2011). Moreover, the competitiveness of products can be expressed by the ratio of quality and the price of a particular agricultural product; the higher the coefficient, the more competitive the product.

For the needs of further development in the field of agriculture, as well as its direct impact on socio-economic factors, it is important to take into account investments in the economy, because each new investment creates the opportunity to increase production volume and product placements, leading to new jobs and employment.

Due to the abovementioned, it is necessary to include a large number of criteria for the survival of small farms, which is why the method of multi-criteria analysis, i.e. the AHP model, will be applied in the paper. The model is illustrated in the project "The role of small farms in sustainable development and food security in Central and Eastern Europe." The research was conducted in Serbia on a sample of 550 farms in the period from June 2019 to September 2019. For the purposes of this paper, by using the AHP model, four criteria (investments in farms, information available to farms, distribution channels of agricultural products, and quality of agricultural products) were analysed in order to select the most important indicator of small farms in Serbia. Each indicator was evaluated and considered in relation to the set criteria, and the indicator with the highest score would be the most favourable solution for small farms.

2. MATERIAL AND METHODS

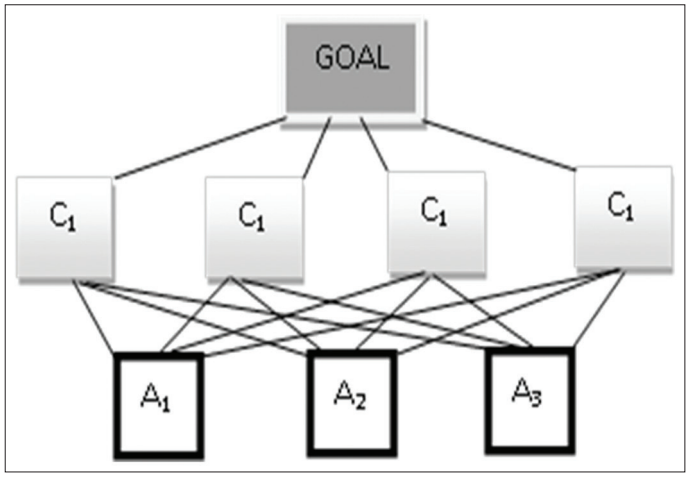
The application of the concept of analytical hierarchical processes (the AHP method) in multi-criteria decision-making tasks has existed for more than four decades. It is used to decide on a number of issues as well as to solve various tasks. The method was created by Thomas Saaty in 1980 and since then the application of the method has significantly expanded to numerous areas. Therefore, nowadays, it has become one of the most used decision-making methods. There are numerous examples and researches by numerous authors on various topics (Hayati 2017, Lakićević et al., 2017, Subbaiah et al., 2011).

In order to make pairwise comparisons between the elements of the hierarchical structure and assess their mutual significance, Saaty's scale of relative importance is used according to the following distribution Table 1:

The importance of applying Saaty's scale of relative importance is reflected in the possibilities it provides for decision-making processes. The analysis of the elements of the hierarchical structure in pairs compensates for the uncertainty that may arise due to small changes in the assessments of decision makers. From the results obtained in this way, we can create appropriate comparison matrices. In the quadratic form A, each element of the matrix a_{ij} is obtained with Saaty's scale of pairwise comparison of n element with the elements of immediately higher hierarchical level, where the indicator of the importance of the element is i (i = 1, 2,…, n) and the element j (j = 1, 2,…, n).

Methodologically, AHP is a hierarchically structured decision-making model, consisting of the goal, criteria, and variants (Figure 1). The goal is always at the top of the hierarchical structure, and, as a rule, it is not compared with other elements. The first structural level consists of criteria that are compared in pairs with each other in relation to the first parent element at a higher level. Having defined the criteria, the variants are evaluated by pairwise comparison in relation to each of them. Thus, the hierarchical or network presentation of the problem is generated through which the solutions of the set goal are defined. All numerical values are entered into the matrix in the order corresponding to the matrix sequence in mathematics. The diagonal of the matrix takes the values 1, the values are entered in the upper triangular of the matrix, while their reciprocal values are entered in the lower triangular of the matrix. For pairwise comparison, the method of eigenvalues is used, that is, the vectors of weights of the entered elements are determined through a linear system:

Figure 1: Hierarchy of decision problems (AHP model)



$$A*\omega = \lambda*\omega, _{e^T=1}$$

where A is the comparison matrix of the dimensions nxn, the eigenvalue vector, and e is the unit vector.

According to Saaty (1980), the synthesis of local priority vectors is conducted by applying a distribution aggregation model. The obtained consistency of evaluation is checked by the degree of consistency - parameter CR, for which a limit of 0.1 is defined in the literature. If the degree of consistency is higher than 0.1 (CR >0.1) it is necessary to repeat the evaluation in the given matrix, i.e. to repeat the comparison of rules with the eigenvalue method. By ranking the final values of the consistency index, a solution to the decision problem is reached.

3. MODELLING DECISION PROBLEMS

Generally speaking, the AHP method enables individual and group decision-making, and implies the analysis of decision problems through several hierarchical levels. The hierarchical structure is presented in Figure 1.

Modelling begins by defining the structure of the problem. Afterwards, all the elements at the same level of the hierarchy are compared to the elements from the higher hierarchical level. At the top of the hierarchical structure is the goal - the choice of the most important indicator of small farms in Serbia. In accordance with the set goal, we have considered four criteria: C_1 - Investment in farms, C_2 - Information available to farms, C_3 - Distribution channels of agricultural products, and C_4 - Quality of agricultural products. Variants are A_1 - Heirs of the farm, A_2 – Agricultural education, and A_3 - Plan of agricultural production.

Investments in farms are one of the preconditions for further survival and development of small farms. Nowadays, with the existing high quality of land agriculture in Serbia higher investment is needed. Rarely available financial resources on the financial market can certainly cause the restrictions regarding further development, and even the survival of farms. Return on investment implies timely invested funds and precisely defined repayment criteria through an adequate plan of production activities based on reliable information accompanied with the knowledge in the field of agriculture and long-term practice resulting in higher yield, better product quality, and market competitiveness. In addition to economic motives, perhaps the most dominant motive for the development and maintenance of small farms in Serbia are the heirs of farms. Property management has been passed down from generation to generation for centuries, and that is the main reason for investing in farms, purchasing arable land and machinery, increasing the number of crops, and raising the quality of agricultural products.

4. RESULTS OF AHP METHOD APPLICATION

The evaluation of the criteria and variants was conducted by an expert in the field of agribusiness, a senior researcher, with relevant references in this field. For broader researches, experts could be included to cover other indicators related to education and social aspects of household members and rural life. Representatives of local communities, cooperatives and local authorities could also make a significant contribution to a decision-making process.

We begin the analysis by defining the goal. With the defined goal, according to the AHP method, the decision maker will compare the criteria to the set goal. In addition to defining the criteria, the variants within the hierarchical structure are also specified. To select the most important economic indicator for the economic survival and development of small farms, 3 variants were compared based on 4 criteria. The next phase, involving the selection of economic indicators by using the AHP method, is the development of a hierarchy of problems. Afterwards, the evaluation of the criteria is performed (based on the abovementioned Saaty's nine-point scale) whose goal is to define the weight coefficients needed for the assessment and selection of economic indicators of small farms. In the fifth phase, variants are evaluated on the basis of each criterion, i.e. each of the 3 variants will be evaluated based on 4 considered decision criteria. Each variant gets its value. Finally, the last phase represents the decision-making and the choice of variants. The economic indicator that has the highest degree of value will be the most favourable solution for small farms.

The decision maker has the task to select the criteria, then to compare the criteria in pairs in relation to the goal (using the Saaty scale) and then to compare the variants in pairs in relation to each criterion.

Table 2 shows that the most important criterion is Information available to farms, followed by Investments in farms, Distribution channels of agricultural products, and Quality of agricultural products, respectively by the size of the analysed vector. To avoid errors in making conclusions when determining the value of the criteria in the pairwise comparison matrix, an assessment of the extent of deviations from the consistency is performed. Firstly, the maximum eigenvalue of the comparison matrix is calculated ($\lambda max = 4.25$), and the consistency index (CI = 0.09) and the

Table 1: Saaty's scale of relative importance (Saaty, 1980)

Intensity of importance	Definition
1	Equally important
3	Weak importance
5	Strong importance
7	Demonstrated importance
9	Absolute importance
2, 4, 6, 8	Intermediate values

Table 2: Matrix of comparison of criteria and computed weights

Goal	C_1	C_2	C_3	C_4	Wi
C_1	1	1/5	3	3	0.29
C_2	2	1	4	3	0.45
C_3	1/3	1/4	1	3	0.16
C_4	1/3	1/3	1/3	1	0.10

degree of consistency (CR = 0.08) are evaluated. The obtained value of the consistency index is less than the limit value for the consistency test of 0.1 which means that the comparison matrix is set correctly.

Afterwards, the evaluation of the variants according to each criterion is performed individually. Table 3 displays the comparison matrix of the variants in relation to the four criteria with the corresponding weight vectors.

According to the concept of the AHP method, with the calculation of the priority of the criteria in relation to the goal and the priority of the variants with respect to the criteria, it is necessary to calculate the priorities of the variants in relation to the set goal. This involves applying a weight product. Finally, at the very end of the procedure, an overall synthesis of the selection problem is conducted. The obtained results enable the last step which is the ranking of economic indicators for small farms (Table 4). We find the final decision, i.e. the selection of the optimal indicator for the survival of small farms in Serbia, in the variant with the highest rank value which has the highest total weight. In the next step, the evaluation of the variants according to each criterion is performed individually. Table 3 shows the comparison matrix of variants in relation to the four criteria with the corresponding weight vectors.

The verification of the performed steps of the test can be seen in the lower right field (grey background), the final tables (Table 4), in the Figure 1 - the sum of all the values for the variants (the last column), i.e. the criteria (the last row). Therefore, the conclusion is that the procedure was conducted precisely and accurately to the end.

The final decision indicates that the education of the owner, especially in the field of agriculture and agribusiness, is vital for the survival and development of small farms. As the survey showed, older population in farms is dominant, previous knowledge and experience fit into the modern knowledge of younger members of farms. Personal attitude of the owner is of great importance; whether there are heirs who would continue to engage themselves in agriculture, who would stay in the countryside and continue to run the farm. Production plan has the least impact, since most cultures have existed for decades, both due to natural conditions and acquired habits and knowledge in the existing production. As for criteria, the influence of Information available to farms is dominant. The synergy of knowledge, acquired through education and experience, and information gives better results in farms, as shown in the survey results. Along with information, a significant criterion is Investment in farms, especially when it comes to different types of machinery, as well as the application of modern methods in agriculture. Less important criteria for the survival of small farms are Distribution channels and Quality of agricultural products. This may seem unlikely at first glance, but the fact is that the quality of land and products that come from those areas is of high quality. Traditional methods of cultivation are still used, sometimes combined methods of cultivation and treatment of land with different fertilizers and products. This illustrative example of small farms reflects the real picture of the survival of an average farm in Serbia - education, information and heirs are essential for the survival of small farms up to 10 ha. Evidently, state incentives, which do not have to be only in money, are key to overcoming obstacles to the development of small farms in Serbia. The inclusion of additional criteria and variants makes it possible to see more detailed performance of farms in Serbia.

Table 3: Decision-making matrices with respect to criteria and computed weights

C_1	A_1	A_2	A_3	W_i	C_3	A_1	A_2	A_3	W_i
A_1	1	2	2	0.48	A_1	1	3	2	0.52
A_2	1/2	1	3	0.35	A_2	1/3	1	1/3	0.14
A_3	1/2	1/3	1	0.17	A_3	1/2	3	1	0.33
C_2	A_1	A_2	A_3	W_i	C_4	A_1	A_2	A_3	W_i
A_1	1	1/2	3	0.32	A_1	1	1/3	1/4	0.13
A_2	2	1	4	0.56	A_2	3	1	2	0.51
A_3	1/3	1/4	1	0.12	A_3	4	1/2	1	0.36

Table 4: Total weight and rank of variants

Goal	C_1	C_2	C_3	C_4	Rang
A_1	0.14	0.14	0.08	0.01	0.38
A_2	0.10	0.25	0.02	0.05	0.43
A_3	0.05	0.06	0.05	0.04	0.19
	0.29	0.45	0.16	0.10	1

5. CONCLUSION

The application of the AHP method, in the process of solving multi-criteria decision-making, has proven to be a useful tool in solving the issue of survival of small farms in Serbia. Using this method we were able to rank the importance of each chosen criterion for selecting the indicators of survival of small farms based on the opinion of the decision maker. The AHP method can also be used in the detailed analysis of other indicators, such as social, educational.

In the paper, the sets of criteria and variants in the AHP hierarchical structure are accurately defined in accordance with the methodology and the concept of the AHP method. The evaluation of the criteria was conducted correctly in relation to the defined goal. Afterwards, the evaluations of variants in relation to the criteria were precisely established. The weight vectors of the criteria and variants are in the limit values, meaning that the matrices are set correctly. When the product matrices, the weight of the criteria and variants have been calculated, the obtained values are ranked, enabling the final decision. The results of the survey showed that the best ranked indicator of the survival of small farms in Serbia is the level of education and knowledge of farmers, holders of farms.

6. ACKNOWLEDGMENTS

The paper was written as a part of the project titled The role of small farms in the sustainable development of agri-food sector in the countries of Central and Eastern Europe, financed by the Polish National Agency for Academic Exchange (agreement no. PPI/APM/2018/1/00011/DEC/1).

REFERENCES

Besusparienė, E., Miceikienė, A. (2020), The influence of subsidies and taxes on economic viability of family farms in Lithuania. Bulgarian Journal of Agricultural Science, 26(1), 3-15.

European Commission. (2014), Family Farming. Available from: http://www.ec.europa.eu/agriculture/events/familyfarming-conference-2013_en.htm. [Last accessed on 2020 Mar15].

Food and Agriculture Organization. (2013), 2014 International Year of Family Farming-Main Message. Available from: http://www.fao.org/family-farming-2014/about/main-messages/en.

Hayati, D. (2017), A Literature Review on Frameworks and Methods for Measuring and Monitoring Sustainable Agriculture, Technical Report No. 22. Rome: Global Strategy Technical Report.

Ivanov, B. (2020), CAP support policy impact on Bulgarian agriculture. Bulgarian Journal of Agricultural Science, 26(2), 268-274.

Lakićević, M., Srđević, B, Ninić-Todorovića, J., Bajić, L. (2017), Multi-criteria evaluation of parks in Novi Sad by AHP method. Annals of Agronomy, 41(1), 22-29.

Matthews, A. (2013), Promoting Family Farming: The European Union. Vol. 3. GREAT Insights; 2014. Available from: https://www.ecdpm.org/great-insights/family-farming-and-food-security/promoting-family-farming-european-union/.

Miljković, M., Alčaković, S. (2015), Distribution Channels for Agricultural Products with an Emphasis on the Market Place in Serbia. Serbia: Synthesis-International Scientific Conference of IT and Business-Related Research. p599-601.

Moreda, G.P., Ruiz-Altisent, M. (2011), Quality of agricultural products in relation to physical conditions. In: Encyclopedia of Agrophysics. Berlin: Springer.

Saaty, T.L. (1980), The Analytic Hierarchy Process. New York: McGraw Hill.

Sloof, M., Tijskens, L.M.M., Wilkinson, E.C. (1996), Concepts for modelling the quality of perishable products (review). Trends in Food Science and Technology, 7, 165-171.

Statistical Office of the Republic of Serbia. (2018), The Survey on the Structure of Agricultural Holdings. Belgrade: Statistical Office of the Republic of Serbia. Available from: http://www.stat.gov.rs. [Last accessed on 2020 Feb 10].

Subbaiah, K.V., Prasad, K.G.D., Bharathi, M.U., Sekhara, K.S.R. (2011), Integrating factor analysis and analytic hierarchy process for library service quality. International Journal for Quality Research, 5(3), 205-212.

Zwolak, J. (2016), Regression relationship between production and factors of production in Polish agriculture. Bulgarian Journal of Agricultural Science, 22(6), 893-896.