https://doi.org/10.17221/168/2022-AGRICECON

Economic overview of the distribution channels used by Eastern European small farms for their agricultural products

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Citation: Ristanović V., Tošović-Stevanović A., Maican S., Muntean A. (2022): Economic overview of the distribution channels used by Eastern European small farms for their agricultural products. Agric. Econ. – Czech, 68: 299–306.

Abstract: The role of small farms in agricultural production is particularly important for less developed economies, with a high share of agriculture in GDP and a lower level of national income. These economies have a high share of small-scale farms in the total number of registered farms, measured by the size of an agricultural holding. The paper thoroughly analyses the distribution channels of the agricultural products of Moldova (MDA), Romania (ROM), and Serbia (SRB). The data sources for this analysis are taken from the survey conducted on 1 608 small-scale farms in the above-mentioned countries in 2019. The aim of the paper is to develop a model that could enable the structured analysis of distribution channels. Analytical Hierarchy Process (AHP) method was used for efficient assessment and as a criterion for choosing the most appropriate distribution channel. The results of the analysis show that small-scale farms mostly place their products in green markets and processing plants and that the quality and the price of agricultural products are the dominant criteria for the selection of a channel. The results of the applied model indicate that the model is stable and that small-scale farms can choose the optimal distribution channel by using this study.

Keywords: agribusiness; AHP method; decision making; distribution chains; small-scale farms

The choice of a distribution channel in the field of agriculture depends on a number of factors: firstly, the market of agricultural products, then the existing regulations, and, finally, the established practices. This specific task for small farm owners encourages them to find the answer to the question: 'Which distribution channel is the best or the most efficient?' It should be a distribution channel (one of the alternatives) that makes consumers available a high-quality product at the best price, paid for and delivered on time (one of the criteria). However, these two goals are very difficult to achieve at the same time. Therefore, our goal is to test the following two hypotheses:

H_1: The choice of distribution channel for small farm owners depends on the available distribution channels.

Supported by the Polish National Agency for Academic Exchange, Poland (the paper was written as a part of the Project No. PPI/APM/2018/1/00011/DEC/1, 'The role of small farms in the sustainable development of agri-food sector in the countries of Central and Eastern Europe'); the present article received financial support from the funds for scientific research of the '1 Decembrie 1918' University of Alba Iulia, Romania.

https://doi.org/10.17221/168/2022-AGRICECON

H_2: Regardless of the chosen distribution channel, two factors dominate – quality and price of agricultural products.

The practice has shown that in less developed economies with underdeveloped markets, there are numerous problems in the agricultural sector. The vulnerability of the agricultural sector in Eastern Europe [(Moldova (MDA), Romania (ROM), Serbia (SRB)] is reflected in the declining trend of employment and the ageing of the labour force in the agricultural sector, the greater impact of seasonality in agricultural production, difficult and expensive processes of adapting production, the instability in the production of agricultural products, a large number of smaller players exploiting niche markets, and the growing role of the hospitality industry. Simultaneously, small farm owners demonstrate vulnerability, which can be seen in their limited capacity, insufficient capital accumulation, outdated equipment, strong competition, the lack of manpower and skills, greater dependence on foreign markets, etc. (EIT Food 2020). In such circumstances, the choice of the best distribution channel is made difficult and even more complicated by a large number of available distribution channels, different effects of the chosen distribution channel, evaluation of the advantages and disadvantages of a certain distribution channel, as well as the potential choice of several simultaneously used distribution channels of agricultural products. The larger the number of distribution channels, the more complex the decision about choosing the right one is. The uncertainty in the operation of small farms and the difficulties in choosing the best distribution channel in an unfavourable environment are the motives for our analysis. Fundamentally, the problems with product placement by small farmers originate from the fact that a lot of farmers are scattered in remote villages, being far from the market for agricultural products, usually located in semi-urban and urban areas. Each commodity group has a slightly different distribution channel, so small-scale farmers are often forced to produce certain products. Therefore, the overall structure of the distribution channels in certain parts of the country changes according to the required planted crops. Moreover, the perishability of agricultural products forces farmers to use direct distribution channels, such as selling in a village over a fence or in local shops. Hence, the optimal allocation of available distribution channels is of paramount importance for the distribution of products in the market. The distribution is performed according to the relevant set of criteria which have different importance and depend on the requirements of a product. Taking everything into account, proper assessment of available distribution channels is key to the effectiveness and efficiency of product distribution (Brezović et al. 2021).

The agricultural model based on small farms is recognised by the EU through the common agricultural policy (European Parliament 2014). Small farms are characterised by a small volume of production. However, due to a large number of small farms, they have a prominent place in this sector of the economy (Ricciardi et al. 2018). According to Eurostat (2019), in 2016 there were about 10.5 million farms in the EU, the vast majority of them (96%) were classified as small farms. Furthermore, they accounted for approximately 80% of labour input and about 60% of the total utilised agricultural area, livestock units, and the value of agricultural production. Out of 570 million farms in the world, the vast majority were small-scale farms, and the smallest ones, up to 2 ha, made up approximately 475–500 million, especially in poorer countries (Borychowski et al. 2020).

Small-scale farms also play a crucial role in these three economies. In ROM, small farms produce an estimated 25–30% of the nation's food products, while they constitute 95% of all the farms (Muntean et al. 2020). In MDA in 2017, small-scale farms produced about 56% of the total agricultural production, while they constituted about 98% of all the farms (Stratan et al. 2020). In SRB in 2012, around 92% of cattle and 80% of pigs were reared on small farms. In 2012, the farms under 10 ha bred about 55% of total livestock. In the same year, smallholders and small farms accounted for 40% of the total production of orchards, about 30% of the total pulses and vineyards production, and about 25% of the total potato production (FAO 2020).

It has become clear to researchers that the decisions about distribution channels need to be guided by a comprehensive set of performance metrics and product features. In this paper, performance metrics are considered to be decision criteria for optimising the alternative distribution channels. Qualitative and quantitative factors are considered when selecting an optimal distribution channel using the Analytical Hierarchy Process (AHP) method. The decision regarding the choice of the distribution channel has been made after considering all the ideas of the group of experts. The AHP model is able to assist decision-makers in making complex decisions. It has been applied in numerous studies in various areas: to develop an evaluation model capable of measuring the performance of the quality indicators and evaluating the performance of the outsourced services provided to the

https://doi.org/10.17221/168/2022-AGRICECON

company (Longaray et al. 2015), in the papers with the AHP model in the agricultural sector to determine key agricultural strategic factors using AHP-Impact Matrix Cross-Reference Multiplication Applied to a Classification (AHP-MICMAC) (Barati et al. 2019), to determine the priorities of food commodities targeted districts as new food in Minahasa Tenggara (Setiawan et al. 2014), to show how AHP can successfully be used in agriculture by assessing the role of agri-environmental measures to improve agriculture and the countryside (Huehner et al. 2016).

In this paper, the emphasis will be on the decision of the best distribution channel for agricultural products in the selected countries of Southeast Europe, which have similar economies – they have similar economic structures, business operations under the Central European Free Trade Agreement (CEFTA), the existing agreements with the EU. The specification of the AHP model will be presented in the following part. We are going to discuss the results of the analysis before the concluding remarks.

MATERIAL AND METHODS

Data and model specification. The data sources for this analysis are taken from the conducted survey in the project entitled 'The Role of Small Farms in the Sustainable Development of the Food Sector in Central and Eastern Europe' (Project No. PPI/APM/2018/1/00011). The survey was conducted on a sample of 2 980 farms in 5 countries (928 farms from Lithuania, 444 farms from MDA, 448 farms from Poland, 784 farms from ROM, and 376 farms from SRB). Such a large sample gave precise estimates and is considered to be the advantage of the research, while the disadvantage is that the survey was conducted only in 2019 (Polcyn 2022). The survey was carried out by a face-to-face interview, using a pre-prepared survey containing four thematic areas: economic and social sustainability, environmental sustainability, market linkages, and the general characteristics of the farm. For the purpose of this analysis, the research was conducted in three countries (MDA, ROM, and SRB). The database was cleared of redundant and omitted data prior to the analysis, so the sample was relevant. The emphasis in the analysis was on the economic consideration of the plan for agricultural product placement through distribution chains. Based on the available survey results, the experts reviewed and compared the distribution channels on the basis of which the matrices of all three economies were created, which are necessary for further analysis.

The countries selected for analysis have a similar history related to the socialist period. In a similar way, socialism shaped the situation of small farms, affecting mainly the degree of fragmentation of agriculture and economic conditions. The subject of our interest was small farms, considering that the statistics of the EU show that approximately half of the farms have an area of up to 2 ha, and another 22% are farms with 2–5 ha of agricultural land. The target group covered by the analysis were small farms participating in the agricultural accounting system or running accounting books on their own. The survey was carried out by a face-to-face interview, using a pre-prepared questionnaire (45 questions) containing four thematic areas: economic and social sustainability, environmental sustainability, market linkages, and the general characteristics of the farm. Before we carried out our survey in every country we had a 'pilot interview' stage with experts from Poland, who gave all the necessary skills and rules to be sure that the answers from the survey will be carried out in a good way and useful for the further analyses. After we finished the survey, in the next stage, data were selected from the group of all farms in order to conduct an in-depth expert study (Figure 1). For more details see also Polcyn (2022) and Stępień et al. (2022).

A total of 20 experts completed the process of weighting criteria and alternatives and comparisons in a pair of indicators, 45% from academia, 30% from business bodies and 25% from research centres. The analysis of the area of economic and social sustainability of small farmers was conducted by 5 experts, who were selected from three different groups: the academic community (2), business bodies (2) and the research centre (1). For the purposes of this research, each expert analysed the answers to the questions from the completed questionnaires of farmers from all three countries, namely those that directly referred to the first criteria (products), and then to the alternatives (distribution chains). The experts gave their assessments comparing pairs of criteria and/or alternatives. To express their preferences, the evaluators used the Saaty scale (Saaty 1990).

A decision-making model is used to analyse the choice of a distribution channel. We have opted for Multi-Criteria Decision-Making (MCDM) methods. A hierarchical structure for decision-making based on the criteria and sub-criteria relevant to the decision-making process on the distribution channels of agricultural products in small-scale farms is created in order to provide the conditions for applying the multi-criteria methods of the AHP for all seven previously selected distribution

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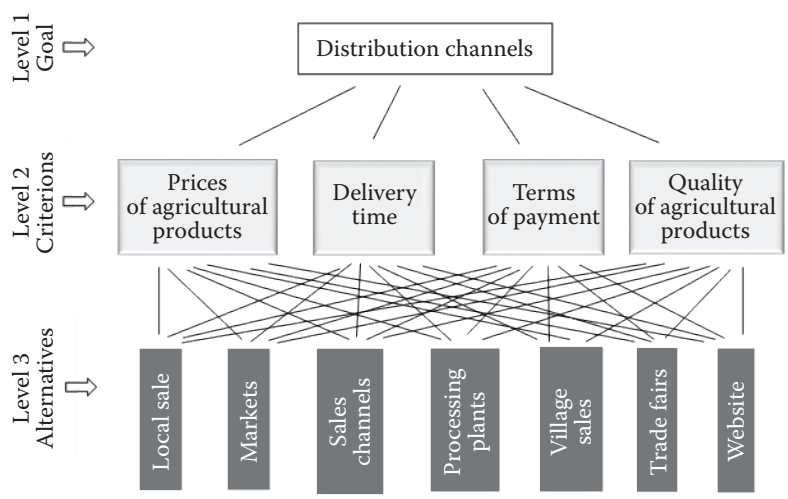

Figure 1. Survey implementation scheme

Source: Authors' elaboration

channels. The aim of applying this methodological tool is to assess which is the most favourable distribution channel out of the available distribution channels since in agribusiness it is necessary to eliminate the potential conflicts between several selected distribution channels. In this way, we have tried to remove the doubts of small farmers when deciding on the placement of their products in case of using several distribution channels simultaneously, so that one channel does not overpower the other or that one channel does not jeopardise the other. At the same time, starting from the criteria of agricultural products important for small farms, those criteria that are specific have been singled out.

The hierarchical structure for decision-making when choosing the distribution channel of agricultural products for small-scale farmers is shown in Figure 2.

Decision makers perform the decision-making process based on the previous experience, acquired knowledge and skills, as well as their own intuition. This subjective decision-making is successfully overcome by including more criteria in the decision-making process. Numerous MCDM methods bring objectivity to the decision-making process, which contributes to achieving more efficient assessments and results. The application of different MCDM methods enabled the ranking to be performed through the criteria, and then the selection of one or more alternatives from the defined group of alternatives (Figure 2). An effective framework for comparing multiple criteria becomes available to decision makers or experts. The experts involved in our distribution channel analysis are experts with extensive experience in science (agriculture) and agribusiness (Table 1).

The model originated in the early 1970s. It was developed by Saaty (1990) as a practical approach to solving relatively complex decision-making tasks. The model contains a hierarchical structure that enables simple comparisons and rankings of several consecutive levels – from a general goal to criteria, sub-criteria and alternatives. Synthesizing the results makes it easier for analysts to make the best decision with a simple explanation of the choice made (Chin et al. 1999). The efficiency of evaluating the model is measured by the procedure of evaluating the consistency of decision-makers' decisions and checking the value of the obtained evaluations and their weight values.

The process of analytical hierarchy (AHP model) is among the most commonly used methods of decision-making with multiple criteria since it successfully enables the modelling of complex problems in a hierarchical structure, which shows the relationships between the goal, criterion-goals, sub-criteria, and alternatives. In this way, the model provides an overview of the problems for decision-makers (Szabo et al. 2021). The main advantage of the AHP model is the ability to easily adapt to specific situations. Its design depends on the problems and needs, the knowledge, assessment, opinions or wishes of a decision-maker. Therefore, some traditional problems of subjective assessment *versus* an objective one can be overcome (Tošović-Stevanović et al. 2020; Ristanović et al. 2021).

The model is simply structured and realised in several steps (Saaty 1990). In the beginning, the elements in the structure are defined, and then the comparisons are made by the pairs of the elements within all the levels of the hierarchical structure (they are compared with each other in relation to the first superior element at a higher level). Their mutual significance is assessed using Saaty's scale of relative importance. In this way, the criteria within the hierarchical structure are determined. Later, the evalua-

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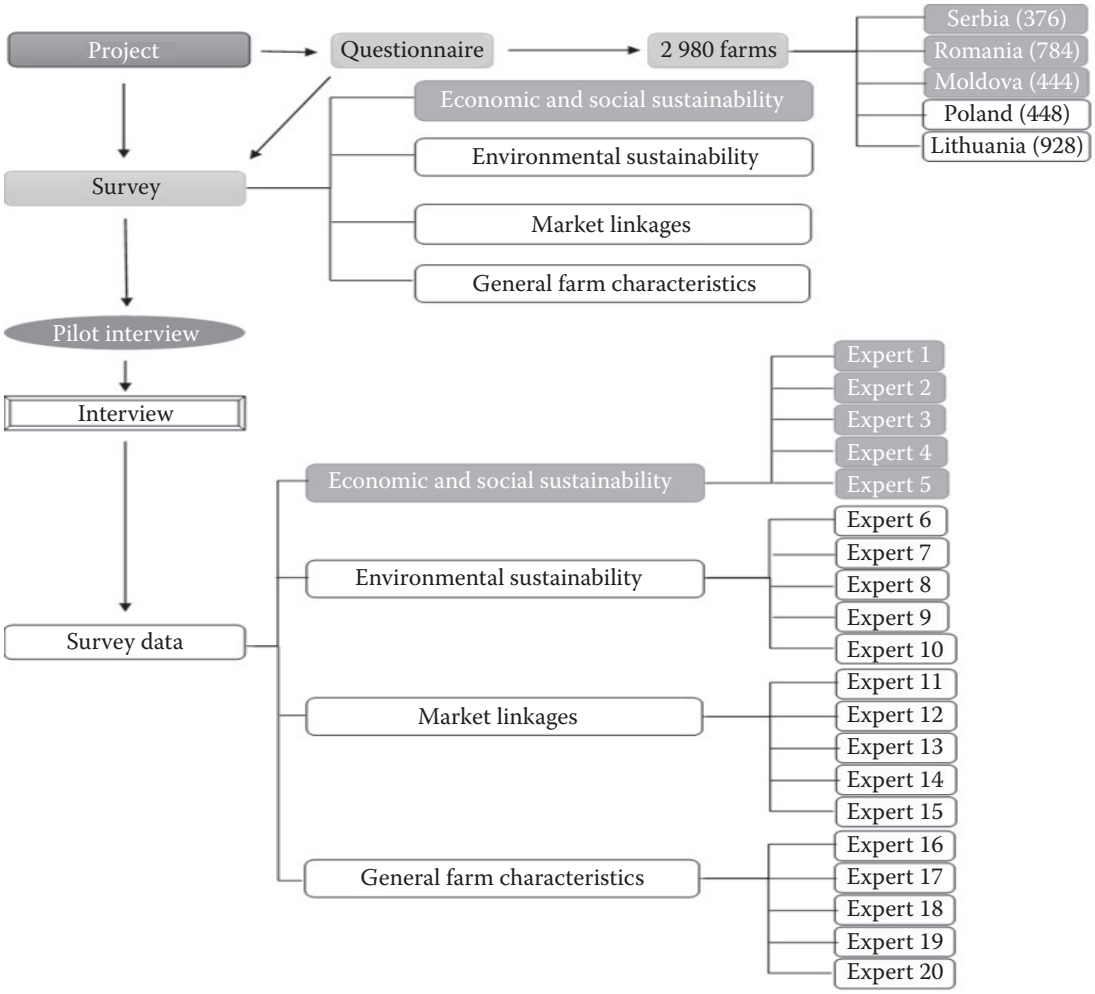

Figure 2. The Analytical Hierarchy Process (AHP) model – distribution channel objectives and actions hierarchy

Source: Authors' graph

tion of the alternatives is conducted, in relation to each criterion, and, finally, all the necessary elements of the hierarchical structure are obtained. The final result is a network presentation of the problem. The obtained values are placed in the matrix (square matrix A, matrix elements a_{ij}) in the order corresponding to the matrix sequence. The comparison of the elements in pairs is performed by the method of eigenvalues, where the weight vectors of the entered elements are determined through a linear system ($A \times \omega = \lambda \times \omega$) [where: A – matrix (the dimension n × n); ω – eigenvalue vector; λ – eigenvalue]. The model set up in this way successfully neutralises the uncertainties in the decision-making process. However, in order to obtain efficient model estimates, the matrix needs to be consistent, which is achieved by the previously calculated maximum eigenvalue of the comparison

Table 1. Experts' profile

Expert No.	Gender	Age	Education level	Experience (years)	Sector/institution
1	male	45	Bachelor	> 20	economy (chamber of commerce)
2	female	38	Master	> 10	research (university)
3	male	53	PhD	> 25	education (institute research)
4	female	59	Bachelor	> 30	cconomy (chamber of commerce)
5	female	43	PhD	> 15	education (university)

Source: Author's own elaboration

https://doi.org/10.17221/168/2022-AGRICECON

matrix (λ_{max}). Afterwards, the synthesis of the local priority vectors is performed by applying the distribution model of aggregation [$CI = (\lambda_{max} - n)/(n - 1)$] (where: CI – consistency index; n – number of parameters). The consistent matrix helps to measure and correct the errors of experts when evaluating and making decisions. The calculation of the degree of consistency [parameter $CR = CI/RI$, whose limit value is 0.1 (where: RI – random index in Saaty's scale)] is necessary, so as to calculate the values within the matrix. The values of the consistency index are then ranked, and the highest in rank is the final solution to the decision problem. For more information, see Tošović-Stevanović et al. (2020) and Ristanović et al. (2021).

RESULTS AND DISCUSSION

According to the analysed expert assessments and the results of the survey conducted by a face-to-face interview with small farm owners in MDA, ROM and SRB, we came to the results that clearly reflect the features of the agricultural markets in Eastern Europe: *i*) the quality and the prices of agricultural products are the key criteria for evaluating the process of agricultural production, and *ii*) the largest percentage of the placement of agricultural products are bidirectional-oriented – directly control the placement through green markets, where they participate in creating the final price, and offer the products to processing plants and shorten the time of the placement by accepting the agreed/established price.

Table 2 presents the thoroughly analysed results of the AHP model. According to the results of the analysis, the criteria (C1 – prices of agricultural products, C2 – delivery times, C3 – terms of payment, C4 – quality of agricultural products) specific to this region of Eastern Europe were selected. The criteria were evaluated and, according to the rank, two criteria prevail, the quality (score 0.49) and the price (score 0.33) of agricultural products.

Seven distribution channels (A1 – local sales, A2 – markets, A3 – sales channels, A4 – processing plants, A5 – village sales, A6 – trade fairs, A7 – website) were analysed and the following results were obtained: *i*) in MDA the dominant distribution channels are product placements through local sales (0.31) and green markets (0.22); *ii*) in ROM the dominant criteria are green markets (0.32) and processing plants (0.22); *iii*) in SRB, the dominant distribution channels for product placement are both processing plants (0.28) and green markets (0.25).

The results showed clear similarities for some criteria, but also significant differences for other criteria. For example, all three groups of experts consistently ranked the quality criteria of agricultural products as the highest. Also, all three groups of experts ranked the criteria for prices of agricultural products higher than the others. However, a consistent ranking could not be concluded, as the results differed in part between the three groups of experts in terms of delivery time and payment terms. In any case, these two criteria are in the last place in the ranking. In the ranking of alternatives, for example, all three groups of experts consistently ranked processing plants, while markets ranked the highest. Experts have shown a clear tendency towards low weighting of the distribution chain

Table 2. Total weight and rank of variants

Distribution channel	Serbia (SRB)					Romania (ROM)					Moldova (MDA)				
	C1	C2	C3	C4	rank	C1	C2	C3	C4	rank	C1	C2	C3	C4	rank
A1	0.04	0.01	0.02	0.06	0.13	0.03	0.01	0.01	0.05	0.11	0.09	0.02	0.02	0.17	0.31
A2	0.10	0.02	0.02	0.11	0.25	0.12	0.02	0.03	0.15	0.32	0.08	0.02	0.02	0.10	0.22
A3	0.02	0.01	0.01	0.04	0.08	0.02	0.01	0.01	0.03	0.06	0.03	0.01	0.01	0.04	0.08
A4	0.09	0.02	0.02	0.14	0.28	0.07	0.02	0.02	0.11	0.22	0.05	0.01	0.02	0.07	0.16
A5	0.04	0.01	0.01	0.08	0.15	0.03	0.01	0.01	0.05	0.10	0.04	0.01	0.01	0.06	0.11
A6	0.02	0.00	0.01	0.03	0.07	0.05	0.01	0.02	0.08	0.16	0.03	0.00	0.01	0.03	0.07
A7	0.02	0.00	0.01	0.03	0.06	0.02	0.00	0.00	0.02	0.04	0.01	0.00	0.01	0.02	0.04
Sum	0.33	0.08	0.10	0.49	**1.00**	0.33	0.08	0.10	0.49	**1.00**	0.33	0.08	0.10	0.49	**1.00**

C1 – prices of agricultural products; C2 – delivery times; C3 – terms of payment; C4 – quality of agricultural products; A1 – local sales; A2 – markets; A3 – sales channels; A4 – processing plants; A5 – village sales; A6 – trade fairs; A7 – website; bold values explain sum numbers in a row and sum in a column

Source: Authors' calculations

https://doi.org/10.17221/168/2022-AGRICECON

sales channels and internet sales. However, for the group of actors in the distribution chain local sales, village sales and trade fairs, it was not possible to conclude a consistent ranking, as the results differed in part between the three groups of experts, for all three groups of experts in all three countries.

There are few authors who analysed the distribution channels of the agricultural products from small farms in the Eastern European region. For example, Tošović-Stevanović et al. (2020) obtained the same results for SRB, where the dominant distribution channels are processing plants and green markets; bearing in mind that the placement through green markets included the product placement through local stores, so the rating was higher. Gajdić et al. (2018) also analysed the distribution of organic food products in Croatia and they concluded that most producers sell their organic food products directly to the final consumer, mostly on small farms and local fairs, and regarding indirect distribution, specialised stores are dominant retail format, followed by wholesale. Atănăsoaie (2011) reveals that it is better for small farmers to use distribution channels directly, without intermediaries, while for large farms he recommends the use of indirect distribution channels, through which they can sell large quantities of agricultural products (supermarkets, specialty stores, processors). Nikolaou et al. (2017) tried to identify consumer attitudes and preferences in Greece towards alternative agricultural distribution channels regarding fresh fruits and vegetables, and they underlined the importance of the components of alternative distribution channels, such as high quality, high standards, and consumer-producer trust. Borychowski et al. (2020), analysed this region, but the focus of the research was on the socio-economic determinants of small farms, making a clear distinction between EU members and other Eastern European countries, using the method of Criteria Importance through Intercriteria Correlation (CRITIC). Using a two-step control function approach, Chang et al. (2021) find that selling agricultural products to modern food distributors does not produce a positive difference compared to traditional outlets in agricultural households in Taiwan.

CONCLUSION

In the paper, the analysis of the distribution channels of the agricultural products on small-scale farms in MDA, ROM and SRB is conducted using the multi-criteria AHP decision-making model. The results indicate that there are individual differences in the alternative distribution channels between the analysed countries, but the common conclusion for all three economies is that the most important criteria for small-scale farmers are the quality and the price of agricultural products, while the most important distribution channels of agricultural products are green markets (the second in rank in MDA, the first in rank in ROM, the second in rank in SRB), followed by the placement of agricultural products through processing plants (the third in rank in MDA, the second in rank in ROM, the first in rank in SRB).

With the above analysis, we have tested the hypotheses successfully and proved that small-scale farmer chooses the distribution channel that achieves the greatest economic result. The application of the AHP model has demonstrated in this study that it is an excellent tool for assessing multicriteria problems. And it was once again confirmed why the AHP method is the most used in MCDM.

The contribution of this paper is reflected in the additional scope of knowledge through the research on the choice of food distribution channels by small-scale farms, with a unique set of data about the households on the farms.

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Received: June 7, 2022
Accepted: July 14, 2022
Published online: August 8, 2022