FARM ECONOMY IN SERBIA – DISTRIBUTION CHANNELS OF SUSTAINABLE PRODUCTS

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ABSTRACT

Sustainable agricultural products are sophisticated because they are directly related to the health of end users and have a specific quality and yield. The market for these products is specific and determined by various factors. This paper analyses the placement of sustainable agricultural products on small farms in the Serbian economy through multiple sales channels. We organized a one-on-one meeting with 150 small and medium-sized farm owners and collected data through a questionnaire. We then created a model through the Analytical Hierarchy Process (AHP method) to evaluate the decision-making of small farmers about placing products on the market. The results showed that the quality of the products is crucial for small farmers, who need to distribute them through local shops, retail chains, and markets. In this way, we have opened space for future analyses that can include regression models and assess relationships between individual categories.

Introduction

The agricultural sector is traditionally the most important in the economy. For centuries, it satisfied the basic population needs, and ensured the security of food supply in times of crisis, but was also used to strengthen other sectors of the economy. Farmers manage to realize subsidies from the state to ensure the progress of farms and to meet the food needs of people living in cities. At the same time, quality was a priority because the final product relates to population health. The price reduction has always been at the expense of the agricultural sector, but it has also brought progress to other faster-growing sectors, especially industry. Today, organized agriculture is a profitable and rapidly developing sector. Modern trends have made agricultural production sustainable, and it is the backbone of a circular and green economy, biodiversity, and sustainable development.

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Some authors believe that too much focus on agriculture aimed at high productivity to ensure food security and reduce poverty, along with the economic growth of other sectors and the intensive use of non-renewable energy, significantly affects the degradation and collapse of the quality of the environment (Parušić et al. 2023; Usman et al. al. 2022). Because of that, Pešić and Janković (2009) underline the major emphasis which is today and it is placed on sustainable agriculture, i.e. sustainable natural resources for exploitation - agricultural production is expected to preserve biodiversity and equilibrium in the biosphere, i.e. enabling the survival of genetic resources of both animal and plant origin, contributing to their adaptability and future use in food production. According to FAO (2023), agro-food businesses are increasingly adopting sustainable practices and reporting on their environmental, social, and governance performance, but still, many private businesses might have a vested interest in maintaining the status quo, therefore governments may impose laws and regulations affecting the private sector.

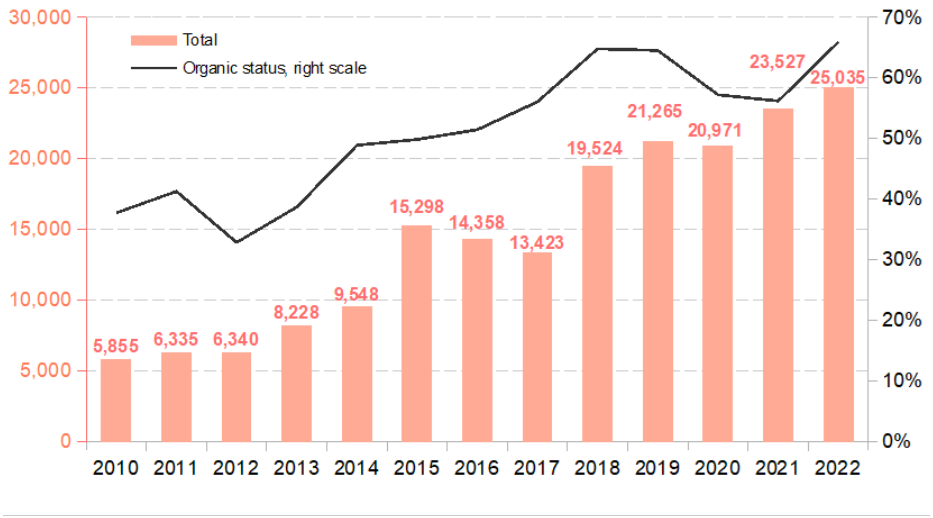
Tomić et al. (2007) believe that rural areas in Serbia represent our comparative advantage in applying sustainable development in food production. It is up to us to turn the previous backwardness and devastation of rural areas into our advantage. Other authors (Šeremešić et al. 2017) have the opinion that directions of this type of production can be considered within organic agriculture because it is stated (Reganold & Wachter, 2016) that organic agriculture (biological or ecological) is based on the integration of traditional agricultural production methods with modern technological processes in agriculture. Precisely by achieving better results in organic agriculture, environmental protection, and overall rural development, the quality of life of the population in the given territory is improved, which according to Subić et al. (2010), an excellent example of agricultural producers throughout the territory of the Republic of Serbia, but also beyond.

A similar conclusion is reached by one of the studies conducted in Serbia (Đurić et al. 2018), which shows that the agroecological conditions for growing alternative cereals and the sustainable agricultural production system for small farmers in Serbia are very favorable. However, in practice, it is obvious that small and medium-sized farms have the most difficulties and dilemmas regarding the transition from traditional to sustainable agricultural production, both due to insufficient knowledge, administrative and advisory support from professional services, and financial assistance, motivation, and support. This is not the case only in Serbia, but also in other countries. Smallholder farmers are unwilling to engage in their small farms due to low returns food and farm income, instead relying on off-farm alternatives to feed their families (Mugambiwa, 2023; Ritzema et al., 2017). Widespread challenges organic growers face includes lower yields, difficulty maintaining soil fertility levels, obtaining proper certification, and accessing markets.

However, despite the mentioned difficulties that farmers face, their number in organic production is gradually increasing. One of the reasons is the high demand for this type of product, so, apart from the awareness and importance we attach to sustainable production, the economic moment is very significant and certainly represents one of

the main motivators, both in Serbia and Europe. This is supported by the figures from the records of the Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia, which show an increase in the total number of producers (including subcontractors from group production) from 1,073 in 2012 to 6,408 certified producers in 2021. Also, there was a significant increase in the total organic production area from 2010 to 2022 (Figure 1), especially by types of production of organic products for the same analyzed period.

Figure 1. Area under organic production 2010-2022 (ha)



Source: http://www.minpolj.gov.rs/organska

The next key issue, when agricultural producers decide to produce organic products, is related to distribution channels. Given the limited number of products of organic origin, the question arises as to how best to choose distribution channels, bearing in mind the gap between the insufficient amount of organic food that can be offered, and on the other hand, the high prices of those same products. Some authors (Stanković et al. 2023) highlight problems related to poor information management, inadequate communication with each partner channel, and divergent objectives between partners, but also highlight the constant growth of retail sales, as one of the main channels of distribution of organic products. According to the research carried out in Serbia, an analysis of the market channels of organic products was carried out and the following stand out as the most significant (Simić, 2020): Retail trade chains, Specialized stores, Internet sales, Sales through direct marketing, and Greenmarkets.

Numerous studies have been conducted on distribution channels (Nikolaou et al 2017; Zhu 2020; Šostar and Ristanović 2021), but there is a lack of research on alternative distribution channel types in organic agriculture. Brezović et al. (2021) show that an accurate assessment of available distribution channels is crucial for the effectiveness and efficiency of confectionery distribution. Atanasoaie (2011) recommends that smallholder

farmers maintain a closer relationship with the end customer, using distribution channels directly, without intermediaries, such as Community Supported Agriculture (CSA) "box" systems, farmers' markets, and farm gate stores. Tošović-Stevanović et al. (2020) investigated the distribution channels of agricultural products of small farms in Serbia showing that farmers first decide to sell their products to factories for processing agricultural products, prioritizing product quality. Ristanović et al. (2022) analyzed the distribution channels of small farms in Eastern European countries showing that farmers mainly sell their products on markets and processors and that the quality and price of agricultural products are the dominant criteria for channel selection. Modern food distribution channels in Taiwan's agricultural sector were investigated by Chang et al. (2021). They showed that the sale of agro products through modern food distribution channels (supermarkets, hypermarkets, branded retailers) does not make a positive difference compared to traditional sales facilities, but the inclusion of small farmers in this distribution channel type improves the general well-being of the rural population. Gajdić et al. (2018) show that most producers sell their organic food products directly to the end consumer, mostly at family farms and local fairs. Concerning indirect distribution, specialty stores are the dominant retail format, followed by wholesale.

Serbia is an agricultural country with large capacities and various advantages for a certain type of agricultural production. As much as 60% of the total agricultural land is used for grain production. We used data from a survey conducted in the northern province of Vojvodina, among 150 small and medium-sized farms engaged in grain production. The mission is to analyze the best way to distribute sustainable agricultural products to small and medium-sized farmers in Serbia. The idea is to look at the criteria and make the right decision on the placement of this type of product. Our goal is to show small farms the advantages of different channels of distribution of sustainable agricultural products based on the results of analysis and practice from the market. Based on the available data from the survey, the following research hypotheses were defined: H1 - Quality is the basic characteristic of sustainable agricultural products; H2 - If distribution channels require more labour participation, they will be less acceptable to farmers; H3 - Distribution to local chains is the best distribution channel for the farmer.

The AHP method, devised by Thomas L. Saaty, represents a sophisticated pillar in multi-criteria decision-making (MCDM). The extensive validation and application of AHP in various fields – from resource allocation and strategic planning to health care and environmental management – confirms its versatility and effectiveness. For example, Forman and Gass (2001) discuss the application of AHP in operations research, emphasizing its ability to reconcile qualitative and quantitative data. Similarly, Wind and Saaty (1980) highlight its utility in marketing, where AHP helps to reveal consumer preferences and competitive strategies. The AHP model, using Saaty's precise methodology, turns the intricate maze of multi-criteria decision-making into a navigable path. By constructing hierarchies, performing pairwise comparisons, ensuring consistency, and synthesizing results, AHP provides a comprehensive framework that guides decision-makers with precision and clarity.

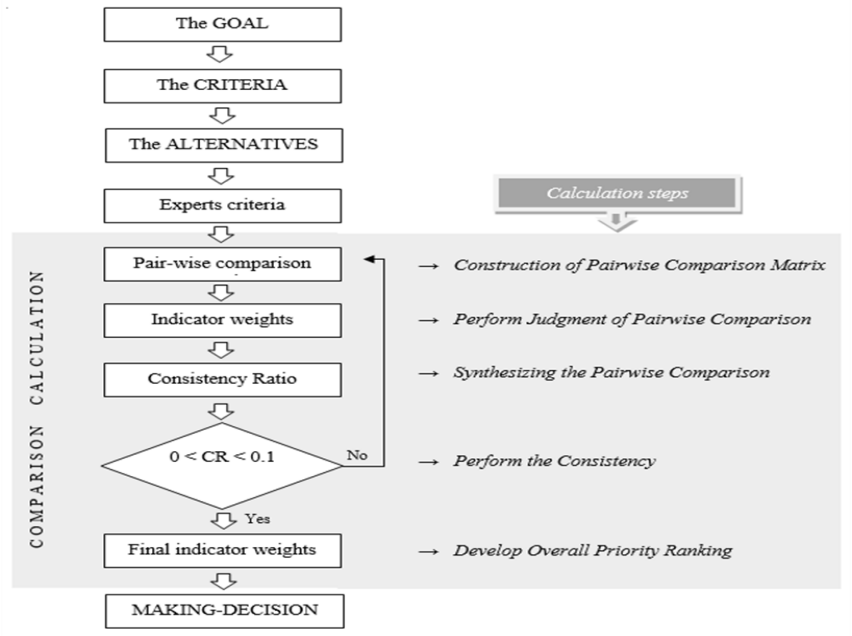
The structure of the manuscript is as follows. After its introduction, the AHP method was stated as the most suitable for application in the distribution of sustainable products by small farmers because it can help in more efficient decision-making in ranking criteria and alternatives in order of importance. The results are presented in the next part of the manuscript. At the end of the paper are the conclusions.

Materials and methods

The data source for this research was taken from a survey that is part of the project titled "Eco-efficiency and sustainability of small-scale farming: exploring slacks for undesirable outputs and public goods". Sample data from 150 small and medium-sized farms in Serbia were analysed. The analysis advantage is the sample size, while the disadvantage is that the survey was conducted for only one part of Serbia, the northern province of Vojvodina (1/3 organic producers and agriculture). The interviews were conducted using a pre-prepared survey. The database consists of responses from farmers, cleaned of unnecessary data so that the sample is relevant. Experts, who are members of the academic community (50%), research centres (30%), and business (20%), based on the data from the survey, created the comparison matrices necessary for the continuation of the analysis.

The AHP model is like a finely tuned algorithm, designed to decompose complex decision-making problems into a structured and comprehensible hierarchy of criteria and alternatives (Figure 2). The beauty of AHP lies in its systematic approach to quantifying subjective judgments and synthesizing them into objective priorities.

Figure 2. AHP hierarchy structure



Source: Authors' calculation

As part of monitoring the sustainable products of small and medium farmers, it is necessary to evaluate their placement on the market. A structure was devised for criteria evaluating for making decisions about product placement and alternatives in the way of product placement. 8 criteria (prices, certification, incentives, and quality) and 4 alternatives (local shops, the market, sales chains, processing plants, a fence, trade fair, and the network) were identified for discussion with experts in the field of agriculture. Using the AHP model, an expert evaluation was performed to determine the weight of indicators and compare indicators by level. Such an algorithm allowed us to identify the main distribution channels of sustainable agricultural products of small farms in Serbia.

At the top level, a general goal is broadly set. The lower level specifies the criteria used for evaluation. The evaluation begins by constructing a comparison matrix of all elements in the hierarchy level with the immediately higher level. In this way, priorities are determined and used for individual comparative judgments with the help of Saaty's scale of measurement ratios. Decision alternatives are at the lowest level. The synthesis of priorities is the final evaluation to determine the criteria's importance and alternative performance (Saaty, 1987). The advantage of this method is that this structure can be elaborated following the existing problem in the company's management system or decision-making at higher management levels.

This hierarchical structure enables decision-makers to dissect a problem into its elemental components (Ristanović et al., 2021). The process begins with the hierarchy construction, establishing the goal at the apex, cascading down through the various criteria that influence the decision, and culminating in the possible choices.

In the part of the comparison calculation, AHP uses pairwise comparisons to quantify decision-maker's preferences. It evaluates different criteria, systematically comparing them to determine which one best suits the farmer's interests. These comparisons generate a set of matrices, each representing the relative importance of criteria and alternatives. The intensity of preferences is expressed using Saaty's scale (1990) which typically ranges from 1 (equal importance) to 9 (extreme importance), capturing the nuanced judgments of decision-makers.

Saaty's methodology is underpinned by the consistency ratio (CR), a diagnostic tool ensuring the reliability of the comparisons. The aim is to ensure that the ratio remains coherent and credible. The consistency ratio (CR) is the ratio of the consistency index (CI) to the random index (RI). First, a calculation is made for the eigenvalue (λmax) and the consistency index. A CR below the threshold of 0.1 indicates that the pairwise comparisons are consistent, reinforcing the robustness of the derived priorities. Should the CR exceed this threshold, it signals the need for a reassessment, much like a detective revisiting a crime scene to uncover overlooked details. When the final weights are obtained, the overall priority ranking is realised. The final step is to fusion these priorities across the hierarchy to rank the alternatives. This is akin to executing a complex algorithm where inputs from multiple stages are combined to produce a definitive output. The overall priority of each alternative is determined by aggregating

the weights assigned at each level, ensuring that the final decision reflects a balanced consideration of all criteria.

Results and Discussions

The results from Table 1 show the ranking of distribution channels of the agricultural products and the criteria related to deciding the channel type. The final decision of the best distribution channel for organic products for small and medium-sized farms in Serbia is found in the alternative with the highest ranking value of the overall weight.

These data show that farmers are mainly oriented toward local marketing of organic agricultural products (about 62%). As the dominant distribution channel, we can include local stores (rank 0.26), then retail chains (rank 0.19), and markets (rank 0.17), while direct sales to customers are made on the farm itself, over the fence (as much as 13%). Similarly, Stanković et al. (2023) show that customers in Serbia most often buy directly from producers (19.44%), in specialized stores and markets (16.85%), in new distribution channels (hypermarkets 14.09%, supermarkets 13.60% and pharmacies 10.15%). Milanović et al. (2020) show that as many as 77% of organic products are sold by farmers in Serbia through direct sales, at markets, but this percentage also includes sales at home and in local stores. In neighbouring Croatia, Gajdić et al. (2018) show that the main distribution channel of agricultural products is direct sales to consumers with 60.6%.

Table 1. Total weight and rank of criteria and alternatives

GOAL	P	C	I	Q	Rank
LS	0.06	0.04	0.03	0.13	*0.26*
M	0.04	0.03	0.02	0.08	*0.17*
SC	0.04	0.04	0.02	0.10	*0.19*
PP	0.01	0.02	0.01	0.05	*0.10*
F	0.03	0.02	0.01	0.07	*0.13*
TF	0.02	0.02	0.01	0.04	*0.08*
N	0.02	0.01	0.01	0.03	*0.07*
Rank	*0.22*	*0.18*	*0.11*	*0.50*	1.00

Source: Authors' calculations

Note: P – prices, C – certification, I – incentives, Q – quality, LS – local shops, M – the market, SC – sales chains, PP – processing plants, F – a fence, TF – trade fair, and N – the network

Farmers of small and medium-sized farms sell only 10% of organic products to agricultural processing plants. It is the complete opposite concerning other agricultural products. Some studies show that for farm products, the dominant distribution channels of farmers in Serbia are processing plants, followed by markets (Tošović-Stevanović et al. 2020; Ristanović et al. 2022).

The lowest placement of organic agricultural products in Serbia is achieved through fairs (rank 0.08) and the Internet (rank 0.07) because farmers focus more on the production

process than marketing. Milanović et al. (2020) show that of the 23% of organic products in Serbia, that are marketed through intermediaries (wholesale and retail), a small percentage is realized via the Internet. Also, Stanković et al. (2023) show that customers in Serbia buy the least amount of organic agricultural products online (9.07%). In Croatia, the online sale of organic farm products is only 6.0% (Gajdić et al. 2018).

The criteria that determine organic agricultural products are the quality (rank is 0.50) and price (rank is 0.22) of the product. Product certification (rank 0.18) also shows that quality is a dominant criterion, which guarantees quality control. Control and certification of organic products in Serbia is an advantage chosen by a few buyers, primarily due to a lack of knowledge or incomplete information. State incentives (rank is 0.11) are in the last place among the criteria because farmers on small and medium farms mostly rely on their capacities and varieties. Other researchers also single out the quality and prices of agricultural products as dominant criteria for farmers (Tošović-Stevanović et al. 2020; Ristanović et al. 2022; Xu 2009) as well as for consumers (Milić et al. 2022; Tsakiridou et al. 2008).

Conclusions

This research was conducted on a sample of 150 small and medium-sized farms in Serbia. The paper presents the criteria and alternatives in the multiple decision-making system using the AHP model. The results of the analysis confirmed all three hypotheses. Product quality is always associated with organic agricultural products which is confirmed by the assessment that quality is a key characteristic of sustainable agricultural products among farmers. Farmers are mostly interested in producing quality products, not in marketing. This is why online and fair sales are at the bottom of the list of distribution chains, while product placement through local and sales chains dominates.

The AHP model has again, through a compelling hierarchical structure, created an abstract network into a tangible decision-making framework. This hierarchy descends from the ultimate goal at the top, through different criteria levels, to the base level of alternatives. Once again, the application of the AHP model proved to be successful. This confirms that the AHP model is the most widely used tool for evaluating multi-criteria problems. The AHP method successfully solved the decision-making problem around the distribution of sustainable products for small and medium farmers.

This paper provides valuable new insights into the growing literature on the perceptions of small and medium farmers. We faced two limitations in this research. First, the focus is on the part of Serbia that is very fertile and rich in crops. Second, only those farms that produce arable and vegetable production are included. Future research should conduct a more detailed analysis of the main factors affecting all farmers, identify new criteria, and examine the importance of expanding the various distribution channels of sustainable agricultural products.

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Conflict of interests

The authors declare no conflict of interest.

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