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EVALUATION OF SUSTAINABLE AGRICULTURAL TOURISM CRITERIA

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Abstract: In this paper, a group of selected factors of importance for the sustainable development of agritourism in Serbia was assessed using the fuzzy logic of expert decision-making, i.e. the objective multi-criteria decision-making method SiWeC (Simple Weight Calculation). The aim of the research was to determine the significance of the criteria that influence the potential further development of this branch of tourism in our country. The results show the successful application of the selected method, where the criterion “Active participation in tourism activities” together with the criterion “Environmental quality” received the highest rating from the experts. Given the results obtained, it is necessary to improve the criteria that were rated the worst in the future, i.e. work on greater cooperation with the local community through expanded and improved marketing activities of hosts, i.e. service providers. The method used for assessing the criteria thus gains greater transparency in research in this area, and as such needs to be further developed.

Key words: Agrotourism, Sustainability, Multi-criteria decision-making, SiWeC method

1. INTRODUCTION

Nowadays, there is an increasing emphasis on improving rural areas, and the way to achieve this is to develop tourism, or tourism activities in them. In addition to the development of tourism activities, attention should also be paid to their sustainability. Therefore, it is necessary to develop the principles on which sustainability is based. Thus, Tseng et al. (2019) believes that the emphasis of sustainability is on the application of values and principles that aim to direct human activities in a responsible and coordinated manner with environmental and social consequences. Also, as Prevolšek et al. (2020) concludes, the concept of sustainability in tourism implies the presence of economic, environmental and social dimensions as the primary criterion of sustainability. Jeločnik et al. (2013) believe that sustainability related to tourism is usually framed by its large share in the GDP of a country, and that it exerts an impact on a balanced regional and contributes to the further increase in foreign direct investment in a country.

Agritourism represents a diverse offer of agricultural activities, most often on small and medium-sized farms. (Giaccio et al., 2018) Agritourism as such has its roots at the beginning of the last century. It represents an unusual combination of tourism and agriculture and, as Puška et al. (2020) notes, is not the only form of tourism that can occur in rural areas of a country. The existing interaction between agriculture and tourism is crucial for the socio-economic stability of rural areas, thus enabling farmers to maintain their agricultural practices while engaging visitors (Baby and Kim, 2024). Palmi and Lezzi (2020) believe that agritourism is a form of multifunctionality in agriculture, which presupposes the preservation of rural landscapes and biodiversity, thereby strengthening employment and providing sustainability to rural areas. Thus, farmers use this multifunctionality to achieve full integration of farm income on the one hand and raise tourist awareness about the role of agriculture in preserving the environment, natural resources, cultural heritage, as well as traditions and customs (Giaccio et al., 2018; Puška et al., 2020). Kousar and Kausar (2024) believe that the

practice of agritourism varies greatly across regions, emphasizing their cultural, economic and ecological characteristics, thereby promoting their sustainable development and unique rural experiences.

Based on the previous statement, the subject of this paper will be the sustainability of agritourism in the Republic of Serbia, or rather, determining the importance of the characteristics that influence its development. The need for research lies in the fact that Serbia is a rural country with a well-rooted tradition and historical and cultural heritage, preserved nature, which can best demonstrate its financial valorization through the development of this type of tourism. For this purpose, it is necessary to investigate the factors that influence sustainability, or rather, to show their individual importance.

For the purpose of evaluation, multi-criteria analysis methods play a major role, which have taken their place in a large number of works by the author in the previous period. Mahaptra et al. (2023) using the AHP method identifies key indicators of impact on rural tourism (agritourism) in India. In his study, the cultural factor plays the greatest role in the development of rural tourism, followed by criteria such as heritage and local quality factors. Wu et al. (2022) using a hybrid fuzzy multi-criteria decision-making model selects the most suitable agritourism location in Vietnam, while Vazin et al. (2024) also using a fuzzy decision-making model identifies certain villages suitable for agritourism. Using the Delphi method and the AHP multi-criteria decision-making method. Park et al. (2017) assess the quality of accommodation in rural tourism, and ways to improve and expand them. Many other authors also use multi-criteria analysis methods for the purpose of selecting factors of influence for the development of sustainable agrotourism potential (Muhacir and Tazebay, 2017; Anabestani, 2016; Puška et al., 2022; Adamov et al., 2020; Nedeljković et al., 2022).

The aim of the research was to determine the significance of the criteria that influence the potential further development of this branch of tourism in our country.

2. MATERIAL AND METHODOLOGY

The research process is presented in the following flowchart (Figure 1), in the elaboration of which the available scientific and professional material was used as a source of information, as well as a questionnaire sent to the engaged experts to fill in. The first step was to determine (define) the criteria that will be used in the research. The selection was narrowed down to ten criteria that are presented in the following Table 1. After that, a framework research model was formed, and the selection of experts in the subject area was initiated. Given that this is an expert decision-making process, it was necessary to obtain as precise an assessment as possible of the criteria that were forwarded to the selected experts via questionnaire. The research involved 6 experts whose structure was such that it consisted of employees in tourism organizations who have many years of experience in this field. After that, the selected selection method was applied, and the final ranking was made. The results are given in the continuation of the paper, as well as a description of the applied method. Finally, the necessary conclusions were drawn.

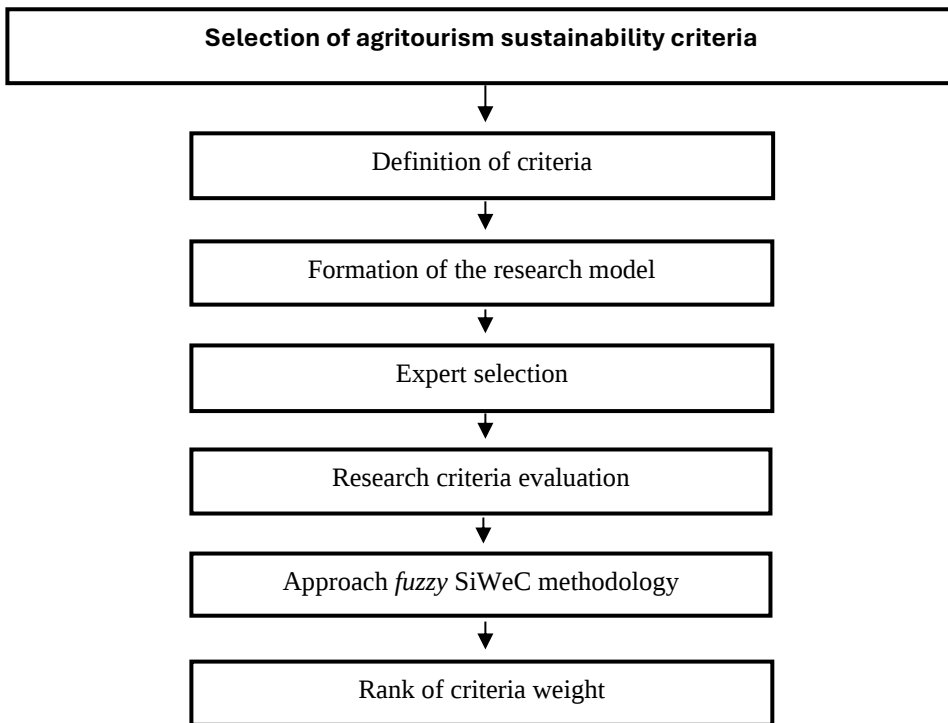


Figure 1. Research methodology

Table 1. Evaluation criteria

ID	Criterion	Explanation
1	Price	Examination of monetary rewards for the use of agrotourism facilities.
2	Location	Examination of the spatial accommodation of agrotourism capacity.
3	Marketing	Examining whether the promotion of sustainable tourism offers is necessary.
4	Quality of service provided	Examination of the quality of the provided sustainable agritourism offer.
5	Helping the local community	Examining whether the use of agritourism offers contributes to improving the standards of the local community.
6	Collaboration with the local community	Examining the possibility of helping the local community by users of agritourism offers.
7	Active participation in tourism activities	Survey of the participation of users of sustainable agritourism in all the content offered.
8	Availability of natural resources	Examining the availability of natural resources.
9	Environmental quality	Examining the quality of the environment in the agritourism offer.
10	Diversity of resources	Examining the diversity of sustainable resources in the agritourism offer.

The classical logic of decision-making and evaluation of given criteria finds its place in research where the information is complete and accurate. For this purpose, it is particularly desirable to use objective methods for calculating weighting coefficients. In the case of incomplete and inaccurate

information of a subjective nature, it is important to apply *fuzzy* logic in research. In this case, the research uses *fuzzy* logic and thus converts linguistic values into a fuzzy number system. For the purposes of this paper, the *fuzzy* scale shown in the following Table 2 was used.

Table 2. Linguistic evaluations and *fuzzy* membership functions (Puška et al., 2024)

Linguistic Values	Fuzzy numbers
Very low (VL)	1, 1, 2
Low (L)	1, 2, 4
Medium low (ML)	2, 4, 6
Medium (M)	3, 5, 7
Medium good (MG)	5, 7, 9
Good (G)	7, 9, 10
Very good (VG)	9, 10, 10

For the evaluation of the criteria, i.e. obtaining the necessary weight coefficients, we used the innovative fuzzy subjective method of multi-criteria decision-making SiWeC (Simple Weight Calculation). The method was developed by Puška et al. (2024) and is characterized by simplicity both for decision-makers and for the calculation itself. The method was developed in two directions, namely as a regular SiWeC method (crisp numbers) and a fuzzy SiWeC method that we will use further in the work. By using it, we popularize the method and set the basis for its further development and application in the subject area. The steps of the fuzzy SiWeC method are given below:

Step 1. Experts determine the importance of each criterion.

Step 2. Linguistic values are transformed into fuzzy numbers, represented as:

$$\tilde{x}_{ij} = (x_{ij}^l, x_{ij}^m, x_{ij}^u)$$

where x_{ij}^l represents first, x_{ij}^m second, and x_{ij}^u third fuzzy number.

Step 3. The fuzzy numbers are normalized as:

$$\tilde{n}_{ij} = \frac{x_{ij}^l}{\max x_{ij}^u}, \frac{x_{ij}^m}{\max x_{ij}^u}, \frac{x_{ij}^u}{\max x_{ij}^u}$$

where $\max x_{ij}^u$ is the maximum value across all criteria.

Step 4. Calculation of standard deviation (*st.dev*_{*j*}).

Step 5. The normalized ratings are weighted using the standard deviation values:

$$\tilde{v}_{ij} = \tilde{n}_{ij} \times st.dev_j$$

Step 6. The sum of the weighted values for each criterion is calculated:

$$\tilde{s}_{ij} = \sum_{j=1}^n \tilde{v}_j$$

Step 7. The fuzzy values of the criteria weights are computed as:

$$\tilde{w}_{ij} = \frac{s_{ij}^l}{\sum_{j=1}^n s_{ij}^u}, \frac{s_{ij}^m}{\sum_{j=1}^n s_{ij}^m}, \frac{s_{ij}^u}{\sum_{j=1}^n s_{ij}^l}$$

Step 8. Defuzzification of the weights criteria

$$w_{j\text{def}} = \frac{w_{ij}^l + 4 \times w_{ij}^m + w_{ij}^l}{6}$$

3. RESULTS AND DISCUSSION

Table 3 presents the linguistic values obtained, or scores, using the fuzzy number scale presented in the previous Table 2. Previously, the expert assessment was given by the experts via a questionnaire using scores from 1 (worst) to 7 (best). The next step is to form a fuzzy decision matrix (Table 4).

Table 3. Experts evaluations of the criteria importance

Expert	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
E1	G	MG	M	VG	G	G	VG	G	VG	MG
E2	MG	MG	ML	G	MG	MG	VG	VG	G	VG
E3	VG	VG	G	VG	G	G	MG	MG	G	MG
E4	MG	VG	MG	G	G	MG	VG	G	VG	MG
E5	G	VG	MG	MG	G	MG	VG	VG	G	G
E6	G	G	M	VG	M	M	VG	G	VG	MG

Table 4. Fuzzy decision matrix

Expert	C1	C2	C3	C4	C5	C10
E1	(7,9,10)	(5,7,9)	(3,5,7)	(9,10,10)	(7,9,10)	(5,7,9)
E2	(5,7,9)	(5,7,9)	(2,4,6)	(7,9,10)	(5,7,9)	(9,10,10)
E3	(9,10,10)	(9,10,10)	(7,9,10)	(9,10,10)	(7,9,10)	(5,7,9)
E4	(5,7,9)	(9,10,10)	(5,7,9)	(7,9,10)	(7,9,10)	(5,7,9)
E5	(7,9,10)	(9,10,10)	(5,7,9)	(5,7,9)	(7,9,10)	(7,9,10)
E6	(7,9,10)	(7,9,10)	(3,5,7)	(9,10,10)	(3,5,7)	(5,7,9)

After forming the fuzzy decision matrix, we perform the intended calculation steps using the given method. Through the following graph 1, we see that criterion 7, or “active participation in tourist facilities”, received the highest score (Figure 2). Immediately following is the criterion “environmental quality”. The worst rated criterion was “marketing”, as well as the criterion “cooperation with the local community”. The assessment results show an increasing interest in active participation and a healthy and clean environment, thus escaping from the urban areas in which they live every day.

Although active participation in tourist activities was rated the best, cooperation with the local community itself was not rated the best, which indicates that tourist facilities are still used sporadically or randomly, without any pre-arranged organization, which is also confirmed by the assessment of marketing activities obtained through expert opinion. The research somewhat coincides with the results of the research by Nedeljković et al. (2022) and the study by Puška et al. (2022), where priority is given to criteria that promote sustainable development and environmental protection. It is also interesting to note that the “price” criterion did not receive the highest rating.

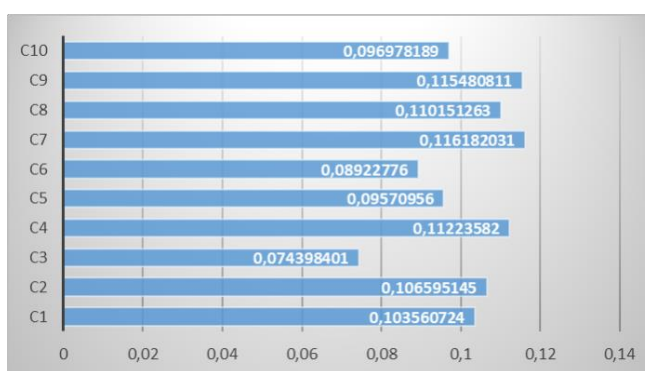


Figure 2. Ranking of criteria

4. CONCLUSION

Agrotourism today represents an important niche of a country's tourist offer. As a complex activity with diverse content that it can afford to its users, many factors influence its sustainable development. For this reason, the paper attempted to determine the significance of the selected factors and select the most important ones using an adequate innovative method. Active participation in tourist content and the quality of the environment represent the most important factors for users. In the continuation of the development of this form of tourism, it is necessary to animate the local population more, as well as to establish greater cooperation with potential tourists through additional marketing activities. Also, the paper successfully applied the fuzzy innovative method of multi-criteria decision-making, which can be successfully used in future similar research.

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