
FORMAL VS INFORMAL CONTRACTS (NETWORKS) AND SUSTAINABILITY OF RASPBERRY FARMS IN WEST SERBIA – AN EXPLORATORY RESEARCH

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ABSTRACT

Serbia has gained international recognition for its fruit production, particularly establishing itself as one of the top five global producers and exporters in the raspberry sector. Given the highly intensive nature of raspberry production and the diverse range of producers, spanning from small farms to large corporate entities, research on the sustainability of production and future strategies has become increasingly important. The study explores the significance of economic, environmental, and social factors influencing raspberry producers' practices. It also delves into their future production strategies, examining these aspects from the perspective of farmers. The findings derived from interviews with farmers reveal statistically significant differences between the two subsamples, namely formal and informal, across basic socio-economic and sustainability indicators, as well as in their anticipated future production strategies. The specific approaches and measures in achieving overall sustainability were emphasised in the concluding remarks.

Introduction

Starting from the fact that sustainable agriculture aims to minimize the environmental impact of farming practices by simultaneously promoting social justice and economic viability for farmers, the sustainability concept in agricultural sector manifests through two primary aspects: as a criterion guiding agricultural change (impacts of agriculture) and as a response to different changes in the environment (threats to agriculture)

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(Hansen, 1996). Regardless of the focus, it is anticipated that incorporating the sustainability concept in agriculture should aid in resolving the dilemma of how to intensify agricultural production while simultaneously reducing its negative impact on the environment. The use of the term “environment” here encompasses not only the ecological aspect but also the economic and social aspects. This is crucial because, often, the economic aspect of agricultural production takes precedence over social and ecological considerations (Lee et al., 2006; Struik, Kuyper, 2017).

Since the ecological consequences of intensified agriculture become apparent almost immediately, numerous studies have covered a broad range of aspects, from soil, climate, and other environmental conditions to themes connecting social factors and constraints to agriculture. Simultaneously, these studies delve into themes with a traditional economic orientation, treating agriculture as a food supplier and a market-relevant activity (Cassman, 1999; Rodríguez et al., 2014; Schiefera et al., 2016; Norton, 2016; Komlavi et al., 2019). These studies incorporate different subjects of the agriculture system, attempting to discern any patterns in their behaviour when evaluating potential risks and constraints in agricultural production (Buttel, 1993; Shreck et al., 2006; Pilarova et al., 2018, Stojanović et al., 2019).

A considerable number of new studies present innovative sustainable concepts in agricultural production, with a focus on farmers (Garnett et al., 2013; Pretty, Bharucha, 2014; Tiftonell, 2014; Petersen, Snapp, 2015). One such practice gaining attention is sustainable intensification - a practice intended to enable intensive agricultural production while minimizing ecological impacts. The acceptance of this practice implies that farmers are willing to change their agricultural production methods and, importantly, are open for considering and learning about different factors influencing their practices. In most cases, the introduction of such concepts usually comes from the governmental level (Santos, 2016; Kuhfuss, Subervie, 2018; Mazhar, 2021; Bougherara, 2021) although the private sector could play a certain role (Cholez, 2020).

While economic and environmental themes within agricultural production still heavily influence sustainability, recent studies focus on analysing the influence of farm contracting on green, smart approaches in agriculture production (Guo Jiang, 2007; Begum et al., 2012; Wang et al., 2014; Bellemare, Bloem, 2018; Meemken, Bellemare, 2020; Ikeda, Natawidjaja, 2022; Junjin Chen, Yhou, 2023). This aspect of research includes broader social context of farming. Topics that investigate farmers’ quality of life, their social networks and connections with other producers, as well as socio-demographic backgrounds and production approaches, can also be considered through farm contracting/networking status (Herrera et al., 2016; Janker et al., 2019; Wojewodzka-Wiewiorska et al., 2020; Brennan, 2021; Weituschat et al., 2023). Most of these studies use empirical evidence to demonstrate that farmers with formal contracts/networks are more prone to accept changes leading to new practices in their productions. An effective institutional arrangement can promote win-win situation, including income increasing and other aspects of sustainability, among various stakeholders within food chain.

Sustainable agriculture aims to establish a well-balanced and resilient farming system through a holistic approach that considers the interconnectedness of environmental, social, and economic factors in agricultural production. Emerging methodologies emphasize the economic well-being of farmers and rural communities, focusing on fair-trade practices, supporting local economic development, social justice, and building resilience against various uncertainties. The nature of networks within the agricultural production system plays a crucial role in determining sustainable business practices. However, there is no clear indication of whether formal contracts (networks) are superior to informal ones. Formal agreements may include clauses that promote sustainable practices, such as biodiversity conservation, the adoption of environmentally friendly methods, improved soil conservation, waste reduction, and optimized use of inputs. These agreements contribute to economic sustainability by ensuring a stable income for farmers through clear payment terms, pricing agreements, and risk-sharing mechanisms. Nevertheless, informal networks in rural communities also offer significant advantages as they rely on strong community relationships, providing farmers with greater flexibility to adapt to the specific needs of their local communities. Shared values within this system can promote collective efforts for environmental and social well-being, fostering sustainable practices.

The analysis in this paper includes identification of characteristics of traditional and entrepreneurial farmers in terms of business strategies (Zakić, Stojanović, 2008; Tošović et al., 2020). These two groups of producers may choose different contracts/social networks for conducting their businesses. Social networks can have a substantial impact on the strategies employed in the context of sustainable business development in the future (Stojanović, Radosavljević, 2013). Considering sustainability indicators, this paper explores new considerations that emphasize the role of contracts/social networks in achieving an overall sustainable business orientation within raspberry production in West Serbia. The paper is structured as follows: after the introduction and literature review, the research hypothesis, methodology and the analysed sample are presented, followed by empirical results and discussion. The main conclusions are provided at the end of the paper, indicating statistically significant differences between formal and informal raspberry production subsamples, laying the groundwork for further policy actions.

Research context: hypothesis, methodology and sample description

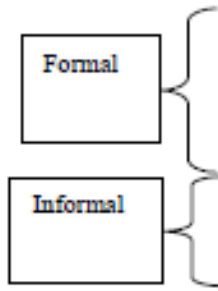
Serbia has been well known by its fruits production in general, having establishing itself the position of the regional leader in fruits exports during the last two decades (Pantić et al., 2021). This especially stands for the raspberry sector in West Serbia, a region that has been at the leading position both in the quantity and the quality of the raspberry production within the country (several municipalities within Moravički and Zlatiborski county, produce the famous brand of "Arijska malina") (Kljajić et al, 2017). As a consequence of the decades-long practice of small family farming in the Region, raspberry producers are organized either as traditional or entrepreneurial farms (Paraušić, Simenunović, 2016). The research aims to establish a connection between

the type of agreement that farmers have while organizing their agricultural production in Serbia (formal vs. informal contracts or networks) and different indicators and strategies referring to sustainability they consider in raspberry production. Basically, it is an exploratory research focused on one agricultural product with the aim to check whether the formality of agreements in agriculture affects sustainability and farmers' production strategies in the Region. The research was based on the structured face-to-face interview (Vigani et al. 2018).

The sample was consisting of 131 farms. The farms are predominantly small in size, below 2ha, managed by individuals or families. Only 45 farms in the sample are larger than 2ha. Concerning the gender structure, farms are mostly managed by male managers or owners (108 vs 23). The age structure is unfavourable – predominant age of owners is above 51 years (in 87 households) while there is only 24 farmers younger than 40 years. In educational structure the primary and secondary education dominates, with very rare examples of specialization in agricultural education. Producers are mainly producing as individual entities and in small number of cases they are members of collective schemes (108 vs 23).

The sample further divide is based on the formality of the sales contract into, so called, formal and informal subsamples (*Table 1*). Formal subsample includes legal contract before or during production and the ones agreed at the time of sale. It also includes collective organization memberships. The informal subsample includes informal agreements before or during the production and the ones at the time of sale. The farms that were not clearly classified in this manner were excluded from analysis (4 in total). Thus, formal sample includes 57 farms, while informal includes more, even 70 farms.

Table 1. Sample division into formal and informal subsamples



No. of farms	Contract/Network form
49	legal contract before or during production
3	legal contract agreed at the time of sale
5	collective organization membership
47	informal agreement before or during the production
23	informal agreement at the time of sale
1	other
0	not applicable
3	do not know
131	Total

Source: Stojanović et al. (2018): H2020 SUFISA WP2 National Report (Serbia), https://www.sufisa.eu/wp-content/uploads/2018/09/D__2.2-Serbia-National-Report.pdf

The implemented methodology is based on hypothesis testing in order to be able to investigate whether formal and informal subsamples are different in basic and advance indicators (ecological, social, economic sustainability) and in their future business strategies. For such a purpose, it is used Mann-Whitney test (Bhatta, Doppler, 2010; Hlouskova, Prasilova, 2020). The Mann-Whitney test is a non-parametric test that allows comparison of two independent samples. Test can determine if the samples may be considered identical or not on the basis of their ranks. This test can only be used to study the relative positions of the samples. So, having all that in mind, the hypotheses considering the samples that are the research object could be formulated as follows:

H₀: The difference of location between the samples is equal to 0.

H_a: The difference of location between the samples is different from 0.

For the variables given in absolute size and currency measurement units, the standard two-tailed t-test for two independent samples on the difference between the means was conducted.

Results and Discussions

a) Basic socio-demographic and economic indicators

The group of basic indicators encompasses socio-demographic characteristics such as age, gender, education/agri-education of the owner and economic indicators related to legal status of the farm, sale channel, total and commodity area, and farm income. The results showed that there are significant differences between formal and informal sectors in four out of eight basic indicators. Only the age and total area indicators did not show significant differences while income and education show certain differences but not so significant as it was in the case of legal status, gender, specific agri-education and area under raspberry production (*Table 2a* and *Table 2b*).

Table 2a. Demographic indicators: Mann-Whitney test / Two-tailed test

	Age	Gender	Education	Agri-education
U	2196.500	1634.500	1577	1969
U (standard.)	1.035	0.000	-2.284	0.000
Expected value	1995.000	1995.000	1995.000	1995.000
Variance (U)	37738.189	18936.667	33405.840	7536.667
p-value	0.301	< 0.0001	0.022	< 0.0001
Significance level: 5%				

Source: Authors' calculations

Table 2b. Legal and economic indicators: Mann-Whitney test / Two-tailed test

	Legal status	Sale channel	Total area	Area under raspberry production	Income
Difference	2863.500	1974.500	0.536	0.347	2960.047
t (Observed value)	5.039	0.000	1.310	2.961	2.280
t (Critical value)	1995.000	1995.000	1.979	1.979	1.979
DF	29672.539	18936.667	125	125	125
p-value (Two-tailed)	< 0.0001	< 0.0001	0.193	0.004	0.024
Significance level:	5%				

Source: Authors' calculations

Generally, older farmers dominated in both subsamples corresponding to the age structure of farms in the Region. However, females had higher share in the formal subsample. Although the significant differences between formal and informal subsamples were not noticed in the context of highest level of education, specific agri-education delivered in the form of workshops, discussion groups, trainings or other is more represented in the group of producers that rely on formal contracting. Regarding legal status, in the formal subsample 89.5% of producers were individual farmers, while 7% were family farm partnerships, and only 3.5% were organized in the form of companies. In the informal subsample the situation was as follows 44.29%, 52.86% and 2.86% respectively. In the formal subsample average income was EUR 9775.76, while in the informal subsample average income was EUR 12735.8. In both subsamples less than 40% of farms had higher income than average in the subgroup. Farms in both subsamples were generally small in size, while differences were noticed in the context of average size of commodity area - in the formal subsample the average area under raspberry was 0.8 ha and in the informal subsample 1.15 ha. At the same time, only 17.5% of producers in the formal subsample had larger farms than 1 ha, while 40% of producers in the informal subsample cultivated larger area.

b) Sustainability indicators

When investigating the potential impact of the sale agreement (contract/network) on production choices that farmers made considering sustainability, it was noticed that there were statistically significant differences between formal and informal subsamples for all investigated variables. The results showed that more than half of the respondents within formal subsample had no idea whether type of agreement had any influence on given ecological, social or economic aspects of sustainability, while considerably higher proportion of the informal subsample respondents were better informed.

The analysis of the farmers' answers about the importance of the ecological factors generally revealed difference between two subsamples (*Table 3a*). There were four different

indicators over which respondents supposed to give an opinion regarding the connection to the sales agreement type (maintain biodiversity, support animal welfare, maintain water quality and soil organic matter). The informal subsample respondents clearly indicated that the type of agreement did not help them to accept ecological sustainability within their agriculture production in a greater amount (around 6% agreed or strongly agreed). At the same time, the group of formal agreement respondents who answered the questions related to ecological aspects, showed greater awareness of agreement type influence on certain ecological indicators (around 12% agreed or strongly agreed).

Table 3a. Sustainability indicators – ecological, social, economic; Mann-Whitney test / Two-tailed test: Ecological indicators

	Biodiversity	Animal welfare	Water quality	Organic matter	Average	Median
U	999	935.500	990.500	1068	956.500	968.500
U (standardized)	-5.161	-5.422	-5.111	-4.672	-5.187	-5.225
Expected value	1995.000	1995.000	1995.000	1995.000	1995.000	1995.000
Variance (U)	37211.824	38147.736	38590.571	39322.520	40046.240	38560.650
p-value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Significance level:	5%					

Source: Authors' calculations

Interviewed farmers showed that there were also certain differences between two subsamples when the social indicators of sustainability were taken into consideration (Table 3b). Four indicators had been put in front of the farmers in order to score them having in mind their own sale agreement type: creation of good connections with buyers and input providers, connections with other farmers, societal recognition and succession.

Table 3b. Sustainability indicators – ecological, social, economic; Mann-Whitney test / Two-tailed test: Social indicators

	Vertical cooperation	Horizontal cooperation	Societal recognition	Succession	Average	Median
U	1173.500	1183	1167.500	1169	1172	1158.500
U (standardized)	-4.125	-4.082	-4.173	-4.144	-4.089	-4.182
Expected value	1995.000	1995.000	1995.000	1995.000	1995.000	1995.000
Variance (U)	39617.618	39513.268	39267.165	39685.814	40461.896	39958.596
p-value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Significance level:	5%					

Source: Authors' calculations

Regarding the creation of good connections with buyers and input providers (vertical cooperation), formal agreement respondents show greater level in agreement type influence on their social sustainability (only 18% of respondents within formal subsample did not agree versus 39% within informal subsample). Connection with

other farmers (horizontal cooperation) was perceived as not important/not existing by 16% of respondents within formal subsample and 40% in the informal subsample. Achievement of societal recognition and succession were indicators which respondents in both subsamples consider as expected – informal subsample respondents showed more negative attitude regarding this issue (50% to 20% respondents disagreed).

It was expected that the economic indicators such as maintain profitability, investment in a farm business, selling the products in periods of greater difficulty where prices were low and changing market conditions were considered as most important generally. Comparing the two subsamples, the differences were more than evident (*Table 3c*).

Respondents within the formal subsample showed that formal agreement/network had low influence on farmers' economic sustainability (18-20% of the respondents disagreed about this influence considering all four indicators: profitability, investments, prices and market conditions). On the other side, the informal subsample respondents, which were better acquainted about these issues generally, showed even higher disagreement (from 45% up to 53%). It has to be emphasised that economic sustainability generally has the highest influence on farmers future business strategies.

Table 3c. Sustainability indicators – ecological, social, economic; Mann-Whitney test / Two-tailed test: Economic indicators

	Profitability	Investments	Low prices	Market conditions	Average	Median
U	1113.500	1166.500	1164	1126.500	1149	1121
U (standardized)	-4.445	-4.174	-4.192	-4.392	-4.213	-4.395
Expected value	1995.000	1995.000	1995.000	1995.000	1995.000	1995.000
Variance (U)	39289.980	39356.181	39257.690	39064.449	40273.018	39495.315
p-value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Significance level:	5%					

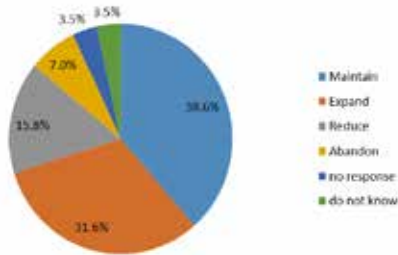
Source: Authors' calculations

c) Strategies and drivers of farming

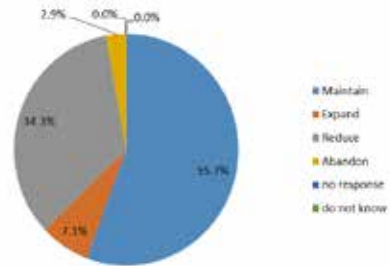
The conducted analysis investigated the wider strategies producers adopt in their farming activities, with a special reference to the changes that they could implement in their business in the next five years, having in mind the type of their sale agreement. The farmers were asked to choose one among four strategies: maintenance of the existing scale of operations, expansion, reducing the production or abandoning.

Figure 1: Strategies of farming in the next 5 years

a) Formal subsample



b) Informal subsample



Source: Stojanović et al. (2018): H2020 SUFISA WP2 National Report (Serbia),

https://www.sufisa.eu/wp-content/uploads/2018/09/D__2.2-Serbia-National-Report.pdf

In both subsamples maintain farming was generally highly ranked. However, in the formal subsample, strategy based on expanding scale accounted for one third of respondents, while reducing scale or abandoning farming account for more than third of all respondents within the informal subsample.

In further analysis, the farmers were asked about the changes they expected to implement to their farm business in order to achieve the strategy they chose as preferable (production and market related changes). The results indicated statistically significant differences for both subsamples (*Table 4a* and *Table 4b*). Within the production related changes (Future strategy I), the respondents of both subsamples who had earlier chose one of three strategies (to maintain, expand or reduce the production), supposed to express their attitude related to further business plans in production facilities, possible externalizing of particular aspect of their business, specialization plans of their production and insurance against crop losses (*Table 4a*).

Table 4a. Mann-Whitney test / Two-tailed test: Future strategy I

	Invest	Externalize	Specialize	Insure	No plans
U	1338.500	1454	1454	1584.500	2024.500
U (standardized)	0.000	0.000	0.000	0.000	0.000
Expected value	1666.000	1666.000	1666.000	1666.000	1666.000
Variance (U)	19532.414	13931.207	13931.207	8373.086	24559.138
p-value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Significance level:	5%				

Source: Authors' calculations

Around 60% of the formal subsample respondents said they have no specific plans for their business in the future. Supporting previous finding, the informal subsample respondents chose in a greater amount all four production related changes comparing to the formal subsample (93% of them said that they have plans to insure their production,

88% had plans to externalize or to specialize their production and 81% had plans to invest in production facilities).

The drivers related to market activities were presented in *Table 4b*. Totally five different drivers in this area were identified: diversification, insurance against volatile prices and costs to avoid income loss, development of new partnerships (with other producers, retailers, processors), development of a new sale channels, as well as adding value (e.g. conversion to organic or processing). More than 60% of the formal subsample respondents indicated that they had no plans in the next five years considering this issue. Producers with informal type of agreement showed greater willingness to improve their business (85% for insurance, 87% for new channels, 91% connected to the new partnerships and 97% for add value). Only regarding diversification, the formal subsample respondents showed greater interest which is generally well accepted strategy of traditional producers all over the world. Farmers within the informal subsample simply seek for wider range of activities that will lead them to higher risk control.

Table 4b: Mann-Whitney test / Two-tailed test: Future strategy II

	To diversify	To insure	New partnership	New channels	Add value	No plans
U	1688	1571	1201	1546.500	1569.500	1960.500
U (standardized)	0.000	0.000	0.000	0.000	0.000	0.000
Expected value	1666.000	1666.000	1666.000	1666.000	1666.000	1666.000
Variance (U)	13931.207	13931.207	16028.069	13371.086	6261.862	24487.328
p-value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Significance level:5%						

Source: Authors' calculations

Concluding remarks

The tradition of raspberry production in West Serbia, especially in the Arilje and surrounding municipalities, has a long history (Paraušić, Simenunović, 2016; Kljajić et al, 2017). This selected area has significant importance due to the large number of agricultural producers who fully or partially derive their income from raspberry cultivation. Moreover, this region has significant export potential, which not only contributes to the agricultural sector development but also to the overall economy of Serbia (Pantić et al, 2021).

The exploratory analysis presented in this paper provides initial insights into the characteristics of raspberry farmers in Serbia, particularly regarding the formality of contracts or social networks they utilize in developing their businesses. This aspect of research was not exploited in the national literature so far. Additionally, the paper investigates how identified farmer characteristics influence the drivers and choices of sustainable business strategies, which is generally an important topic highly investigated worldwide (Herrera et al., 2016; Wojewodzka-Wiewiorska et al., 2020; Brennan 2021;

Weituschat et al., 2023). The profiles of farmers are summarized in *Table 5*. Considering the broader context of Serbian agriculture and the raspberry sector, the obtained results indicate the important differences among farmers based on the type of sales agreements/networks. Furthermore, these differences significantly influence their sustainability.

Table 5. Farmers profiles – most important differences

Characteristic/group	Formal contracts/networks	Informal contracts/networks
Representation of family farms	89.5%	52.9%
<i>Socio-demographic characteristics</i>		
Age (<40)	26.3%	12.9%
Gender (females)	28.1%	10.0%
Education (higher education)	17.5%	2.9%
<i>Economic indicators</i>		
Land (average size)	0,8 ha	1,15 ha
Income (average)	9776 euro	12736 euro
<i>Sustainability</i>		
General awareness	Not informed	Better informed
Overall contracts influence on sustainability	Included	Do not consider sustainability at all
<i>Drivers and strategies</i>		
No plans	60%	40%
General strategies	Prone to maintain and expand	Prone to maintain and reduce

Source: Authors' calculations

Our findings confirm the prevalence of family farming within the raspberry sector, aligning with this sector structure in the practice. However, family-owned farms were disproportionately represented in the subset of farmers who favoured formal contracts or networks in their operations. Farms within this subset tended to be smaller in terms of both property size and annual income. In terms of demographics, farmers involved in formal contracts or networks were, on average, younger and more formally educated, with a higher representation of female owners compared to the informal counterpart. The quality of formal agreements or networks demonstrated higher capacity to facilitate vertical connections within the food chain and overall sustainability of their businesses which is in the line with the previous research (Janker et al., 2019; Weituschat et al., 2023).

Farmers within formal subsample showed lower levels of awareness regarding sustainability in general, yet the contracts they entered into or the networks they joined demonstrated a stronger orientation towards sustainability issues. It was surprising that sustainability concerns were largely absent within informal contacts or networks. It appears that farmers belonging to the informal subset tended to be more entrepreneurial in nature due to higher income and average farm size. However, the perceived lack of institutional support hindered the implementation of sustainable business strategies. As it was noticed in the discussion part of this paper, they simply ask for better institutional arrangements that will help them to shape their future businesses fully aligned with sustainability as the main goal.

Traditionally organized farmers typically adhere to conventional farming practices, exhibiting resistance to change and a slower adoption of new technologies and innovative farming methods. It might be assumed that traditionally oriented farmers in developing countries lean towards sustainable business practices due to their focus on traditional supply chains and local or regional markets. Conversely, entrepreneurially oriented farmers are more inclined to adopt new technologies, employ modern farming techniques, and explore alternative production methods to improve efficiency and profitability. They actively seek out new markets, view risks as opportunities for growth, and maintain flexibility in selecting future farm strategies to maximize returns. Based on the previously mentioned differences, the question which group of our farmers can be identified as traditionally or entrepreneurially oriented is raised. Our analysis showed that informal subsample belonged more to the entrepreneurially oriented farmers, although most of their characteristics suggested the opposite. This group of farmers should be more supported by the agricultural policy measures in general, including better institutional arrangements among stakeholders within the food chain. Contrary to the above, traditionally oriented farmers should be in the focus of broader, rural development policy.

The production decisions made by raspberry producers in relation to their primary sales agreements (formal/informal) led to different perspectives on the potential impact on sustainable production (environmental, societal, and economic). In general, respondents from the formal subset recognized a greater influence of their agreements on all economic indicators, as well as most ecological and societal indicators. Due to an underdeveloped market, a consumer-oriented approach as the main driver may not incentivize farmer-entrepreneurs to adopt advanced farming techniques that prioritize both productivity and sustainability. Sustainability could be achieved through a more incentive-based approach. Generally, in our case the overall capacity of contracts or social networks is recognized as a highly influential factor that can shape entrepreneurs' behaviour in achieving more sustainable production models. Without strong institutional connections among stakeholders within the food chain, the prospect of sustainability is jeopardized in every aspect, particularly in the economic sphere, which still remains the most important aspect of sustainability in Serbia.

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Conflict of interests

The authors declare no conflict of interest.

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