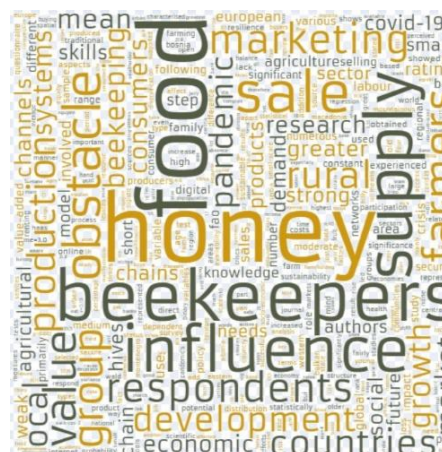


**RESPONSE OF SHORT FOOD SUPPLY CHAINS
IN WESTERN BALKAN COUNTRIES
TO THE COVID CRISIS:
A CASE STUDY IN THE HONEY SECTOR**

Vesna Paraušić¹, Etleva Muça Dashi²,
Jonel Subić³, Iwona Pomianek⁴,
Bojana Bekić Šarić⁵



¹ Vesna Paraušić, Ph.D., Institute of Agricultural Economics, Belgrade, Serbia, e-mail: vesna_pa@iep.bg.ac.rs, ORCID: 0000-0001-6193-5297

² Prof. Dr. Etleva Muça Dashi, Agricultural University of Tirana, Albania, e-mail: evadashi@ubt.edu.al, ORCID: 0000-0002-6524-8467

³ Jonel Subić, Ph.D., Institute of Agricultural Economics, Belgrade, Serbia, e-mail: jonel_s@iep.bg.ac.rs, ORCID: 0000-0003-1342-1325

⁴ Ass. Prof. Iwona Pomianek, Ph.D., Warsaw University of Life Sciences, Poland, e-mail: iwona_pomianek@sggw.edu.pl, ORCID: 0000-0002-2858-2714

⁵ Bojana Bekić Šarić, Ph.D., Institute of Agricultural Economics Belgrade, Serbia; e-mail: bojana_b@iep.bg.ac.rs, ORCID: 0000-0001-9763-236X

Abstract: Operation of short food supply chains (abbr. SFSCs) during the period of the pandemic caused by the SARS-CoV-2 virus provided a lesson which might be useful for perceiving the behaviour of farmers and local food systems in potential future crises caused by various endogenous or exogenous factors. A study based on a sample of 1081 beekeepers in Western Balkan countries shows how beekeepers involved in SFSCs perceived the influence of the pandemic on the growth of demand and sale of honey through these marketing channels. On the scale from 1 (no influence) to 7 (very strong influence), the average rating of 3.53 indicated a weak to moderate influence, which was fairly consistent across the countries of this region. The Kruskal-Wallis test and Mann-Whitney test determined that large-scale beekeepers, those in mountainous areas, those adding value to honey and beekeepers producing other bee products apart from honey stated that the pandemic had a stronger influence on the growth of demand and sale of honey through SFSCs. At the same time, a higher rating of the pandemic's influence on sales growth was accompanied by greater limitations of beekeepers regarding the availability of family labour for selling honey, as well as by greater needs for digital marketing knowledge and skills. Binary logistic regression showed that the increase in beekeepers' age led to the decreased rating of the influence of the pandemic on the growth of demand and sale of honey through SFSCs. It also showed that the influence rating rose with the increase in production capacity, adding value to honey and beekeepers' needs for digital marketing knowledge and skills. The obtained results provide valuable knowledge about the potential response of SFSCs and involved producers to future crises and disruptions. It is primarily intended for policy makers, but also to practitioners and scientific and expert communities. All of them should respond proactively on behalf of society and prepare themselves for future challenges.

Keywords: beekeepers; honey; short food supply chain; pandemic; Western Balkan; demand; survey

Highlights

- The impact of the pandemic on the sales growth of honey through SFSCs was weak to moderate.
 - In the potentially new global crisis, older beekeepers might not be able to increase retail sale of honey.
 - Chances for sale through SFSCs in the potentially new global crisis are increase with beekeepers with larger production capacities, who add value to honey and use digital marketing.
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1. Introduction

The global pandemic caused by the SARS-CoV-2 syndrome, announced in March 2020 by the World Health Organization, is over now. Global food supply chains (abbr. GFSCs) were in the focus of attention during this crisis and represented one of the first affected sectors (Aday & Aday, 2020; Wang, Wang & Wang, 2020; Anderson et al., 2021; Chowdhury et al., 2021; Sanderson Bellamy, et al., 2021; Štreimikienė et al., 2022). At the beginning of the pandemic, they showed a high level of vulnerability and instability, and had numerous bottlenecks caused primarily by the problems related to workforce availability (Aday & Aday, 2020; Bakalis et al., 2020; Devereux, Béné & Hoddinott, 2020; Hobbs, 2020; Richards & Rickard, 2020; Hobbs, 2021). However, after brief disruptions, the market supply was stabilised and in the long term, there have been no fundamental changes in the nature of food supply chains (Hobbs, 2020; Wang, Wang & Wang, 2020; Chenarides, Richards & Rickard, 2021; Hobbs, 2021).

The pandemic created an unexpected negative situation at the global level, affecting the agricultural sector, the economy, human health and food security (Okolie & Ogundeji, 2022). As pointed out by the group of authors Benedek et al. (2022, p. 85) "*an important difference between COVID and other types of disasters such as earthquakes, floods, and so forth, is that social relations were disrupted due to*

the need for isolation and restrictions on movement, while infrastructure remained intact, and a shortage of food was not a threat". Also, "due to local regulations concerning restrictions on movement, it was only impersonal (online) channels that survived, or the opposite type, i.e., very personal ones involving the face-to-face meeting of producers and consumers in the private spaces (mostly homes) of one of the parties" (Benedek et al., 2020, p. 59).

Will the world's food systems and GFSCs be able to respond successfully to some future disruptions and market shocks? The sources of future crises can be numerous and diverse (Patz et al., 2005; Sarkis et al., 2020; Jagtap, et al. 2022), and they constantly warn us that food systems must ensure equity, security and availability of food for all citizens during the times of crises (Bakalis, 2020; Klassen & Murphy, 2020; Sanderson Bellamy et al., 2021). The pandemic provided lessons which might incite us to respond proactively, and it indicated numerous possibilities for transformation and innovation (Klassen & Murphy, 2020; Sarkis et al., 2020; Sanderson Bellamy et al., 2021). Consequently, today when the pandemic is over, numerous authors agree that the key determinants of strategic plans for managing food supply chains should focus on sustainability, resilience, elasticity, flexibility, agility, adaptability and equity (Aday & Aday, 2020; Bakalis et al., 2020; Klassen & Murphy, 2020; Sarkis et al., 2020; Anderson et al., 2021; Chenarides, Manfredo & Richards, 2021; Chowdhury et al., 2021; Hobbs, 2021; Sanderson Bellamy, et al., 2021; Štreimikienė et al., 2022).

One way to build such food systems and ensure food safety and rural development is to localise food production, i.e., to acknowledge the concept of local and regional food systems, and short food supply chains (abbr. SFSCs) within these. These distribution channels are characterised by the absence or a small number of trade intermediaries, and by the existence of close and confidence-based relationships between farmers and consumers where farmers transfer valuable information about products and their production directly to consumers (Marsden et al. 2000; Renting et al. 2003). The pandemic just highlighted the significance of the relationship between farmers and producers. At the same time, local food systems and shortening of food supply chains proved very flexible and resilient during the pandemic, while ensuring product traceability (Aday & Aday, 2020; Bakalis et al., 2020; Anderson et al. 2021; Thilmany et al., 2021).

Various endogenous and exogenous disturbances at the global and/or regional food market can also cause problems regarding food offer, supply and security in Western Balkan countries (abbr. WBCs). Also, SFSCs can represent a way for these countries to successfully solve numerous future challenges in food supply chains, thus ensuring benefits to participants in the exchange process and to society as a whole.

Bearing in mind the importance of localization of production and shortening the supply chain in times of crisis, authors studied beekeepers' perceptions in WBCs of the demand and sale of honey in direct distribution channels during the pandemic. The beekeeping sector is selected because honey, as the most important product of beekeeping, is one of the most represented products placed through these channels in all countries, including analysed WBCs (Dedej, Delaplane & Gocaj, 2000; Kneafsey et al. 2013; Ignjatijević, Ćirić & Čavlin, 2015; FAO, 2018; Nedić, Nikolić & Hopić, 2019; FAO 2020; Rucabado-Palomar, T., & Cuéllar-Padilla, M., 2020; Djordjevic Milosevic et al. 2021). We examined whether the demand and sale of honey through SFSCs in WBCs increased during the pandemic, and what was the difference of the pandemic's influence on selling honey directly to consumers between beekeepers with different spatial and socio-economic characteristics. In addition, the paper provides the prediction of the influence of several spatial and socio-economic characteristics of beekeepers and honey production on the probability of increased honey sale through SFSCs during the pandemic i.e., some other possible market disturbances in the future.

The aim of the research is directed at understanding how possible future disturbances of the food market might affect sale by farmers involved in SFSCs in the WBC region. Through the science-policy interface, the knowledge obtained in this empirical research will be primarily useful to public policy makers. Mainly, they might use adapted rural development measures to support farmers involved in SFSCs and ensure an unhindered supply of local and/or regional markets. In addition, the results will contribute to enriching the scientific literature in the field and better understanding of the SFSC concept in WBCs by scientists, practitioners and society as a whole.

2. Balance of SFSCs and GFSCs in times of crisis

Whether they include direct sales by farmers, collective direct sales (local festivals, sales by cooperatives owned by farmers) or partnerships (“community supported agriculture”), SFSCs are an alternative to long, commercial or global food supply chains (GFSCs). They represent another food supply option, which is less reliant on GFSCs and provides numerous benefits to farmers, consumers and sustainable development of local rural communities.

SSCs primarily contribute to the economic empowerment of small-scale farmers (by means of the effects of different farm gate prices, price premium, chain value added, diversification of income sources) and their better integration in agri-food supply and value chains (Marsden et al. 2000; Renting et al. 2003; Malak-Rawlikowska et al., 2019; Rucabado-Palomar and Cuéllar-Padilla, 2020). They have a very significant role in encouraging endogenous rural development by contributing to the social capital empowerment in the community, stimulation of extensive production methods and offer of locally produced healthy food of high-quality, reduction of greenhouse gas emissions, etc. (Knickel & Renting, 2000; Marsden et al. 2000; van der Ploeg et al, 2000; Renting et al. 2003; Kiss et al., 2019). Furthermore, the pandemic underlined their resilience and capacity to supply the market in an unhindered manner without compromising food safety (Bakalis et al., 2020; Anderson et al. 2021; Thilmany et al., 2021).

Still, we should be cautious when glorifying SFSCs and emphasising their contribution to resilient and sustainable food systems in the future. Number of authors are considerate or even extremely critical when interpreting positive aspects of SFSCs and related local food systems in all sustainability dimensions, particularly compared to GFSCs (Allen et al., 2003; DuPuis & Goodman, 2005; Born & Purcell, 2006). Based on a comprehensive study, Kiss et al. (2019) indicated that the economic and ecological sustainability of SFSCs in literature is rather questionable. Also, as the group of authors points out (Malak-Rawlikowska et al., 2019, p. 20), *“In view of the changes that have occurred in the retail sector in some European countries (e.g., UK, Norway) that have resulted in the domination of hypermarket and discount chains in the food market, and changes currently occurring in other countries (e.g., Poland), it can be expected that the importance of traditionally important short distribution channels such as on farm sales or traditional local farmers’ markets will have less significance in the overall structure of sales channels, with the exception of modern initiatives such as ‘Sunday’ or ‘breakfast’ markets in various innovative forms”*.

Even role of SFSCs in periods of crisis is questionable, having in mind smaller production volume, more expensive and less efficient systems of production and marketing in relation to long supply chains. So, if SFSCs would operate independently in periods of crisis, they would definitely not represent a successful competition to GFSCs (primarily in terms of their selling price, diversified offer and food availability), which are more technologically advanced, rationally organised and have a highly efficient production (Hobbs, 2021; Anderson et al., 2021).

The contribution of SFSCs to sustainable development depends on the prevailing situation and cannot be generalised (Kiss et al., 2019). Also, strict differentiation and dualism between GFSCs and SFSCs are vague and unclear in practice (Ilbery & Maye, 2005). Bearing these in mind, we believe that the truth is somewhere in between and that SFSCs should be regarded in the context of a balanced and evened approach to the relationship between long and short supply chains. This attitude is also supported by Paciarotti and Torregiani (2021), who highlighted the need for creating *“a balance between local civic agriculture values such as transparency, environmental protection, health promotion and social fairness, and the typical factors of large supply chains such as efficiency, standardisation and accessibility”* (Paciarotti and Torregiani, 2021, p. 437). Similarly, Bakalis et al. (2020, p. 171) underlined that the *“development of enhanced, robust agri-food chains will probably require a fine, complementary balance between the current, “global”, food supply practices and other, “local”, trends”*.

Accompanied by greater business digitalization, this approach might ensure the much-needed economic sustainability of small family holdings, which can use resources efficiently, be promising and dynamic, and represent no obstacle to the growth and development of agriculture (Griffin et al., 2002; Rada & Fuglie, 2019). What is more, according to Griffin et al., (2002), the distribution of income and wealth is much more even and equitable in the small peasant farming system than in the large-scale farming system

exploiting economies of scale. These advantages are particularly visible when sector policies tend to promote the rise of employment and social capital in rural areas. Simultaneously, the balance between global and local sources can ensure the necessary diversification, flexibility and security of food supply, which is essential in the times of crisis (Bakalis et al., 2020; Remko, 2020).

Studies on consumer behaviour and demand change in SFSCs during the pandemic have had different results depending on the country and product type. During the pandemic, consumers changed their preferences in comparison to the previous period, and gave more significance to buying high-quality food, primarily fruit, vegetables and dairy products, directly from producers (Celik & Dane, 2020; Benedek et al., 2020; Brumă et al., 2021; Sanderson Bellamy, et al. 2021). Small-scale farmers involved in SFSCs managed to adjust their operation to the pandemic, although the new circumstances had a negative impact on their operation and income, primarily in terms of lowering the usual number of buyers and ways to reach the market: closing of restaurants supplied by farmers or open markets where farmers had traded their products; manifestations and fairs were not allowed, etc. (Bui et al., 2021; Sanderson Bellamy et al., 2021). For example, Hammond et al. (2022) examines the effects of the COVID-19 crisis on smallholder farmers' business in seven African lower- and middle-income countries to point out the negative socio-economic impacts of the crisis on these farmers, food shortage and security, as well as the absence of official state assistance.

On the other hand, the reaction of agricultural producers in Hungary during the pandemic period was heterogeneous: on the one hand, there were farmers who suffered a large economic loss due to lower sales, while a number of farmers increased sales and achieved profit growth (Benedek et al., 2020; Beneke et al., 2022). Successful producers have been fortunate to operate in the fresh fruit and vegetable sector, where demand has grown significantly. Also, successful producers, or the so-called "*kings of the corona crisis*" (as Benedek et al. 2020 call them) invested a lot of work before Covid to maintain personal relationships with their customers, were more flexible during the pandemic, applied various marketing strategies and were open and ready to learn and take advantage of the opportunities offered by social networks, online technology (ICT tools) and emerging market niches (Benedek et al., 2020; Beneke et al., 2022).

During the pandemic, shortening of supply chains within strong local communities with joined resources resulted in stable food supply, decreased gender discrimination in rural areas, improved living conditions of ethnic minorities, and led to a greater consideration of organic farming (Bui et al., 2021; Štreimikienė et al., 2022). Yet, we have to be aware and realistic that although the pandemic (especially at its outbreak) encouraged consumers to take SFSCs into account or use them more often, there have been no fundamental changes of the supply chain nature in the long run (Hobbs, 2020; Anderson et al., 2021; Hobbs, 2021).

3. Short food supply chains in Western Balkan countries

Farmers' markets and on-farm sales are traditionally widely represented in Central and Eastern European countries (abbr. CEECs) and consequently in WBCs. The existence of these marketing channels are the result of different factors such as: domination of small-scale family farms (with subsistence and semi-subsistence farming), insufficient integration of these farms in GFSCs, traditional existence of informal economies, fragmented farm structure, etc. (Kneafsey et al., 2013; Latruffe and Desjeux, 2014; Kotevska et al. 2015; Hanf and Gagalyuk, 2018; Malak-Rawlikowska et al., 2019; Benedek et al., 2020; FAO 2020; Djordjevic Milosevic et al. 2021). They also reflect traditional consumer preferences for buying the food of local origin directly from the producer and the increasing interest of consumers in healthy products obtained in sustainable production systems (Malak-Rawlikowska et al., 2019; Pilař et al. 2019; Hanus, 2020; Brumă et al. 2021; Haas et al. 2021). Practices of SFSCs are also identified in all other countries in the world, and they are most often present in sectors like meat, processed dairy, vegetables and fruit, eggs, honey (Chauzat et al., 2013; Kneafsey et al., 2013; Jarzębowski, Bourlakis & Bezat-Jarzębowska, 2020; Rucabado-Palomar, T., & Cuéllar-Padilla, M., 2020).

The category of traditional SFSCs (direct on-farm, off-farm sales) is widely represented in food supply chains of most CEECs and almost all Mediterranean countries (Augère-Granier, 2016; Borowska, 2016; Djordjevic Milosevic et al., 2021). The second category, i.e., neo-traditional SFSCs, encompasses more modern, complex and innovative approaches to local food (Augère-Granier, 2016). This category might involve “community supported agriculture”, as well as various social movements, mainly in cities promoting local food (Augère-Granier, 2016; Sylla, Olszewska & Świąder, 2017). Neo-traditional SFSC types are mainly present in high income EU countries. However, the example of Poland and Hungary shows that these types of SFSCs are also growing fast in CEECs, mainly in large cities and tourist centers (Sylla, Olszewska & Świąder, 2017; Benedek et al., 2020). Also, as Benedek et al. (2020, p. 53) pointed out “while older and less educated farmers prefer traditional forms of direct marketing (such as conventional markets, farmgate and roadside sales), younger and more educated farmers tend to use more innovative marketing channels, including farmers’ markets, box schemes and consumer buying groups”.

The idea of SFSCs in WBCs is gradually being acknowledged in the studies underlining the importance of these marketing channels in the context of strengthening the competitiveness and economic empowerment of small-scale farmers, their better market integration, and securing the vitality and sustainable development of rural areas (Goszczyński & Knieć 2011; Borychowski et al. 2020; FAO, 2020; Brumă et al. 2021; Djordjevic Milosevic et al. 2021). Shortening of supply chains in WBCs is significant having in mind that in all the WBCs small-scale family farms are an inevitable part of food supply chains. These farms are characterised by numerous developmental limitations, such as fragmentation of ownership of all agricultural funds, low productivity and difficult access to production factors and the product market (Latruffe & Desjeux, 2014; Ciaian et al., 2018; Hanf & Gagalyuk, 2018; FAO 2020; Horvat et al, 2020). Also, all the countries these areas are characterised by ageing and poverty, high rates of migration and abandoning of villages, underdeveloped social and physical infrastructure and various other limitations (Guri, Jouve & Dashi, 2014; Kotevska et al., 2015; FAO 2020).

Yet, in all WBCs the market of products placed in direct marketing channels is still not institutionally arranged and mature in terms of sales tax, safety and quality control of locally produced food and decreased sale through (semi)informal channels of direct selling (FAO 2020; Brumă, et al., 2021; Djordjevic Milosevic et al. 2021; Haas et al., 2021). Countries do not have established national support schemes for small-scale farmers involved in SFSCs and they do not use the EU pre-accession assistance for these purposes. Simultaneously, the concept and meaning of SFSCs are insufficiently understood by academic and professional circles, as well as by the general public.

It can be noticed that Serbia shows the biggest improvement in this field, which can be seen in the following: (a) with the support of FAO appropriate regulations were introduced in terms of placing small quantities of plant and animal food products; (b) the Law on regulation of the market of agricultural products (Official Gazette R.S. No. 67/21) was enacted in 2021, which represents a prerequisite for the establishment of producer organizations and development of their operational programmes; (c) social media marketing and various online platforms (Facebook and Instagram, blog sites) are used successfully for promoting and marketing of small-scale farmers’.

Institutional framework for further development of SFSCs in all WBCs must be strengthened in the following period. Also, establishing the support measures for the development and promotion of SFSCs and local food systems within national and regional rural development programmes would empower farmers and rural communities, and further adapt agricultural policies of these countries to the EU’s common agricultural policy.

4. Economic aspects of beekeeping in WBCs

The economic aspects of beekeeping, as a professional agricultural activity, are poorly understood and studied in the scientific literature (Chauzat et al., 2013; Kouchner et al., 2019; Ramadani et al. 2019; Bislimi, 2022). This is largely due to the fact that beekeeping in all world countries is mostly a traditional family business, in the form of craft entrepreneurship, mostly occurs on small and medium-sized farms, and the sector is dominated by non-professional beekeepers (Dedej, Delaplane & Gocaj, 2000; Chauzat

et al., 2013; Altunel & Olmez, 2019; Nedić, Nikolić & Hopić, 2019; Ramadani et al., 2019; Djordjevic Milosevic et al., 2021; Andrieu et al., 2021; Bislimi, 2022).

On the one hand, the sector “receives” positive market impulses in the form of a secure market, growing market demand for beekeeping products and the consumers’ willingness to pay premium prices for locally produced and marketed honey (Altunel & Olmez, 2019; Cela *et al.*, 2019; Ritten *et al.*, 2019; Vapa Tankosić *et al.*, 2020; Kallas *et al.*, 2021). The economic attractiveness of beekeeping is affected by other factors as well, such as low costs of investment and maintenance of hives, the possibility of generating income in the short term, the possibility of performing beekeeping activities with a limited budget, capital or land funds (Altunel & Olmez, 2019). On the other hand, the sector “suffers” from the great economic consequences of global climate change, ecological threats and loss of diversity, resulting in losses of bee colonies and fluctuating honey yields (Chauzat et al., 2013; Kouchner et al., 2019; Durazzo et al., 2021; El Agrebi et al., 2021).

Similar circumstances affect the economic aspects of the beekeeping sector in WBCs, with no significant differences among them. Specifically, in all WBCs, beekeeping is a traditional, important and growing household activity. It is mainly a family and part-time job on small and medium-sized farms. It contributes to the national economy (not only through bee products but also pollination), biodiversity protection, employment of the local population, diversification, i.e., additional income on the farm, ensuring the sustainable development of rural areas (Dedej, Delaplane & Gocaj, 2000; Cane et al., 2014; FAO, 2018; Nedić, Nikolić & Hopić, 2019; Ramadani et al., 2019; FAO 2020; Djordjevic Milosevic et al., 2021; Čavlin et al., 2023).

Honey, as the most important product of beekeeping, is predominantly sold through SFSCs in all WBCs (Dedej, Delaplane & Gocaj, 2000; Ignjatijević, Ćirić & Čavlin, 2015; FAO, 2018; Nedić, Nikolić & Hopić, 2019; FAO 2020; Djordjevic Milosevic et al. 2021). There is a high demand for honey and a safe market, and the selling prices of honey ensure sustainable income for beekeepers (Cane et al., 2014; FAO, 2018; Ramadani et al., 2019; Djordjevic Milosevic et al., 2021; Bislimi, 2022; Čavlin et al., 2023). Since they perceive honey as important for their health, some consumers are prepared to pay premium prices for locally produced honey which is sold directly, while paying attention to its geographic origin and landscape surrounding the apiary (Cela et al., 2019; Vapa-Tankosić et al., 2020). These positive market impulses, along with low initial investment, largely determine the profitability and economic cost-effectiveness of honey production and the competitiveness of this sector on the foreign market (Ignjatijević, Ćirić & Čavlin, 2015; FAO, 2018; FAO, 2020). In addition, WBCs and Eastern European Countries have potential for the production of organic honey and regional honey protected with geographical indication schemes (Borowska, 2016; Čavlin et al., 2023).

At the same time, numerous factors limit the development of the sector and the economic profitability of honey production in WBCs, the most common of which are: (a) global climate change, bee diseases and loss of diversity; (b) lack of labor for business commercialization (both family and hired), as well as the high price of hired labor; (c) lack of organized and collective marketing channels and long-term contracts between beekeepers and buyers; (d) inadequate techniques and knowledge of beekeepers on product marketing (packaging, labeling, promotion); (e) low comprehensive knowledge and skills of beekeepers, which are based on practical experience and little use of advisory and educational services; (f) atomization of production; (g) limited access of beekeepers to favorable capital, lack or outdated equipment and the like (Dedej, DeKaokabe & Gocaj, 2000; Cane *et al.*, 2014; Ciaian *et al.*, 2018; FAO, 2018; Ramadani *et al.*, 2019; FAO, 2020; Brumă *et al.*, 2021; Djordjevic Milosevic *et al.*, 2021; Bislimi, 2022; Čavlin *et al.*, 2023).

Lack of quantitative data and limited or unavailable statistical sources reduce the possibilities of economic analysis of the beekeeping sector in majority WBCs, as well as a comparison between countries. As stated by Ramadani et al. (2019, p. 717), “*unavailable databases for beekeepers make any quantitative approach difficult, if not impossible, resulting in most research using the qualitative research approach*”. Based on the available data, Serbia has the largest number of hives and beekeepers, while Bosnia and Herzegovina has the largest number of hives per farm. This data should be taken with great caution, given the lack and/or temporal inconsistency of statistical data or the use of different data sources. As for honey

production, according to national statistics, Serbia has the highest production, given the largest number of beehives and beekeeping farms. Honey production in all countries shows oscillations by year, and they are particularly high in Serbia, Bosnia and Herzegovina and Montenegro.

One of the factors that strongly affects the economic profitability of honey production is the method of its distribution. The example of the beekeeping sector in Argentina shows that in the conditions of dominance of small-scale beekeepers, low organization of beekeepers and honey wholesale, a large part of the added value of honey that could come from the packaging and direct marketing stages is lost (Andrieu et al., 2021). In general, local markets and SFSCs represent valuable and affordable tools for farmers to valorize positive market impulses, improve sales and marketing of all beekeeping products, ensure economic profitability of production and strengthen the market position of producers. With low marketing costs, farmers can use SFSCs to transmit valuable information about their products to consumers, and with collective actions, tourism development and the use of social networks, these marketing channels ensure value added to many agricultural products in the value chain, such as fruits, vegetables, dairy products, meat products and the like (Cane *et al.*, 2014; Kneafsey et al., 2013; Cela et al., 2019; Ritten et al., 2019; Rucabado-Palomar & Cuéllar-Padilla 2020; Andrieu et al., 2021; Brumă *et al.*, 2021; Djordjevic Milosevic et al., 2021; Kallas et al., 2021).

5. Materials and method

The data were collected on the basis of a survey including a sample of 1081 holdings/farms with beehives, which deal actively with beekeeping as the main or additional activity. The researched area encompassed the following WBCs: WBCs: Albania, Bosnia and Herzegovina, North Macedonia, Montenegro, Kosovo*⁶ and Serbia. These countries have numerous and centuries-long connections in terms of space, economy, culture and history. They all belong to the group of upper middle-income economies (World Bank, 2022), and have been granted candidate status, or potential candidate status, for the accession to the EU.

The proportional stratified sample was used, while the criterion for forming strata was the country of origin of the holdings/farms with beehives. The authors intended to make the percentage share of beekeepers per stratum proportional to the statistical data on the percentage share of holdings/farms with beehives per WBC. Due to the difficult access to beekeepers in Kosovo* and a low response rate of beekeepers in the area of Bosnia and Herzegovina, these two strata were not represented in the sample as proportional to their size. Consequently, the sample was distributed by territory in the following manner: Serbia – 52%, Albania – 24%, North Macedonia – 11%, Bosnia and Herzegovina, and Montenegro – 5%, respectively, and Kosovo* – 2%.

The survey research was realised in the period from December 2021 to March 2022 using a structured questionnaire in the mother tongue of each of the involved countries. The final structured questionnaire was created after conducting semi-structured interviews with 5 beekeepers and pre-testing the questionnaire with 10 beekeepers. The structured questionnaire was distributed to the respondents online using the Google Forms software.

The questionnaire distribution was mainly conducted through beekeepers' associations and/or unions of beekeepers' associations. The presidents of associations and/or unions of beekeepers' associations were sent a link to the questionnaire (via email or Viber) and asked to forward the link to their members. The authors conducted a smaller number of the respondents through the websites of large beekeeping holdings, social networks gathering beekeepers (Facebook), chambers of commerce, recommendations, and personal contacts.

The structured questionnaire contained a set of questions about the socio-economic and structural characteristics of the respondents, and about different aspects of placing honey through SFSCs. In order to obtain the number of the respondents selling honey through SFSCs (exclusively through SFSCs or combined with wholesale), and having in mind that the respondents were not familiar with the concept

⁶ This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo declaration of independence.

of SFSCs, the authors explained this idea to beekeepers by introducing the term “retail or sale to consumers in jars or smaller packages”. In addition, the respondents were asked to select the following type(s) of SFSCs they used: (a) farmers’ markets; (b) direct on-farm sales, such as sales to individual consumers or direct off-farm sales, such as delivery to consumers; (c) sales at manifestations, honey exhibitions or local fairs, as well as roadside sales; (d) sales via the Internet or social networks (Facebook, Instagram); and (e) direct sale to small retail outlets, hotels or restaurants.

This paper presents part of the collected data in order to answer the following research questions: (a) how do beekeepers perceive the influence of the pandemic on the growth of demand and sale of honey through SFSCs and are there any differences in the influence intensity between the beekeepers with different spatial and socio-economic characteristics; (b) what is the prediction of probability for beekeepers to rate the pandemic’s influence on the growth of demand and sale of honey through SFSCs as strong to very strong depending on different spatial, demographic and socio-economic characteristics of beekeepers and honey production.

The respondents rated the examined dependent variable “influence of the pandemic on the growth of demand and sale of honey through SFSCs” using an ordinal scale of influence, where 1 = no influence, 2 = very weak, 3 = weak, 4 = moderate, 5 = moderately strong, 6 = strong and 7 = very strong. The independent (predictor) variables and their description are given in Table 1 shown in the Annex. The last categories of the predictor variables were used as reference categories.

In order to answer the research questions, the data were processed using descriptive statistics, while the Kruskal-Wallis one-way analysis of variance and Mann-Whitney U test were used for comparing groups. Binary logistic regression was used for predicting the impact of the pandemic on the growth of demand and sale of honey depending on the spatial and socio-economic characteristics of beekeepers. In binary logistic regression, the dependent variable was coded as the dummy variable: 0 – no influence to moderate influence and 1 – moderately strong to very strong influence. The method used for the selection of the variables was Forward Stepwise (Wald criterion). The variables were selected after four iterations of the algorithm. The validity of the model was determined using the Omnibus and Hosmer-Lemeshow tests.

The data were processed using the statistical software Statistical Package for the Social Sciences (SPSS) 25. The alpha level of ≤ 0.05 was applied for making conclusions about statistical significance.

6. Results and discussion

Out of the total number of 1081 respondents involved in the research, 647 respondents (60%) place honey only through one or more offered direct sale channels, i.e., through SFSCs. The total number of 395 respondents (37%) combine direct sale channels with wholesale, while only 39 respondents (3%) place honey only through wholesale (sales to cooperatives, associations, wholesalers, in buckets or barrels). The respondents who sell honey solely through wholesale were excluded from further analysis, so the total number of the analysed respondents amounted to 1042.

These respondents were asked to evaluate the influence of the pandemic on the growth of demand and sale of honey through SFSCs by providing ratings on the scale from 1 (no influence) to 7 (very strong influence). The total number of 1011 responses were obtained (31 respondents did not provide a response to this question). The structure of the sample is provided in Table 2 in the Annex.

The respondents in the WBC region assigned the average rating of 3.53 to the dependent variable “influence of the pandemic on the growth of demand and sale of honey through SFSCs”. This can be described as a weak to moderate influence. The median and mode have the same value (4, moderate influence), while the interquartile range amounts to 3 and indicates that the middle 50% of the respondents’ replies ranged from rating 2 (very weak influence) to rating 5 (moderately strong influence). The scale of the respondents’ answers showed that the greatest percentage of them (31.8%) assigned the rating 4 (moderate influence) to the dependent variable. The next largest percentage share (21.8%) included the respondents who stated that the pandemic had no influence on the growth of demand and sale of honey (Figure 1).

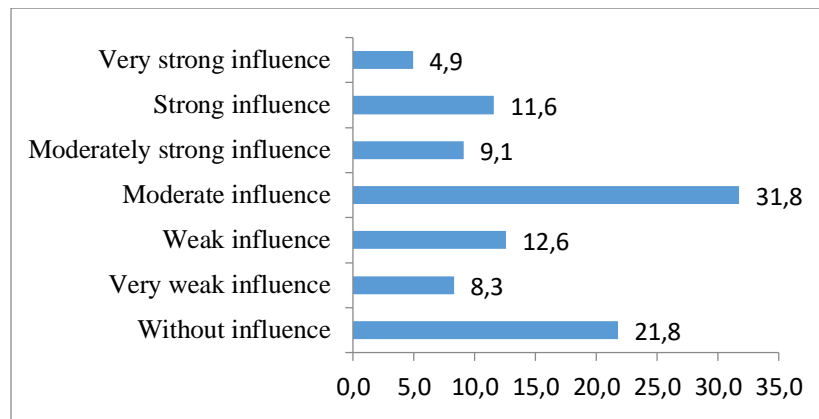


Fig 1. The influence of the pandemic on the demand and sale of honey through SFSCs in the region of WBCs, % of the responses on the 1–7 scale. Source: Authors' calculations

Observed per country (Figure 2), the impact of the pandemic on the growth of demand and sale of honey through SFSCs is fairly consistent. The average values range from 3.2 (Kosovo* and Montenegro) to 3.9 (North Macedonia and Albania) on the scale from 1 (no influence) to 7 (very strong influence). In all the countries of the region, the median amounts to 4 (moderate influence), except in Montenegro (median = 3, weak influence), and Kosovo* (median = 3.5).

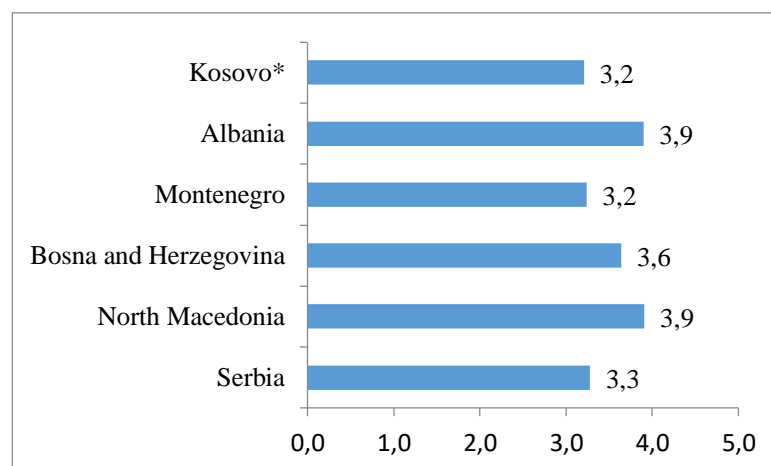


Fig 2. The influence of the pandemic on the demand and sale of honey through SFSCs per country, average rating in the 1–7 range. Source: Authors' calculations.

The following text provides the results of testing the hypothesis whether the influence of the pandemic on the growth of demand and sale of honey through SFSCs differs between the beekeepers with different demographic, socio-economic and business characteristics. The Kruskal-Wallis test, and Mann – Whitney U test showed a statistically significant difference in the rating of the dependent variable between the following beekeeper groups (Table 3 shown in the Annex):

- Altitude of apiaries. The respondents whose apiaries are located in the mountainous areas had the highest value of the constant variable (Mean rank = 532.1), while the respondents whose apiaries are in the lowland areas had the lowest value (Mean rank = 473.3). This is in accordance with the findings of Cela et al. (2019), indicating that Albanian consumers prefer the honey produced in mountains. It can be assumed that in the other countries of the region consumers also hold mountain honey in high esteem.
- Number of hives per farm/holding. The respondents from the group of large-scale beekeepers had the highest value of the constant variable (Mean rank = 562.47, Me = 4), while small-scale beekeepers had the lowest value (Mean rank = 448.21, Me = 3).

- Availability of family labour for selling honey through SFSCs. The respondents who evaluate availability of family labour as strong to very strong obstacle to honey sale had the highest value of the constant variable (Mean rank = 533.7), while the respondents who stated that the availability of family labour represents no obstacle or only a small obstacle to honey sale had the lowest value (Mean rank = 450.00). In other words, the respondents who perceived a greater influence of the pandemic on the growth of demand and sale of honey also considered the family labour factor to be a strong obstacle to honey sale through SFSCs. This result is logical, bearing in mind that labour to production ratio is much greater in short supply chains than in the long ones (Malak-Rawlikowska et al., 2019), and that the migrations of inhabitants and abandoning of agriculture in WBCs lead to insufficient family labour and high costs of hiring workers (Guri, Jouve & Dashi, 2014; Kotevska et al., 2015; FAO 2020; Djordjevic Milosevic et al. 2021).
- Needs for digital marketing knowledge and skills for participation in SFSCs (Internet sales, digital advertising, etc). The respondents with high needs for this type of knowledge and skills had the highest value of the constant variable (Mean rank = 521.3), while those who have no needs or low needs for these skills had the lowest value (Mean rank = 453.4). This result can be explained by the fact that the respondents who felt a greater growth of demand and honey sale during the pandemic had higher needs for new digital knowledge and skills required for providing services to buyers more easily and efficiently. Surveys of farmers involved in SFSCs in Hungary indicated that successful producers, who increased the sales of their products, were flexible, applied various marketing strategies and were open enough and ready to learn and use the opportunities offered by social networks, online technology (ICT tools) and emerging market niches (Benedek et al., 2020; Beneke et al., 2022).
- Range of products. The beekeepers who produce other bee products apart from honey had a higher value of the dependent variable (Me = 4.0, Mean rank = 525.1). This indicates that this group has a more positive evaluation of the influence of the pandemic on the growth of demand and sale of honey through SFSCs than the beekeepers who produce only honey.
- Value-added honey. Greater values of the dependent variable obtained by the beekeepers who add value to honey (Me = 4.0, Mean rank = 561.3) showed that this group of beekeepers have a more positive evaluation of the influence of the pandemic on the growth of demand and sale of honey through SFSCs than the beekeepers not adding value to honey.

According to Cohen (1988), the influence of the pandemic on the statistical significance confirmed between the analysed groups of beekeepers can be estimated as small in all cases of comparison.

Binary logistic regression was used to evaluate the influence of the predictor variables on the prediction of the probability for respondents to state that the pandemic had a moderately strong to very strong influence on the growth of demand and sale of honey through SFSCs. The variables from Table 1 (shown in the Annex) were included in the model as predictors. The method used for selecting the variables was Forward Stepwise (Wald criterion). The variables were selected after four iterations of the algorithm.

Table 1 provides the results of the Omnibus tests of model coefficients, showing that the final model with all predictors obtained in step 4 is adequate and statistically significant ($\chi^2(4) = 53.473, p = 0.000$). In other words, the model provided a good prediction of the results for the dependent variable. The Hosmer-Lemeshow test, being the most reliable test of the model quality, also showed that the model was good (Step 5, $\chi^2(8) = 4.232, p = 0.836$). The model explains 10.6% (Nagelkerke R^2) of the variance of the dependent variable and correctly classifies 73.7% of the cases.

Tab 1. Omnibus Tests of Model Coefficients. Source: authors' calculation

		Chi-square	Df	Sig.
Step 1	Step	30.593	1	0.000
	Block	30.593	1	0.000
	Model	30.593	1	0.000
Step 2	Step	8.237	1	0.004
	Block	38.829	2	0.000
	Model	38.829	2	0.000
Step 3	Step	8.537	1	0.003
	Block	47.366	3	0.000
	Model	47.366	3	0.000
Step 4	Step	6.107	1	0.013
	Block	53.473	4	0.000
	Model	53.473	4	0.000

Only four independent variables provided a unique statistically significant contribution to the model. These were: age of the respondents, number of hives per farm/holding, value-added honey and needs for digital marketing knowledge and skills for participation in SFSCs (Table 2).

Tab 2. Variables in the Equation. Source: authors' calculation

		B	S.E.	Wald	Df	Sig.	Exp(B)
Step 1 ^a	Value-added honey	0.962	0.178	29.186	1	0.000	2.616
	Constant	-2.499	0.299	69.726	1	0.000	0.082
Step 2 ^b	Number of hives per farm/holding	0.411	0.144	8.157	1	0.004	1.508
	Value-added honey	0.845	0.183	21.394	1	0.000	2.328
	Constant	-3.093	0.373	68.785	1	0.000	0.045
Step 3 ^c	Number of hives per farm/holding	0.458	0.146	9.885	1	0.002	1.580
	Value-added honey	0.835	0.184	20.550	1	0.000	2.305
	Needs for digital marketing knowledge and skills	0.322	0.109	8.668	1	0.002	1.380
	Constant	-3.669	0.428	73.511	1	0.000	0.025
Step 4 ^d	Age of the respondents	-.354	0.144	6.007	1	0.018	0.702
	Number of hives per farm/holding	0.467	0.145	10.368	1	0.001	1.595
	Value-added honey	0.840	0.185	20.618	1	0.000	2.317
	Needs for digital marketing knowledge and skills	0.362	0.111	10.603	1	0.001	1.436
	Constant	-3.116	0.479	42.349	1	0.000	0.044

The results in Table 2 indicate the following:

- The increased age of beekeepers leads to a greater probability for beekeepers to believe that the pandemic (COVID-19) did not affect the growth of demand and sale through SFSCs or that this influence was moderate ($\text{Exp}(B) = 0.702$, $p = 0.018$). This result was partly confirmed by Mastronardi et al. (2015), who underlined that while SFSCs offered attractive possibilities for developing business to young farmers, they were less promising (less able to provide additional income) to pensioners who dealt with farming. On the other hand, having in mind that rural areas in WBCs are characterised by the pronounced processes of depopulation and migration of inhabitants, particularly women and

the young (Guri, Jouve & Dashi, 2014; Kotevska et al., 2015; FAO 2020; Djordjevic Milosevic et al. 2021), it is questionable whether old farmers will be able to respond to the consumer demands in SFSCs, especially during potential future crises.

- The rise of production capacity, i.e., the number of hives per farm/holding, ($\text{Exp}(B) = 1.159, p = 0.001$), increases the probability for beekeepers to evaluate the influence of the pandemic on demand and sale of honey as moderately strong to very strong. Farmers with a greater production capacity will obviously respond more efficiently to the market demands within SFSCs (and to potential future crises). At the same time, Stępień et al. (2022) and Borychowski et al. (2020) just stated that production volume represents a key factor of resilience, economic sustainability and market integration of farms in Central and Eastern European countries (including WBCs).
- Beekeepers adding value to honey believe that the influence of the pandemic on the growth of demand and sale of honey is greater than beekeepers not adding value to honey ($\text{Exp}(B) = 2.317, p = 0.000$). This also represents the strongest predictor. The $\text{Exp}(B)$ value shows that the respondents adding value to honey are 2.3 times more likely to state that honey demand and sale without intermediaries increased moderately strongly to very strongly during the pandemic in comparison to those not adding value to honey, when the other variables in the model are kept constant. According to the survey results, more than half of the respondents (56%) said that they did not add value to honey, while 44% of the respondents confirmed adding value to honey. There are numerous factors in WBCs that hinder farmers' investment in adding value to their products. Some of these factors are old-fashioned technology, lack of facilities and equipment, limited knowledge and working abilities, insufficient financial resources, etc. (FAO, 2020; Djordjevic Milosevic et al. 2021). Therefore, providing support to producers (by means of national and IPARD measures) for investment in properties and equipment in the processing sector, as well as gaining new knowledge through the support of advisory services should be the focal point of the WBC agriculture in the future.
- Greater needs for digital marketing knowledge and skills for participation in SFSCs (Internet sales, digital advertising, etc.) increase the probability for beekeepers to believe that the pandemic (COVID-19) had a moderately strong to very strong influence on the growth of demand and sale of honey ($\text{Exp}(B) = 1.436, p = 0.001$). This result may indicate that farmers' needs for greater knowledge and digital marketing skills increase in order to better sale of their products and serve customers efficiently (Benedek et al., 2020; Beneke et al., 2022). Future directions of the SFSCs development will certainly involve greater digitalization of operation and a higher rate of online deliveries (Aday & Aday, 2020; Brumă et al., 2021; Hobbs, 2021). Farmers in all WBCs lack various and complex knowledge and skills in all segments of production, sale, and marketing, and the role of advisory services is still insignificant (Dedej, Dekakabe & Gocaj, 2000; Kotevska et al. 2015; FAO, 2020; Djordjevic Milosevic et al. 2021). Therefore, the question arises to what extent the SFSC development will be modernised in the following period by using the Internet, social networks, or online deliveries, and adjusted to the needs of primarily young people in urban areas.

Efficient logistics of products, developed road and communication infrastructure in remote villages and vicinity of larger/urban settlements is of utmost importance for efficient and successful SFSCs. In addition, direct sale to consumers is definitely easier in larger urban areas with wealthier residents and established social networks (Sylla, Olszewska & Świąder, 2017; Benedek et al., 2020; Rucabado-Palomar and Cuéllar-Padilla, 2020; Paciarotti & Torregiani, 2021; Sanderson Bellamy, et al. 2021). Furthermore, rural areas are characterised by high migration rates and depopulation, while remote, underdeveloped and inaccessible villages make the logistics of products expensive and inefficient (Guri, Jouve & Dashi, 2014; Kotevska et al., 2015; FAO 2020; Djordjevic Milosevic et al., 2021). Nevertheless, our research has shown that the type of the settlement, placement and marketing costs, and distance to consumer/urban centres had no influence as predictor variables. There were no differences in the dependent variable between the beekeeper groups related to these variables.

The greatest limitation of the study is the respondents' subjectivity, which characterises all social research (Shipman, 2014). Another limitation is the fact that the attitudes of consumers and other stakeholders in rural communities were not examined. Still, the opinions of producers who are directly involved in SFSCs represent valuable inputs for policy makers, giving them priceless knowledge in terms of the science-

policy interface (Šūmane et al. 2021), and enabling the empirical confirmation of scientific and theoretical studies.

Future research should include consumers' attitudes and analysis of their preferences related to buying food directly from producers. This should encompass both the buyers already supplied by SFSCs, and those who do not use or rarely use these channels. In addition, the analysis should be directed at the possibility of development and acknowledgement of SFSCs through rural tourism, as well as through various forms of associating, i.e., horizontal and vertical connecting of actors in rural areas.

7. Conclusion

The term "short food supply chain" is not very common in WBCs, although these placement channels are significantly and traditionally represented in the food systems of all the countries of the region. In developed European countries, these channels belong to value-added agriculture, while in WBCs, they are primarily the result of insufficient competitiveness and integration of small-scale farmers in GFSCs, and the reflection of consumer preferences for buying local products directly from producers.

Shortening of supply chains ensures sustainable income of the involved producers and their integration in supply and value chains. It also leads to greater fairness in the exchange process (by eliminating intermediaries) and availability of fresh, local, secure and safe food to consumers. In this manner, SFSCs strengthen endogenous sources of sustainable rural development. Although a large number of products are placed through SFSCs in local food systems, the market of these products has not been institutionally arranged in WBCs, while a great percentage of turnover is in (semi)informal chains.

Since the COVID-19 pandemic, the contribution of short food supply chains to all sustainability aspects has been underlined from various viewpoints. SFSCs are not the only or the best option that ensures sustainable and secure market supply during crises. In addition, these placement channels are in many aspects inferior to organised and technologically advanced GFSCs (economies of scale, product price, availability and variety of the offer...). However, a balance between SFSCs and GFSCs starts to represent a way for communities to develop resilient, flexible and sustainable food systems in all circumstances and during different crises.

The paper systematises the knowledge obtained by empirical research on the response of SFSCs to the pandemic in the WBC beekeeping sector. The study included the sample of 1081 beekeepers. Honey producers involved in SFSCs rated the influence of the pandemic on the growth of demand and sale of honey using a scale from 1 (no influence) to 7 (very strong influence). The results showed that the influence was weak to moderate (average rating 3.53) and fairly consistent across the countries of the region.

The Kruskal-Wallis test and Mann-Whitney test determined that a stronger influence of the pandemic on the growth of demand and sale of honey through SFSCs was perceived by the beekeepers of greater production capacity, those in mountainous areas, those adding value to honey and those producing other bee products apart from honey. A stronger influence of the pandemic was also perceived by beekeepers who rated the availability of family labour as a strong to very strong obstacle to honey sale and the beekeepers with high needs for digital marketing knowledge and skills. This shows that the increase in demand and sale of honey causes problems regarding the lack of family labour and greater needs for digital knowledge, required for providing services to a larger number of buyers. Although the statistical significance of the pandemic's influence between the beekeeper groups was confirmed, this influence was small in all the compared groups according to Cohen's criterion (Koen, 1988).

Binary logistic regression showed that the increase in beekeepers' age led to the decreased rating of the pandemic's influence on the growth of demand and sale of honey through SFSCs, and that this influence rose with the increase in beekeepers' production capacity, adding value to honey and their needs for digital marketing knowledge and skills. The results related to honey and other food products can indicate that in the future times of crises, older producers might not be able to significantly increase direct selling of food to consumers. At the same time, the chances for responding to demand and

increasing sale rise significantly with greater production capacities of farmers, adding value to products and greater farmers' needs and demands for digital marketing knowledge and skills.

The obtained results help to understand SFSCs in WBCs more clearly. They also provide valuable knowledge about the possible responses of these placement channels and the involved farmers to future crises and disturbances. They are primarily intended for policy makers in rural development, but also to practitioners, scientific and expert communities. All of them should respond proactively on behalf of society and prepare themselves for future challenges.

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ANNEX

Tab 1. Description of the predictor variables. Source: Authors' presentation

Description	Categories
Age range of the respondents	Group 1: Young (<40) Group 2: Middle-aged (40–65) Group 3: Old (>65)
Experience in beekeeping	Group 1: Beginners and less experienced (<10) Group 2: Medium experienced (10–20) Group 3: Very experienced (>20)
Type of the respondent's settlement	Group 1: Urban, suburban, tourist Group 2: Rural leading region (medium and high stage of development) Group 3: Underdeveloped, sparsely populated, and inaccessible rural region
Altitude of apiaries	Group 1: Lowland area Group 2: Hilly area Group 3: Mountainous area
Number of hives per farm/holding	Group 1: Small-scale ≤30 hives Group 2: Medium-scale 31–150 hives Group 3: Large-scale > 150 hives
Range of products	Group 1: Honey, only Group 2: Honey and other bee products, such as royal jelly, pollen, propolis, and wax
Value-added honey	Group 1: No value added, only honey Group 2: Value-added honey (adding different products, processing, certification, original packaging...)
Placement and marketing costs as an obstacle to honey sale through SFSCs	Group 1: No obstacle to weak obstacle Group 2: Moderate obstacle Group 3: Strong to very strong obstacle
Distance to consumer/urban centres as an obstacle to honey sale through SFSCs	Group 1: No obstacle to weak obstacle Group 2: Moderate obstacle Group 3: Strong to very strong obstacle
Availability of family labour for selling honey through SFSCs	Group 1: No obstacle to weak obstacle Group 2: Moderate obstacle Group 3: Strong to very strong obstacle
Needs for digital marketing knowledge and skills for participation in SFSCs (Internet sales, digital advertising, etc.)	Group 1: No needs to low needs Group 2: Medium needs Group 3: High needs

Tab 2. Structure of the sample of respondents who evaluated the impact of the pandemic on the growth of demand and sale of honey through SFSCs. Source: Authors' presentation based on the survey

Sample characteristics	Structure (%)
Country, N 1,011	
– Serbia	51.1
– Bosnia and Herzegovina	5.5
– North Macedonia	11.6
– Montenegro	4.8
– Albania	24.5
– Kosovo*	2.4
Age range of the respondents, N 1,011	
– Young (<40)	29.8
– Middle-aged (40–65)	56.8
– Old (>65)	13.5
Experience in beekeeping, N 1,011	
– Beginners and less experienced (<10)	43.4
– Medium experienced (10–20)	24.6
– Very experienced (>20)	31.9
Type of the respondent's settlement, N 1,011	
– Urban, suburban, tourist	33.3
– Rural leading region (medium and high stage of development)	42.7
– Underdeveloped, sparsely populated, and inaccessible rural region	23.9
Altitude of apiaries, N 1,011	
– Lowland area	33.6
– Hilly area	38.9
– Mountainous area	27.5
Number of hives per farm/holding, N 1,011	
– Small-scale ≤30 hives	30.2
– Medium-scale 31–150 hives	57.8
– Large-scale > 150 hives	12.1
Range of products, N 1,003	
– Honey, only	23.1
– Honey and other bee products, such as royal jelly, pollen, propolis and wax	76.9
Value-added honey, N 999	
– No value added	54.5
– Added value (adding different products to honey, processing, certification, original packaging...)	45.5
Placement and marketing costs as an obstacle to honey sale through SFSCs, N 808	
– No obstacle to weak obstacle	55.9
– Moderate obstacle	30.3
– Strong to very strong obstacle	13.7
Distance to consumer/urban centres as an obstacle to honey sale through SFSCs, N 927	
– No obstacle to weak obstacle	72.3
– Moderate obstacle	16.8
– Strong to very strong obstacle	10.9
Availability of family labour for selling honey through SFSCs, N 938	
– No obstacle to weak obstacle	65.6
– Moderate obstacle	21.4
– Strong to very strong obstacle	13.0
Needs for digital marketing knowledge and skills for participation in SFSCs (Internet sales, digital advertising, etc.), N 931	
– No needs to low needs	67.0
– Medium needs	16.2
– High needs	16.8

Tab 3. Testing the differences in rating the influence of the pandemic on the growth of demand and sale of honey through SFSCs between the beekeeper groups. Source: Authors' presentation

Independent/ predictor variables	Kruskal-Wallis test/ Mann-Whitney U test	Statistical significance
Age of the respondents	Gp1, n=301: Young, Gp2, n=574: Middle-aged, Gp3, n=136: Old $\chi^2 (2, n=1011)=2.913, p=0.233$	None
Experience in beekeeping	Gp1, n=439: Beginners and less experienced, Gp2, n=249: Medium experienced, Gp3, n=323: Very experienced $\chi^2 (2, n=1011)=1.377, p=0.502$	
Type of the respondent's settlement	Gp1, n=337: Urban, suburban and tourist settlement, Gp2, n=432: Rural leading region of medium and high development, Gp3, n=242: Undeveloped, sparsely populated and inaccessible rural settlement $\chi^2 (2, n=1011)=2.071, p=0.355$	
Altitude of apiaries	Gp1, n=340: Lowland area; Mean rank=473.3 Gp2, n=393: Hilly area; Mean rank=515.8 Gp3, n=278: Mountainous area; Mean rank=532.1 $\chi^2 (2, n=1011)=7.278, p=0.026$ The Mann-Whitney U test revealed a statistically significant difference of the dependent variable between Gp1 and Gp3 ($U = 41808.00, z=-2.532, p=0.011, r=0.10$), and between Gp1 and Gp2 ($U = 61145.00, z=-2.033, p=0.042, r=0.075$);	Exists (small influence)
Number of hives per farm/holding	Gp1, n=305: Small-scale beekeepers; Mean rank=448.2; Me=3.0 Gp2, n=584: Medium-scale beekeepers; Mean rank=524.4; Me=4 Gp3, n=122: Large-scale beekeepers; Mean rank=562.5; Me=4.0 $\chi^2 (2, n=1011)=19.762, p=0.000$ The Mann-Whitney U test revealed a statistically significant difference in the rating of the dependent variable between Gp1 and Gp3 ($U=14417.00, z=-3.727, p=0.000, r=0.12$), and between Gp1 and Gp2 ($U=75621.00, z=-3.789, p=0.000, r=0.12$);	
Range of products	Group 1, n=232: Honey, only, Me=3.0, Mean Rank=425.1, Group 2, n=771: Honey and other bee products, Me=4.0, Mean Rank= 525.1 $U=71597.50, z=-4.725, p=0,000, r=0.15$	
Value-added honey	Group 1, n=544: No value added, Me=3.0, Mean Rank = 448.8 Group 2, n=455: Added value, Me=4.0, Mean Rank= 561.3 $U=95882.5, z=-6,289, p=0,000, r=0.2$	
Placement and marketing costs as an obstacle to honey sale through SFSCs	Gp1, n=452: No obstacle to weak obstacle, Gp2, n=245: Moderate obstacle, Gp3, n=111: Strong to very strong obstacle; $\chi^2 (2, n=808)=2.366, p=0.306$	None
Distance to consumer/urban centres as an obstacle to honey sale through SFSCs	Gp1, n=670: No obstacle to weak obstacle, Gp2, n=156: Moderate obstacle, Gp3, n=101: Strong to very strong obstacle; $\chi^2 (2, n=927)=2.077, p=0.354$	None

Independent/ predictor variables	Kruskal-Wallis test/ Mann-Whitney U test	Statistical significance
Availability of family labour for selling honey through SFSCs	Gp1, n=615: No obstacle to weak obstacle, Mean rank=450.0; Gp2, n=201: Moderate obstacle, Mean rank=490.2; Gp3, n=122: Strong to very strong obstacle, Mean rank=533.7; $\chi^2(2, n=938)=11.767, p=0.003$ The Mann-Whitney U test revealed a statistically significant difference in the rating of the dependent variable between Gp1 and Gp3 (U=30884.000, z= -3.164, p=0.002, r=0.12)	Exists (small influence)
Needs for digital marketing knowledge and skills for participation in SFSCs (Internet sales, digital advertising, etc.)	Gp1, n=624: No needs to low needs, Mean rank=453.4; Gp2, n=151: Medium needs, Mean rank=461.00; Gp3, n=156: High needs, Mean rank=521.3; $\chi^2(2, n=931)=8.411, p=0.015$ The Mann-Whitney U test revealed a statistically significant difference in the rating of the dependent variable between Gp1 and Gp3 (U=41568.500, z= -2.895, p=0.004, r=0.10)	