

Short Food Supply Chains in Slovenia: Exploring Challenges, Good Practices and Educational Needs

Key words

short food supply chains;
local food systems;
good practices in food chains;
sustainable food systems;
agri-food education;
agrifood

Spela Strnad¹, Mojca Jevsnik Podlesnik¹, Urska Jamnikar-Ciglenecki^{2*}

¹Faculty of Health Sciences, University of Ljubljana, Zdravstvena pot 5, 1000 Ljubljana, ²Institute of Food Safety, Feed and Environment, Veterinary Faculty, University of Ljubljana, Gerbičeva 60, 1000 Ljubljana, Slovenia

*Corresponding author: urska.jamnikar@vf.uni-lj.si

Abstract: Short food supply chains are an innovative sustainable approach emerging to address global food supply challenges by promoting closer relationships between producers and consumers, minimizing environmental impacts and enhancing rural resilience. This represents the first systematic empirical assessment of short food supply chains (SFSCs) in Slovenia. The study investigates good practices, stakeholder challenges and specific educational needs relevant to developing targeted capacity-building initiatives. Conducted within the framework of the Erasmus+ KA2 project Food Improv'iders, the research applies a quantitative cross-sectional design based on an online survey of Slovenian food producers.

Findings indicate that short food supply chains in Slovenia are predominantly characterized by direct sales, participation in local farmers' markets and an increasing use of national and European-level quality assurance schemes. However, significant barriers persist, including limited regulatory support, inconsistent enforcement of food hygiene regulations and infrastructural constraints such as poor digital connectivity. Producers expressed a strong interest in further training, especially in food safety, marketing and knowledge-sharing on best practices, with a preference for blended learning approaches, combining occasional in-person workshops with digital modules and identified one to two training courses per year as optimal.

This study provides the first systematic and statistically supported empirical assessment of short food supply chains in Slovenia, a context that has remained largely unexplored in European SFSC research. Unlike previous studies that focus primarily on Western and Northern European countries or on single dimensions of SFSCs, this research integrates producers' practices, perceived barriers and capacity-building needs within a sustainability framework. The results reveal distinct generational and educational patterns shaping sales strategies, perceived challenges and preferred learning formats, offering novel evidence to inform targeted educational programmes and policy interventions for strengthening sustainable local food systems in smaller EU member states.

Received: 2 February 2026

Accepted: 24 April 2026

Introduction

The consumption of locally produced food is increasingly recognized as a key component of healthy diets and sustainable food systems. In addition to its nutritional benefits, local food production supports rural economies, reduces environmental externalities and fosters social cohesion (1). In recent years, the global food system has been undergoing significant transformations, marked by growing interest in sustainability, regional sourcing and closer relationships between producers and consumers (2). At the heart of these changes are Short Food Supply Chains (SFSCs), which have gained traction across Europe as a

promising strategy to address ecological, economic and social challenges (3). Although widely used, the concept of SFSCs lacks a universally accepted definition (4). Terms such as "short supply chains" and "local food" are often used interchangeably (5). According to Regulation (EU) No 1305/2013 (6), an SFSC refers to a supply chain involving a limited number of economic operators who are geographically and socially connected and who collaborate in local economic development.

In practice, SFSCs are characterized by minimal or no intermediaries and by geographical proximity between producers and consumers, often defined as within 30 to 100 km, although this

range can extend further depending on demographic and geographic conditions (e.g., 160 km in the UK or 250 km in Sweden) (7). In Slovenia, the entire national territory is officially defined as a local market under the Agriculture Act (8).

In Slovenia, SFSCs often rely on direct sales through a variety of channels. It depicts a traditional farm where primary agricultural products are processed and sold directly on-site where visitors usually combine leisure and recreational activities with on-farm purchasing. Research shows that SFSCs can improve transparency, enhance traceability, reduce the carbon footprint of food transport and provide fairer economic returns to small-scale producers (9, 10). They also contribute to social equity, preserve local traditions and support environmentally responsible production practices, including environmental integrity, local economic vitality, participatory governance and social well-being (11, 12).

Good practice in SFSCs in European Countries

The implementation of SFSCs across Europe demonstrates diverse practices tailored to local contexts. The most offered products include milk and dairy products, meat and meat products, eggs, fruits and vegetables, fish, cereals and alcoholic beverages (7).

The European project The Short Supply Chain Knowledge and Innovation Network (SKIN) identified several prevalent sales channels, including home delivery schemes, online and social media sales, retail outlets, farmers' markets and direct on farm sales. Less frequently, producers supply goods to institutional buyers such as hotels, caterers, restaurants, hospitals and schools. Innovative practices include vending machines and kiosks for food distribution (13).

In Austria, collaboration among farmers has proven beneficial, particularly in reducing costs, labour requirements and enhancing knowledge exchange. A notable example is the development of joint logistics and coordinated product delivery (14).

Challenges faced by local food producers in European countries and opportunities for improvement

Despite the growing momentum of SFSCs, local producers face structural, regulatory and operational barriers. A key difficulty is compliance with food hygiene legislation (13). Regulatory flexibility exists but is inconsistently applied across the EU, leading to uneven burdens (15). The SKIN project also revealed that farm shops often face accessibility issues, limited opening hours and a narrow product range (13). Although many producers use promotional materials and websites, there is still a need to improve digital infrastructure in rural areas (11, 13).

Socio-economic disparities further complicate participation, with women facing greater financial constraints and generational differences influencing adoption of innovative approaches. Geographical fragmentation and labour shortages also remain important challenges (12, 14).

Local food in Slovenia

Slovenia remains under-represented in academic discourse despite strong policy framework supporting local food. SFSCs are supported through EU legislation and national instruments promoting food quality and sustainable procurement. EU-wide food quality schemes such as Protected Designation of Origin, Protected Geographical Indication, Traditional Speciality Guaranteed and Organic Farming are harmonized within the single European market (16). Slovenia has introduced national quality labels such as "Higher Quality", "Integrated Production" and "Selected Quality", which are regulated under the national Agriculture Act (17).

The Heart of Slovenia initiative operates not as a single sales platform, but as a regional coordination model combining a local action partnership, a consortium of schools and kindergartens, a collective quality brand, and intermediary actors supporting aggregation and distribution. In this way, it strengthens linkages between local food providers and institutional buyers and contributes to more durable local procurement arrangements.

Public initiatives including Slovenian Food Day and the Traditional Slovenian Breakfast promote local food consumption in public institutions (18) alongside awareness campaigns such as "Naša super hrana" (Our Super Food) (19). Legislative instruments promote the inclusion of locally produced food in public procurement, with defined targets for organic and quality-certified food (20, 21).

Additional support is provided through the Rural Development Programme 2014–2020 and the LEADER (Liaison Entre Actions de Développement de l'Économie Rurale) initiative (16, 22). Examples include the "Green Supply Chains" project, which connects local farmers with hospitality providers through initiatives such as local food markets, the "Ljubljana Breakfast," and the "Culinary Calendar" (23). Digital tools such as the Catalogue of Food for Public Procurement improve communication and visibility for producers (24, 25).

The aim of the study was to examine the implementation of SFSCs in Slovenia, focusing on good practices, stakeholder challenges and educational needs. The research was conducted within the Erasmus+ KA2 project Food Improv'iders, using a quantitative cross-sectional survey of Slovenian food producers.

Materials and methods

Research objectives and methodology

The standardized questionnaire consisted of five sections: (1) introduction to the study and research team; (2) demographic data (gender, age, education, location); (3) business activities and farm characteristics (size, certification, supply-chain role, employees, income, products, sales channels, diversification); (4) knowledge of SFSCs (definitions, examples, barriers, challenges); and (5) training needs and preferences (topics, meth-

ods, frequency, tools). It mainly included closed-ended questions, 7-point Likert scales, and some open-ended or mixed-format items. The study pursued three objectives: (1) to identify good practices and innovative approaches in SFSCs in Slovenia; (2) to assess food producers' knowledge and information needs regarding SFSCs; and (3) to examine capacity-building preferences for the development of targeted educational workshops.

Five research questions guided the study, focusing on producers' demographic characteristics, production activities, level of SFSC knowledge, perceived needs, and expectations regarding training methods and formats. Based on previous European research, four hypotheses were formulated: (H1) stakeholders in SFSCs adopt innovative approaches such as quality schemes, direct sales, farmers' markets, online sales, and diversification; (H2) producers show strong interest in further training, especially in food safety, marketing, and exchange of good practices; (H3) blended learning formats are preferred over fully digital training; and (H4) the preferred training frequency is once or twice annually.

Sampling and data collection

A random sampling method was applied using publicly available email addresses listed on official farm websites, the "Naša super hrana" (Our Super Food) portal and the Catalogue of Food for Public Procurement. The survey was anonymous and conducted via Google Forms. Participants were selected through a random sampling method. A pilot questionnaire test involving ten producers was first conducted and their feedback guided the final adjustments to the questionnaire. The survey was subsequently emailed to 160 producers and remained open for ten days. A reminder was sent on the seventh day, resulting in a total of 50 valid responses. No incentives were offered for participation.

Questionnaire structure

The survey questionnaire consisted of five sections: introduction, demographic information, business activities, knowledge of SFSC, and training needs. The questions were mostly closed-ended, using a Likert scale (1–7), with a few open-ended questions.

Data analysis

We collected 50 valid and complete responses for analysis. The responses were exported to Microsoft Excel 2016 for initial data processing, including descriptive statistics (frequencies, percentages, arithmetic means, standard deviations, minimum and maximum values). The results are presented in tables and graphs. To examine differences in responses based on independent variables (e.g., gender, age, education, field of study), additional statistical analysis was performed using IBM SPSS Statistics version 26.0. For nominal variables, we used chi-square tests. For numerical variables, t-tests (gender and field of study) and one-way ANOVA (age and education) were performed. In the Results section, we report only statistically significant results ($p < 0.05$).

Results

Research questions

Demographic Characteristics of Respondents

The survey included 50 respondents with a nearly equal gender distribution (52% male, 46% female, 2% undisclosed). The age structure was dominated by the 50–65 age group (50%), followed by participants aged 35–50 (30%). Younger producers (20–35 years) represented 14%, while those over 65 accounted for the smallest share (6%). The educational structure ($N = 50$) varied significantly. Interestingly, 61% of participants had formal education outside of agriculture or food technology. Geographically ($N = 49$), respondents represented most Slovenian regions, with the highest concentration in Gorenjska (22%), followed by Podravska (14%) and Central Slovenia (12%) (Table 1).

Table 1: Demographic Profile of Respondents

Variable	Category	Number of Respondents (%)
Gender	Male	26 (52%)
	Female	23 (46%)
	Not specified	1 (2%)
Age group	20–35 years	7 (14%)
	35–50 years	15 (30%)
	50–65 years	25 (50%)
	Over 65 years	3 (6%)
Education level	University degree (agriculture related)	12 (24%)
	Higher vocational education, General secondary education	9 (18%)
	Vocational secondary education (agriculture)	6 (12%)
	Primary education	1 (2%)
	Other	13 (26%)
Field of study	Agriculture/Food technology	19 (39%)
	Other	30 (61%)
Region of operation	Gorenjska	11 (22%)
Region of operation	Podravska	7 (14%)
Region of operation	Central Slovenia	6 (12%)
Region of operation	Southeast Slovenia	5 (10%)
Region of operation	Savinjska, Pomurska, Primorsko-Kraška, Goriška	4 (8%)
Region of operation	Koroška	2 (4%)
Region of operation	Primorsko–Notranjska, Posavska	1 (2%)

Specific characteristics of the producers' activities

Regarding years of experience in agriculture or food processing, a significant relationship was observed with the age of respondents ($\chi^2(N = 50) = 21.47, p = 0.044$) (Table 2). The majority of respondents aged 20–35 (43%) and 35–50 (33%) reported having between 10 and 20 years of experience, while most respondents aged 50–65 (52%) and those older than 65 (67%) had over 30 years of experience.

Table 2: Statistical differences in food producers' activities, SFSC involvement and training needs. Degrees of freedom (df) for F-tests were approximated manually as $df1 = k - 1$ and $df2 = N - k$, where k = number of groups and N = total sample size; df for χ^2 tests were calculated as $(rows - 1) \times (columns - 1)$. ns = not significant; SFSCs = Short Food Supply Chains

Variable/Item	Comparison/Group	Test	df	Value	p
Years of working in agricultural production or food processing	Age group	χ^2	-	21.47	0.044
Years of working in agricultural production or food processing	Education level	χ^2	-	32.87	0.035
Working with value-added products (e.g., oil, vinegar, mustard)	Age group	χ^2	-	11.44	0.010
Working with value-added products (e.g., oil, vinegar, mustard)	Education level	χ^2	-	11.42	0.044
Involvement in dairy production	Study in agriculture/ food technology	χ^2	-	5.21	0.022
Use of online agricultural marketplaces	Gender	χ^2	-	8.37	0.015
Use of online agricultural marketplaces	Age group	χ^2	-	3.57	0.312 (ns)
Use of the HoReCa sales channel	Gender	χ^2	-	17.27	<0.001
Successful experience with SFSCs	Study in agriculture/ food technology	χ^2	-	5.31	0.021
Local and regional support (financial/human resources)	Study in agriculture/ food technology	χ^2	-	4.10	0.043
Share of income from agricultural/ food production	Age group	F	2, 47	3.94	0.015
Training/capacity building – managerial advice	Age group	F	2, 47	3.01	0.040
Networking (knowledge exchange, public procurement, etc.)	Age group	F	2, 47	3.37	0.027

A similar pattern emerged in relation to education ($\chi^2(N = 50) = 32.87, p = 0.035$). Respondents with only primary education (100%), general secondary education (56%) or vocational agricultural education (83%) had primarily worked in agriculture or food processing for more than 30 years. Conversely those with higher vocational education (33%) mostly had 5 to 10 years of experience, while university educated respondents (50%) reported predominantly 10 to 20 years of work experience.

The types of products also varied significantly by age ($\chi^2(N = 50) = 11.44, p = 0.010$) and education ($\chi^2(N = 50) = 11.424, p = 0.044$) (Table 2). Respondents over 65 years of age (100%) and those with primary education (100%) were far more likely to work with value-added products such as condiments and sauces (e.g., oil, vinegar, mustard) compared to younger or more highly educated groups. Furthermore, a statistically significant correlation was found between respondents' education in agriculture or food technology and their involvement in dairy production ($\chi^2(N = 50) = 5.21, p = 0.022$). Those who had studied agriculture or food technology (42%) were more likely to report working with milk and dairy products compared to those without such education (13%).

Statistically significant correlation was also found regarding marketing and sales channels. Gender influenced the use of online agricultural marketplaces (Figure 1) ($\chi^2(N = 50) = 8.37, p = 0.015$): with 15% of male respondents reported using this sales channel, compared to only 4% of female respondents. As shown in Figure 1 gender differences were again evident in the use of farmers' markets. Female respondents (70%) were significantly more likely to engage in direct sales at regular or occasional farmers' markets than male respondents (30%).

As shown in Figure 2 age differences were also evident; while none of the respondents aged 20–35 used agricultural web stores, the proportion increased with age, reaching 67% among those older than 65 ($\chi^2(N = 50) = 3.57, p = 0.312, ns$). Social media use as a sales channel showed an inverse pattern (Figure 2). Respondents aged 20–35 (86%) and 35–50 (60%) were considerably more likely to utilize social media platforms for selling their products than older groups. Younger respondents (20–35 years: 43%; 35–50 years: 40%; 50–65 years: 16%) were less likely to sell through cooperatives than those aged over 65 (100%).

In terms of public procurement, the 35-50 age group was the most active (60%), while sales to institutional buyers (cooperative supply) were most common among the oldest group (100%).

Additionally, significant gender differences were found in the HoReCa sales channel ($\chi^2(N = 50) = 17.27, p < 0.001$), used by 65% of men but only 9% of women.

Age was significantly associated with the share of income generated from agricultural or food production activities ($F(2,47) = 3.94, p = 0.015$). Respondents aged 20–35 derived 81% of their income from these activities, rising to 89% among those aged 35–50, then declining to 66% for ages 50–65 and 33% for those older than 65.

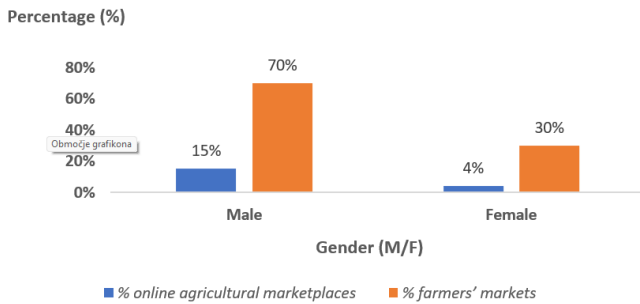


Figure 1: Sales channels used by respondents: the use of online agricultural marketplaces and direct sales at regular or occasional farmers' markets by gender

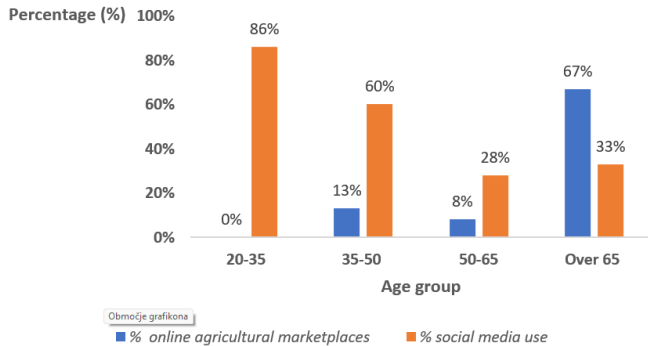


Figure 2: Sales channels used by respondents: the use of online agricultural marketplaces and social media platforms by age differences

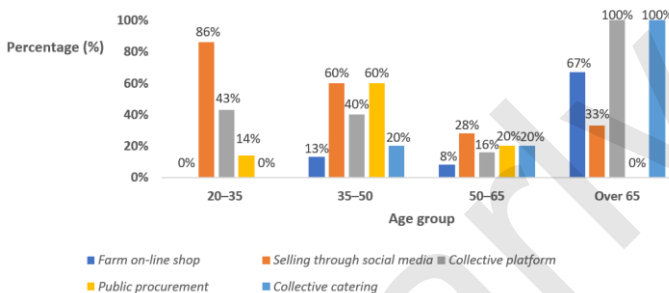


Figure 3: Differences in the use of sales channels in SFSCs by age group (% of respondents)

Knowledge of SFSCs

Participants' agreement with the definition of SFSCs did not significantly differ according to demographic variables (gender, age, level of education, field of study or geographic location) ($p > 0.05$). This lack of demographic variation suggests a uniform baseline understanding of the SFSC concept among respondents, regardless of their professional background or region of activity.

Food producers' needs and experience in SFSCs

Statistical analysis revealed that educational background significantly influences how producers perceive their success and needs within SFSCs ($p < 0.05$). Participants with a formal education in agriculture or food technology reported a 100% success rate in their SFSCs experiences compared to those without such an educational background (64%) ($\chi^2(N = 50) = 5.31, p = 0.021$).

Furthermore, educational background significantly affected the perceived needs for "local and regional support (financial and human resources)" ($\chi^2(N = 50) = 4.10, p = 0.043$). Interestingly, respondents without agricultural education were more likely to emphasize the need for such support (80%) than their professionally trained counterparts (53%). This suggests that formal agricultural training may provide producers with better self-reliance or existing resources to navigate SFSC challenges.

Preferences for training and capacity-building

Age was significantly associated with the share of income generated from agricultural or food production activities ($F(2,47) = 3.94, p = 0.015$). Respondents aged 20–35 derived 81% of their income from these activities, increasing to 89% among those aged 35–50, before declining to 66% for those aged 50–65 and 33% among respondents older than 65.

Hypotheses testing

H1 proposed that stakeholders in SFSCs adopt innovative approaches to develop their business and best practices, and that the use of these channels is influenced by socio-demographic characteristics. The results confirmed this hypothesis, as several statistically significant associations ($p < 0.05$) were found between sales channels and gender or age. Men used farm online shops and the HoReCa channel more frequently, whereas women more often relied on direct selling at local or farmers' markets. Younger producers (20–50 years) were more active in selling through social media, while respondents over 65 showed the highest use of collective platforms, collective catering channels, and farm online shops. Sales via public procurement were most common among producers aged 35–50 (Figure 3). Overall, the findings indicate that innovative sales approaches in SFSCs differ significantly by age and gender, highlighting the need for tailored development strategies. H2 proposed that food producers are willing to pursue additional training and education, particularly in food safety, marketing, and the exchange of best practices. The results confirmed this hypothesis, as several statistically significant associations ($p < 0.05$) were identified across motivations, barriers, and awareness of SFSCs. Respondents with agricultural or food technology education more frequently recognized local markets as a form of SFSC, while women more often identified web sales. Profitability and better prices were stronger motivators among respondents with higher or primary education, whereas men more often emphasized innovation. Producers with lower education levels placed greater importance on closer connections with local actors. Regarding barriers, younger respondents more frequently reported traceability regulations and transportation or cold-chain logistics as challenges (Figure 4), while those without agricultural education were more concerned about sectoral policies and lack of financial support. As shown in Figure 5 negative consumer perception and lack of digitalization were particularly emphasized by respondents with only primary education. Younger producers also showed the lowest awareness of available support and incentives compared with older groups.

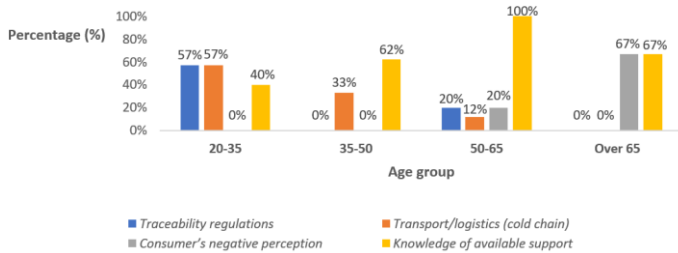


Figure 4: Distribution of perceived barriers to the implementation of SFSCs by age group

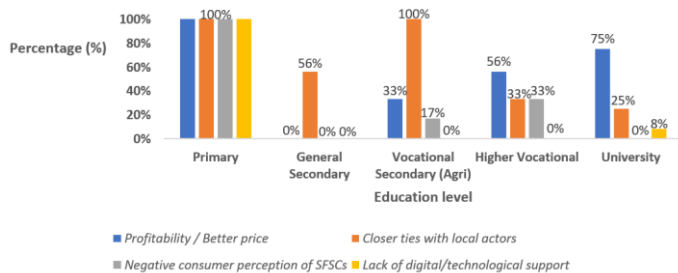


Figure 5: Key motivations for joining SFSCs based on education levels of respondents

Overall, the findings indicate a clear demand for targeted training in food safety compliance, digital and direct marketing, policy awareness, logistics, and networking, including the exchange of best practices. H3 and H4 examined food producers' preferences regarding training content and frequency for participation in SFSCs. The analysis revealed statistically significant age-based differences ($p < 0.05$). Respondents aged 35–50 rated managerial advice as the most important training topic ($M = 5.79$), while those over 65 considered it least important ($M = 5.33$). Networking activities, such as knowledge exchange and understanding public procurement mechanisms, were rated highest by respondents aged 50–65 ($M = 6.21$) and lowest by those over 65 ($M = 4.33$). Overall, the results suggest that blended, practice-oriented training offered once or twice per year would be most effective, particularly when tailored to age-specific learning needs.

Discussion

The findings confirm the complexity and multidimensionality of SFSC development in Slovenia. Although the present study is empirically grounded in Slovenia, its findings can be meaningfully interpreted in relation to the wider European SFSC literature. Such comparisons should not be understood as implying full equivalence across countries, since SFSCs differ substantially in their organisational forms, territorial embeddedness, and regulatory context. Rather, the comparative literature provides a framework for identifying which findings appear robust across settings and which are more likely to reflect country-specific conditions. European studies highlighted the importance of spatial heterogeneity in understanding SFSC performance. In line with the H1, our research confirms that most implement innovative approaches such as on-farm sales, local markets, quality schemes and digital integration reflecting trends identified in

projects like SKIN (13). However, the conceptual understanding of SFSCs among producers remains fragmented, particularly regarding sustainability, dimensions, supporting observations that the term is inconsistently defined (4).

The confirmation of H2 highlights a demand for human capital development. Respondents prioritize knowledge in food safety, digital marketing and exchange of best practices supporting arguments that human capital is crucial for SFSC success (11, 26). Specifically, the need for peer-to-peer learning was also emphasized (14).

H3 is also validated as producers prefer short workshops, webinars and self-paced learning over formal courses which is important for designing educational content adapted to their capacities.

H4 is confirmed as well, with a preferred learning frequency of one to two times per year.

A key issue is the digital divide. While digital tools are positive, many producers lack adequate infrastructure and skills (13, 26). Structural and legislative barriers, particularly inconsistent interpretations of EU food safety regulations (e.g., Regulation (EC) No 852/2004), continue to create unequal conditions for small producers (15).

Socio-demographic differences persist. Younger producers are more open to innovation but often lack the necessary resources while older producers possess have experience but face difficulties with digital tools. Female producers often encounter greater financial barriers, reflecting broader inequalities within the agricultural sector.

Promising Slovenian examples, such as Green Public Procurement in Ljubljana and digital Catalogue of Foods for Public Procurement show that effective collaboration between local producers and public sector buyers is achievable. Strengthening such models and improving digital tools could further reduce administrative burdens and improve market access. The Catalogue of Foods for Public Procurement should be continuously upgraded to simplify traceability and logistics, which were identified as primary concerns for younger participants in this study (GZS, n.d.). These examples may serve as transferable models for replication in other regions while such models can be effectively supported by Local Action Groups (LASs), such as LAS Heart of Slovenia, which act as key intermediaries in rural development, helping producers access funding and integrate into local value chains (28).

In summary, Slovenian producers are willing to contribute to the development of SFSCs but require stronger support at policy, infrastructural and knowledge levels. Future development SFSCs should focus on digital integration, institutional support and targeted training.

Novelty and contribution of the study

This confirmatory, hypothesis-driven study advances current knowledge on SFSCs by addressing several gaps identified in ex-

isting European research. While previous studies have predominantly focused on Western and Northern European contexts or examined individual aspects of SFSCs this research provides an integrated empirical assessment of producers' practices, challenges and capacity-building needs within a single framework. In this context, organizations such as the Slovenian Rural Youth Association (ZSPM) play a vital role in connecting young producers and providing them with the necessary advocacy and networking opportunities to overcome initial resource barriers (27).

A key contribution is the identification of socio-demographic differences influencing sales channels, barriers and preferred training formats that has been largely absent from previous SFSC literature. From an applied perspective, the findings suggest that support for producers in SFSC should go beyond general promotion and include targeted capacity building in digital marketing, online communication, pricing, cost calculation, business planning, and participation in institutional markets. At the same time, these educational interventions should be complemented by structural support measures, since small-scale producers often face limited digital connectivity, fragmented logistics, and high transport costs. In this regard, cooperative approaches, shared distribution arrangements, local aggregation hubs, and farmer-friendly digital tools may be particularly important for improving market access and competitiveness.

By linking empirical findings with educational design and policy implications, the study provides actionable insights and contributes to European discussions on sustainable food systems and rural development.

Research limitations

This study used a quantitative design based on an online survey. While efficient, this approach has limitations such as potential response bias technical constraints in data processing, including manual coding after export to Excel.

Future research should seek to validate and extend these findings using larger samples and longer recruitment periods. In addition, mixed method designs combining surveys with interviews or focus groups could provide a more in-depth understanding of producers' experiences, motivations and barriers in SFSCs. Cross-country comparative research and longitudinal studies would further strengthen the evidence base for policy and educational interventions.

Conclusion

This study provides empirical evidence on the functioning of SFSCs through a systematic analysis of Slovenian food producers' practices, challenges and educational needs. Unlike existing research, it adopts an integrated approach that examines production practices, socio-demographic differences and capacity-building preferences within a sustainability framework.

A key contribution is the identification of generational and educational patterns influencing engagement in SFSCs, including

marketing strategies, perceptions of barriers and learning preferences. These findings highlight the need for targeted policy and educational interventions.

By addressing the specific conditions shaping SFSC implementation in Slovenia, the study contributes to the broader discourse on sustainable food systems and aligns with the EU's Farm to Fork Strategy. While further research is needed, it provides a foundation for evidence-based policymaking and the development of more resilient agri-food systems.

Acknowledgements

The authors thank Dr Petra Raspor Lainšček, Dr Malan Štrbenc, Dr Tanja Knific and all of the European partners for their valuable support in the preparation of educational materials for stakeholders.

Funding: FOOD IMPROV'IDERS project was funded by the European Commission within its Erasmus+ Programme, under KA-2 Cooperation for innovation and the exchange of good practices, Strategic Partnership for Adult Education. Project Number: 2020-1-FR01-KA204-080640. The authors also acknowledge the financial support from the Slovenian Research and Innovation Agency (research core funding No. P4-0092 and No. P3-0388).

Conflicts of interest/Competing interests: The authors declare no competing interests.

Ethics approval: Not applicable.

Authors' contributions: UJC and MJP conceived and designed the study. All authors contributed to the implementation of the study and led conducted training on SFSC related to the research. SS drafted the initial version of the manuscript, which was revised and edited by UJC and MJP. All authors read and approved of the final manuscript.

References

1. Aguiar L, DelGrossi ME, Thomé KM (2018). Short food supply chain: Characteristics of a family farm. *Rural sociology Cienc Rural* 48 (5). doi:10.1590/0103-8478cr20170775 <https://www.scielo.br/jj/cr/a/GmmnrGBJN7WJB68gKBYjn5b/?lang=en>
2. Bayir B, Charles A, Sekhari A et al. (2022). Issues and challenges in short food supply chains: A systematic literature review. *Sustainability* 14(5):3029. doi:10.3390/su14053029 <https://www.mdpi.com/2071-1050/14/5/3029>
3. Aguado-Gragera C, Sama-Berrocal C, Mesías F et al. (2024). Challenges and opportunities of short food supply chains in Spain: A stakeholder participatory study. *Journal of Agriculture and Food Research* 18: 101276. doi:10.1016/j.jafr.2024.101276 <https://www.sciencedirect.com/science/article/pii/S2666154324003132?via%3Dihub>
4. Enthoven L, Van den Broeck G (2021). Local food systems: Reviewing two decades of research. *Agricultural Systems* 193. doi:10.1016/j.agsy.2021.103226
5. European Commission. (n. d.a). Farm to Fork strategy https://food.ec.europa.eu/horizontal-topics/farm-fork-strategy_en

6. Regulation (EU) No 1305/2013 of the European Parliament and of the Council of 17 December 2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) and repealing Council Regulation (EC) No 1698/2005. Official Journal of the European Union, L 347, 487–548 <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32013R1305>
7. Paciarotti C, Torregiani F (2020). The logistics of the short food supply chain: A literature review. *Sustainable Production and Consumption* 26. doi:10.1016/j.spc.2020.10.002
8. Republika Slovenija. (2018). Zakon o spremembah in dopolnitvah Zakona o kmetijstvu (ZKme-1E) [Act amending and supplementing the Agriculture Act]. Uradni list RS, No. 22/18
9. Abbate S, Centobelli P, Cerchione R et al. (2023). Coming out the egg: Assessing the benefits of circular economy strategies in agri-food industry. *Journal of Cleaner Production* 385:135665. Doi:10.1016/j.jclepro.2022.135665 <https://www.sciencedirect.com/science/article/abs/pii/S0959652622052398?via%3Dihub>
10. Mangla SK, Kazancoglu Y, Ekinci E et al. (2021). Using system dynamics to analyze the societal impacts of blockchain technology in milk supply chains. *Transportation Research Part E: Logistics and Transportation Review* 149:102289. doi:10.1016/j.tre.2021.102289 <https://www.sciencedirect.com/science/article/abs/pii/S1366554521000636>
11. European Economic and Social Committee (2019). Opinion of the European Economic and Social Committee on “Promoting short and alternative food supply chains in the EU: the role of agroecology” (own-initiative opinion) (2019/C 353/11). Official Journal of the European Union, C 353, 65–71. <https://eur-lex.europa.eu/legal-content/SL/TXT/PDF/?uri=CELEX:52019 IE1463 & from=HU>
12. Lioutas DE, Charatsari C (2020). Smart farming and short food supply chains: Are they compatible?. *Land Use Policy* 94. doi:10.1016/j.landusepol.2020.104541
13. Hyland J, Crehan P, Colantuono F et al. (2019). The Significance of Short Food Supply Chains: Trends and Bottlenecks from the SKIN Thematic Network. *Studies in Agricultural Economics*, 121(2), 59–66. doi:10.7896/j.1904
14. Lutz J, Smetschka B, Grima N (2017). Farmer Cooperation as a Means for Creating Local Food Systems—Potentials and Challenges. *Sustainability* 9(6), 925. doi:10.3390/su9060925
15. European Parliament and Council. (2004). Regulation (EC) No 852/2004 of the European Parliament and of the Council of 29 April 2004 on the hygiene of foodstuffs. Official Journal of the European Union, L 139, 1–54. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32004R0852>
16. Ministry of Agriculture, Forestry and Food of the Republic of Slovenia (MKGP). (2020a, November 5). The importance and strengthening of self-sufficiency and short supply chains in rural areas through the LEADER / community-led local development approach [In Slovenian]. <https://www.gov.si/novice/2020-11-05-pomen-in-krepitev-samooskrbe-ter-kratkih-dobavnih-verigna-podezelju-preko-pristopa-leader-lokalnega-razvoja-ki-ga-vodi-skupnost/>
17. Agriculture Act (ZKme-1). (2008). Official Gazette of the Republic of Slovenia (Uradni list RS), No. 45/2008 (as amended: 57/2012; 90/2012; 26/2014; 32/2015; 27/2017; 22/2018). <https://pisrs.si/aktualno/zakonodaja-v-anglescini>
18. Ministry of Agriculture, Forestry and Food of the Republic of Slovenia (MKGP). (2022, September 6). Slovenian Food Day and the Traditional Slovenian Breakfast [In Slovenian]. <https://www.gov.si/zbirke/projekti-in-programi/dan-slovenske-hrane-in-tradicionalni-slovenski-zajtrk/>
19. Ministry of Agriculture, Forestry and Food of the Republic of Slovenia (MKGP). (2020b, May 7). Promotion of local food [In Slovenian]. <https://www.gov.si teme/pomen-lokalne-hrane-in-nacelo-kratkih-verig-v-dobavi-zivil/>
20. Republic of Slovenia. (2015). Public Procurement Act (ZJN-3). Official Gazette of the Republic of Slovenia, No. 91/15. <https://www.uradni-list.si/glasilo-uradni-list-rs/vsebina/2015-01-2915>
21. Republic of Slovenia. (2017). Regulation on Green Public Procurement (Uredba o zelenem javnem naročanju). Official Gazette of the Republic of Slovenia, No. 51/17. <https://www.uradni-list.si/glasilo-uradni-list-rs/vsebina/2017-01-2511>
22. European Court of Auditors. (2010). Implementation of the LEADER approach for rural development (Special Report No. 5/2010). Publications Office of the European Union. <https://www.eca.europa.eu/en/Pages/DocItem.aspx?did=13502>
23. Turizem Ljubljana. (n.d.). Green supply chains [In Slovenian]. <https://www.visitljubljana.com/si/turizem-ljubljana/turizem-dela-ljubljano/zelene-nabavne-verige/>
24. Chamber of Commerce and Industry of Slovenia – Chamber of Agricultural and Food Enterprises (GZS). (n.d.). Catalogue of food products for public procurement [In Slovenian]. <https://www.katalogzivil.si/>
25. Chamber of Agriculture and Forestry of Slovenia (KGZS). (n.d.). Products from Slovenian farms [In Slovenian]. <https://www.dobroteslovenskihikmetij.si/>
26. FAO. 2021. The State of Food and Agriculture 2021. Making agrifood systems more resilient to shocks and stresses. Rome, FAO. <https://doi.org/10.4060/cb4476n>
27. Slovenian Rural Youth Association (ZSPM) (2026). <https://zspm.si/>
28. Heart of Slovenia (LAS) (2026). Local Action Group Heart of Slovenia. <https://www.las-srcoeslovenije.si/>

Early View

Supplementary material

Survey Questionnaire

Survey Questionnaire of Short Food Supply Chains

Dear Sir or Madam,

The Veterinary Faculty, University of Ljubljana and Faculty of Health Sciences, University of Ljubljana together with partners from four other European countries, are participating in the FoodImProviders project, funded by the Erasmus+ programme. The aim of the project is to establish new models of short food supply chains. Through the questionnaire below, we seek to explore examples of good practice, identify information and knowledge needs, and analyze producers' preferences related to short food supply chains. The objective is to provide food producers – farmers and processors – with appropriate education and targeted knowledge in order to ensure higher incomes and greater customer satisfaction.

For this purpose, we kindly ask for your cooperation. By completing the questionnaire, you will help us better understand your needs and thus enable the development of suitable educational content. We sincerely thank you in advance for the time you devote to answering the questionnaire.

All responses are anonymous. The collected data will be treated as strictly confidential. For any additional information related to this questionnaire, please contact us at: kratke.verige@gmail.com.

Thank you very much in advance for your participation.

1. INFORMATION ABOUT THE RESPONDENT

a. Gender

- Female
- Male
- Non-binary / Neutral
- Prefer not to answer

b. Age

- Under 20 years
- 20–35 years
- 35–50 years
- 50–65 years
- Over 65 years

c. What is your highest level of education?

- Primary school
- General secondary education
- Vocational secondary education in agriculture
- Post-secondary / College education
- University degree in agriculture, agronomy, animal husbandry or related fields
- Other (please specify): _____

d. Have you studied agriculture or food technology?

- Yes
- No

e. In which town/municipality is your main activity located? (open-ended question)

2. INFORMATION ABOUT THE RESPONDENT'S ACTIVITY

Only for respondents active in agriculture:

a. How would you describe your farm?

- Conventional
- Organic
- Mixed
- Other (please specify): _____

b. Please indicate the size of your cultivated land area: (open-ended question)

For all respondents:

c. Do you hold any specific certifications?

- Organic farming
- Protected Designation of Origin (PDO)
- Protected Geographical Indication (PGI)
- Other (please specify): _____

d. How do you define your position in the supply chain?

- Primary sector
- Secondary sector
- Both sectors
- Consumer / consumer groups
- Other (please specify): _____

e. Type of your enterprise?

For respondents active in agriculture:

- Family farm
- Small to medium-sized farm
- Large farm
- Cooperative
- Other (please specify): _____

For respondents working in industry:

- Micro enterprise: <10 employees, annual turnover under EUR 700,000
- Small enterprise: <50 employees, annual turnover under EUR 8 million
- Medium-sized enterprise: <250 employees, annual turnover under EUR 40 million
- Company or association (e.g. chambers, associations)
- Other: _____

f. How many people are employed on your farm / in your company, including yourself? (open-ended question)

g. How many of them are family members? (for respondents in agriculture) (open-ended question)

h. Are employees employed full-time? If not, please estimate the number of people working part-time on the farm. (open-ended question)

i. Is agriculture/food production your main activity? (open-ended question)

j. Estimate the share (%) of your income derived from agriculture/food production. (open-ended question)

k. How many years have you been working in agriculture or food processing?

- Less than 5 years
- 5–10 years
- 10–20 years
- 20–30 years
- More than 30 years

l. Are you a member of any production or sales cooperative? (for respondents in agriculture)

- Yes, a formal (contractual/institutional) cooperative
- Yes, an informal cooperative/association
- No, but I would like to become a member of a cooperative/association
- No, such cooperation does not interest me

m. Have you received financial or other support from:

- Municipality
- Regional investment funds
- National public funds
- Other public funds
- Private investments: _____

n. What types of products/crops do you deal with?

- Meat products
- Dry unprocessed foods (grains/legumes)
- Dry processed foods (e.g. pasta)
- Fresh vegetables
- Fresh fruit
- Bread and bakery products
- Condiments and sauces (oil, vinegar, mustard)
- Honey and beekeeping products
- Milk and dairy products
- Wine, beer and other alcoholic beverages
- Non-alcoholic beverages (juices)
- Eggs
- Fish
- Confectionery
- Other: _____

o. On a scale from 1 to 7, where 7 indicates the highest impact, how strongly do seasonal conditions affect your activity?

- 1 – not important at all
- 2 – of little importance
- 3 – partially important
- 4 – neither important nor unimportant

5 – moderately important

6 – quite important

7 – very important

p. On a scale from 1 to 7, how much importance do you attach to the following product characteristics? (1 – not important at all, 7 – very important)

Quality (organoleptic/sensory characteristics)

1 2 3 4 5 6 7

Safety

1 2 3 4 5 6 7

Health (less processed food)

1 2 3 4 5 6 7

Price

1 2 3 4 5 6 7

Certification (organic, etc.)

1 2 3 4 5 6 7

Locally produced

1 2 3 4 5 6 7

q. Which sales channels do you use? (select one or more)

- Direct sales on the farm
- Direct sales in own physical store
- Direct online sales
- Agricultural online marketplace
- Via social media
- Via a cooperative
- Direct sales at permanent or occasional markets
- Direct sales to consumer groups/initiatives
- Sales to external wholesalers
- Sales to external cooperatives
- Sales through supermarkets/specialised food stores
- Sales through local retailers
- Public procurement (direct sales to local or national public institutions)
- Cooperative supply (hospitals, schools, kindergartens, restaurants, nursing homes, hotels)
- HoReCa channels (professional buyers – restaurants, hotels, private clients)
- Home delivery schemes (box systems)
- Other: _____

r. If you participate in public procurement, please specify which institutions you supply (hospitals, schools, nursing homes, etc.). (open-ended question)

s. Have you introduced any supplementary activities/additional products on your farm? (for respondents in agriculture)

- Farm visits (open days/schools/kindergartens)
- Education/training
- Farm tourism (accommodation/catering)
- Social programmes (inclusion of people through public works, people with disabilities or psychological difficulties, socially disadvantaged groups, juvenile offenders, hard-to-employ or long-term unemployed people)
- Other: _____

3. YOUR BASIC KNOWLEDGE OF SHORT FOOD SUPPLY CHAINS

Short food supply chains are an innovative and successful supply chain model aimed at restoring the link and reducing the distance between producers and consumers by involving a limited number of economic operators committed to cooperation, local economic development, and close geographical and social relationships between producers, processors and consumers (EU Regulation No 1305/2013).

a. On a scale from 1 to 7, to what extent do you agree with this definition?

1 – not important at all

2 – of little importance

3 – partially important

4 – neither important nor unimportant

5 – moderately important

6 – quite important

7 – very important

b. What is your opinion of this definition? How do you perceive short food supply chains? (open-ended question)

c. Please select examples of short food supply chains you are familiar with:

- Individual direct sales

- Collective direct sales

- Partnerships

- Local markets

- Online sales

- Other: _____

d. What are the most important reasons for you to join short food supply chains? Select five (5) options.

- Profitability – better price
- Increased added value
- Access to new markets
- Innovation (trying something new)
- Closer relationships with local actors
- Equality and trust among value chain actors
- Visibility/reputation
- Fair price/fair share
- Security (stable sales volume, adapted distribution)
- Environmental sustainability – ethics
- External support (local community/local or national authorities)
- Differentiation and increased resilience
- Opportunity to cooperate with other farmers
- Strategic reorientation of the whole farm
- Other: _____

Please rank the five selected reasons by importance where the first listed reason is the most important for you. (open-ended question)

e. Which barriers and challenges do you identify (or anticipate) in implementing short food supply chains for your enterprise? Please select five (5) options.

- National regulations on mandatory quality requirements
- National traceability regulations
- Other national/regional regulations
- Certification/labelling requirements
- Costs (measures and infrastructure)
- Sectoral and market policies
- Lack of regulatory tools to support and protect short food supply chains
- Lack of financial support/investment
- Demand variability and supply-demand mismatch
- Competition with conventional channels/supermarkets
- Transport and logistics costs (cold chain)
- Product constraints or requirements
- Lack of industrial infrastructure
- Lack of communication, marketing and sales
- Lack of information and support for developing new short food supply chains
- Lack of consumer awareness/trust
- Negative consumer perception
- Lack of digitalisation and technological support
- Lack of knowledge on specific issues
- Limited available quantities
- Limited labour availability (seasonal labour)
- Lack of cooperation with other short food supply chains
- Product perishability
- Need for new competences and skills
- Competition within the short food supply chain market segment
- Other: _____

f. Are you aware of any incentives or support schemes for short food supply chain operators? (local/national/European level; public or private institutions) (open-ended question)

4. YOUR NEEDS RELATED TO SHORT FOOD SUPPLY CHAINS

a. Have you ever participated in a short food supply chain?

- Yes

- No

b. If YES, which types of short food supply chains did you participate in? (open-ended question)

c. Was this experience successful?

- Yes

- o No
- d. What were the advantages of participating in a short food supply chain? (open-ended question)**

- e. What were your main challenges? (open-ended question)**

- f. What were your main barriers? (open-ended question)**

- g. What were your main strategies? (open-ended question)**

- h. If NO, have you ever considered becoming part of a short food supply chain?**
 - o Yes
 - o No
- i. Why? (open-ended question)**

- j. What would your needs be regarding your involvement in short food supply chains?**
 - o Local and regional support (financial and human resources)
 - o Knowledge of actors and practices
 - o Knowledge of tools
 - o Legal knowledge
 - o Other: _____

5. YOUR REQUIREMENTS AND PREFERENCES REGARDING EDUCATIONAL METHODOLOGY

a. What would you expect from training/capacity building for short food supply chains? Rank the importance of each proposal from 1 to 7. (1 – very unlikely, 7 – very likely)

Legal advice	1	2	3	4	5	6	7
Infrastructure advice (digitalization, technical advice)	1	2	3	4	5	6	7
Management advice	1	2	3	4	5	6	7
Social advice (stakeholder cooperation)	1	2	3	4	5	6	7
Financial advice (public/private support, funds, insurance, etc.)	1	2	3	4	5	6	7
Food safety standards	1	2	3	4	5	6	7
Basics of processing and storage	1	2	3	4	5	6	7
Traceability	1	2	3	4	5	6	7

Labelling schemes	1	2	3	4	5	6	7
Marketing (digital marketing)	1	2	3	4	5	6	7
Best sustainability practices (e.g. waste management)	1	2	3	4	5	6	7
Networking (knowledge exchange, public procurement, etc.)	1	2	3	4	5	6	7
Legislation in different fields (food safety and hygiene)	1	2	3	4	5	6	7
Success stories	1	2	3	4	5	6	7

b. Which type of training would you prefer for capacity building in short food supply chains? Select one.

- o Self-learning (e-learning platform)
- o Formal training (digital or classroom-based courses)
- o Individual training and mentoring
- o Blended learning (occasional courses, webinars and self-learning)

c. What is the ideal frequency of learning opportunities for you?

- o Daily
- o Weekly
- o Bi-weekly
- o Monthly
- o Once or twice per year
- o Other: _____

d. How receptive would you be to using the following educational tools for capacity building? Please rate from 1 to 7. (1 – very unlikely, 7 – very likely)

Webinars	1	2	3	4	5	6	7
Videos	1	2	3	4	5	6	7
Podcasts	1	2	3	4	5	6	7
Online classroom with interactive content	1	2	3	4	5	6	7

e. Do you consider lifelong learning important for the development of your organization?

- o Yes
- o No

f. Comments/questions (open-ended question)

Thank you for completing this questionnaire!