

Shaping Knowledge as an Element of the Functioning of Short Food Supply Chains

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Abstract: Sustainable rural development in social, environmental and economic terms is development that takes into account the challenges and opportunities offered by contemporary rural areas. A key component of these challenges and opportunities is local produce identified as healthy food. Such fresh, healthy food from a reliable source is sought after by the modern consumer. But how can one obtain such food in urban areas whilst taking the economic aspect into account? The solution lies in short food supply chains, which connect local producers of healthy food with consumers. Through this connection, the end consumer has the opportunity to purchase fresh, organic, healthy, tasty food of known origin. Such activity is carried out in line with the farm-to-table strategy. Short food supply chains mean increased sales opportunities for local food producers and farmers. A key element in the organisation, operation and development of such chains is the knowledge that farmers and local food producers possess or need to acquire. The knowledge analysed extends beyond the realm of agricultural and food production to cover logistics, food certification processes, patent law, trademarks, new technologies, artificial intelligence and other areas of expertise. The aim of this article is to present the results of research into the development of knowledge by farmers and local food producers carrying out tasks (operating) within short food supply chains.

Keywords: Local food producer, Farmer, Short food supply chains (SFSCs), Logistics, Sustainable development, Food system transformation

1. Introduction

Sustainable rural development involves implementing measures in the social, environmental and economic spheres, taking into account the unique challenges and opportunities presented by contemporary rural areas. These measures are reflected in sustainable food systems in line with the farm-to-fork strategy. This strategy takes a comprehensive approach to the challenges associated with the transformation of food systems (the aim being sustainable food systems) and emphasises the importance of the links between human health, public health and the health of the planet.

The changes in food purchasing observed in recent years are a direct reflection of sustainable food systems. The driving force behind these changes is the modern consumer's preference for healthy and sustainable eating. A key aspect of these trends is a sustainable diet based on local food products. Consequently, there is a demand for fresh, organic, healthy, tasty and locally sourced food of known origin, purchased through direct and transparent food supply chains. These efforts are reflected in short food supply chains (SFSCs), defined as the organised production, distribution and transaction between a farmer or local food producer and the final consumer. The essence of SFSCs is to minimise the number of intermediaries throughout the food supply chain, and distance is irrelevant, which translates into online sales. In SFSCs, direct contact between the farmer and local food producer and the final consumer is crucial. It is this mutual trust that guarantees the success of SFSCs.

The proposed concept of SFSCs requires farmers and local food producers to take steps to organise, implement and develop SFSCs. This approach generates new knowledge that extends beyond the scope of agricultural production and food production carried out by farmers and local food producers. In these new activities, farmers and local food producers must acquire knowledge in the fields of logistics, food certification processes, patent law, trademarks, new technologies, artificial intelligence and other areas relevant to the implementation of processes within SFSCs. The aim of this article is to present the results of research into the development of knowledge among farmers and local food producers carrying out tasks (conducting business) within SFSCs.

2. Literature Review

2.1 The Knowledge of Farmers and Local Food Producers

Since the dawn of agriculture, farmers' knowledge has centred on the preparation of arable land, sowing, tending and harvesting crops, and animal husbandry. For many years, the traditional model of agriculture was based on knowledge that farmers acquired and developed during their daily agricultural work. In the 20th

century, it was recognised that farmers, as food producers, play a vital role in the process of supplying food to society. The success of the harvest and the conditions under which animals are reared depend on their knowledge, and this ultimately translates into food quality. Measures were therefore taken to improve farmers' skills, which facilitated the dissemination of technical innovations in agriculture. The education of young people from rural areas and a training system aimed directly at farmers became crucial. Research has indicated that skills relating to technological change, the changing environment, environmental protection, social change and economic knowledge are crucial for agriculture. Training systems and other initiatives to develop farmers' knowledge and skills in areas relevant to modern agriculture have been developed and implemented. Knowledge transfer has been initiated in areas including (Charatsari et al., 2025):

- climate change and mitigating the impact of climate-related risks on farm production (Kreft et al. 2021; Rodríguez-Barillas et al. 2024),
- addressing problems arising from water scarcity in specific agricultural areas, taking into account the different seasons (Su et al. 2021),
- how to cope with and resolve problems and difficulties caused by crises (Hsiao & Tuan, 2023),
- how to increase the diversification of farms (Dumont et al. 2022),
- how to implement sustainable agricultural solutions and practices (Lalani et al., 2021),
- how to improve the quality of their crops and food products (Milone & Ventura, 2019),
- regarding the use of new digital technologies on farms (Da Silveira et al., 2023; Grando-Diaz et al., 2024; Sadjadi & Fernandez, 2023).

In view of the above, numerous educational initiatives have been undertaken, including measures to improve the skills of farmers and local food producers, which have been adopted by the EU. It has been recognised that improving skills through various agricultural training initiatives and healthy food production programmes constitutes a vital element in the functioning of modern farms and local food producers. This is because research findings showed that only 8.9% of farmers had completed a full training course and 22.7% had completed a basic training course (EC, 2020). It is also significant that there is a wide variation across Member States: in the Netherlands, 62.6% of farmers participated in full training, whereas in Greece only 0.7% did so (Eurostat, 2022).

2.2 Short Food Supply Chains

Short food supply chains, as alternative food networks, differ in essence from conventional systems of supplying food to consumers. Conventional food supply systems are based on a group of intermediaries involved throughout the entire food supply chain. In SFSCs, however, the number of intermediaries is limited to one or there are no intermediaries at all throughout the food supply chain. It is farmers or local food producers who sell their products directly to end consumers. Sales take place at agricultural, food or horticultural markets and fairs, through direct sales at the farm or the premises of the local food producer, or via direct online sales (Charatsari et al., 2020; Renting et al., 2003). Proposed SFSCs, driven by the actions of politicians, local authorities, environmentalists, dieticians, scientists and the growing popularity of healthy food, are becoming increasingly important to consumers.

Farmers and local food producers participating in SFSCs are actors supporting socially sustainable processes (Vitterso et al., 2019). SFSCs constitute innovative food distribution models which, in essence, address issues of sustainable development, the transformation of food systems, and resilience (Sciortino et al. 2025). Such supply chains shorten the distance between the farmer, the local food producer and the end consumer, reduce transport emissions (CO₂, NO_x, PM₁₀, etc.), support local economies and foster strong social bonds. It is important to note that a local economy based on SFSCs is capable of adapting in times of crisis (e.g. pandemics, climate change). This adaptation is made possible by mutual trust between the farmer, the local food producer and the consumer (Lang & Heasman, 2015).

3. The Knowledge System of Farmers and Local Food Producers

Building the knowledge of farmers and local food producers operating within SFSCs is a complex process. The process must take into account a number of elements that are essential for the of knowledge regarding the organisation and functioning of SFSCs. In the research process, the development of knowledge among farmers and local food producers was approached as a system, which was outlined in the form of five structured elements, namely:

$$SKF = \langle TE, FB, RW, WB, RP \rangle \quad (1)$$

SKF – the knowledge system of farmers and local food producers, **TE** – types of entities (the system analyses farmers and local food producers),

$$TE = \langle FA, LFP \rangle \quad (2)$$

FA – the set of farmers. A farmer is a natural person who personally and on their own account carries out agricultural activities within a given country,

$$FA = \{1, 2, \dots, fa, \dots, FA\} \quad (3)$$

where *fa* is a given farmer, and *FA* is the total number of farmers in the analysed area (territory, country),

LFP – a set of local food producers. A local food producer is a farmer or small business owner who produces food in close proximity to the consumer. This is usually a family farm or a small artisanal business focused on producing organic and healthy food in small quantities for the needs of local consumers,

$$LFP = \{1, 2, \dots, lfp, \dots, LFP\} \quad (4)$$

where *lfp* is a given local food producer, and *LFP* is the total number of local food producers in the analysed area (territory, country),

FB – forms of activity,

$$FB = \langle RHD, SB, MOL, JDG, SC, IF \rangle \quad (5)$$

RHD – a group of farmers operating as agricultural retailers. Farm retail trade (RHD) is a form of supplementary activity carried out by small-scale farmers, which enables the production of food on farms and its sale to consumers. Food sales take place within SFSCs,

SB – a group of farmers carrying out additional activities such as direct sales. Direct sales (SB) constitute an additional activity for farmers, involving the direct sale of products of animal origin, and are regulated by the relevant minister in each Member State of the EU,

MOL – a group of farmers carrying out additional activities as marginal, local and limited activities. Marginal, local and limited activities (MOL) are additional activities carried out by a farmer on a small scale, involving the production of specific types of products with specific characteristics for local markets,

JDG – a group of local food producers operating as sole traders. A sole proprietorship is the simplest and most common form of business operation by natural persons,

SC – a group of local food producers operating as civil partnerships. Partnerships are associations of natural or legal persons, based on a contract, whose purpose is to conduct business,

IF – a group of local food producers operating under other forms of business,

RW – type of education,

$$RW = \langle PW, KW \rangle \quad (6)$$

PW – level of education,

$$PW = \langle P, S, W \rangle \quad (7)$$

P – a group of farmers and local food producers with primary education, **S** – a group of farmers and local food producers with secondary education, **W** – a group of farmers and local food producers with higher education,

KW – field of study,

$$KW = \langle R, PR \rangle \quad (8)$$

R – a group of farmers and local food producers with agricultural education, **PR** – a group of farmers and local food producers with non-agricultural education,

WB – the age group of the farmer or local food producer,

$$WB = \langle WB_1, WB_2, WB_3 \rangle \quad (9)$$

WB₁ – a set of farmers and local food producers in the age group up to 44 years, **WB₂** – a group of farmers and local food producers aged between 45 and 64, **WB₃** – a set of farmers and local food producers in the over 65 age group,

RP – the gender of the farmer or local food producer,

$$RP = \langle W, M \rangle \quad (10)$$

W – a set of women who belong to the group of farmers and local food producers, *M* – a group of men who fall into the category of farmers and local food producers.

4. Research into the Formation of Knowledge Among Farmers and Local Food Producers

4.1 Introduction to the Research

Research into the knowledge formation of farmers and local food producers was conducted in Poland. The research group comprised farmers and local food producers who sell food through SFSCs partnerships.

It is important to note that in EU member states, including Poland, specific forms of business activity can be attributed to strictly defined types of entities. A farmer, as a natural person engaged in agricultural activity, may additionally carry out other forms of business activity. The study focused on farmers operating within SFSCs. Such a farmer may, under simplified rules, carry out additional activities such as RHD, SB, and MOL. Conversely, a local food producer who is not a farmer but operates within SFSCs may conduct business as a sole trader, a partnership, or other forms of business activity. It should be noted that such a local food producer may not carry out activities as RHD, SB or MOL.

The research was conducted on a group of 600 respondents operating within SFSCs. Geographically, the research covered the whole of Poland. The criteria for selecting respondents stipulated that: (1) the group of respondents surveyed must be involved in sales within SFSCs, (2) the group of respondents surveyed must operate a registered RHD, SB or MOL business in Poland. The questionnaires were sent only to such respondents.

4.2 Characteristics of the Entities

During the initial research phase, a key element was the profile of the farmers and local food producers participating in the study. Based on the collected questionnaires, a group of farmers and a group of local food producers were identified for each type of entity studied. In terms of the forms of business activity, a set of farmers operating as RHD, a set of farmers conducting additional activity in the form of SB, a set of farmers conducting additional activity as MOL, a set of local food producers operating as sole traders, and a set of local food producers operating as civil partnerships were identified. With regard to the gender and age of the respondents, the following groups were identified: a group of women, a group of men, a group of farmers and local food producers aged up to 44, a group of farmers and local food producers aged between 45 and 64, and a group of farmers and local food producers aged over 65. The characteristics of the surveyed group of farmers and local food producers are presented in Figure 1. Within the surveyed group, 56% are local food producers and 44% are farmers engaged in agricultural activities. Taking into account the structure of business activities, 34% of farmers engage in farm retail trade as a secondary activity, 6% engage in marginal, local and limited activities, and only 4% engage in direct sales as a secondary activity (Fig. 1). In contrast, among local food producers, the vast majority operate as sole traders (48%) and only 8% operate as civil partnerships (Fig. 1).

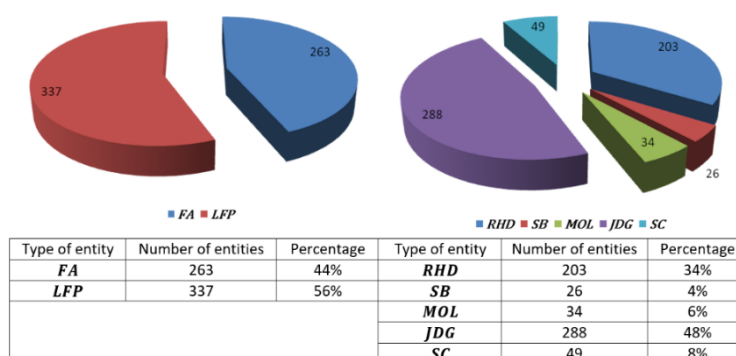


Figure 1: Structure of the group of farmers and local food producers participating in the research

At the stage of developing knowledge as an element of SFSCs, the gender and age of individual farmers and local food producers carrying out tasks within short food supply chains are also significant. In the study group, 50% were men, 41% were women, and 9% of respondents did not specify their gender. As for the age structure, over half (58%) of the respondents were aged between 45 and 64, 39% were aged 44 or under, and only 3% were over 65.

4.3 The Process of Knowledge Formation Among Farmers and Local Food Producers

The process of knowledge formation among farmers and local food producers depends on the sources of new knowledge for farmers and local food producers. Based on the literature and research conducted among farmers and local food producers, processes, activities and new tools that act as knowledge generators have been defined. It has been established that such generators include, amongst others, the food certification process, the process of protecting the name and origin of local food, and the process of selling local products via the Internet. The generator of the process of further training for farmers and local producers was recorded in the form of a structured triad of elements, namely:

$$GD = \langle DC, KI, PI \rangle \quad (11)$$

GD – the generator of the process of further training for farmers and local food producers,

DC – activities aimed at obtaining certification or protecting the name and origin of products,

$$DC = \langle N, T_1, T_2, T_3, T_4, T_5 \rangle \quad (12)$$

N – no (no actions taken to obtain certification), **T₁** – yes (protected designation of origin), **T₂** – yes (protected geographical indication), **T₃** – yes (geographical indication), **T₄** – yes (sustainable product), **T₅** – yes (other),

KI – knowledge of selling local products via the Internet,

$$KI = \langle KI_1, KI_2, KI_3 \rangle \quad (13)$$

KI₁ – knowledge and skills required to sell local products online, **KI₂** – experience in selling local products online, **KI₃** – knowledge of setting up online sales of local products at the initial stage,

PI – knowledge of the reasons for low interest in selling local products online,

$$PI = \langle PI_1, PI_2, PI_3, PI_4, PI_5, PI_6, PI_7, PI_8, PI_9, PI_{10} \rangle \quad (14)$$

PI₁ – lack of sufficient knowledge regarding online sales, **PI₂** – lack of knowledge on how to secure additional funding for selling local products online, **PI₃** – lack of knowledge regarding the preparation of products for online sales, **PI₄** – fear of being unable to carry out online sales, **PI₅** – lack of knowledge regarding after-sales service, **PI₆** – lack of knowledge regarding the protection of customers' personal data, **PI₇** – lack of legal knowledge, **PI₈** – lack of knowledge regarding whether online sales are necessary, **PI₉** – lack of a stable internet connection, **PI₁₀** – other.

Information on specific areas, i.e. (1) knowledge regarding the sale of local products via the Internet and (2) knowledge of the reasons for low interest in selling local products via the Internet, was obtained through surveys. Farmers and local food producers were given a choice of five possible answers, namely:

$$PA = \langle DN, PN, HS, PY, DY \rangle \quad (15)$$

DN – definitely not, **PN** – rather not, **HS** – hard to say, **PY** – rather yes, **DY** – definitely yes.

4.4 Survey Results

The survey research focused on the process of knowledge formation among farmers and local food producers, specifically regarding the sources of new knowledge for farmers and local food producers. In the case of sources of new knowledge for farmers and local food producers, the research focused on activities aimed at obtaining certification or protection of the name and origin of local products. The research revealed whether farmers and local producers undertake activities aimed at obtaining certification or protection of the name and origin of products. The results of the research are presented in Figure 2.

Analysing the survey results, it must be clearly stated that farmers and local food producers are not interested in obtaining certification for the local products they produce. This is because as many as 95.17% of respondents do not take any action towards obtaining certification or protecting the names or origins of their local food products. Only 3.1% of respondents are taking action in this area.

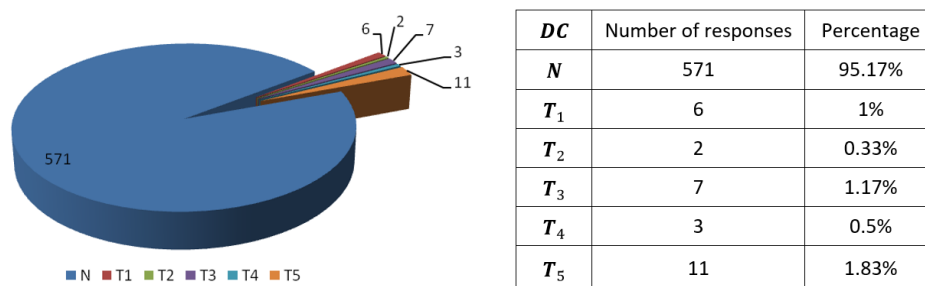


Figure 2: Activities aimed at obtaining certification or protecting the name and origin of products DC: *N* – no (no actions taken to obtain certification), *T*₁ – yes (protected designation of origin), *T*₂ – yes (protected geographical indication), *T*₃ – yes (geographical indication), *T*₄ – yes (sustainable product), *T*₅ – yes (other)

Another source of knowledge relates to the sale of local products via the Internet. The information obtained from farmers and local food producers concerned their knowledge and skills regarding the sale of local products online. Respondents were asked whether possessing the knowledge and skills to sell online is necessary. The survey results are presented in Figure 3.

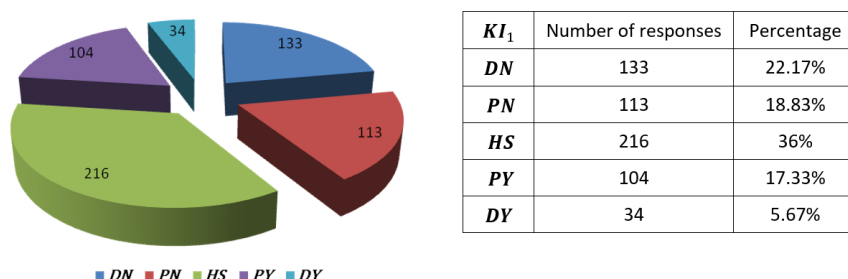


Figure 3: Possession of the knowledge and skills required to sell local products online KI₁, *DN* – definitely not, *PN* – rather not, *HS* – hard to say, *PY* – rather yes, *DY* – definitely yes.

When analysing the survey results, 41% of respondents answered that it is definitely not necessary, or rather not necessary, to possess the knowledge and skills to sell online. 36% of respondents indicated that it was difficult to say. Only 23% of respondents indicated that the knowledge and skills to sell online are necessary.

Further information obtained from farmers and local food producers concerned whether they had experience in selling local products online. Respondents were asked whether having experience in selling local products online was necessary. The survey results are presented in Figure 4.

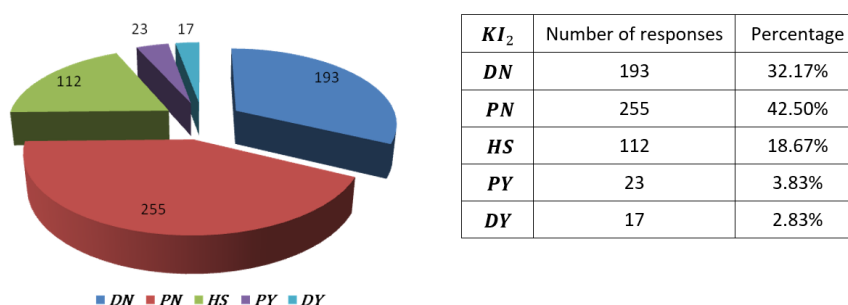


Figure 4: Experience in selling local products online KI₂, *DN* – definitely not, *PN* – rather not, *HS* – hard to say, *PY* – rather yes, *DY* – definitely yes.

Analysing the survey results regarding whether one should have experience in selling local products online, 74.67% indicated that one does not need to have experience in online sales to carry out such sales. Only 6.66% replied that experience in online sales is necessary. 18.67% of respondents stated that it is difficult to say whether such experience is necessary.

Further information obtained from farmers and local food producers concerned whether knowledge of setting up online sales of local products is required at the initial stage. Respondents were asked whether, in their

opinion, knowledge of setting up online sales of local products is necessary at the initial stage. The survey results are presented in Figure 5.

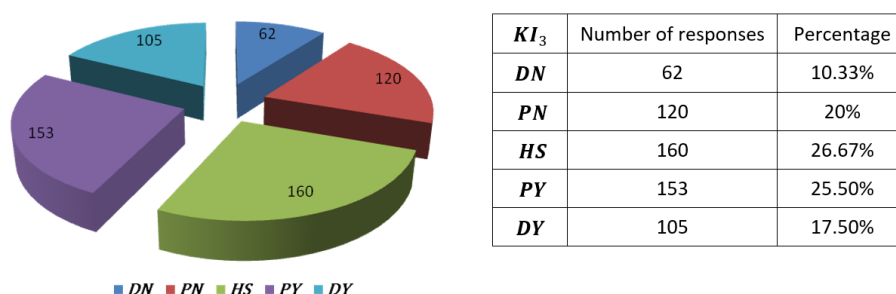


Figure 5: Knowledge regarding the setup of online sales of local products at the initial stage KI_3 , *DN* – definitely not, *PN* – rather not, *HS* – hard to say, *PY* – rather yes, *DY* – definitely yes.

In response to the question of whether knowledge regarding the configuration of online sales of local products is needed at the initial stage, 43% of respondents answered ‘rather yes’ and ‘definitely yes’. 33.33% of respondents indicated ‘definitely not’ and ‘rather not’. 26.67% of respondents answered ‘it is difficult to say’.

Continuing the theme of selling local products online, respondents were asked what the reason is for the low interest among farmers and local food producers in selling via the Internet. The survey results are presented in Table 1.

Table 1: Knowledge and reasons for the low interest in selling local products online

PI	Yes		No	
	Number of responses	Percentage	Number of responses	Percentage
PI_1	203	33.83%	397	66.17%
PI_2	167	27.83%	433	72.17%
PI_3	409	68.17%	191	31.83%
PI_4	304	50.67%	296	49.33%
PI_5	302	50.33%	298	49.67%
PI_6	139	23.17%	461	76.83%
PI_7	113	18.83%	487	81.17%
PI_8	287	47.83%	313	52.17%
PI_9	135	22.50%	465	77.50%
PI_{10}	0	0%	600	100%

What is the reason for the low interest among farmers and local food producers in selling online? According to the respondents, the reasons for the low interest in online sales include:

- a lack of sufficient knowledge regarding online sales (33.83%),
- lack of knowledge regarding the preparation of products for online sale (68.17%),
- lack of knowledge regarding after-sales service (50.33%).

According to the respondents, the reason for the low interest in online sales is not due to, amongst other things:

- a lack of sufficient knowledge regarding online sales (66.17%),
- a lack of knowledge on how to obtain additional funding for selling local products online (72.17%),
- lack of knowledge about the protection of customers’ personal data (76.83%),
- a lack of legal knowledge (81.17%).

5. Summary

In this study, we conducted research into the development of knowledge among farmers and local food producers operating within SFSCs. Given the insufficient impact of motivation on participation in training (Chratsari et al., 2025), it was assumed that there may be factors or activities capable of encouraging

participation in training. Based on literature and practical research, it was assumed that such elements are generators of new knowledge. The study identified two generators of new knowledge, namely: (1) obtaining certification or protection of the name and origin of local products, and (2) selling local products via the Internet (online sales). To verify whether the proposed knowledge generators serve as an incentive to take action towards expanding knowledge, a survey was conducted on a group of 600 farmers and local food producers from Poland who operate within SFSCs. The structure of the study group comprised farmers (44%) and local food producers (56%). Within the study group, 34% of farmers engage in agricultural retail trade, 6% operate on a marginal, local and limited scale, and 4% engage in direct sales. Meanwhile, 48% of local food producers run sole traders, and 8% operate as civil partnerships. In the study group, women accounted for 41% and men for 50%. In terms of age, 58% were aged 45 to 64, 39% were aged 18 to 44, and 3% were over 65. The research findings show that farmers and local food producers do not always emphasise knowledge as a key area for running their businesses and carrying out tasks within short food supply chains. In the case of (1) the generator – the issue of certification or the protection of the name and origin of local products is not important to farmers and local food producers, and therefore they do not take action in this area. In this case, 95.17% of respondents indicated that new knowledge and undertaking training in the area of certification or the protection of the name and origin of local products is not necessary. In contrast, in the case of (2) – selling local products online – the issue of new knowledge relates to several areas, and consequently the pattern of responses was more complex. The survey results showed that 41% of respondents believe that there is no need to possess the knowledge and skills to sell online. Only 23% of respondents indicated that knowledge and skills for online sales are necessary. However, regarding existing experience in online sales, 74.67% replied that experience is not necessary. It is interesting to note that the same group of respondents indicated that the low interest in online sales of local products is due to a lack of knowledge regarding the preparation of products for online sale (68.17%).

The research findings clearly demonstrated that the issue of building the knowledge of farmers and local food producers operating within SFSCs is significant. It doesn't matter what products are sold or whether the farmers are from Poland or other countries. This is confirmed by the results of research carried out by GRANULAR, our project partner from Lithuania. Although the surveyed group very often does not cite a lack of knowledge as the reason for low sales or limited interest in specific local products, farmers and local food producers should be encouraged to improve their knowledge. Cooperatives and Living Labs can offer assistance in this area, as they are able to help farmers establish SFSCs.

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AI Declaration: We confirm that no AI tools were used in the creation of this paper.

Ethics Declaration: We declare that ethical clearance was not required for the research.

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