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Value Propositions for Improving the Competitiveness of Short Food Supply Chains Built on Technological and Non-Technological Innovations

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Abstract

There has been growing consumer demand for the products and services of the short food supply chains (SFSCs) in recent times. A procedure was developed to identify the technological and non-technological innovations that can improve the performance and competitiveness of the SFSCs. The needs of the SFSCs for innovative solutions were collected by interviewing 18 SFSCs from 9 countries. An inventory was prepared to contain 136 technological and non-technological innovations, meeting these needs. The innovations were collected from the good practices of the 18 SFSCs, experiences of the project partners and state of the art. The success factors and bottlenecks of each short food supply chain operation and their current value propositions were identified. From the inventory, those innovations were selected for each short food chain case study which can be applied to eliminate or reduce the bottlenecks or enhance the success factors leading to new, upgraded value propositions with increased added value for the consumers. The new, upgraded value propositions can serve as a starting point for developing a strategy for improving the competitiveness of a short food chain organisation through the application of innovations.

Keywords: Short food supply chain; Value proposition; Technological innovation; Non-technological innovation; Competitiveness; Success factors

1 Introduction

According to the European rural development regulation (1305/2013), the short food supply chain means a supply chain involving a limited number of economic operators committed to cooperation, local economic development, and close geographical and social relations between producers, processors and consumers. It is important that this regulation recognises the importance of social relationships between people involved in the food chain and is also very important for understanding how collaborative SFCs operate (European Commission, 2015).
Short food supply chains (SFSCs) have to satisfy consumers' needs for their products and services

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Nomenclature

BN	bottleneck	SFSC	Short Food Supply Chainn
NTI	non-technological innovation	SME	Small- and medium-sized enterprise
SF	success factor	TECI	technological innovation

and the expectations of their chain members for feasible operation. There is growing consumer demand for the goods and products of SFSCs nowadays. Consumers prefer to buy local foods for several reasons, such as environmental concerns, health reasons, the perception that local foods are high quality, the enjoyment of shopping at local outlets, and to support local farmers, economies, and communities (). The words "local food" and "local product" are more attractive for consumers than the term "short food supply chain" since they better understand the benefits associated with this concept. Consumers buying products of SFSCs usually associate local products with higher quality even if their understanding of the criteria of a local product is not always clear. "Some consumers declare that they want to support SFSCs, the local farmers, and producers.

In many cases, the high prestige of local products is not followed by purchasing because consumers don't know where to buy local products, and they have limited access to these products (Kneafsey et al., 2013). Grunert (2017) described that focusing on authenticity provides an opportunity for SFSCs to satisfy consumer needs and meet consumer trends with respect to diet, health, and sustainability. Kher et al. (2013) recommend using traceability to increase consumer trust by providing evidence on provenance. Elghannam et al. (2019) highlight the potential of using social media and electronic word of mouth to create alternative channels. They recommend providing more information on products, the company and certification. Delicato et al. (2019) emphasise the importance of a clear value proposition to differentiate their products and services from the alternative products and services offered by conventional food supply chains. SFSCs can usually differentiate themselves by focusing on specific provenance and efficient traceability to increase consumer trust. They established that consumer expectations vary across Europe. Therefore, each SFSC should focus on selected factors for which they can prove the verity and on which they can base their value proposition. Thomé et al. (2021) developed a coexistence conceptual framework for food supply chains and SFSCs. They grouped chain models by two main criteria: the convergence of interests and the need to add value. In the segment called co-ordinative coexistence, which is characterised by a high need to add value and the convergence of interests, typical activities include sharing practices, relationships, knowledge values, redesigning the food supply chains to meet consumer demands for food safety, traceability, fair trade, nutritional value, specific origin, better and simplified processes. This concept of operation can be very successful for SFSCs.

The objective of the present work carried out as a part of the SmartChain H2020 project was to identify such innovations that can be applied in the short food chains to increase the attractiveness of their value proposition for the consumers and improve the operation of the SFSC to deliver these value propositions reliably and consistently. We focused on two main groups of innovation: technological- (TECIs) and non-technological innovations (NTIs). Other teams of the SmartChain project analysed social and environmental innovations. The terms technological and non-technological innovations were used only to distinguish the innovative methods related to these aspects from the social

and environmental innovations studied by other research teams to avoid overlap of the activities. It was not our intention to compare technological and non-technological innovations since all of our previous experiences showed that for the solution of a problem usually, the combined use of technological, organisational and marketing methods is necessary. Technological innovations are primarily driven by a technological invention or improvement and comprise new products (good and services) and processes and significant technological changes of products (considerably improved) and processes. Innovation has been implemented if introduced in the market (product innovation) (Modified OECD Frascati Manual, 2015). Non-technological innovation is defined as the introduction of new organisational methods or the introduction of new marketing methods (). Nowadays, new design is also included in the non-technological innovation. They are not primarily driven by a technological invention or improvement and are hence referred to as non-technological innovations. The term is non-unproblematic since a technology (for example, information and communication technology) is used as an enabler to support most of today's innovations, even when technology is not the focus or driver of the innovation (European Commission, 2019). In this document, we use the term "non-technological innovation" consistently since it was used in the task description of the SmartChain project.

The adoption of technological and non-technological innovations by SFSCs can comply with legal requirements, meet consumer needs and expectations, and improve competitiveness. Although several innovations have been developed for SMEs and larger food businesses, SFSCs have specific barriers to applying innovations since they frequently have limited human and financial resources and only a few physical facilities and equipment but SFSCs can apply innovations directly in their original form in some cases; however, considering their resources, capabilities and competencies, they usually need to adapt the solutions to suit their situation. During the implementation process, typical issues arise resulting from the particular operation and needs of SFSCs.

The majority of the SFSC members, entrepreneurs, managers, employees are not aware of the availability and technical and organisational potential of the innovations. The innovative solution providers are not aware of the needs SFSCs that may apply and use their innovations.

In many cases, facilitators and members of SFCs have not systematically identified their needs for innovative solutions. They are aware of only a part of their needs, and some are hidden. Due to the several similarities between the innovation needs of conventional food chains and SFSCs, a reliable insight can be gained on the hidden needs by considering the information on the needs of the conventional food and drink supply chains. Campden BRI carried out a major survey and prepared a study of the food industry's research and innovation needs in 2018 and 2021 (Campden, 2018). A specific collection of technological and other innovations meeting the needs of the SFSCs is available from the SKIN H2020 project (2016 – 2019), which was input for the Innovation Inventory developed in the SMARTCHAIN project.

This research is a part of a large project called "SMARTCHAIN" supported by the European Union Horizion 2020 framework program. The objective of this work was to develop a structured approach to enhance the adoption of technological and non-technological innovations of SFSCs, improving their performance and financial sustainability by enhancing their competitiveness.

By systematic step-by-step analysis of the gaps of the operation of the short food supply chains, the applicability of technological and non-technological innovations can be identified. The process includes the examination of:

- products and services;
- the barriers in satisfying the needs of the consumers;
- the needs of their chain members for a financially feasible operation along the food chain. Good practices of the SFSCs, knowledge and experience from the project partners (researchers, food technologists, consumer & social scientists, LCA & ICT experts, policy scientists, entrepreneurs,

food producers, cooperatives, associations, NGOs, etc.) and have been utilised in this work, additionally to the general literature of the field. The explicit and hidden needs of the SFSCs for technological and non-technological innovations have been identified and a collection of applicable TECI and NTI for SFSCs have been prepared. During the operation of the SFSCs, several constraints of competitiveness can be identified, which are caused by bottlenecks (BN) like the limited resources and volume of products, the lack of business and marketing skills, limited access to consumers and information, etc. These barriers hinder the exploitation of success factors (SF) like the specific quality, the local operation, and consumer trust in products. The exploitation of success factors and the application of appropriate innovative methods and solutions (including technological and non-technological innovations) enables the elimination of bottlenecks (BNs), improving the performance and the competitiveness of the SFSCs.), the performance and competitiveness of the SFSCs can be improved. SFs and BNs can be identified by a SWOT analysis of a specific SFSC (Gellynck et al., 2006). This study focused on developing methods and supporting tools that can help SFSCs find such TECIs and NTIs that are applicable for eliminating the BNs and exploiting their SFs of competitiveness while strengthening their value propositions and improving the perceptibility of these value propositions by the consumers.

2 Materials and Methods

A systematic analysis of the needs of the SFSCs for technological and non-technological innovations was carried out by the following procedure (Figure 1.)

2.1 Step 1. Identification of the explicit and hidden needs of the SFSCs of innovation

The explicit needs of the SFSCs for technological (TECI) and non-technological innovations (NTI) were identified by analysing the information received through a questionnaire with the assistance of project partners acting as hubs in these countries. The answers came from the 18 case studies of SFSCs from 9 countries participating in the project: Switzerland (Biofruits, Chevrément Bon), Germany (Landwitschaftkammer Niedersachsen, Solidarische Landwirtschaft), France (Association Gersoise pour la Promotion du Foie Gras, Couleurs Paysannes), Greece (Gaia, Allotropon), Hungary (FoodHub, Zala Termál Völgye), Italy (Arvaia, Alce Nero), the Netherlands (Vleesh&Co, Local2Locad), Spain (Lantegi Batuak, La Trufa de Alava), Serbia (Polo Cacak, Association of companies for the processing of fruits and vegetables).

The first step was to prepare short summaries from the answers. From the short summaries, the explicit needs of the SFSCs were identified and collected.

The explicit needs of the SFSCs for TECI and NTI were compared to the research and innovation needs of food businesses and the practical experiences of project partners participating in this task and by adaptation of needs described in the "Scientific and technical needs of the food and drink supply chains 2018-2020" (Campden, 2018).

Based on the comparison between the research and innovation needs of the food chains in general and the specific, explicit needs of the SFSCs represented by the case studies, the potential hidden needs of SFSCs were identified in addition to the explicit needs and requirements. SFSCs and an inventory of the explicit and hidden needs of SFSCs have been prepared.

The general needs of SFSCs are described by the researchers of the EIP-Agri Focus Group in the topics of "supporting scaling up of SFSCs through multi-actor collaboration", the need to "the access for young farmers" (generation gap), "technology innovation for SFSCs", "concepts,

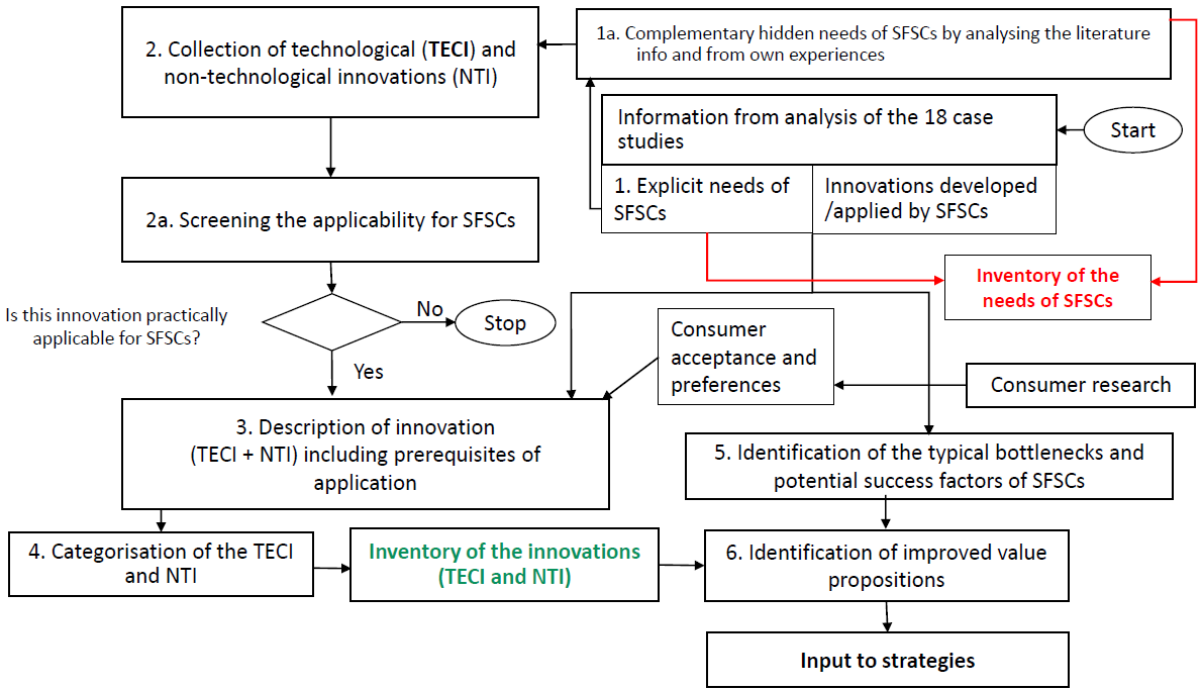

Figure 1: Process flow of preparation of the inventories and the upgraded value propositions

tools and methods for evaluating the impact of SFSCs", "the contribution of SFCs to resilient food systems", "the environmental Impacts and global challenges of SFCs", "public health and nutrition", "nutritional quality of food from SFSCs" (European Commission, 2015). The general needs of SFSCs described by the researchers of the European Commission (2015) are aligned with the results found in this research.

2.2 Step 2. Collection and description of technological and non-technological innovations for SFSCs

Innovative methods, solutions, and systems were collected following a structured approach from a wide range of sources, including the 18 case studies in the SmartChain project, the knowledge, experiences of the project partners participating in this task, publicly available information, literature review, results of other projects, such as SKIN (2019), Finish (2016), TRUEFOOD (2010), I-CON (2019), CapinFood (2014). These include technological (TECI) and non-technological innovations (NTI) for the individual steps of the SFSCs and SFSCs as a whole versus the needs of consumers and the chain actors. The research team identified typical hidden issues not mentioned in the case studies and collected potential innovative solutions to tackle these.

Innovative solutions were also collected to tackle hidden problems, which were not mentioned in the case studies, but identified by the research team as typical ones. The collected innovations were screened for applicability in SFSCs, using the knowledge and practical experience of the participants in this work and potentially applicable innovations were analysed further.

2.3 Step 3. Descriptions of each specific innovative solution

The description of each innovative solution contains the following information: the particular need or problem and the novelty of this innovative solution, the enabling function(s), and the practical benefits, the method/procedure/technology/solution implemented, reference to the business, which implemented the innovated solution (size, country, region, location, type of food) if there is any, the distribution channels of the product(s), what makes the innovation work, the specific prerequisites for the organisation necessary for the implementation of the method and, or related to the location, method, procedure, solution, the results, achieved and the typical failures, the summary of the lessons learned, the aspects, recommended practice for transferring the method for other SFSC members, recommendations for members of other SFSCs for further applications, further details.
The collected innovations were summarised in an inventory of innovative solutions split into nine chapters by the aspect of their application:

- Agriculture and primary production
- Food safety and hygiene aspects and regulatory issues related to technological and non-technological innovation
- Food quality aspects
- Food preservation and other processing technologies, including preservation of freshness and nutritional value and- packaging from
- Logistics, accessibility of the product, and short food chain channels
- Food integrity, traceability, transparency, certification, voluntary labelling, food chain management, and networking
- Marketing concepts and communication tools
- Structural and economic aspects, enhancing collaborative SFSCs
- Modern information and communication technologies (ICTs) (Sebok et al., 2020).

A short description of the solutions was prepared for each innovation:

- the reference to the chapter,
- the reference to the analysed case study or the source of information,
- the title of the technological or non-technological innovation
- the description of the need or problem
- the description of the technological or non-technological innovation (Sebok et al., 2020).

2.4 Step 4. Categorisation of TECIs and NTIs into the overview matrix

The collected innovations were categorised in the following way. One group of innovations serves consumers' needs (food safety, food quality, trust, ethical aspects, accessibility). The other group serves the needs of the chain actors (like a fair price, increased negotiating power, shared use of available resources, product development support, access to markets and consumers, access to infrastructure). They were allocated to the different individual steps of the SFSCs (farming, primary production, transport, processing and packaging, storage, logistics, sales) and to the food supply chain as a whole (product integrity/authenticity, transparency, marketing concepts, food chain management and networking for enhancing cooperation among chain actors, business modelling, policy environment, legal requirements, labelling). By the above-mentioned aspects, the title and reference number of each innovation was positioned in were arranged in a matrix that was formed by the aspects of the individual steps of the SFSCS and the SFSC as a whole *versus* the aspects of the consumer's needs and the chain actors' needs. This matrix provided an accessible overview for identifying relevant innovations for eliminating a bottleneck or enhancing a success factor.

2.5 Step 5. Identification of the specific and typical bottlenecks and success factors of SFSCs

Through the SWOT analysis, using the information and data received from the 18 case studies, and their specific strength (S), weaknesses (W), opportunities (O), threats (T) were identified. The success factors and the bottlenecks were determined by using the following concept:
Success factors were defined as outcomes of the combinations of those strengths and opportunities or strengths and threats (Figure 2.) that

- supported the exploitation of an opportunity for improving the performance of the SFSC (Strength-Opportunity) or
- eliminated or reduced the impact of a threat that could decrease /spoil the performance of the SFSC (Strength-Threat). Many success factors could be enhanced by the application of innovation.

Bottlenecks are outcomes of the combinations of those weaknesses and opportunities or weaknesses and threats that

- can hamper the exploitation of an opportunity to improve the performance of an SFSC (Weakness-Opportunity) or
- can increase the impact of a threat, reducing the performance of the SFSC (Weakness-Threat).

Many bottlenecks can be eliminated or reduced by applying innovation (Figure 3.) First, the specific SFs and BNs of the 18 case studies were identified. These were complemented with the information collected from additional examples from own knowledge, experiences of the participating partners, publicly available information, literature, results of other projects to identify the specific strengths, weaknesses, opportunities, and threats of the SFSCs. This collection of SFs and BNs was analysed, grouped, and the typical SFs and BNs of SFSCs were identified. It resulted in additional success factors and bottlenecks. The specific bottlenecks and success factors were collected from individual steps of the SFCs, and the SFCs as a whole.

2.6 Step 6. Identification of potential, upgraded, additional value proposition providing the SFSCs' with competitive advantages

First, the current value propositions of the short food supply chain cases were identified. These were complemented with the information on the typical value propositions of other SFSCs, from own experiences, and a review of the state-of-the-art from the literature. The list of typical and specific bottlenecks and success factors was used as additional input for defining the objectives of upgrading the current value propositions of an SFSC. The current value propositions, specific bottlenecks and success factors of an SFSC, innovations from the inventory, personal experience, expert advice, and available public information were analysed. The SFs and the BNs of a Short Food Chain were evaluated to see whether some of the SFs could be enhanced or the BN could be eliminated, through the application of relevant innovation. If relevant innovations were identified the performance of the SFSC could be improved and provide more attractive value propositions to be developed compared tothe current ones. Based on that, strategies were elaborated for the implementation of these innovations to enhance the marketability of the products, the access to the markets and the efficiency of the operation of the SFSCs.

3 Results and Discussion

3.1 Typical problems and needs of the short food chains ("Inventory of the needs")

From the 18 case studies and the literature survey, the following problems, difficulties, needs were identified:

- Limited, unpredictable volumes; high uncertainty, high cost of meeting retailers' re-

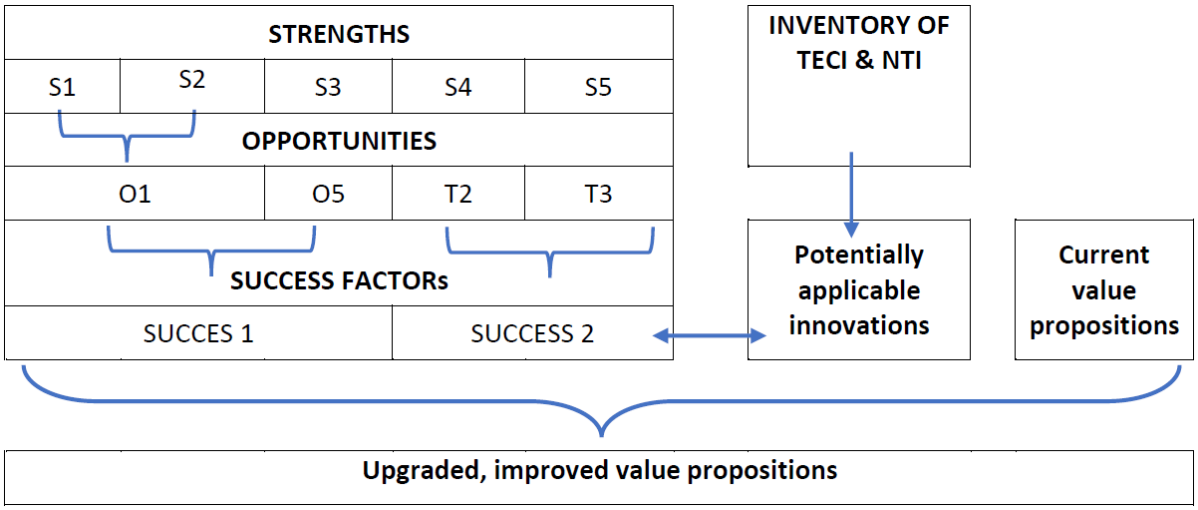

Figure 2: Method of identification of the success factors, potentially applicable innovations to enhance their exploitation, leading to upgraded value propositions

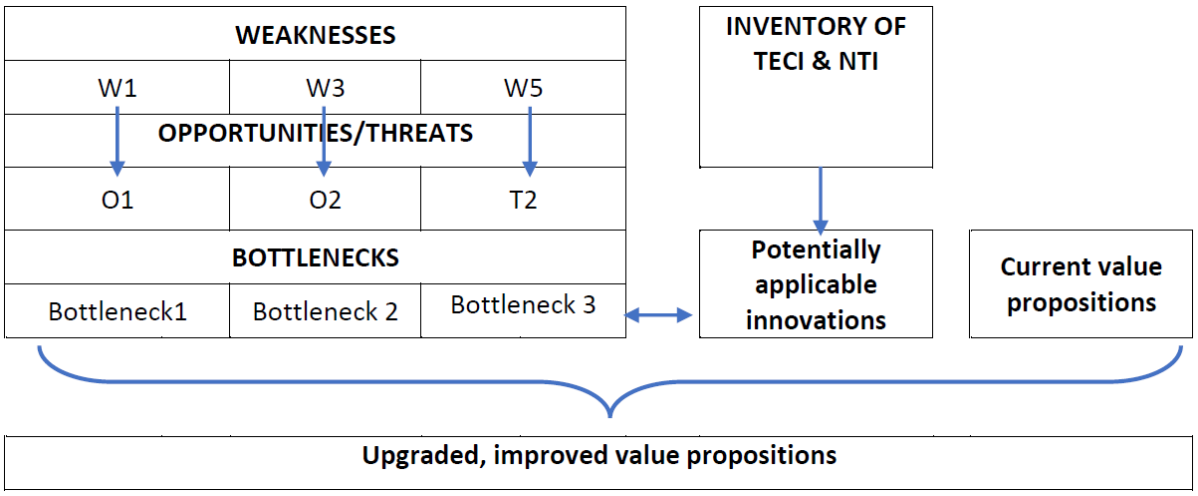

Figure 3: Method of identification of the bottlenecks, potentially applicable innovations to eliminate or reduce them, leading to upgraded innovations

quirements

- Perishability of some fruit, vegetable, meat, dairy products
- Limited infrastructure, technical, IT resources, limited financial resources for investment for improving technical capabilities
- Limited availability of labour force, skilled human resources
- The high cost of logistics/product unit lack of efficient cold chain
- Low direct access/links to consumers, market – low awareness of consumers
- Lack of trust of consumers in food safety, authenticity, (need for transparency solutions)
- Low negotiating power with retailers, large service/ utility providers, large customers, intermediaries, a municipal government to achieve a fair price
- Relatively high price – low adaptability to price competition
- Lack of information, professional staff and knowledge of product development skills, new, advanced technologies, marketing, and awareness of public funding opportunities, understanding of and compliance with legal requirements
- Lack of collaboration with peers, other SFSC members, lack of experience collaborating on shared use of resources, and agreement on joint goals for mutual benefits (Sebok et al., 2020).

Out of these 11 main categories of problems, difficulties and needs, the first nine were identified from the analyses of the answers of the 18 cases and the literature and the experience of the researchers. The last 2, the lack of information, professional staff, specific skills, awareness of funding opportunities, lack of understanding of methods to achieve compliance to legal requirements and the lack of collaboration, agreeing on joint goals, shared use of resources, were not mentioned by the cases in the sample except one case for the shared use of resources. These were identified by the researchers from their experience and the literature. Although the interviewed SFSC described consumers' lack of trust in food safety and transparency, they did not mention the need for transparency solutions. The researchers identified the need for this solution based on their experiences.

These needs match the original categories defined for the individual steps of the value chain in the matrix for collecting references of the innovations for assuring a quick overview very well. Still, they provide a more accurate explanation of the actual needs. While all aspects of the needs of the consumers and the chain actors related to the operation of the individual steps of the value chains were covered, relatively few requirements and expectations were mentioned related to the operation of the food value chain as a whole. For the aspects related to the value chain as a whole, only the use of some marketing concepts and compliance to legal requirements were mentioned by the SFSC cases in the sample. The case studies did not mention the need for tools supporting authenticity, transparency, food chain management, business modelling, and certificates. These indicated that most SFSCs are unaware of the benefits of such tools, methods, solutions that they can apply (Sebok et al., 2020). These are hidden needs identified by the researchers from their experiences and the literature.

3.2 Analysis of the needs and the related innovative solutions

Altogether 136 innovative solutions were identified and collected in the inventory (https://www.smartchain-platform.eu/en/innovation-inventory). According to categories of aspects of the application, their distribution is shown in Figure 4. The innovations were divided into two categories: innovations collected by the 18 case studies and innovations collected from knowledge and experience from the project partners and previous projects relevant for this topic.

The largest number of innovations was found for the "Logistics, accessibility of the product

Table 1: Matching the needs identified by experience and the needs summarised from the responses of the cases by cases (Sebok et al., 2020)

		individual steps of the SFSC						
		farming	primary production	transport	processing and packaging	storage	logistics	sale
needs of the consumers (citizens)	food safety	Perishability of some fruit, vegetable, meat, dairy products Poor direct access/links to consumers – low awareness of consumers Lack of information and knowledge						
	food quality	Perishability of some fruit, vegetable, meat, dairy products Limited availability of labour force Poor direct access/links to consumers – low awareness of consumers Lack of information and knowledge						
	trust	Lack of trust of the consumers Poor direct access/links to consumers – low awareness of consumers						
	sustainability	Poor direct access/links to consumers – low awareness of consumers						
	ethical aspects	Poor direct access/links to consumers – low awareness of consumers						
	accessibility	The high cost of logistic/product unit Poor direct access/links to consumers – low awareness of consumers Lack of information and knowledge						
needs of the chain actors	fair price	Relatively high price – low adaptability to price competition						
	increased negotiating power	Limited volume Limited availability of labour force Low negotiating power with retailers, providers Lack of collaboration with peers, other SFSC members						
	shared use of available resources	Limited volume Limited infrastructure, technical resources, limited financial resources for investment Lack of collaboration with peers, other SFSC members						
	product development support	Lack of information and knowledge						
	access to markets and consumers	Limited availability of labour force Lack of collaboration with peers, other SFSC members						
	access to infrastructure	Limited infrastructure, technical resources, limited financial resources for investment Lack of collaboration with peers, other SFSC members						

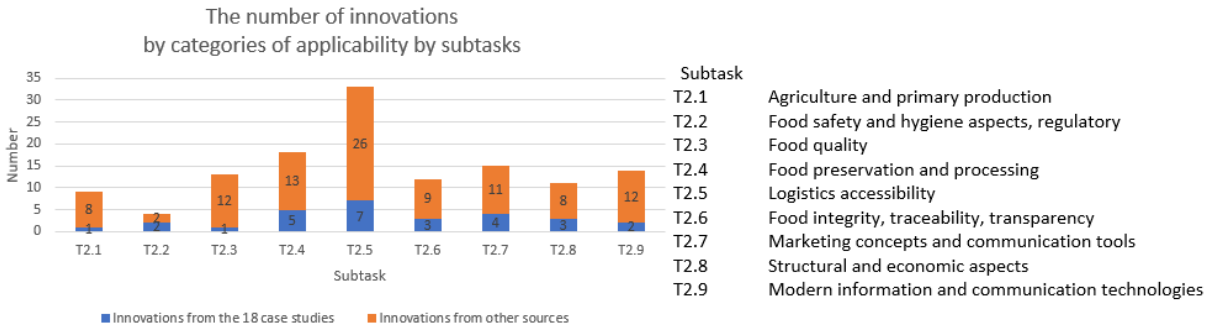

Figure 4: The number of innovations by categories of applicability

and short food chain channels" followed by the food preservation and other processing technologies, including preservation of freshness and nutritional value and packaging. Nearly the same number of innovations arose for the "Marketing concepts and communication tools" and "Modern information and communication technology". Few innovative solutions arose for food safety, hygiene aspects, and regulatory issues. The case studies provided innovations for each category. A significant number of innovative solutions applicable to SFSCs came from additional sources.
The Innovation Inventory is freely available for users. It is available on the SMARTCHAIN project website.

3.3 Typical bottlenecks of the SFSCs

The bottlenecks concerning the short food supply chains can be divided into two groups. There are bottlenecks, which hinder the operation of an individual step (of a food chain member, like one organisation, one step within the supply chain) within the short food supply chains. The other group is the bottlenecks, that hinder the organisation of the short food supply chain as a whole, not only the operation of one chain member.
Various aspects can hinder the development of the short food supply chains. Nevertheless, bottlenecks can be overcome by sharing information on successful SFSCs through disseminating Good Practices between various actors and territories (Hyland et al., 2019). These can impact the food chain members and the food chain as a whole. This was the objective of developing an inventory of innovation applicable in SFSCs.

Bottlenecks of individual steps of the SFSCs

Farming and primary production

Bottlenecks related to farming and primary production came up in 7 cases. Due to the lack of expertise in the production of raw material and agricultural production, SFSCs have difficulties achieving good quality of raw materials. The unpredictability of the weather and the yield causes problems. In many cases. new solutions for crops (e.g. resistance against droughts, frost, hail) are expensive and unavailable for small farmers. For those producers who started their activities in the SFSC as an auxiliary job or by interest without comprehensive basic training, the lack of knowledge about farming and technology makes it difficult to find an innovative solution for these problems. Several respondents mentioned that the more stringent environmental requirements mean difficulties for them. They needed more investment and cost-effective solutions that are rarely available for the producers. Many of the products of the SFSC are perishable goods, and effective post-harvest technologies, like refrigeration, drying, simple preservation techniques, are limitedly used.

Transport

Most of the case studies mentioned problems related to the cold chain from farms to consumers. In delivery and home delivery, the use of transport vehicles required support by logistics software, making it expensive. Processing and packaging processing and packaging were mentioned as bottlenecks by four case studies. The limited availability of software and innovative solutions is one of the most frequent problems. In some cases, farmers have difficulties meeting all the legal requirements for labelling.

Storage

Only one case study identified storage as a bottleneck. Nevertheless, the lack of investment in storage technology is an obstacle that needs to be addressed in almost all cases.

Sales

The sales came up as a bottleneck for 7 case studies as the products of SFSC often cannot compete with lower-priced imported products, e.g. it was a typical problem. Moreover, farmers and producers have limited knowledge of the demand for new and even traditional products. Because the seasonality and the volume and quality of the products vary, the supply does not always match consumer needs and expectations.
Finally, consumers usually do not understand the differences between the specific local food products of SFSCs, and their competitor alternatives from conventional food supply chains. They compare the prices of the products from short-chain witho conventional ones without comparing the associated value if they are not made aware of this added value. Therefore, consumers do not accept the higher cost of local products as proportional to the higher value. They need to be adequately informed about the additional benefits of the local products. The local farmers do not know about the good practices of short food supply chains and the sales methods to access consumers easily. Some producers recognise the opportunities in niche products. Still, the lack of knowledge of good sales of what practices and advanced IT supporting tools are available hinders them from identifying and reaching the particular consumer groups of potential customers of these niche products.

Bottlenecks of the SFSCs as a whole

Product integrity/Authenticity/Transparency

The lack of ability to provide product integrity/authenticity/transparency information was considered a bottleneck by 7 case studies. The SFSC cases studied used the term traceability since they are usually unaware of the difference between transparency and traceability. The higher price of local products can be accepted by the consumers only if their added value is derived from a reliable, local food source that can be demonstrated. If the SFSC producers cannot communicate the authenticity and transparency of their products effectively, consumers do not acknowledge the higher price.

Marketing concepts

Bottlenecks in the marketing concepts were found in 5 case studies. In many cases, SFSC organisations have a minimal marketing budget. However, weak marketing activities are also related to little knowledge about targeted consumer groups. SFSC organisations and individual producers frequently use inefficient marketing and communication tools.
One of the most critical bottlenecks is the lack of understanding of the importance of differentiating the products and services from the conventional chains by using the value for money concept. SFSC products are often niche products that require special marketing knowledge and market research. This is a bottleneck where training and advice on the basics of marketing for SFSC can bring improvements quickly.

Food chain management and networking for enhancing cooperation among chain actors

Food chain management and networking were among the most severe bottlenecks of the SFSCs since they arose in 9 cases. Several issues

are related to the lack of systematic implementation of the good practices of the food chain management. The lack of using food chain management techniques may have been related to the lack of knowledge of these practices by the SFSC members and food chain managers. The lack of sharing of the necessary information on consumers' and customers' needs along the SFSC by those SFSC members who have direct contact with the consumers and restaurants, catering outlets is one of the main reasons for the lack of meeting the always-changing consumer needs and demands. Producers and consumers alike are not aware of the actual costs of food, are not adequately informed about economic realities and do not exchange information on mutual ambitions. The lack of cooperation and the low level of networking are the barriers to the effective functioning of the SFSC. SFSC members were unaware of the joint effects of these. Main bottlenecks were connected to the high costs of production, transport, marketing, the lack of investment in production/storage systems, etc. Individual producers and organisations cannot introduce innovations using their resources in isolation. Furthermore, the older generation of producers and small entrepreneurs is frequently less innovative, has a limitedly ambitious mentality, lacks open-mindedness, and has fewer new ideas.

Business modelling

The lack of understanding and using a defined business model or a malfunctioning model emerged in 10 cases as a bottleneck. Developing a commonly agreed concept takes time and needs skills that makes it complicated and slows down decision-making. The actors of SFSCs fall behind in the competition. There is still limited knowledge and experience in managing and developing human resources. There is a lack of professional staff for designing and operating a business model for a specific case.

Policy environment

The policy environment is a general problem and barrier for SFSC. A shortcoming of the rural development policy is that it does not consider the specific constraints of SFSCs caused by limited human, financial and physical resources. Currently, the policy framework doesn't include specific provisions for a supporting system for SFSC's to help their business and social development. This might be because SFSC producers are frequently very small entrepreneurs with low power to represent their interests. Some of them carry out food production as an auxiliary activity beside their main job in another sector other than agriculture. The eligibility criteria, pre-financing are the main barriers in their case. Moreover, the lack of available financial resources (EU and national level) presents obstacles to investments and adoption of innovative methods. Nine cases mentioned his specific problem as a bottleneck.

Legal requirements, labelling

The lack of specific legislation for SFSC was a real problem for all the actors. In addition, the different interpretations of the relevant legislation at the EU level have a negative impact.
The regulations on food hygiene and labelling related to specific traditional foods are complex. All the case study partners mentioned that local or national authorities frequently do not consider the specificities of the new innovative short food chain forms, e.g., community-supported agriculture, online delivery system, drive-in system, etc. and do not apply the EU flexibility rules to them. The very detailed rules cannot keep up with the new practices. Farmers and producers cannot meet the requirements of these regulations without the help of national and EU institutions or consultants.
Moreover, operating certified food quality systems is very costly for small-scale producers.
In some countries, the lack of national regulations for the quality requirements and the required processing technologies of traditional food hinders the production and sale of local products.

3.4 Success factors of the short food chains

Success factors of the 18 case studies identified in the context of individual steps of the SFSC

Farming and primary production

The high-quality local product is a success factor for 8 case studies. Fresh and natural products are of great value to consumers. Moreover, sustainable production and animal welfare messages are emphasized to environmentally conscious consumers. Thus, the production of traditional local products is a potential success factor for farmers and producers in SFSCs.

Transport, processing, and packaging

Sustainable production, packaging, and delivery came up as success factors in 2 cases. Sustainable production is an essential criterion in the SFSC that distinguishes local products from conventional foods.

Sales

Sales is a success factor when the actors of SFSC can find a way to reach consumers effectively and continuously.
Innovative solutions for sales can be considered a success factor. These are diverse selling points, online sales, and proper marketing positions on local and international levels, that are supported by low transaction costs and a fairer price. Finally, the steep increase in consumers' interests in purchasing from local and regional sources during the COVID-19 pandemic compared to the other market channels is another essential element for sales as a success factor.

Success factors of the 18 case studies identified for short food supply chains as a whole

Product integrity/authenticity/transparency

Although product integrity/authenticity/transparency was not mentioned by the cases themselves except 2 cases for authenticity, in the analysis of the cases by the project team's external experts; this aspect was identified as a potential success factor in 14 case studies.
The fundamental elements in gaining consumer confidence are authentic, local, traditional, and specific quality products. Also, sustainable production and organic production are essential criteria.

Marketing concepts

Although only 2 cases mentioned different good marketing practices, the researchers identified marketing as a potential success factor in 10 cases.
The key is a strong profile on social media and transparency. It is essential to enable accessible and fair communication with consumers (website and social media). There are various ways to reach the consumer: e-commerce, direct communication between farmers and consumers, online sales, tailor-made services. New markets: consumers can be accessed by cooperation with agritourism, vine tourism, gastronomy. The joint branding of producers promoting healthy and sustainable eating habits is also a successful practice.

Food chain management and networking for enhancing cooperation among chain actors (Sebok et al., 2020)

Good practices for cooperation between producers and other actors of the SFSC was a potential SF in nearly all cases, although these aspects were rarely mentioned by the SFSCs:

- Joint marketing (logo, website, presence in events, etc.) and selling; sharing risks, etc.;
- Exploitation, combining fragmented and complementary resources to achieve strategic objectives;
- Operating a uniform quality assurance system;
- Close communication with members;
- Solid participation of producers and consumers sharing economic responsibility;
- Employment of disabled people;
- Prosumers gain access to spaces of experience and education, shared learning, and innovation;
- Fair income for farmers;
- The producers are well-known in the local community;
- Acting as an interface for matching supply offers of SFSCs with customer demand.

Policy environment

Public funding for supporting research and external funding available for investment are good examples of the supportive policy environment. Our findings partially matched with the findings of Paciarotti and Torregiani (2021), studying the hurdles and opportunities in the operation of SFSCs. These findings include high logistics and transportation costs when compared with other conventional distribution systems, poor scale economies due to the small size of farms; low accessibility of the SFSC products to consumers who do not always know how and where to get products, limited resources (budget and skills) for marketing and communication. Our findings confirm their statement that a general and also crucial challenge of SFSCs is the logistics representing the most significant weak point regarding development and effectiveness. However, there are also contradictions in some cases. While they list the niche market and the limited variety and quantity of products as hurdles, by our evaluation, these provide opportunities for differentiation, focusing on a selected consumer and market segment segmentation and increasing added value. SFSCs, in many cases, are made of micro-businesses with limited product volumes for which the strategy of serving niche markets fits well.

Chiffoleau et al. (2019) conclude that the economic benefits of SFCs are not obvious. Additionally, difficult labour conditions are referred as 'self-exploitation' by Galt (2013). Improvement in marketing and the differentiation of products can significantly improve the profitability and can support the mitigation of these economic difficulties of SFSCs. The findings of this research on BNs and SFs complied well with that of the (European Commission, 2015). Jarzcbowski et al. (2020) identified 3 main factors of success and barriers: the creation of SFSCs, product development, access to the market. Their findings on SFs BNs in all of the 3 main factors were matched by our findings.

According to our results and the literature, several of the identified bottlenecks can be reduced by strengthening the connection between actors, effective communication, and knowledge transfer. Galati et al. (2021) highlight the importance of a multi-stakeholder approach and a shared strategy at the system level to foster the adoption of innovative technology of logistics (electric freight vehicles). Our analyses are in line with this finding in that the complementary use of the limited resource, capabilities, and resources to achieve joint objectives is one of the efficient tools for SFSCs to carry out investments, improve the efficiency of marketing, and adopt innovations. This approach developed by Gellynck et al. (2006) and Kuhne et al. (2007) was the basis of our approach used in this study. Our finding on the benefits of shared use of complementary resources, capabilities and competencies confirms the applicability of the co-ordinative co-existence model of Thomé et al. (2021). We also found that the drive to add value, fostering the convergence of interests systematically, sharing practices, relationships, knowledge, redesigning the food supply chains to meet consumer demands for food safety, transparency, nutritional value, specific origin better were usually the most effective tools for SFSCs to improve their market success. According to Reina-Usuga et al. (2022),

promoting participatory governance mechanisms involving civil society is an essential element in urban food policies enabling the transition of the food system, when they studied its effect on Territorial Short Food Supply Chains (TSFSC). The analysis of TSFCSs shows that public policies, cooperation links, advice and support for production, an informed civil society, and the physical infrastructure of communications and telecommunications are critical factors regarding development.
Appropriate regulation and policies of the system have a huge role in enabling the smooth operation of SFSCs and, therefore, the transition towards a more sustainable food system, thus emphasising the responsibility of the policymakers.

3.5 Examples of the most frequently selected innovations for potential application

The results show that there are several innovative solutions, described in the Inventory of technological and non-technological innovations which could be applied for improving the operation, the quality of the products, and the attractiveness of the offers and related services of the case studies. From the 136 innovations listed in the "Inventory of TECIs and NTIs" of the SmartChain, 98 were identified and proposed for the 18 case studies for supporting them to operate more effectively and innovatively. There are innovations, which may be widely applicable and can offer a solution for many SFCs organizations.
The most frequently recommended innovations were:

- " Collection of rules and regulations, Guidelines and Good Practices" – 15 times recommended
- Social media marketing" – 15 times recommended
- "Risk Assessment on the infection of the consumers by SARS-CoV-2 during purchasing in different types of SFSCs" – 10 times recommended
- "Diverse direct marketing" – 10 times recommended
- "An online marketplace" – 10 times recommended
- "Food labelling and nutritional analyses without lab tests" – 8 times recommended
- "Biodegradable active packaging" – 8 times recommended
- "A platform for Short Food Supply Chains" – 8 times recommended
- "Participatory Guarantee Systems as a mechanism for building the trust of parties" – 8 times recommended

3.6 Typical value propositions for SFCSs

The authors have elaborated the recommended typical value propositions for the SFSCs based on summarising the available information from the 18 cases and analyses of the information on trends of consumers needs from state of the art.

1. Fresh, tasty, natural, specific high quality, distinguishable, produced/processed responsibly, traditional– **Food quality and value**
2. Genuine, authentic, non-manipulated, protected with particular care from (chemical) contamination associated with the global food supply, organic, transparent, not adulterated – **Food safety from a safe, assured source**
3. Fresh, high nutritional value, natural – **Nutrition, health, and well-being**
4. Less transport and distribution, local supply, fewer Greenhouse Gas (GHG) emissions, less distribution cost, a fairer price for producers, social responsibility in food production (less use of chemicals, less environmental impact from technologies, no GMO), and employing underprivileged, disabled people, consumer empowerment – **Sustainability, and food security**

5. Local, supporting the local community, long term viability – **Sustainability, resilience, and food security**

6. A potential place to learn about food production, about nature, place to educate children through playing – **Skills and knowledge** (Sebok et al., 2020)

7. Specific, satisfying food consumer diet trends for food from local plant-based food production e.g. vegan, vegetarian - **Sustainability, Nutrition, health, and well-being**

8. Fresh, high nutritional value, natural – **Nutrition, health, and well-being**

Value propositions for the "consumer needs"

Food safety

Current value proposition: No statement emerged concerning food safety. The consumer surveys show that personal relationships with the producers can build consumer trust in food safety. Except for the conviction through personal contacts, there is no objective statement and guarantee for food safety practice applied by the short-chain members. Generic HACCP models exist in Good Hygiene Practice (GHP) and Good Manufacturing Practice (GMP) guidelines, which the short chains can adapt. Through similar activities, short chains can demonstrate the implementation of appropriate food safety measures. There is no specific audit system that guarantees the food quality in the FSFCs, whereas audit systems already exist and ensure food safety in conventional food production.
Proposed value proposition: Increased food safety and the safety of the consumers shall be guaranteed during the epidemic. The shelf life and expiry date of the product will be longer with innovative solutions.
A tool is available to evaluate the risk of SARCOV-2 contamination during purchasing in SFSCs and apply control measures for its reduction, which was developed in the SmartChain project.

Food quality

Current value proposition: One of the most important, if not the most important, in consumers' purchase habits is the decision based on food quality. Quality is the value by which the SFSC can be distinguishable. In most cases, the proposal of the SFSCs is an authentic, high-quality, local product. The specific, unique properties of the products are often distinguishable by trademarks of Protected Geographical Indication (PGI), Protected Designation of Origin (PDO), Traditional Specialties' Guaranteed (TSG), or with the organic logo. In many cases, SFSCs offer 100% natural, 100% free from artificial food additives products, where the producer confirms the traceability and the origin.
A particular consumer group consumes gluten-, lactose- and/or allergen-free products. Through targeting special consumer groups, new quality trends are evolving in the short chains market. Producing fresh vegetables and fruits are in line with the demand of vegan and vegetarian customers. They form a unique customer group with high potential because the number of vegans and vegetarians increases.
The benefits of this are authentic, locally produced products. SFSCs offer a wide range of products, prominent tradition and origin. **Proposed value proposition**: After applying the proposed activities, SFSCs can put even more emphasis on the authenticity, traditionality, originality, traceability of the products. The freshness, the naturality, the labelling, the expiry date, the diversity of the product ingredients, and the values the consumers receive should be emphasised more for promoting the "value for money" -i.e. image.

Trust

Current value proposition: Consumers' trust in the products of farmers and producers is closely related to the quality of the product offered. The demand-driven system of the SFSCs provides transparent, easily accessible, sustainable products, which may support a healthy diet. The quality labelling systems enhance the the trust consumers have in products.
The close relationship between the consumers

and producers through personal communication and involvement in the farming and processing increases the trust in products.
Proposed value proposition: Implementing the proposed innovations will improve consumer trust. With easy access to local food and clear, easy-to-understand messages about the organisation's benefits, with more information from an authentic source (from experts, agricultural specialists), consumers' trust in the products will increase. The high-quality service of the wide range of products enhances consumer trust. Products and brands can be made more appealing in consumers' minds through improved marketing concepts.
Higher product quality may be guaranteed when the producer meets the minimal standardised quality requirements (on higher standards). Implementing particular sustainable processing technologies, packaging materials, and methods is possible. The application of the Participatory Guarantee System enhances consumer trust.

Sustainability

Current value proposition: A long-term sustainable organisation requires a well-developed, long-term strategy backed by expertise and education. The SFSCs can provide a wide range of fresh, local, natural, environmentally friendly goods from sustainable production with relatively low negative environmental impact. Some short-chain members offer limited waste products, some offer fresh non-prepacked products, and the market or shop can be located in many different town points to reduce people's use of cars.
Ensuring a well-functioning cold chain during the process contributes significantly to the sustainability of the operation. To provide products from sustainable farms by avoiding the use of harmful fertilisers and chemicals, innovative thinking, expertise, and education of the employees are needed to ensure a less environmental impact on their lives.
Proposed value proposition: Children's education plays a responsible role in the long term. Volunteers and ambitious youth should be offered long-term jobs, activities, and education opportunities for thenext generation. To operate a sustainable production system, sustainable methods, technologies, equipment are needed. The ability to prepare successful proposals for public funding to support investments is necessary.
Specific consumer diet trends (e.g. flexitarian, vegan, vegetarian) can be encouraged by healthy, free from chemicals, local fruits and vegetables.

Ethical aspects

Current value proposition: Community building, training, and education of the SFSC members and consumers play the most prominent role in ethical aspects. Consumers are involved in the social life of the region within a community. The collaboration with SFSC practitioners leads to valuable experience-based knowledge.
Proposed value proposition: If young consumers understand the value and the benefits of the agricultural products and services, including healthy food, the environment, local (family, small-scale, mixed) farming methods, they will be the customers of the ethically, sustainable SFSCs. By supporting the consumption of local products, the farmers' and producers' subsistence is encouraged. Organic, environmentally aware, socially sensitive farms have an essential role in SFSC, an ethical value of SFSC.

Accessibility

Current value proposition: One of the most critical issues is selecting the channel to deliver the products on offer to consumers. SFSCs offer several possibilities, e.g. the different types of shops (farmer shop, shop in the farm, mobile shop), the markets (farmer market), several events through temporary purchase, pick-your-own farms. Furthermore, various catering opportunities exist, like products served in hotels, restaurants, institutional catering, or ordering in a web shop for home delivery.
Short food chains provide products with large diversity, seasonality, and high quality with transparent information on the products' origin. Some SFSCs organise open days and events on the farms throughout the year, providing unique services for the region's tourists (e.g. wine-, cheese tasting tours, open farm tours, etc.)

Consumers usually prefer to have direct contact with the farmers and producers themselves. They can exchange information about farming, production, processing of the products. Networking is an essential factor in the successful operation of SFSCs in general. In some cases, consumers can be involved in farming and production.

Some of the SFSCs sell locally, some nationally, and some internationally. Developing IT methods, applications, a website ensures the easy accessibility of the products.

Proposed value proposition: SFSCs can offer easily accessible, authentic, local products directly to the consumers. The service should fulfil better HORECA's needs with the help of demand forecast and IT support.

The SFSCs can offer products tailored to target groups, using the opportunities of niche markets. After applying the proposed activities, the products are accessible and available more frequently, locally and all over the country and at the international level. The availability of products can be promoted at events, workshops, exhibitions, and educational seminars.

The everyday use of IT tools, applications, and improved marketing methods will increase the consumer accessibility of the products. By connecting products on offer and services of SFSCs with the sales channels in the agro-tourism sector and by joint efforts of SFSC network partners and associations, local products can be made more easily accessible for consumers.

4 Conclusions

The trials of the procedure with the SFSC case studies demonstrated that it was an efficient tool for identification of those innovations that can be used for elimination of the bottlenecks and enhancing the exploitation of success factors of SFSCs. The trials were made with 18 cases, the innovations were selected from the SmartChain Innovation inventory containing 136 technological and non- technological innovations The procedure was elaborated with a multi-stakeholder approach by involving SFSC practitioners, researchers, chain coordinators and innovation specialists applicable for the different types of SFCSs. A toolkit was developed that helps select the appropriate innovations for improving the performance of the SFSC as a whole and the specific steps of the food supply process. Identifying the bottlenecks and success factors of the operation of the SFSCs helps define attractive, achievable value propositions. One of the most critical bottlenecks emerged from limited marketing skills. Other bottlenecks are the lack of understanding of the importance of differentiating the products and services from the conventional chains. A key element of the differentiation of the products of the SFSCs is to follow the value-for-money concept based on the high quality, added value local foods from small scale production for niche markets, such as serving a healthy and sustainable diet, specific origin, typical authentic local product, etc. The short food chains need some assistance in identifying such value propositions that can increase the attractiveness of their products and services for their consumers and make the operation of the food chain more efficient. Consumers expect that these claims representing added value shall be verified through transparency systems that enable them to take informed decisions , which represents a typical, yet not properly exploited success factor. Other typical bottlenecks are the lack of skills in agreeing and implementing common objectives for mutual benefits, and combining complementary resources, capabilities, and competencies to achieve these agreed, joint objectives, the lack of awareness of the available technological solutions, and digital solutions to increase consumer awareness help consumers to access products of short food chains. Success factors can be enhanced by emphasising authenticity, traditionality, originality, transparency of the products. The upgraded value propositions based on adopting relevant innovations can serve as a starting point for developing a strategy to improve competitiveness.

A broader overview of the evaluation of the different aspects can be achieved by combining the information on good practices of SFSCs with the external expert view and comprehensive innovation experience of the project team carrying out the analysis and evaluation. The experiences collected during this work verify the benefits of combining the practical problem-solving experience

of the external experts with the detailed knowledge of the operation of the SFSCs via regular dialogue.

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Further information is available on the SMARTCHAIN online platform:
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