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Short Food Supply Chains in Europe:
The Current Situation and the
Way Forward – SMARTCHAIN *Special Issue*



International Journal of Food Studies

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Foreword

Over the last years, the European agri-food system has become increasingly complex bringing several issues to light regarding transparency, environmental policy, worker's rights, and food ethics. Today, most of EU's population buys food from large supermarket chains. However, a range of alternatives have been developed to improve competitiveness including various models of short food supply chains (SFSCs) where farmers sell their produce directly to consumers or with a minimum number of intermediaries, both in rural and urban areas. These family-oriented companies of small and medium sized (SME) producers are under threat from the aggressive sales tactics of large-scale agri-food enterprises and intensive competition from international markets. There is undoubtedly a need for innovative re-organization of the current food supply chains. For this reason, SFSCs are of considerable interest, responding to several needs and opportunities, both of farmers and consumers. They function as a driver of change and a model to increase transparency, trust, equity, and growth throughout the agri-food chain.

The central objective of the SMARTCHAIN project was to foster and accelerate the shift towards collaborative SFSCs and, through specific actions and recommendations, to introduce new robust business models and innovative practical solutions that enhance the competitiveness and sustainability of the European agri-food system. SMARTCHAIN was a three-year project with 43 partners from nine European and two associated countries. The consortium included key stakeholders from the domain of SFSCs, in particular, 18 case studies of widespread SFSCs in Europe with remarkable social, economic, and ecological impacts on rural, peri-urban, and urban communities. To strengthen co-creation and collaboration between partners and stakeholders, nine SMARTCHAIN Innovation & Collaboration Hubs have been established in France, Germany, Greece, Hungary, Italy, the Netherlands, Serbia, Spain, and Switzerland. The SMARTCHAIN Special Issue is a collection of ten scientific publications, showcasing the most relevant outcomes of the project and its work packages.

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CONTENTS

- SI129 SMARTCHAIN - Towards Innovation-Driven and Smart Solutions in Short Food Supply Chains
F. JAVIER CASADO HEBRARD, SUSANNE BRAUN AND DIMITRIOS ARGYROPOULOS
- SI138 Exploring Regulatory Obstacles to the Development of Short Food Supply Chains: Empirical Evidence from Selected European Countries
LAZAR ŽIVKOVIĆ, MIRJANA B. PEŠIĆ, HANNA SCHEBESTA AND VIKTOR A. NEDOVIĆ
- SI151 Application of Digital Solutions to Improve the Operation of Short Food Supply Chains
VIKTÓRIA PARRAG, ÁGNES FRICZ SZEGEDYNÉ AND ANDRÁS SEBÖK
- SI161 Value Propositions for Improving the Competitiveness of Short Food Supply Chains Built on Technological and Non-Technological Innovations
ANDRÁS SEBÖK, KINGA VARSANYI, KATALIN KUJANI, VILMA XHAKOLLARI, AGNES, SZEGEDYNE FRICZ, ALESSANDRA CASTELLINI, DIANA DI GIOIA, FRANCESCA GAGGIA AND MAURIZIO CANAVARI
- SI182 Understanding Social Innovation in Short Food Supply Chains: an Exploratory Analysis
EUGENIA PETROPOULOU, THEO BENOS, IRINI THEODORAKOPOULOU, CONSTANTINE ILIOPOULOS, ALESSANDRA CASTELLINI, VILMA XHAKOLLARI, MAURIZIO CANAVARI, ANNARITA ANTONELLI AND DAMIANO PETRUZZELLA
- SI196 Barriers and facilitators of Purchasing from Short Food Supply Chains in Europe: Insights from a Stakeholder Perspective
CAMILLE AOUINAÏT, DANILO CHRISTEN, CHRISTOPH CARLEN, CAMILA MASSRI, MALOU REIPURTH, SOPHIE HIEKE, ADRIENN HEGYI, KATALIN KUJÁNI, ÁGNES MAJOR, ÁGNES SZEGEDYNÉ FRICZ, VERENA HÜTTL-MAACK, DENNIS GAWLIK, EUGENIA PETROPOULOU, BEGOÑA ALFARO, ELENA SANTA CRUZ, MARIEKE LAMERIS, JASPER KUITEMS, FRANK JANSSEN, SUSANNE BRAUN AND BETTY CHANG
- SI208 Barriers and Facilitators of Purchasing from Short Food Supply Chains: Evidence from Consumer Focus Groups in Germany, Spain, Greece and Hungary
BETTY CHANG, CAMILA MASSRI, MALOU REIPURTH, EUGENIA PETROPOULOU, VERENA HÜTTL-MAACK, DENNIS GAWLIK, KATALIN KUJÁNI, VIKTÓRIA SZENTE, ADRIENN HEGYI, ÁGNES SZEGEDYNÉ FRICZ, ELENA SANTA CRUZ, THEO BENOS, CAMILLE AOUINAÏT, DÉBORA CAMPOS, BEGOÑA ALFARO, FRANK JANSSENI, IRINI THEODORAKOPOULOU, CONSTANTINE ILIOPOULOS AND SOPHIE HIEKE
- SI219 Motivations and Barriers for Engagement in Short Food Supply Chains: Insights from European Focus Groups
CAMILLE AOUINAÏT, DANILO CHRISTEN, CHRISTOPH CARLEN, LOUISE MEHAUDEN, PATRICIA MORA, BOB MASSAR AND MARK FREDERIKS
- SI232 An Online Innovation Platform to Promote Collaboration and Sustainability in Short Food Supply Chains
FOTEINI CHRYSANTHOPOULOU, MARIEKE LAMERIS, GUNTER GREIL, DUSAN VUDRAGOVIC AND KATHERINE FLYNN
- SI248 Gamification for Sustainable Food Transitions: Supporting Multi-level Cooperation in Short Food Supply Chains Through GAIN
DANIKA MOORE BOB MASSAR MARK FREDERIKS REMCO VELTKAMP AND HENS RUNHAAR

SMARTCHAIN

Towards Innovation-Driven and Smart Solutions in Short Food Supply Chains

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Abstract

In recent times, Short Food Supply Chains (SFSCs), i.e., supply chains in which the number of intermediaries between farmer and consumer are minimal or ideally nil, and local markets have flourished in Europe, both in rural and urban areas. SMARTCHAIN is a 3-year Horizon 2020 multi-actor project of 43 partners from 11 European countries, including key stakeholders from the short food supply chain domain – a kaleidoscope of ‘actors’ where science meets a wide range of non-technical disciplines and stakeholders across the agri-food value chain. Its central objective is to develop a portfolio of technological, organisational, social, and digital innovations, which will be validated in a Living Lab approach (18 pan-European use cases on short food supply chains) ensuring powerful co-creation and testing. SMARTCHAIN will develop 9 national Innovation Hubs and the SMARTCHAIN Innovation Platform, a digital portal for building a stakeholder community, and facilitating engagement, communication, and knowledge exchange across stakeholders. This special issue focuses on the most recent developments with respect to innovation in short food supply chains and publishes original research articles in this field.

Keywords: Short food supply chains; Food system; Innovation; Smart solutions; Sustainability

1 Introduction

In recent times, Short Food Supply Chains (SFSCs) and local food markets, have flourished in Europe, both in rural and urban areas. The EU’s rural development regulation (1305/2013) defines a ‘short supply chain’ as a supply chain involving a limited number of economic operators, committed to cooperation, local economic development, and close geographical and social relations between food producers, processors, and consumers. These represent an alternative to conventional longer food

chains. Such food systems have the potential to respond to several needs and opportunities of farmers, food producers and consumers. The development of (different types of) SFSCs is one of the approaches of the Common Agricultural Policy, to increase resilience and promote a more favourable framework for sustainable, healthier, local, and ethically produced food. The increasing attention being paid to SFSCs can be seen in the recent scientific literature (). A work published by Bakalis et al. (2020) reported that the effective implementation of SFSCs could offer an additional mechanism to cope with

the issue of food resilience. In addition, given the extreme uncertainty around the duration and intensity of the current global crisis, it is essential to strengthen research activities to provide technical and non-technical solutions aimed to improve collaboration in SFSCs and local food production (Cappelli & Cini, 2020).

SMARTCHAIN (<https://www.smartchain-h2020.eu/>) aspires to foster collaboration amongst all stakeholders involved in the food system, strengthening the transition of SFSCs in the EU from a niche to a larger market share. To achieve this, it takes a full-chain system-based approach, from producer to consumer and beyond. SMARTCHAIN builds on state-of-the-art technologies and systems and develops a blueprint for the implementation of SFSC-related innovations. SMARTCHAIN connects researchers with knowledgeable stakeholders about the short food supply chain domain. This enables a productive interaction between deductive, theory-driven inquiries with empirically rich case studies, i.e., various SFSC models of evolving processes of innovation in a living lab approach. SMARTCHAIN focuses on different European regions to create favourable overall conditions for cooperation, co-creation, and innovation along the agri-food chain. SMARTCHAIN uses cross-case analyses to generate insights into how innovation functions in short food supply chains. SMARTCHAIN builds a fertile ecosystem of scientists, entrepreneurs, policymakers, farmers, food entrepreneurs, associations, and knowledge transfer agencies, open to multiple pathways of innovation, sustainable growth and better performing agri-food value chains.

2 Concept and Approach

SMARTCHAIN is a 3-year multi-actor project of 43 partners from 11 European countries (Fig. 1), including key stakeholders from the short food supply chain domain – a kaleidoscope of ‘actors’ where science and technology meets a wide range of non-technical disciplines and stakeholders across the value agri-food value chain. It addresses the citizen-technology-environment economics nexus, delivering truly

integrated solutions for this complex challenge, and mobilises a multi-disciplinary consortium with the necessary competences, skills, and reach from the fields of science, technology, industry, business, civil society, education, and policy. The consortium includes farmers, agri-food businesses (large, SME, start-up), universities, technology centres, representative groups and not-for-profit organisations spanning the skill sets and resources needed, from research and innovation to implementation in commercial situations. It is a truly multi-disciplinary and multi-actor consortium, with each member contributing to a holistic approach to addressing this multi-faceted challenge.

SMARTCHAIN also recognises the pivotal role of the consumer in ‘driving’ the market for food in consort with lifestyle and market dynamics. This is achieved through a better understanding of consumer behaviour, lifestyle, and health implications; and how these influence consumption patterns. Consequently, the project addresses the multi-faceted consumer-market dynamics, including socioeconomics, environment, e-commerce, policy, and awareness. A comparative assessment of the 18 SFSC use cases is performed to identify key characteristics of different stakeholders, with a particular focus on farmers and their relationship with consumers. SMARTCHAIN explores the policies and regulatory requirements also considering different national contexts, highlighting regulatory barriers that currently hinder the scaling up of SFSCs.

At its core, SMARTCHAIN is formed by 18 SFSC use cases that demonstrate the business of innovation for several impactful application areas at each stage of the agri-food value chain. The 18 use cases of widespread SFSCs with remarkable social, economic, and ecological impacts on rural, peri-urban and urban communities are evaluated in terms of innovation potential, consumer perspective towards SFSCs, business opportunities in the sector and overall sustainability (environmental, economic and social). The SMARTCHAIN concept and approach is schematically presented in Fig. 2. SFSCs are varied in nature and practice throughout Europe. The functioning of SFSCs is dependent upon different territorial conditions

Table 1: Overview of the actual short food supply chains, directly involved in the project

Short food supply chains	Type	Country
Netzwerk Solidarische Landwirtschaft (SLW) www.solidarische-landwirtschaft.org	Partnership	Germany (DE)
Einkaufen auf dem Bauernhof (CALs) www.einkaufen-auf-dem-bauernhof.com	Individual & collective direct sales	Germany (DE)
Alce Nero (ALN) www.alcenero.com/en	Collective direct sales	Italy (IT)
Arvaia (ARV) www.arvaia.it	Partnership	Italy (IT)
Natuurlijk Vleespakket BV (NV) https://vleeschenco.nl/	Individual direct sales	Netherlands (NL)
Local2Local (AMPED) www.local2local.nl	Individual & collective direct sales	Netherlands (NL)
Association Gersoise (CTCPA) http://www.foie-gras-gers.com/	Partnership	France (FR)
Couleurs Paysannes (CP) www.couleurs-paysannes.fr	Individual & collective direct sales	France (FR)
Allotropon SYN. PE. (ALT) www.allotropon.gr	Partnership	Greece (EL)
Gaia cooperative (GAIA) www.facebook.com/gaiashops	Collective direct sales	Greece (EL)
Foodhub.hu Non-profit Ltd (FH) http://foodhub.hu/	Individual direct sales	Hungary (HU)
Thermal Valley of Zala (TVZ) www.zalatermalvolgye.hu	Collective direct sales	Hungary (HU)
POLO Čačak (PDC) www.polo-cacak.com	Individual direct sales	Serbia (RS)
Udruženje kompanija (AFV) http://preradjivacivocaipovrca.com	Collective direct sales	Serbia (RS)
La Trufa de Alava S. Coop (TRA) www.latrufadealava.com	Collective direct sales	Spain (ES)
Fundacion Lantegi Batuak (FLB) www.lantegi.com	Individual & collective direct sales	Spain (ES)
Biofruits SA (BIO) www.biofruits.ch	Collective direct sales	Switzerland (CH)
Chèvrement bon (CHE) www.fromagebesson.ch	Individual direct sales	Switzerland (CH)



Figure 1: SMARTCHAIN Consortium: 43 partners across 11 European countries including 18 Short Food Supply Chains, 10 Research Institutes, 6 Technology Transfer Centres, 9 Non-profit Organizations.

such as culture, climate, resources, governing structures, available infrastructure, market access and market conditions. SMARTCHAIN has selected an illustrative database of existing SFSC models in 9 European countries (Table 1). The aim is to generate more precise, quantitative and qualitative data regarding the effect of SFSCs for a determined area and to capture the degree of geographical diversity across Europe. The analysis takes place at a national level, in 9 Innovation and Collaboration Hubs established in 9 participating countries, i.e., France, Germany, Greece, Hungary, Italy, Netherlands, Serbia, Spain and Switzerland (Fig. 3). Each hub consists of the national actors, the use cases – actual SFSC entrepreneurs, farmers and the other key stakeholders involved in SFSCs.

The hubs communicate with the National Rural Networks (NRNs) and promote synergies with regional/national EIP-AGRI Operational Groups (OGs).

In line with today's 'Digital Era', SMARTCHAIN develops the SMARTCHAIN Innovation Platform (<https://www.smartchain-platform.eu/>), as a major digital channel for building a stakeholder community, and facilitating engagement, communication, knowledge exchange and dissemination across stakeholders (farmers, retailers, processors, consumers, policy, regulators, NGOs). The SMARTCHAIN Innovation Platform – which provides a virtual hub for operational, dissemination and networking purposes – is a key pipeline for awareness-raising and for supporting

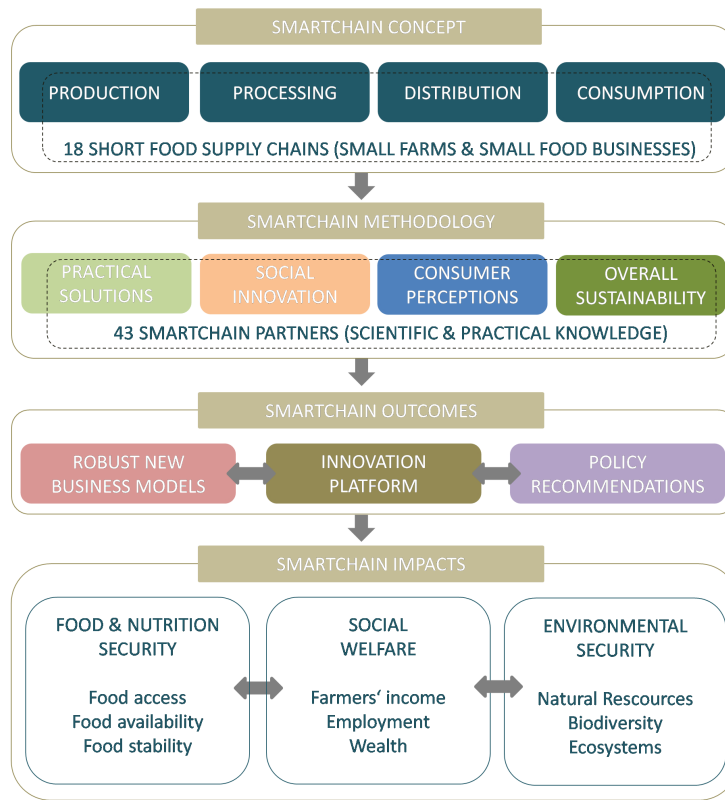


Figure 2: Overall concept, methodology, outcomes and expected impacts of SMARTCHAIN

behavioural change amongst all actors. It provides all stakeholders with the facility to report their experiences of SFSCs, providing useful ‘crowd sourced’ data and enhancing overall awareness of the extent of the challenge. Furthermore, the SMARTCHAIN Innovation Platform represents an integrated knowledge platform for cooperation, co-creation, and innovation by digitally enabling the capacity building and engagement of relevant stakeholders along the agri-food chain.

3 Methodology and Work Plan

SMARTCHAIN develops a conceptual and operational framework for the comparative analysis of the 18 SFSC use cases. This central strategic approach involves farmers, consumers, researchers,

technology providers, policy, and the agri-food sector in evidence-based decision-making processes within a multi-actor environment (Fig. 4). In evaluation of the use cases, SMARTCHAIN’s co-creation methodology contains five phases:

- use of multi-actor workshops to refine results towards the needs of end-users under regional conditions,
- a multi-perspective analysis of SFSCs in terms of technological, non-technological innovation potential, social innovation, digital innovation, consumer perceptions, life cycle sustainability and their national/regional contexts in 7 EU and 2 associated partner countries,
- a compilation of available data on illustrative cases of different types of SFSCs

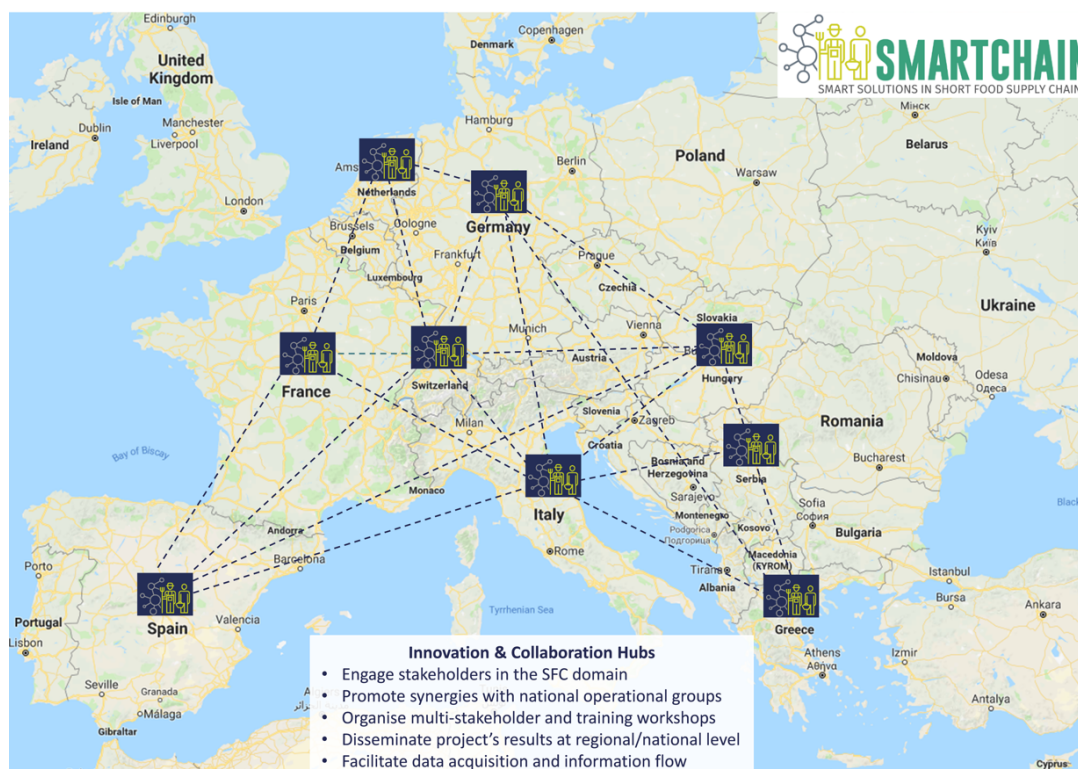


Figure 3: SMARTCHAIN 9 National Innovation & Collaboration Hubs on Short Food Supply Chains

throughout Europe,

- data evaluation performed by strengths, weaknesses, opportunities and threats (SWOT) analysis which includes context, intervention, mechanisms, and outcome and
- use of multi-stakeholder and training workshops for validation, dissemination and know-how transfer. The evaluation will allow concluding remarks on collaborative SFSCs in Europe and on possible policy options to support their development. The use of multi-perspective analysis makes it possible to disentangle the challenges of SFSCs concerning technological, non-technological and social innovations, on the one hand, and linkages with impact on different dimensions of sustainable food production and consumption (such as economic performances, consumer awareness and capacity building, sustainability, and food resilience) on the

other. This points out the innovation potential of the studied practical solutions targeted for SFSCs in urban, peri-urban and rural areas across Europe.

The comparison of use cases will offer insights into the role of region-specific (agricultural, environment and landscape), policy-specific (policies, regulations, institutions and governance structures), consumer behaviour-specific and cultural-civil society-specific factors in the development and operation of innovative solutions within SFSCs. This allows exploration of functions and identification of success parameters of innovative solutions at different territorial levels in relation to regional conditions and their future performance. Based on the selected use cases, a portfolio of innovations is analysed for potential impact on SFSCs. It is determined how they can be most beneficially incorporated and disseminated into regional and European-wide agricultural and

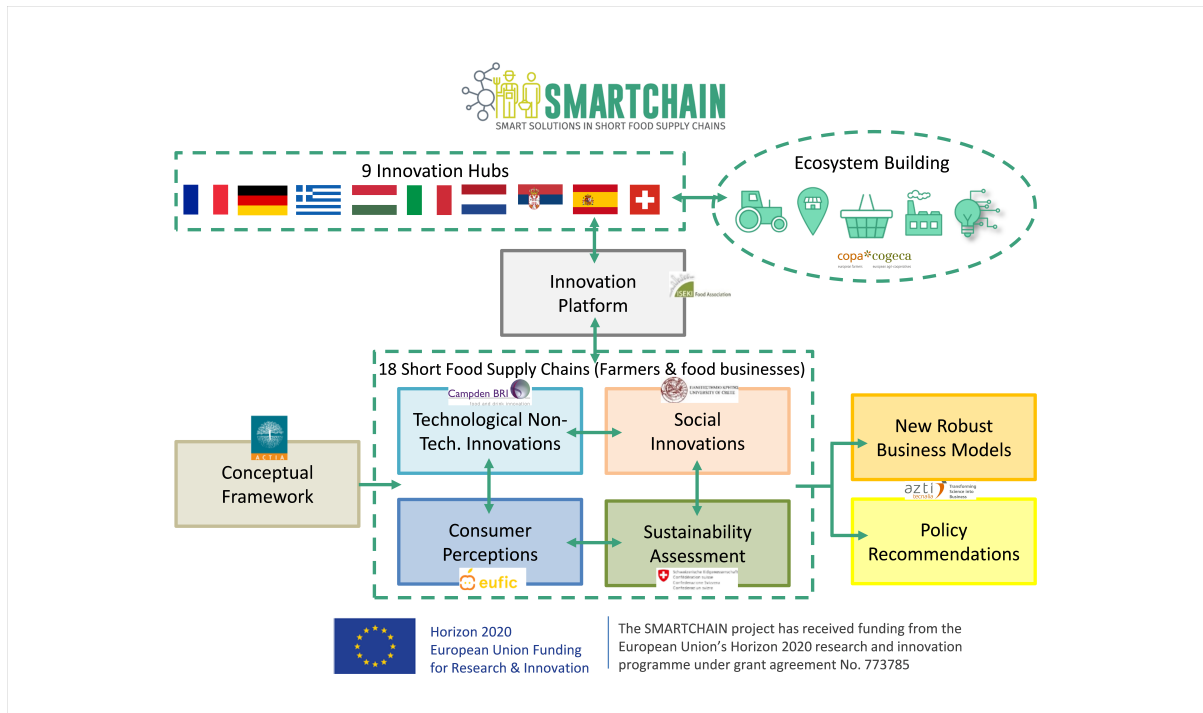


Figure 4: Conceptual structure and workflow of SMARTCHAIN

food production systems. Policy and business recommendations are developed to assure a governance structure and framework that is regionally adapted, thus enabling solutions which effectively contribute to rural development and improve resilience of European food systems.

4 Conclusions

The results of SMARTCHAIN help to unlock the potential for sustainability by providing a portfolio of innovations to practical problems in the short food supply chain domain, taking steps for a transition towards resilient agri-food value chains in Europe. The project engages with and impacts directly on actors at all stages in the agri-food chain, from farmers right through to consumers, contributing directly to policy formulation. Through the multi-sectoral and pan-European approach, SMARTCHAIN increases our understanding of the industry (farming systems and businesses across food production and

the whole supply chain) and citizen (consumer) behaviour in relation to SFSCs, local food production and beyond.

SMARTCHAIN focuses on creating successful business strategies and networking for entrepreneurship in rural areas underpinned by economics that encourages transfer and adoption by industry and social innovations. This strengthens the resilience of farming and food sectors towards shocks and at the same time, fosters their sustainable growth. An effective dissemination, exploitation and communication strategy, and different demonstration activities allow SMARTCHAIN to ensure that innovations are available to farmers, food producers, consumers and other stakeholders involved in the short food supply chain domain during the project lifetime and beyond via the SMARTCHAIN Innovation Platform.

This special issue focuses on the most recent developments with respect to innovation spanning technological, organisational, social, and digital solutions in short food supply chains and pub-

lishes original research articles in this field.

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Exploring Regulatory Obstacles to the Development of Short Food Supply Chains: Empirical Evidence from Selected European Countries

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Abstract

This paper explores the challenges in meeting the regulatory requirements of short food supply chains in 9 European countries based upon findings from the European H2020 3-year project “SMARTCHAIN”. The assessments of the barriers that small food producers face in meeting different regulatory requirements are presented. Drawing on the results of 10 multi-actor workshops that involved 124 participants, the most problematic policy frameworks for short food supply chains and key obstacles in different regulatory requirements are summarized. This research shows that current EU and national regulation is an obstacle to the development of short food supply chains, meaning that additional efforts are needed to tailor the regulations to small food producers involved in short supply chains. Furthermore, it is necessary to consider the introduction of more effective support measures for short food supply chains.

Keywords: Short food supply chains; Obstacles; Regulatory requirements; Policy support; SMARTCHAIN; H2020

1 Introduction

Short Food Supply Chains (SFSC) are increasingly identified as an important opportunity to create a sustainable change in food systems; at the same time, the concept of SFSC remains elusive. EU policy makers appear to increasingly draw attention to the role of SFSCs. In 2013, the European Commission identified some regulatory obstacles for short food supply chains but concluded that the existing and proposed EU rules provide for a “solid framework on the

one hand, and Member States and regions on the other hand to successfully support short supply chains” (European Commission, 2013). The overall findings of our research presented in this paper show that the main regulatory concerns raised in 2013 remain valid for SFSCs today. SFSCs aim at reducing the physical distance and increasing cultural and social proximity between small food producers and consumers (UNIDO, 2020). Due to progressive globalization, consumer scepticism about food quality and safety has grown over the past few decades, matched

by increasing demands for food safety, product diversity and quality of services and products (Toler et al., 2009; Vorst, 2000). Therefore, the SFSC represents one response of concerned consumers to the prevailing conventional global markets, which are characterized by standardized production and industrialized food (Galli & Brunori, 2013). An important feature of successful functioning of SFSCs is mutual trust. Trust drives solid relationships between small producers and consumers and overcomes consumer confusion, building new loyalty and fostering the progressive development of SFSCs (Giampietri et al., 2018).

SFSCs have not been defined at the general level in EU law; this is unlike, for instance, the detailed definitions for Small and Medium Sized Enterprises (Commission Recommendation, 2003). However, since 2013, the rural development legislation that is part of the Common Agricultural Policy uses the following flexible and encompassing definition: "a supply chain involving a limited number of economic operators, committed to co-operation, local economic development, and close geographical and social relations between producers, processors and consumers" (Regulation (EU) No 1305/2013). More specific EU legislation on rural development for the support of the establishment and development of short supply chains restricts this definition to one intermediary, while EU rules in other sectors such as labelling, hygiene, and unfair commercial trading practices use different concepts altogether, such as direct sale, small quantities, or a low annual turnover.

In the literature, a great variety and various classifications of SFSCs have been identified. UNIDO classifies SFSCs into the following: on-farm selling, farmers' markets, farmers' shops, box schemes, consumers-driven initiatives, public (collective) procurement, hotels, restaurants, catering (UNIDO, 2020). The European Network for Rural Development has identified three types of SFSCs: direct sales by individuals; collective direct sales and partnerships of producers and consumers (Peters, 2012). The EC IMPACT project, on the basis of the number of intermediaries, physical distance and organizational arrangements, proposed three types of SFSCs: face to face SFSCs, proximate SFSCs and

spatially extended SFSCs (Renting et al., 2003). SFSCs could be also classified in two broad categories: traditional SFSC, which tend to be farm-based and take the form of on-farm sales through farm shops or sales at producer markets and neo-traditional SFSC, which are more complex operations consisting of collaborative networks of producers, consumers and institutions, (European Parliament, 2016).

Considering the increasing demand of the population for healthy food, there is a trend of growing interest in SFSCs all over the world. More and more consumers tend to buy food products at local agricultural markets or directly on the farm (European Parliament, 2016). Therefore, SFSCs reflect the consumers' demand for quality and traceability, considering the alarming health crises in food markets (Aubry & Kebir, 2013).

There are numerous advantages of SFSCs over conventional food supply chains. SFSCs can reinforce a sense of the prevalence of the agricultural sector in a sustainable society and impact the social development of a region by preserving local communities and social justice. Additionally, SFSCs can have a positive effect on the environment due to greater number of interactions with final consumers by which they can adopt more reasonable agricultural methods and reduce the use of chemical products in the field upon the request of the end-users (Todorovic et al., 2018). As regards environmental impact, they can reduce resource use (such as fossil fuels or packaging), reduce food waste, promote less polluting production methods and reduce GHG emissions, carbon footprint, energy use and food miles (Jarzebowski et al., 2020). Regarding economic impact, SFSCs can contribute to reduce farmers' economic uncertainties, create new jobs in rural areas, increase food production quality and contribute to food safety. As for social impact, they promote more direct relations between producers and consumers, enhance trust within the value chain, foster social inclusion, promote a healthy diet etc. Overall, SFSCs may have a positive impact on sustainable development and the overall economy.

Notwithstanding the significant potential advantages, there are a host of societal, policy and other barriers that impede small farmers in the European markets. Regarding access to the mar-

ket and consumers, small farmers face numerous barriers among which Jarzebowski and Pietrzyck (2018) identified the following: poor internet network, weak IT systems, lack of affordable technical support, lack of knowledge of how to use social media, unreliable distribution, lack of communication skills in sales, inability to pay the cost of owning or renting store space, lack of skills and resources to submit an offer and meet the requirements, lack of bargaining power to challenge supermarkets in trade negotiations and poor organization compared to the professionalism expected by e.g., hotels. The lack of specific management and administrative skills represents an extremely important barrier that has been recognized by many researchers exploring this topic (European Commission, 2015b; Hyland et al., 2019). These shortcomings occur because farmers, in addition to producing foodstuffs, must perform a series of activities for which they do not necessarily have knowledge such as: marketing activities, creating and managing business strategies, distribution and selling activities, communication with customers etc. In addition to the lack of specific capacity and skills, regulatory issues also hamper SFSC. SFSCs are subject to numerous regulations including rules of hygiene, food safety, standards, taxation, certification, trading, etc. A substantial obstacle for an SFSC is the administrative burden associated with direct sales, in particular, the paperwork and costs linked to food hygiene legislation (European Parliament, 2016). Hygiene Regulations are often not adjusted to the specificities of SFSCs (Galli & Brunori, 2013). The implementation of the Hygiene Regulation in the EU favors larger players while on the other hand it marginalizes small producers and farmers, although some exemptions apply (Hyland et al., 2019). It means that some EU countries apply their own regulations and thus put their small farmers at a disadvantage compared to farmers from other countries. Small primary producers also face exclusion from public procurement contracts and other lucrative markets (Hyland et al., 2019). Labelling and procedures of getting certifications are also recognized as obstacles for small food producers (Kneafsey et al., 2013). Considering the variety of challenges that small farmers are facing in their businesses, the aim

of this paper is to explore the most important policy arrangement obstacles in different regulatory requirements of 9 European countries. The results are based upon findings from the European H2020 3-year project “SMARTCHAIN” (2018-2021), that gathers 43 partners from 11 European countries with the main aim to foster and accelerate the shift towards collaborative short food supply chains and, through concrete actions and recommendations, to introduce new robust business models and innovative practical solutions that enhance the competitiveness and sustainability of the European agri-food system.

2 Materials and Methods

2.1 Participants and Procedure

The SMARTCHAIN project was designed to follow a multi-actor approach. Within the project, 18 SFSCs were involved as case studies in 7 EU (Germany, Italy, Greece, Netherlands, France, Hungary, Spain) and 2 associated (Switzerland and Serbia) countries. Apart from the 18 SFSC practitioners, the consortium includes 25 partners from 11 EU countries (next to those already mentioned, Austria and Belgium are also involved) that are experts from universities, businesses, as well as their associations and cooperatives, non-profit organisations and governmental institutions.

In order to analyse SFSC-related policy framework in the 7 EU and 2 associated countries, multi-actor national workshops were carried out between 09 and 26 November 2018. In total, 124 actors, including selected case studies (18 case studies from 9 European countries), national project partners (from Germany, Italy, Greece, Netherlands, France, Hungary, Spain, Switzerland and Serbia) and external invited stakeholders from these countries knowledgeable about SFSCs, participated in 10 multi-actor workshops. The overview of workshop participants can be found on the Zenodo platform as an open dataset (Pestic, 2021). A Participant Information Sheet (containing the objective of the multi-actor workshop and ethics issues) and the Multi-actor Informed Consent Form were distributed to all attendees. In order to collect primary data, a stuc-

tured questionnaire was distributed to participants who were asked to write their answers to questions. In a preliminary analysis of the questionnaires, participants' answers were screened and cases with invalid answers were identified (blank or incomplete answers, obvious misunderstanding of questions asked). Aiming to collect missing data in the questionnaires, a second round of data collection was conducted and managed by hub managers in each participating country. National hub managers contacted participants of national multi-actor workshops and conducted interviews to clarify those parts of the questionnaire that participants had failed to complete. After the collection of the missing data, the questionnaires were analysed. Qualitative and quantitative data analyses were implemented. For quantitative data analysis, descriptive statistics summarizing data from the sample were used. For qualitative analysis, the inductive reasoning approach was used.

2.2 Questionnaire and analysis

The questionnaire was divided into two sections (Pesic, 2021). Section one consisted of four open-ended questions related to the policy environment of the country in which the participants carry out their activities. The questions were:

- What are your most problematic policy frameworks;
- What is the regulation/governance arrangement that is most important to the short supply chain aspect of your business;
- What is the regulation/governance arrangement that presents the most important obstacle to the short supply chain aspect of your business;
- What is the regulation/governance arrangement that present the best facilitation to the short supply chain aspect of your business? After each question, the space for written answers of participants was provided.

Section two included a part on the regulatory and a part on the institutional setting for SFSCs (Fig. 1). In the first part, the respondents were

asked to give their opinion about obstacles or facilitations in meeting regulatory requirements depending on personal experiences. To evaluate the regulatory environment for SFSCs, the following regulatory requirements were selected: labelling, nutrition and health claim, getting business licences and permits, food certificates, hygiene standards, marketing standards, water for production/processing, waste management and recycling, specific quality requirements, food contact materials, food safety, traceability, authenticity, transparency, transportation of goods, ethical food production, public procurements, purchasing equipment, implementation of any legislation, stay up-to date with legislations and employees recruitment. To evaluate the institutional setting, the respondents were asked to answer questions regarding obstacles or facilitations in getting funding for their business, in the payments of their goods, with the efficiency of using resources and with the accessibility of products to consumers. Each question was scaled on a five-point scale, from "great facilitation" to "great problem". A written explanation of the selected answer was mandatory.

Considering that the open questions resulted in unstructured text data, an inductive approach to the construction of classification categories was used. This approach aims to generate meaning from the data set collected in order to identify patterns, conclusions and final generalizations. We started from the assumption that the main issues cannot be determined in advance, due to different national environments and stages of development of SFSCs. Therefore, the frequency of occurrence of different topics was the main method for determining the final issues.

First, a detailed review of all answers to the open-ended questions was done, in order to notice the relevant content, with the recording of first impressions of the analyzed material. All topics that appeared in the answers were registered, and then during the next review, the number of topics was reduced, noting those that covered several aspects. Every response was analyzed one-by-one in order to be placed in the specific category. The process was repeated until the final issues were identified.

2nd part of the Multi-actor workshop		T1.4 Policy analysis at regional level						
A=case study 1, B=case study 2, Numbers=expert rating								
1 rating per expert and per policy category								
According to your personal situation, do you have...								
Policy topics - Meeting requirements for...	...great facilitation	...little facilitation	...no special remark	...little problem	...great problem	Please explain the facilitation (in bracket name and expertise of the expert):	Please explain the problem (in bracket name and expertise of the expert):	
...the labeling								
...the nutrition and health claims								
...getting the business license and permits issued by competent authorities								
...the food certificates (e.g. ISO 9001, ISO 22000, FSIS 22000, BRC Global Standard for Food Safety, IFS (International Featured Standards))								
...the implementation of different hygiene standards (HACCP, GAP, ...)								
...the marketing standards								
...the water for production/processing								
...the waste management and recycling								
...the specific quality requirements								
...the food contact materials (e.g. containers for transporting food, machinery to process food, packaging materials), the foreign body contaminants (physical, chemical, biological nature: e.g. paper, paint, glass, wood, stone, plastic, metal, human hair, part of insects, cleaning fluids, "wrong" food)								
...the food safety (contaminants, allergens, etc.)								
...the traceability, authenticity, food transparency								
...the transportation of goods, the cold chain and refrigeration								
...the ethical food production								
...the public procurements								
...purchasing equipment								
...the implementation of any legislation								
...for remaining up-to-date with legislation changes								
...employees recruitment								
According to your personal situation, do you have...								
Policy topics...	...great facilitation	...little facilitation	...no special remark	...little problem	...great problem	Please explain the facilitation (in bracket name and expertise of the expert):	Please explain the problem (in bracket name and expertise of the expert):	
...in getting funding for your business (subventions, grants, direct payments)								
...in the payments of your goods (late payments for perishable food products, last minute order cancellations, unilateral or retroactive changes to contracts, generally unfair trading practices)								
...with the efficiency of using resources								
...with the accessibility of products to consumers								

Figure 1: Section two of the questionnaire for exploring the most important policy arrangement obstacles in different regulatory requirements of 9 European countries

3 Results and Discussion

3.1 Most problematic policy frameworks

On the basis of inductive reasoning, the final issues were identified; the analysis showed that the most problematic policy frameworks for SFSCs relate to the following issues (Fig. 2):

- Insufficient policy support to SFSCs
- High level of bureaucracy
- Unfavorable subsidy policy

Insufficient policy support to SFSCs

A total of 35 percent of the respondents believe that local, regional or national governments do not provide sufficient support to small farmers and do not recognize their importance for the entire economy. Policy measures aimed at supporting small food producers are scarce. Respondents believe that the main reason for this situation is a focus on global trade and directing support to

exporters. Domestic small producers are not protected from imports of cheap products from third countries, which indicate that they are not sufficiently recognized, nor acknowledged in national policy frameworks.

Specifically, rural development programs are not suitable for SFSCs in most of the respondents' countries, and they are not adequately harmonized with the EU regulations for small farmers. The logistical support to SFSCs by supporting organizations (chambers of commerce, associations, clusters, local government agencies, etc.) is insufficient, which implies the necessity of introducing a more efficient system of support at all government levels.

The workshop respondents stressed the importance of strengthening institutional support for the development of new products, specifically they underlined the need for supporting measures aimed at strengthening the relationship between farmers and customers based on demand-driven production as well as measures aimed to enhance the soft skills of farmers.

Respondents also noted a lack of policy support for trading practices and direct sales. Some of

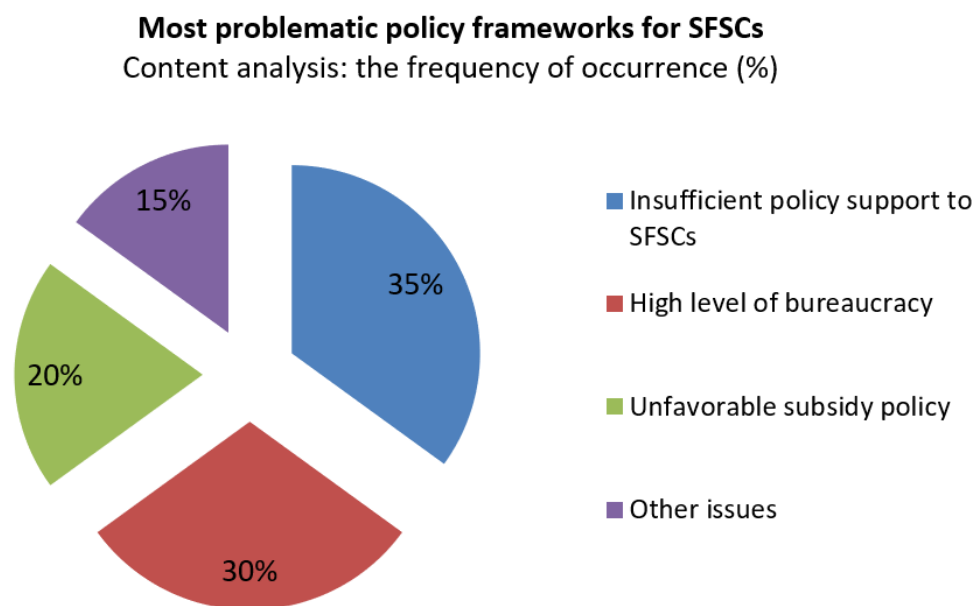


Figure 2: Most problematic policy frameworks for SFSCs, 9 and 26 November 2018

the specific challenges that small farmers are facing regarding trading practices are the following: late payments and a long billing period for food products which have a particularly negative effect on perishable products; generally unfair trading practices with no consequences for retailers; last minute order cancellations; unilateral or retroactive changes to contracts, etc.

High level of bureaucracy

More than 30% of workshop participants find that regulation is very complicated, not transparent and not tailored to small producers and farmers. With limited resources, SFSCs do not have capacities to deal with the regulatory complexity. They consider that there is an extremely high level of bureaucracy in the current regulatory frameworks. Some of the specific examples of complex regulations identified by the participants of multi-actor workshops are the following:

- HACCP standards are not totally applicable to SFSC. For example, some small producers complained that the hygienic regulations

define too small a quantity for marginal food production that is not economically sustainable for small farmers.

- Inconsistency and imprecision in determining product quality regulations.

Unfavorable subsidy policy

Unfavorable subsidy policies are stressed by 20 percent of workshop participants indicating that the subsidy policies are not focused on small farmers. However, in situations where there are support programs aimed at small farmers in the form of public calls, the small farmers do not have the capacity, i.e., do not have the knowledge and resources to apply for calls. Most respondents agreed that it is not difficult to get information about subsidies, grants or direct payments, the difficult part is to fulfil all the requirements that are associated with obtaining this funding. There is a generally low level of knowledge on how to prepare the application dossiers.

Policy instruments do not fit the needs of SFSCs. The local, regional and national sub-

sidy funds continually focus on new initiatives, instead of strengthening the existing ones. Therefore, these instruments disturb momentum rather than strengthening it.

3.2 Key obstacles in different regulatory requirements

This section provides an insight into the workshop participants' attitudes toward pre-defined aspects of regulatory requirements, with the main focus on the obstacles they face in their businesses. The participants expressed their opinion on whether they experienced any barrier in meeting the requirements for specific regulatory frameworks. Fig. 3 summarizes the attitudes of the workshop participants for each of 19 pre-defined regulatory frameworks. The sections below discuss the most salient areas as highlighted by the workshop participants in their written answers.

More than 70% of the workshop participants have experienced minor or major problems in meeting requirements for the following regulatory settings: implementation of legislation, traceability, authenticity, food transparency, nutrition and health claims and labeling requirements. The key causes for most of the problems are similar and can largely be reduced to the following: a lack of knowledge and unfavorable regulations. Obtaining knowledge about what needs to be implemented and finding out a definite list of the exact legislation that needs to be implemented is a challenge for most small food producers.

The legislation is confusing and difficult to understand by small firms, especially in the field of labeling and nutrition and health claims. There are constant changes which are confusing to small producers/processors. The cause of the problem can best be explained by quoting a workshop participant:

Legislation has over 40 pages but no practical examples and instructions. It would be useful if regulatory institutions would provide some kind of practical explanations for regulations they put forward.

Therefore, it is challenging for SFSCs to keep up with the new government legislation and changes to the present legislation. There is a lack of regular communication about changes and their explanation and there is a lack of a free advisory system or a central information platform that should serve small food supply chains in most of the countries from our sample.

Business licenses and permits

In total, 24, of 43 workshop participants pointed out that obtaining business licenses and permits represent a problem for their businesses. Except in samples of Switzerland and Germany, SFSCs from other partner countries have emphasized the problem of insufficiently transparent and clear licensing procedures which is a particularly significant problem for small companies that are just starting a business and do not have enough information and resources to address this issue.

Hygiene regulations

Implementing HACCP standards could be a big burden for small businesses and linked to huge costs. They are designed primarily for agri-industrial processes. Although the rules allow a flexible interpretation to lighten the burden for traditional products, this has only been used to a limited extent according to the workshop participants. In total, 21 of 46 workshop participants have experienced minor or major problems in meeting requirements for the implementation of different hygiene standards.

Food safety

Although more than half of workshop participants (in total 21 of 40) did not have any special remarks on the food safety requirements (contaminants, allergens, etc.), there were still considerable points made by participants from Italy, Hungary, Germany, and Serbia. In addition to the lack of knowledge and unfavorable regulations, they also stressed insufficient institutional support in meeting requirements for food safety, e.g., the Hungarian stakeholder faces the problem of expensive pesticide residue testing since there

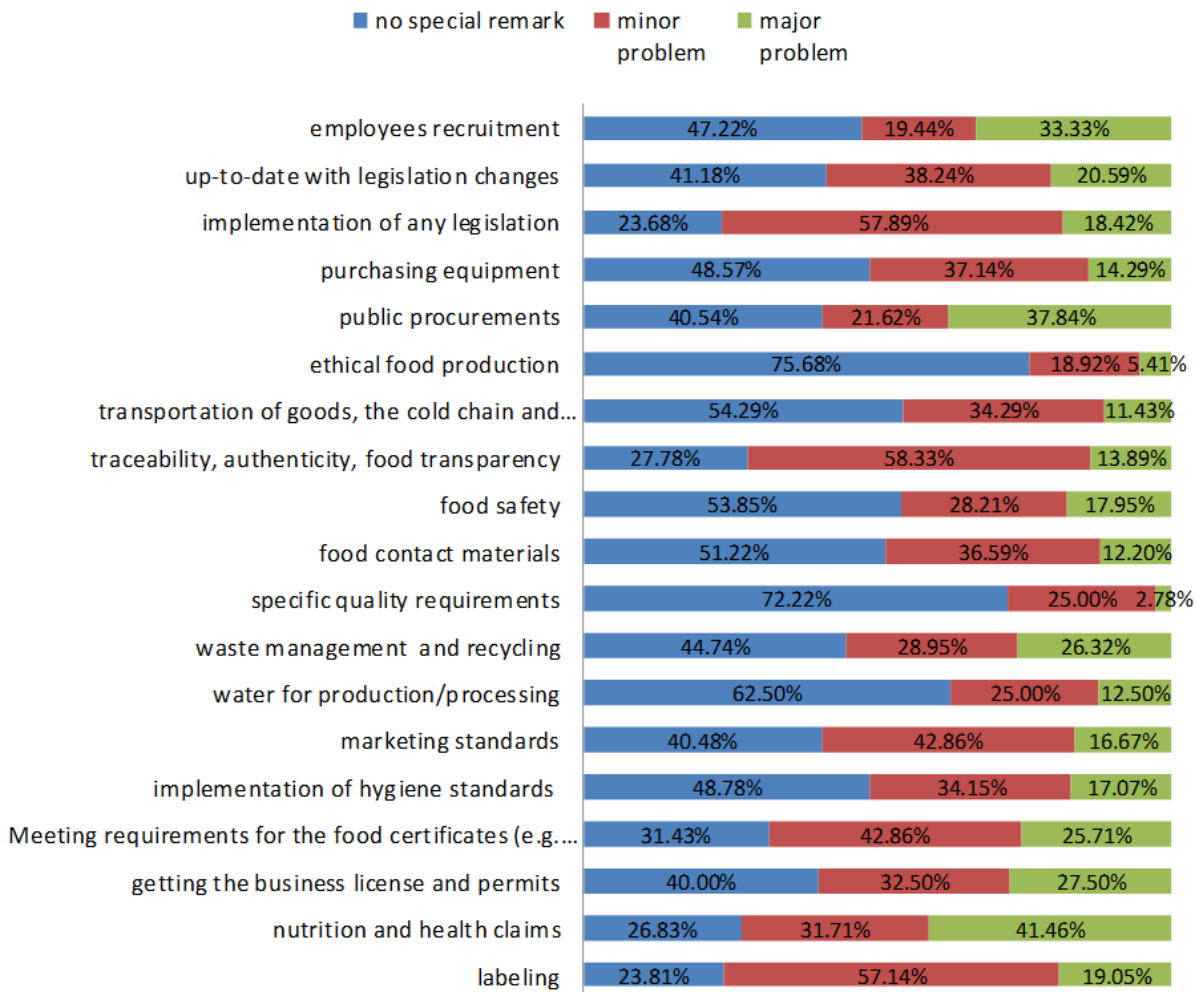


Figure 3: Difficulties of workshop participants in meeting the requirements for specific regulatory settings, 09 and 26 November 2018

isn't an accredited laboratory capacity available in this country.

Waste management and recycling

The problem of waste management and recycling is very different in each country and depends to a great extent on the degree of implementation of this practice in the entire country in general. Although, 17 of 40 stakeholders had no special remarks for waste management and recycling, there were still a considerable number of stakeholders who reported a minor or major problem in this area. Key challenges of 21 stakeholders in this area include the following issues: the lack of knowledge, low control in the presence of phytosanitary waste, low awareness on waste recycling, difficulties to keep up with frequent legislation changes and high costs of plastic waste management.

Public procurement

A considerable number of small farms and producers (22 workshop participants out of 37) have experienced great problems in meeting requirements for public procurement procedures. It is practically impossible for them to win the tenders in competition with much larger companies. The tender rules for SFSCs are perceived as unfeasible and unfair competition. In addition, the public procurement rules are also restrictive as to how social considerations can be used, for instance in how far public authorities can limit the open competition in favor of local production. Participants expressed that there has not been enough support from governments in most of the partner countries in this field so far.

Labeling and claims

Most workshop participants (32 of 44 or 76.19%) have indicated meeting requirements for labeling as problematic. The main challenges that small farmers/food processors have faced in this area include: lack of knowledge/expertise, confusing, broad and restrictive legislation, lack of a free advisory system in labeling and high costs.

3.3 Discussion of the findings

The survey indicates that there are systemic grievances by SFSC about policy support and about more specific regulatory frameworks. One explanation for this dissatisfaction is that most policy frameworks do not deal with the category of SFSC food system participants specifically, and by consequence, adequately.

The fact that SFSCs are linked to a diffuse set of special characteristics, such as specific social embedding, local character of production, closeness to the consumer, artisanal production, and/or limited size make the concept difficult to capture in one definition. For some regulatory contexts, an open definition is most adequate, such as the one adopted under the overarching rural development policy framework as "involving a limited number of economic operators, committed to co-operation, local economic development, and close geographical and social relations between producers, processors and consumers" (Regulation (EU) No 1305/2013 (European Commission, 2013)). By contrast, the EU legislation on rural development for support for the establishment and development of short supply chains is much more restrictive, limiting it to "supply chains involving no more than one intermediary between farmer and consumer" (Commission Delegated Regulation (EU) No 807/2014 (European Commission, 2014)). A flexible definition is capable of capturing the diversity of SFSC, while a narrow definition can be over-exclusive of certain types of SFSC and possibly explain some complaints about the policy frameworks.

A number of legal frameworks create exemptions and flexibilities that are specifically pertinent to SFSC. A main example is the EU hygiene framework. It contains no definition of small food businesses, and no specific requirements are applicable only to them. Nevertheless, there is a complex web of flexibility provisions (Lawless, 2012). Exclusions from the applicability of the Directives exist for direct supply, by the producer, of small quantities of primary products to the final consumer or to local retail establishments directly supplying the final consumer 'primary products' meaning products of primary production including products of the soil, of stock farming, of hunting and fishing, such as eggs, vegeta-

bles or fruit. In addition to this exclusion, Member States may deviate from certain provisions, under specified circumstances. Finally, Member States may adapt requirements laid down in the Annexes of the hygiene package in specific circumstances and adopt national measures adapting, for instance, the requirements for traditional methods or regions with special geographical constraints, or the construction, layout, equipment of establishments. While the legal framework contains several layers of flexibilities, based on our findings, these appear unsuccessful in meeting the needs of SFSC. Instead, the flexibility introduces an additional complexity that may be difficult to handle for SFSC. In addition, it is questionable that the Member States make optimal use of the flexibilities provided; national inconsistencies and incorrect usage of adaptations were noted by the Food and Veterinary Office of the European Commission (2015a). Finally, while there are ad-hoc flexibilities, these are not consistently targeted at SFSC, and the European Commission has never used the possibility afforded it under the Hygiene Regulations to adopt measures to derogate from the HACCP obligations for “small businesses”.

A similar situation exists within the EU labelling law: there is some facilitation for small producers and processors. Foods that are packed on the sales premises at the consumer’s request or prepacked for direct sale are exempt from certain labelling requirements, notably the inclusion of mandatory food information directly on the package.

The various legislation that impacts SFSCs capture short supply chains on an ad-hoc basis and use distinct connecting factors such as the nature of the production (primary production), type of sale (direct sale for food information, or one intermediary for regional development), turnover, or other criteria.

An exception to this overall assessment is the introduction of the Unfair Trading Practices Directive, UTDP, (2019) that will apply as of 2021 (and is therefore not reflected in the workshop findings). The Directive addresses the inferior power position of small food businesses particularly, although it is important to note that this concentrates on the notion of small businesses and loses some nuance of the SFSC concept. The

Directive prohibits certain unfair trading practices of agricultural and food products towards economically weaker suppliers. In characterizing the protected businesses, the UTPD relies on the relative economic relationship between supplier and buyer as measured by turnover; for instance, suppliers which have an annual turnover not exceeding EUR 2 000 000 to buyers which have an annual turnover of more than EUR 2 000 000 (Schebesta et al., 2018). The legal framework was conceived as a protection of farmers/primary producers, but the protection afforded is more akin to protecting SME companies than SFSC specifically.

Overall, the insufficient structural attention to SFSC within current legal frameworks can be used to explain policy deficiencies, dissatisfaction about the rules, and bureaucratic overload alike. Recent policy developments at the EU level do not emphasise the role of SFSC in a food systems transition as much as one might have expected. In May 2020, the European Commission published the new Farm to Fork (F2F) Strategy (European Commission, 2020), which has as its objective a major sustainability overhaul of the EU food system. The F2F Strategy endorses short, regional and/or short supply chains as a way of creating a more resilient food system and in order to reduce dependence on long-haul transportation but remains silent as to how this would be achieved. It is questionable how such ambitions will translate into practice, as they are not matched with concrete legal actions (Schebesta & Candel, 2020). The commitment to SMEs, by contrast, is more explicit, with a commitment to foster “tailored solutions to help SME food processors and small retail and food service operators to develop new skills and business models, while avoiding additional administrative and cost burdens.” The F2F Strategy, however, does foresee legislative initiatives to enhance cooperation of primary producers to support their position in the food chain and non-legislative initiatives to improve transparency. This may benefit those SFSC that are primary producers incidentally but is not related to their status as SFSC. This ties in with the relevance of the outcome of the post-2020 Common Agricultural Policy (CAP) - although unclear, initial policy positions seem to indicate that support for SFSC in the scope of

the CAP will remain within the realm of Member States and not be subject to streamlined policy efforts at EU level within that framework. During the implementation of the F2F Strategy, the legislative initiatives could have gone further in strengthening the category of SFSC within the EU food system, and streamlined this protection with eventual support deriving from the post-2020 CAP.

4 Conclusions

This article examined the most important regulatory barriers that small food producers face in their day-to-day operations, with particular focus on SFSCs. Considering that the agri-food sector is strictly regulated, SFSCs are subjected to the whole system of regulation requirements. This research showed that, although there are certain differences between individual European countries, regulations represent a significant constraint to the development of SFSCs. It turned out that the participants largely believe that the regulation was mainly created for industrial companies and not tailored to farmers and small food producers that are involved in SFSCs.

Regarding the ability of SFSCs to meet different regulatory requirements, it was shown that the main problem small food producers face is the lack of knowledge and expertise to deal with regulatory issues. Small producers lack internal resources to deal with the bureaucratic procedures imposed by various regulations. However, not all the regulatory requirements represent the same level of barrier to the development of SFSCs. The results indicate that the most important obstacles are the regulations in the areas of labelling, nutrition and health claims and traceability, authenticity and food transparency.

Although some progress has been achieved in recent years, this research has shown that SFSCs are still not sufficiently recognized and supported by the policy instruments in most European countries. The bureaucratic procedures are complicated and not tailored to SFSCs. There is a need to provide more efficient institutional support to SFSCs, which includes advising, counselling, training, administrative consulting etc.

There is a certain gap in the implementation of

EU regulations at the national level, which implies that some EU member states do not adequately implement the measures prescribed by the EU regulations. This gap is even more evident for non-EU members. At the EU level, both the diversity of applicable EU legal frameworks as well as the European Commission's Farm to Fork policy strategy do not consider SFSC systematically and coherently, thus failing to facilitate their role in a future EU food system.

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- Ph. D

Application of Digital Solutions to Improve the Operation of Short Food Supply Chains

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Abstract

Short food supply chains (SFSCs) are today widely promoted due to the positive impact on social, economic and environmental sustainability. However, short chains face several specific challenges (e.g., meeting the requirements of consumers and ensuring optimal operations). The application of innovative solutions and digitalisation can support the actors of SFSCs to achieve these goals.

Solutions and methods were collected based on the innovativeness and applicability of SFSCs. Systematic analysis of the needs of SFSCs for technological and non-technological innovations was carried out by partners of the SmartChain project. Based on the research, recommendations were made for the participating SFSCs regarding potential innovations.

A significant proportion of the identified solutions have digital elements that were collectively assessed as a suitable solution in the case of the studied SFSCs. The current work provides an overview of the potential implementation of the collected innovative solutions having digital elements and addresses the primary needs and issues of SFSCs where the application is relevant. Highlighted areas of performance are marketing, communication, packaging and labelling, and logistics.

Keywords: SFSC; Innovation; Digitalisation; Digital solution

1 Introduction

Digitalisation and the application of related technologies have a massive impact on the economy and processes globally. However, the digitalisation process in the agri-food sector needs support due to the sector's special characteristics. SFSCs have a significant role in the transition towards the creation of a sustainable food system in the European Union. Therefore, exploitation of the opportunities provided by these emerging technologies is of great importance to improve the competitiveness of SFSCs.

According to the European Union's rural development regulation, "short supply chain means a supply chain involving a limited number of eco-

nomic operators, committed to cooperation, local economic development, and close geographical and social relations between producers, processors, and consumers" (REGULATION (EU) No 1305/2013 of 17 December 2013).

Short food supply chains (SFSCs) are coming into focus nowadays as an alternative to the conventional long food chains and to satisfy the increasing consumer demand for the products and services of SFSCs (Aggestam et al., 2017; Varsányi et al., 2020). However, SFSCs are still being labelled as a niche market for conscientious consumers (Aggestam et al., 2017).

An SFSC contributes to closer communication and increased collaboration and community building thus strengthening local identity (Vit-

Nomenclature

SFSC Short Food Supply Chain

TECI Technological innovations

NTI Non-technological innovations

tersø et al., 2019) and supporting rural communities and food culture, social sustainability and tradition.

Today, the food system faces significant social, economic, and environmental challenges (Vittersø et al., 2019), including the lack of trust among actors in the food chain, unfair distribution of incomes (Short Food Supply Chain, 2019), overuse of land and water resources, biodiversity loss, pollution, climate change and food waste. SFSCs could contribute significantly to the solution of issues related to these challenges. Global challenges faced by the food industry can be met with the support of information technologies (Demartini et al., 2018).

SFSCs are widely promoted since they are considered important actors for the sustainable transition of the food system. Nevertheless, instead of replacing long chains with short chains, the co-existence of the different food networks is present in the agri-food sector (Thomé et al., 2021).

Sellitto et al. (2018) studied the critical success factors of SFSCs, in other words, adopting procedures that enhance value and promote local characteristics. The identified success factors included environmentally friendly operations, direct and ethical relationships between producers and consumers, food safety and traceability, and cultural heritage. The study also found that despite producers having strived to embrace cultural changes through SFSC implementation, the primary motivation is still economic, in other words, cutting costs of transportation and eliminating intermediary agents that posed heavy operational expenditures to the food supply chain. Several types of short food distribution channels exist, including traditional, direct ways (e.g., producers' market, on-farm sales and pick your own) and innovative new methods (e.g., online

platforms) besides the long, conventional mass food distribution channels (Malak-Rawlikowska et al., 2019).

Depending on the product, distribution system and network characteristics, SFSCs can have several logistics solutions. Specific weaknesses identified by previous research, such as organisational and coordination difficulties and high logistics and transportation costs compared to conventional distribution, can be mitigated through logistics improvement. Potential ways for improvement can be optimising the location of supply chain nodes, improving distribution routes, restructuring the supply chain and making environmentally sustainable food distribution choices (Paciarotti & Torregiani, 2021).

SFSCs are often developed and implemented by local and small actors with limited IT knowledge (Paciarotti & Torregiani, 2021). Though smart farming has had appreciable attention in the past years, the integration of digital technologies in SFSCs has not yet been achieved (Lioutas & Charatsari, 2020). The study of Lioutas and Charatsari (2020) showed, though SFSCs participants have positive attitudes towards smart technologies (e.g., use of connected farm machinery, sensor networks, Internet of Things (IoT), automation systems, farmbots and drones), smart farming is considered a threat to both the quality of the farmer-consumer relationship and the optimally distinct character of SFSCs. SFSCs represent an alternative to "industrialised agriculture" and customers consider smart technologies as belonging to the "industrialised universe", thus estranging consumers who prefer the unconventional character of short food schemes. Their findings also indicate the need for policies to support investment in the development of lower-scale smart technological solutions for farmers

who follow alternative production and/ or distribution routes.

2 Materials and Methods

A systematic analysis of the needs of the SFSCs for technological and non-technological innovations was carried out.

The 18 case studies involved in the SmartChain project provided detailed information on the explicit needs of SFSCs and the developed or applied innovations. Primary data collection was based on a questionnaire consisting of 3 parts:

Part 1 consisted of general information on their activities (entity types, products, services).

Part 2 was a thorough description of the actual operation of the SFSCs selected as case studies through 12 questions. This part of the questionnaire collected information on:

- the main and side activities, and the efficiency of those activities,
- the explanation of the applied innovations,
- issues to be solved,
- IT system,
- experiences and difficulties in the application of innovative solutions,
- resources used for the application of innovative solutions (human, financial and other resources),
- unsolved problems and their causes.

Part 3 described the planned innovations to improve or upscale the activity and sources of innovations.

The annex of the questionnaire served as a basis for identifying innovative solutions. A template for “Short summary findings on SmartChain case studies” has been elaborated to analyse the filled-out questionnaires. The project partners analysed the questionnaires in an agreed and unified way using the template.

Technological (TECI) and non-technological (NTI) innovations have been collected and described based on the survey results and an analysis of the literature. These innovations can be

used to solve the problems of SFSC actors and enable their development plans. Figure 1 shows the process flow for preparation of the inventories with links to the work packages of the SmartChain project:

WP1 Conceptual and analytical framework,

WP2 Technological and non-technological innovations,

WP3 Social innovations,

WP4 Food- related consumer behaviours,

WP5 Integrative sustainability assessment,

WP6 Innovation platform,

WP7 Business and policy recommendation,

WP8 Dissemination, communication and exploitation,

WP9 Coordination and management.

2.1 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 from the 18 cases of SFSCs from 9 countries participating in the project through a questionnaire survey: Switzerland (Biofruits, Chevrément Bon), Germany (Landwirtschaftskammer Niedersachsen, Solidarische Landwirtschaft), France (Association Gersoise pour la Promotion du Foie Gras, Couleurs Paysannes), Greece (Gaia, Allotropion), 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).

Based on the similarities and gaps between the research and innovation needs of the food chains in general and the specific, exact requirements of the SFSCs represented by the case studies, the

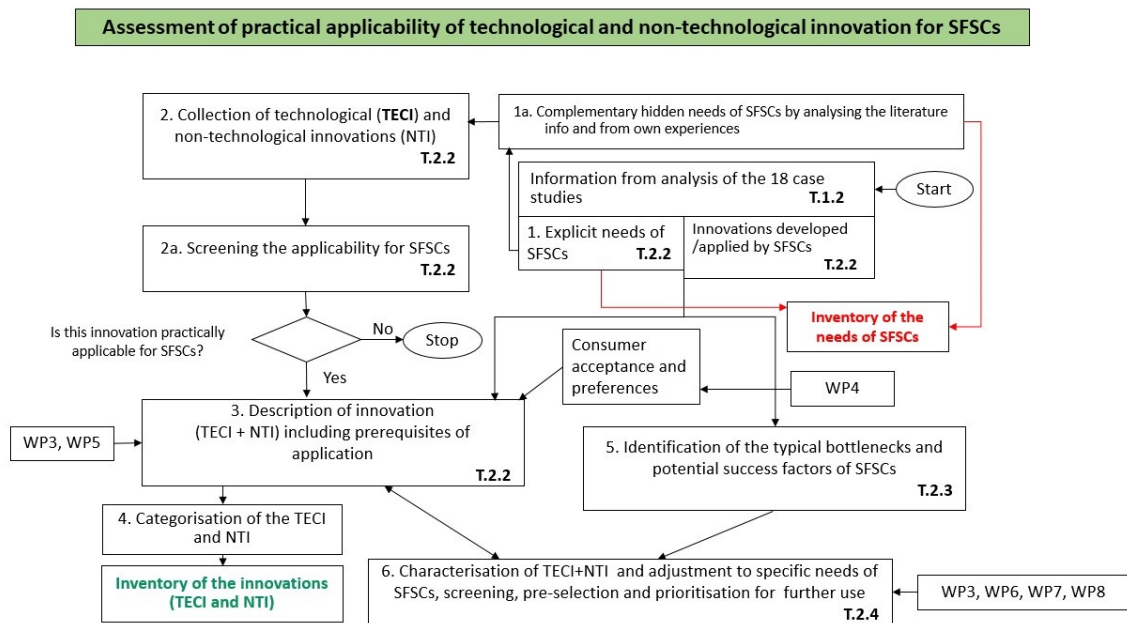


Figure 1: Process flow for preparation of the inventories

potential hidden needs of SFSCs were identified in addition to the explicit needs. The explicit and hidden needs were organised into an inventory of needs of the SFSCs.

2.2 Collection and description of technological and non-technological innovations for SFSCs

Innovative methods, solutions and systems were collected based on the innovativeness and applicability of SFSCs by using a template from a wide range of sources, including the 18 case studies in the SmartChain project, the knowledge and experiences of the project partners participating in this task, publicly available information, literature review, results of other projects such as SKIN (2019), TRUEFOOD (2010), I-CON (2019) and CapinFood (2014). Technological (TECI) and non-technological innovations (NTI) were described for the individual steps of the SFSCs and SFSCs as a whole and for the

needs of consumers and chain actors.

The short summaries were used to identify those innovative solutions developed by the case studies to tackle their problems and to improve the performance of their SFSCs. Additional innovative solutions were also collected to tackle those problems described by the cases that were not known, nor mentioned nor used by the cases, and for the hidden needs of the SFSCs.

2.3 Descriptions of each specific innovative solution, which were kept after the first screening

The critical information on each innovative solution was described and the description of these innovations were organised into an inventory of innovative solutions following the structure of 9 subtasks.

T2.2.1 Agriculture and primary production

T2.2.2 Food safety and hygiene aspects, and regulatory issues related to technological and non-technological innovation

T2.2.3 Food quality aspects

T2.2.4 Food preservation and other processing technologies, including preservation of freshness and nutritional value, and packaging form

T2.2.5 Logistics, accessibility of the product and short food chain channels

T2.2.6 Food integrity, traceability, transparency, certification, voluntary labelling, food chain management and networking

T2.2.7 Marketing concepts and communication tools

T2.2.8 Structural and economic aspects, enhancing collaborative short food supply chains

T2.2.9 Modern information and communication technologies (ICTs)

A brief description tool of innovative solutions was prepared for each innovation, which contained:

- the reference number of the subtask,
- reference to the analysed case study or source of information,
- the title of the technological or non-technological innovation,
- prepared by,
- the description of the need or problem,
- the description of the technological and non-technological innovation.

2.4 Categorisation of TECIs and NTIs into the overview matrix

The collected innovations were categorised as those that serve the needs of the consumers (food safety, food quality, trust, ethical aspects, accessibility) and the needs of the chain actors (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 different individual steps of the SFSCs (farming, primary production, transport, processing and packaging, storage, logistics, sale) and to the food supply chain, as a whole (product integrity/authenticity, transparency, marketing concepts, food chain management and networking for enhancing co-operation among chain actors, business modelling, policy environment, legal requirements, labelling).

The availability of the appropriate innovative solutions for the different needs of the SFSCs was reviewed and the gaps were identified.

Based on the analysis of the short summaries, typical problems and needs of SFSCs were identified. Altogether, 129 innovative solutions were identified that were collected into the inventory of innovative solutions.

3 Results and Discussion

3.1 Proportion of innovations having digital elements

Fifty of the collected 129 solutions have digital features, representing 38.6% of the innovations. Figure 2 shows the proportion of digital solutions by subtask. They represent a significant part in agriculture and primary production (55.5%), food quality (61.5%), logistics (33.3%) and marketing concepts and communication tools (33%).

3.2 Applicable innovative solutions having digital features by the individual steps of the SFSC

At different stages of the SFSCs, specific innovations could be applied. The proportion of innovative solutions having digital features by the individual steps of the SFSC can be seen in Figure 3.

A significant amount of the solutions can be used in sales processes (29), followed by food chain

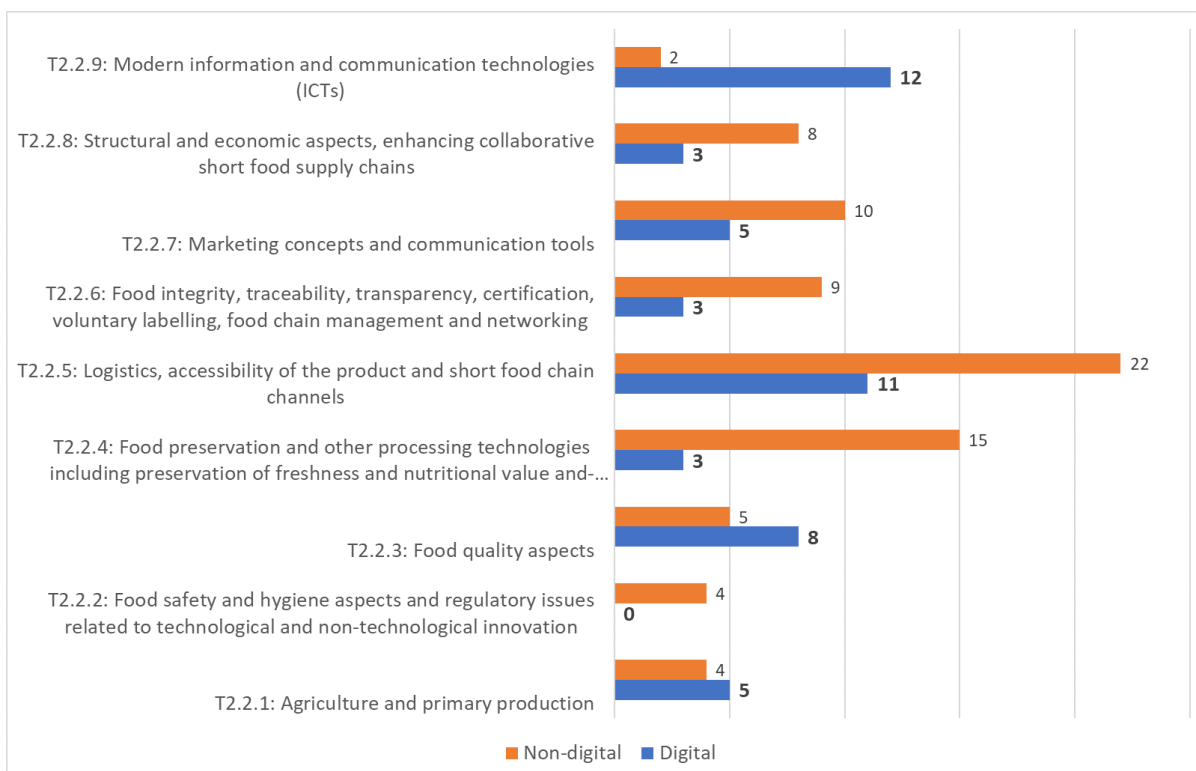


Figure 2: The proportion of digital and non-digital solutions by subtask

management and networking for enhancing cooperation among chain actors (26). Numerous digital solutions support the communication between actors represented in these categories. These are followed by applications for logistics (15), storage (15) and innovations related to marketing concepts (15).

3.3 Fulfilling the needs of the chain actors using innovative solutions having digital features

The proportion of innovative solutions having digital features by the needs of the chain actors can be seen in Figure 4. The highest amount of the opportunities is related to food quality (35), followed by access to markets and consumers (27), trust (24) and accessibility (20). A high proportion of innovations easing information flow

between SFSCs and consumers can be observed in the latter three categories.

Food quality as one of the main issues in the food sector is highly represented (24%) though only 6% of the innovations provide solutions regarding food safety. Food safety is the most critical topic for every actor in the food ecosystem, therefore mostly conventional solutions are applied in this field according to regulations at national and international level. There is a development in this direction (novel technologies in sensing, application of IoT systems), however, in the case of the current inventory of solutions, the proportion of innovations is low (6%).

3.4 Recommendation of solutions having digital elements

Ninety-eight from the current 129 innovations of the “Inventory of TECIs and NTIs” were used

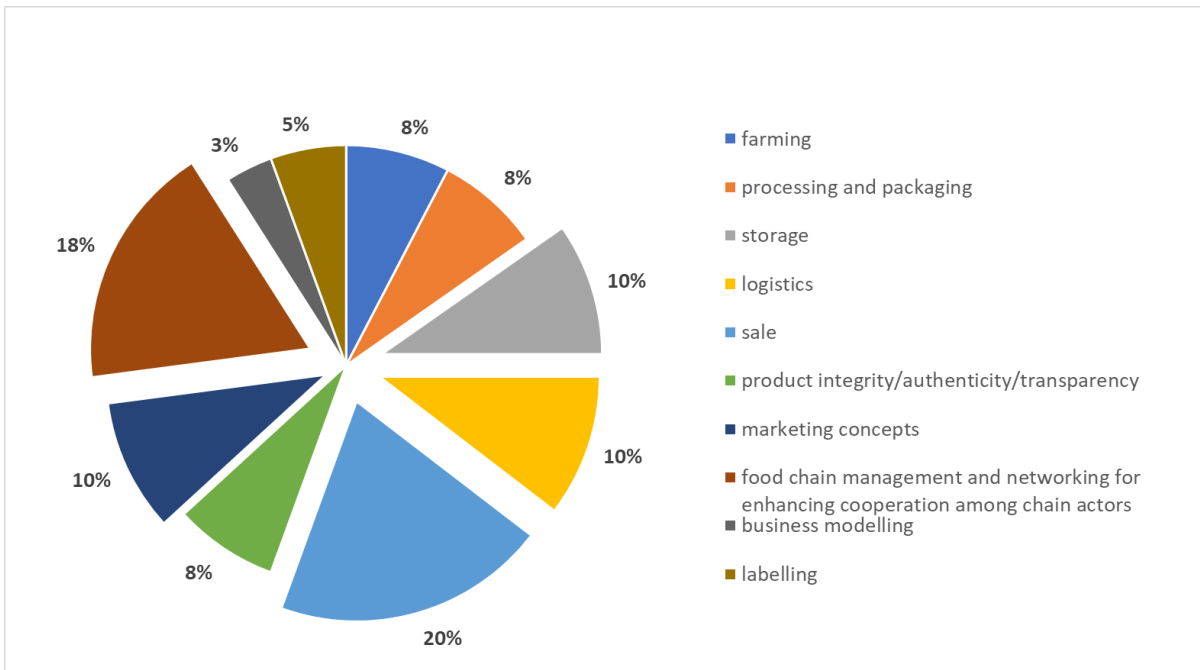


Figure 3: The proportion of innovative solutions having digital features by the individual steps of the SFSC

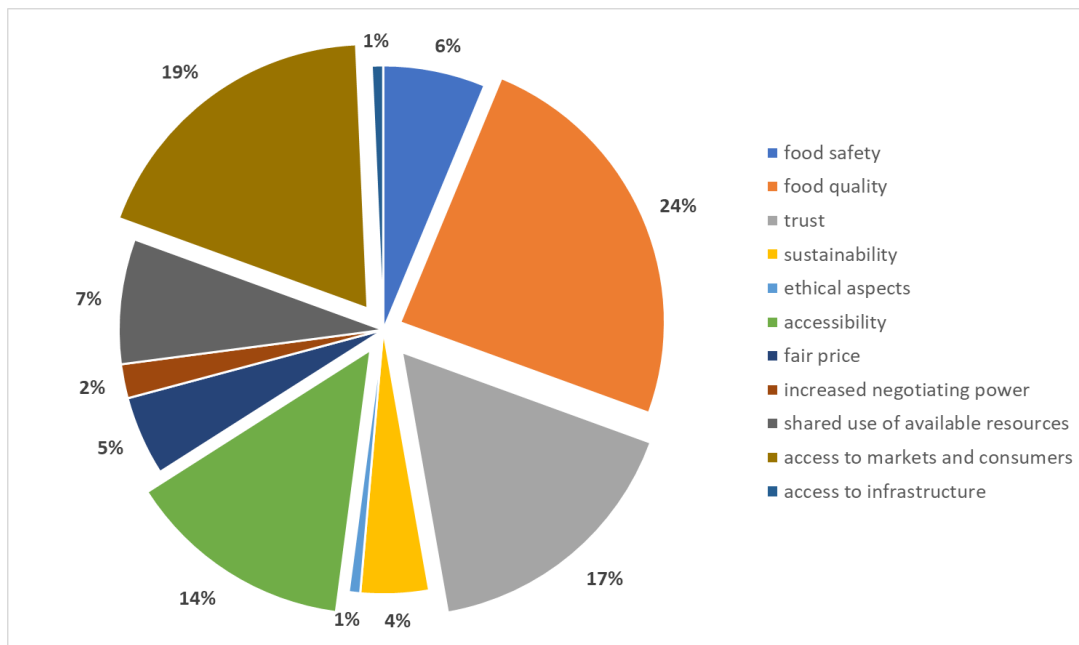


Figure 4: The proportion of innovative solutions having digital features by the needs of the chain actors

Table 1: The most frequently proposed digital innovations for the 18 case studies

Reference and title from the inventory	Number of presences
T2.7.1D Social media marketing	15
T2.5.5D Diverse direct marketing	10
T2.3.13D Food labelling and nutritional analyses without lab tests	8
T2.4.14D Biodegradable active packaging	8
T2.6.2D Platform for Short Food Supply Chains	8
T2.7.3D Marketing tools	8
T2.3.11D Temperature Monitoring Labels	7
T2.5.2D Multi-channel sale	7
T2.5.22D Involvement of the consumers	6
T2.8.12D Platform in collaboration	6
T2.9.3D Smart label	6

and proposed for the 18 case studies to operate more effectively and innovatively, including 34 innovations having digital elements. There are innovations that may be widely applicable and can offer a solution for many SFSC organisations.

The most frequently recommended digital innovations are summarised in Table 1. Among the most frequently recommended solutions, there are different marketing tools and concepts (T2.7.1D Social media marketing, T2.5.5D Diverse direct marketing, T2.7.3D Marketing tools) which can be broadly and universally applied. A trustworthy company identity can be created through their implementation and a high number of consumers can be reached at a cost-efficient price.

Many of the solutions (T2.5.5D Diverse direct marketing, T2.5.22D Involvement of the consumers) can help to overcome some of the identified problems of the SFSCs, including the poor direct access/links to consumers, in other words, low awareness and lack of trust of consumers.

A specific aspect regarding SFSCs is the logistics due to the geographical proximity and the limited number of intermediaries. Several solutions have been proposed to support these processes by tracing and monitoring the parameters of containers or products (T2.9.11.D Babbler, T2.9.13D Tsenso, T2.9.10D PerishABLE) or by enabling proper information flow management (T2.9.12D Qifresh).

Packaging and labelling were also important ar-

eas where several solutions can be implemented (T2.3.13D Food labelling and nutritional analyses without lab tests, T2.4.14D Biodegradable active packaging, T2.3.11D Temperature Monitoring Labels).

Digital solutions can ease communication and collaboration between the actors of SFSCs and support the empowerment of communities. The unity of small producers enables a common strategy for marketing and logistics, and eases access to consumers. One of the identified main hurdles of SFSCs, the low negotiating power, can be overcome by the organisation of communities and collaboration.

4 Conclusions

SFSCs have a highlighted role within Europe in the transition towards a sustainable food system, preserving cultural heritage and the development of rural areas. Nowadays, there is a growing number of innovative solutions in the agri-food sector that can be adapted in the case of SFSCs. The promotion of the short supply chains needs effective methods which can be easily adapted and accessible for small-scale producers. The appearance of digital technologies enables significant development in many sectors. Additionally, in the prepared inventory of technological and non-technological innovations, there are several examples of innovations that can be implemented without considerable investment or expertise.

The awareness-raising actions are essential to the actors of the SFSCs regarding the opportunities these innovations can provide to increase the competitiveness of SFSCs. The inventory of technological and non-technological innovations collected in the framework of the SmartChain project can be a practical tool for the improvement of SFSCs and to find answers to the most problematic questions of actors. It is continuously updated and available on the website of the project: <https://www.smartchain-platform.eu/en/innovation-inventory>.

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Further information is available on the SMARTCHAIN online platform:

<https://www.smartchain-platform.eu/>.

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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

Nomenclature

BN	bottleneck	SFSC	Short Food Supply Chain
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, en-

trepreneurs, 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 SFSCs 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 Horizon 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 (Landwirtschaftskammer 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,

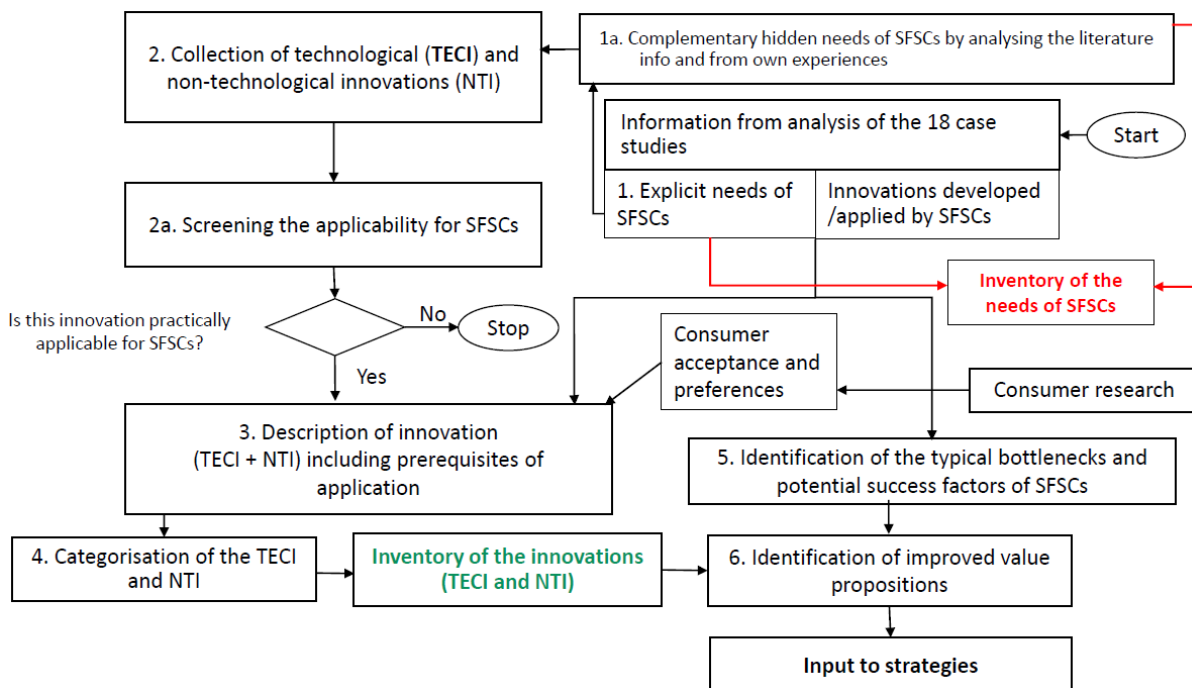


Figure 1: Process flow of preparation of the inventories and the upgraded value propositions

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), TRUE-FOOD (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 fac-

tors were collected from individual steps of the SFSCs, and the SFSCs 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 to the 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-

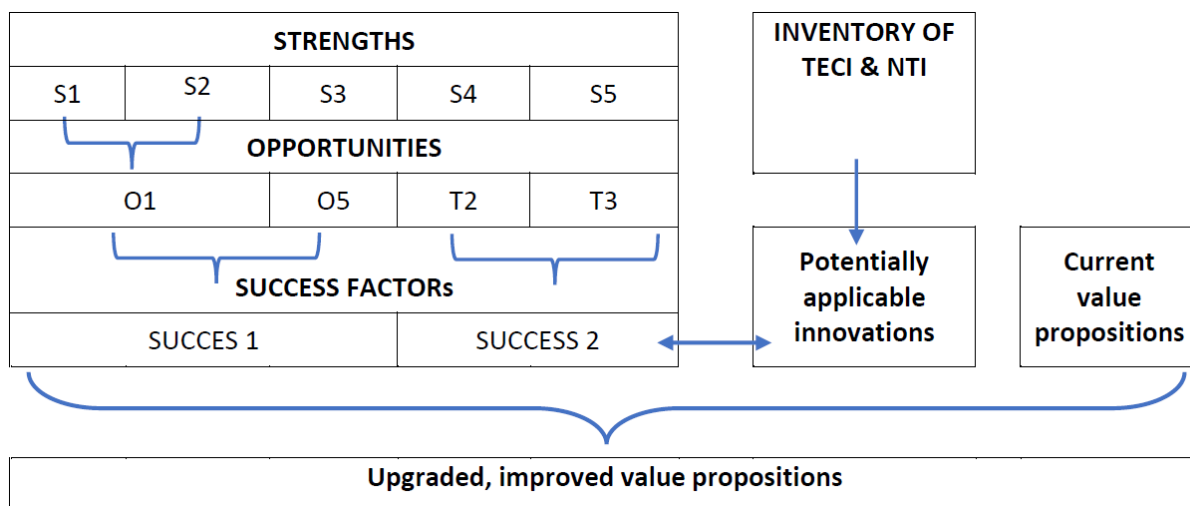


Figure 2: Method of identification of the success factors, potentially applicable innovations to enhance their exploitation, leading to upgraded value propositions

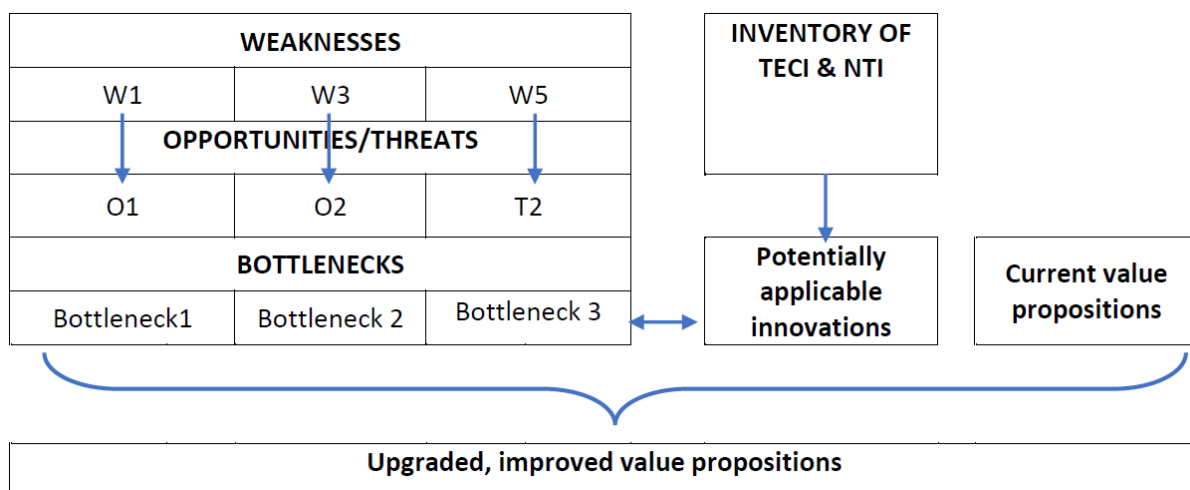


Figure 3: Method of identification of the bottlenecks, potentially applicable innovations to eliminate or reduce them, leading to upgraded innovations

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						
	fair price	Relatively high price – low adaptability to price competition						
needs of the chain actors	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						

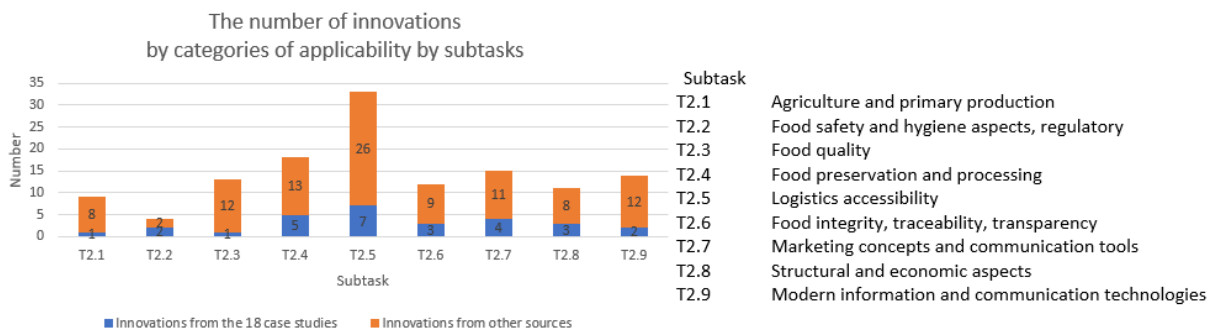


Figure 4: The number of innovations by categories of applicability

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 with 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.

Chiffolleau 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 TSFSCs 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 SFSCs, 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 SARS-COV-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 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 the next generation. To operate a sus-

tainable 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 SFSCs. 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:

<https://www.smartchain-platform.eu/>.

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Understanding Social Innovation in Short Food Supply Chains: An Exploratory Analysis

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Abstract

Short food supply chains (SFSCs) are alternative food chains that have gained ground and contribute to the global food system's sustainable transition. To explore how to enhance their capacity to act and benefit society at large, we turned to scholarly and policy work on Social Innovation (SI). We concentrated on understanding what SI in SFSCs is and how it may stimulate their potential, following a two-phase approach. In Phase 1, employing a two-step systematic literature review, we generated a rich database of SI definitions, but no suitable definition was found. We proceeded to craft a domain-specific systems-centred definition, positing that SFSCs can be seen as social living systems, while SIs in SFSCs may be seen as processes that bring about change (e.g., new mentalities) and result in the creation of sustainable value for the actors involved and beyond. With the aid of an additional scholarly review, we also determined that the drivers of SI that matter are those that secure actor engagement in the co-design and co-development stages of SI (e.g., training). In Phase 2, we attempted to empirically validate the findings from Phase 1 in 12 Community of Practice (CoP) events in nine European countries. We found partial support for the SI definition, strong support for the vital role of trust, and concluded that, in any SFSC, it is critical to have a group of dedicated actors that have realized their role as (co-)leaders in co-shaping their own future.

Keywords: Short food supply chains; Social Innovation; Social living systems; Community of Practice; Actors' engagement; Trust

1 Introduction

Unlike contemporary zoonotic diseases (e.g., bird flu, foot-and-mouth disease, listeria), the COVID-19 pandemic did not spread directly

through livestock or agricultural commodities and did not disrupt on-farm production (FAO, 2020). Still, it compromised the ability of producers and agri-food enterprises to supply global markets consistently due to enforced closures,

labour shortages, and slowdowns in operations (OECD, 2020). Alternative circuits of food provision, where food is produced near the consumer, are seen as a potential answer to the food distribution challenges posed by the ensuing lockdowns and international restrictions (Cappelli & Cini, 2020). Actually, such alternative agri-food networks, commonly known as short food supply chains (SFSCs), have emerged as a response to the prevailing conventional agri-food system and its multiple crises of environmental, economic, and social nature (Aggestam et al., 2017; Berti & Mulligan, 2016; Vitterso et al., 2019). Although there is no single definition of what constitutes a SFSC, it is undoubtedly assumed by academics and practitioners alike that SFSCs are associated with local food and fewer (if any) intermediaries than conventional supply chains (Rucabado-Palomar & Cuellar-Padilla, 2020; Sellitto et al., 2018). In reality, SFSCs customarily embody direct marketing configurations, like farmers' markets, on-farm sales, food box schemes, online sales, pick-your-own arrangements, and community-supported agriculture (Giampietri et al., 2018; Lioutas & Charatsari, 2020; Mundler & Jean-Gagnon, 2020). Not surprisingly, in recent years, SFSCs have increasingly gained ground, particularly in Europe, where, on average, about 15% of EU farms sell more than half of their produce directly to consumers (EC, 2019).

Recent studies have highlighted the abundant merits of SFSCs. Notably, such alternative chains increase the transparency of and restore consumer confidence in food provision systems (Giampietri et al., 2018), benefit the environment through supply proximity (Sellitto et al., 2018), ensure a fair income to farmers and equitable distribution of added value among network actors (Berti & Mulligan, 2016), and enhance farmers' job satisfaction and social recognition (Mundler & Jean-Gagnon, 2020). Nevertheless, SFSCs are not without challenges. They often maintain an exclusivism status (Vitterso et al., 2019), predominantly appealing to select types of consumers (Giampietri et al., 2018), producers' participation is perplexing as competency needs (e.g., technical, marketing, and financial skills) are typically high (Charatsari et al., 2020), and adoption of innovations (e.g., smart farming

technologies) is met with scepticism, as it might hurt their distinct "alternative" character (Lioutas & Charatsari, 2020). Not unexpectedly, it is frequently contested whether SFSCs are in a position to commit actors and make a significant socio-economic and environmental impact (Aggestam et al., 2017; Rucabado-Palomar & Cuellar-Padilla, 2020). Therefore, understanding how to enhance SFSCs' capacity to act and engage actors without jeopardizing their unique character is crucial for their ability to continue making meaningful socio-economic and ecological contributions.

To address this issue, we turned to research on social innovation (SI). SI is about the satisfaction of social needs and the achievement of common interests, comprising the processes needed to address such interests and empower groups in society (Castro-Arce & Vanclay, 2020). SI involves participatory processes and outcomes that provoke changes in social relations, facilitate collective empowerment, lead to new or improved capabilities and relationships, and ultimately improve the social system (Caulier-Grice et al., 2012). Although extant studies (e.g., Giampietri et al. (2018) and Vitterso et al. (2019)) and policy briefs (e.g., EIP-AGRI (2019)) recognize that SFSCs should place emphasis on transformative and participatory social processes, such as nurturing actor relationships and building shared values, no study investigates how to enable such processes in SFSCs, let alone how to cultivate them in order to enhance SFSCs' capacity to act and benefit society at large. In this research, we drew from SI literature and explored how SI may change SFSC systems and stimulate their potential without altering their distinct character. The principal objective of this paper, therefore, was to provide a conceptual analysis of SI in SFSCs and empirically inquire how SI can be fostered in SFSCs.

To delve into the area of interest (i.e., that of SFSCs), we drew upon the premise that SFSCs may be viewed as coherent and collaborative systems of interconnected producers, processors, and consumers, distinguished - but also demarcated - by geographical and social proximity (Rucabado-Palomar & Cuellar-Padilla, 2020). Thus, our point of departure for the understanding of SI in SFSCs was a systems-centred per-

spective, grounded in the domain-specific social systems of SFSCs. Systems theory is an interdisciplinary theory about every system in nature and society, as well as a conceptual lens through which we can investigate phenomena from a holistic perspective (Capra & Luisi, 2014). It is rooted in Aristotle's claim that knowledge is derived from the understanding of the whole and not that of the single parts (Aristotle's holism) (Mele et al., 2010). A system must have elements (different parts, processes), interconnections (between these elements), and a function or purpose (Onat et al., 2017). In other words, systems maintain certain characteristics that differentiate them from mere collections of single parts: (a) they have a purpose that holds the different parts together; (b) no single part can fulfil the purpose alone, but, in so doing, each part relies on others to maximize performance (so, the different parts are interrelated and interconnected); and (c) all parts, as well as their arrangements (e.g., feedback flows), within the system are important (Meadows, 2008).

Unlike mechanistic systems, SFSCs can be viewed as social living systems that are created by the interactions of several parts, and they are themselves parts of larger systems (e.g., local communities) (Vitterso et al., 2019). A living system like a SFSC group is an integrated whole whose essential properties arise from the interactions and relationships between the parts (Capra & Luisi, 2014). SFSCs share all the defining characteristics of systems, as they constitute groups of stakeholders (i.e., the parts of a system) that are interrelated, interconnected and interdependent, and form a unified whole that has a specific purpose. Moreover, SFSCs may be treated as complex systems, given that complexity in a social system is distinguished by the high levels of interrelationships and interactions among the system's components (Meadows, 2008). Actually, in a world where supply chains are getting increasingly connected and complex, it should come as no surprise that systems-thinking provides a suitable perspective to unveil the complexity within and between different social systems (Onat et al., 2017). Hence, SFSCs should not be seen as plain alternative food networks or mere direct marketing configurations, as their scope is broader and inextricably linked to the

sustainable transition of the complex global food system (Vitterso et al., 2019).

To better understand SI in SFSCs, we also reviewed research on the drivers of SI. We explored the literature on the drivers of SI, but placed our focus on actor engagement, as the latter is a crucial process that ensures SI is tailored to the needs of the very people whose needs it is supposed to serve. Moreover, it is an important and flexible process that meets existing social needs because it guarantees that a SI is adopted by a crucial mass of actors and thus has a high potential to result in systemic social change (Westley & Antadze, 2010). Notably, the engagement of actors in SIs has attracted the interest of researchers, policymakers, and practitioners alike (e.g., Moulart et al. (2017), Neumeier (2017), Peris-Ortiz et al. (2018), and Sinclair and Baglioni (2014). In fact, scholarly and policy studies have emphasized that the drivers of actors' participation are among the top factors influencing the success of the SI process (e.g., Butkeviciene (2009), Davies et al. (2012), and Neumeier (2017)).

2 Materials and Methods

We advanced the SI conceptualization in two phases. In Phase 1, we performed a systematic review of pertinent literature, documenting a wealth of SI definitions. We then encountered the outcomes with a systems-centred, theory-building exercise and created a new domain-specific definition that did justice to the SFSC specificities. In Phase 2, we empirically validated the definition from Phase 1 as well as the SI drivers in 12 Community of Practice (CoP) events, which took place in nine European countries.

2.1 Phase 1: Understanding SI in SFSCs

To understand SI in SFSCs, we first set out to create an operational definition. Strikingly, at the outset of our attempt, we realized that even though SI has entered mainstream policy discourses and become a major research topic, there is still confusion about what it is (Periac

et al., 2018; Sinclair & Baglioni, 2014; Van der Have & Rubalcaba, 2016). In fact, despite the numerous contributions on defining SI in different fields, such as sociology (Bock, 2016), welfare economics (Pol & Ville, 2009), and organizational studies (Grimm et al., 2013), a common understanding of the term has not yet emerged (Edwards-Schachter & Wallace, 2017; Neumeier, 2012). Moreover, few SI studies have centred on the area of agri-food chains, let alone on SFSCs. Consequently, to lay the ground for sound theoretical foundations in the study of SI in SFSCs and, simultaneously, overcome the ambiguity encompassing the meaning and scope of SI in present work (Van der Have & Rubalcaba, 2016), we placed the definitional focus on the specific area of SFSCs.

We performed a two-step systematic review to generate a database of definitions (i.e., extraction of literal texts). In Step 1, a search was conducted for documents related to SI in major electronic databases, namely “Google Scholar”, “WorldCat”, “Web of Science Plus”, “AGRIS”, and “SSRN”. The technique of keyword search was favoured, as it is standard practice in systematic reviews (Russo-Spena et al., 2017), particularly when encompassing a specific topic that is present in various academic disciplines (Seuring & Gold, 2012). All types of scientific documents were targeted, such as articles, book chapters, conference proceedings, editorials, reviews, research reports, policy reports, and dissertations. The search was performed using the keywords “social innovation” in combination with two sets of other keywords (see Table 1). Two rounds of brainstorming among the author team members were organized to determine both sets, followed by a screening test with different SFSC stakeholders (e.g., policymakers, producers) and academics. The first set of 20 keywords related to the definition of SFSCs by the European Commission in Regulation (EU) No 1305/2013 (e.g., short chain, economic operators, social relations, trace food), while the second set of 19 keywords related to various aspects of alternative agri-food chains (e.g., fair trade, social needs, trust, collective decisions). Search parameters were equal in both sets, such as document type (e.g., article, chapter, proceedings) and search fields (i.e., title, abstract, and keywords). The “AND” oper-

ator was used in all cases. Only English written records were selected, which is typical for systematic reviews, given the practical difficulties of translation and the replicability of the review. Moreover, we used a publication time window from 1980 to 2019.

In Step 2, we refined our search from Step 1 to distinguish the documents that contained SI definitions. Given the large number of documents and to ensure reliability and consistency, we adhered to the following process: (a) documents that contained the term “social innovation” and “review” or “definition*” in their title or abstract were first selected; (b) the documents extracted in (a) were divided into two categories, one containing review articles on SI (generated by the combination of the terms “social innovation” and “review”) and one containing articles explicitly containing a SI definition; (c) the documents from the first category in (b) were assigned to three of the authors for critical reading and independent coding based on the full content, while the ones from the second were assigned to another three authors; (d) each author individually reviewed the documents assigned to them and archived all the definitions contained in each document; (e) the definitions extracted were reciprocally evaluated (i.e., each author received the archives prepared by the other five authors and reviewed them). This elaborate coding process reduced the risk of including articles with low relevance to the topic. Moreover, it raised the chances that important articles would not be disregarded.

As soon as the systematic review on the SI definition was complete, we focused on the drivers of actors’ engagement to design and implement successful SIs in SFSCs. We performed a comprehensive review of scholarly and policy work, but, naturally, many of our sources were drawn from the material gathered during the systematic review on the SI definition.

2.2 Phase 2: Empirical validation of the definition and drivers of SI in SFSCs

Based on the findings from Phase 1 and the associated literature reviews, we developed three

Table 1: Keywords used for retrieving data in Step 1

Set 1: Based on the definition of SFSCs used by the European Commission in Regulation (EU) No 1305/2013	Set 2: Based on various aspects of alternative agri-food chains
1. short chain	1. competition
2. short food supply chain	2. fair trade
3. food	3. hybrid
4. economic operators	4. solidarity
5. cooperation	5. basic needs
6. local development	6. social needs
7. rural development	7. resilience
8. economic development	8. trust
9. local economic development	9. social responsibility
10. geographical proximity	10. collective decisions
11. social relations	11. collective needs
12. social relationships	12. values
13. community	13. social values
14. rural community	14. empowerment
15. alternative rural	15. gender
16. agriculture	16. sustainability
17. bargaining	17. justice
18. trace food	18. health
19. consumers	19. environment
20. producers	

core propositions and tested them with multiple SFSC actors, such as producers, policymakers, consumers, and food experts. Our first proposition related to the central premise from Phase 1 that SFSCs can be viewed as social living systems. We, thus, inquired with different actors whether SFSCs exhibit and maintain properties of social living systems (e.g., interrelations, interconnections, and interdependencies between actors). The second proposition related to the key finding from our additional scholarly review on the instrumental drivers for a successful SI process. We explored whether the drivers that matter are, indeed, those that secure actor engagement in the co-design and co-development stages of SI in SFSCs. In our third proposition, we centered on the SI definition developed in Phase 1, and asked the various SFSC actors to discuss and evaluate it.

We organized Community of Practice (CoP) events to test the three propositions. A CoP

is a co-creative learning process in which varied stakeholders from diverse parts of a system (e.g., sectors, different parts of SFSCs) that share a concern or a passion about a topic, come together and deliberate. Essentially, CoP participants mutually guide one another into their understanding of common problems, create a common ground of thinking, and discuss solutions to the problems (Berti & Mulligan, 2016). We followed a multi-actor approach for the validation of the definition and the drivers of SI. To maximize the potential benefits of the CoP process, we opted for the “World Café” variant, where people are placed in a fitting context, explore questions that matter to them, and in regular intervals switch to a different discussion table and point, until they have deliberated about all topics in the discussion agenda. The World Café method has turned out to be a rather effective qualitative data-collection technique, as it blends different creative aspects of other, more traditional

qualitative data-collection techniques, such as interviewing, drawing, and narration. In addition, it allows time to reflect on what is shared during a discussion (Koen et al., 2014). Thus, a World Café discussion is an easy-to-use method of conducting discourses around issues that matter to the participants.

Twelve CoP events were conducted in nine European countries (see Table 2). We chose all these different countries as the diversity of the EU agri-food sector - also in terms of farm involvement in SFSCs (EC, 2019) - would allow us to examine the robustness of our findings from Phase 1. To test for differences within a single country, we conducted four events in a country where SFSCs have largely gained ground in recent years (i.e., Italy; Giampietri et al. (2018)). As we can see in Table 2, on average, almost 14 people took part across all countries, meeting the suggested threshold for data-collection purposes (Koen et al., 2014). Moreover, in almost all events, participation was balanced in terms of gender and professional representation.

Before the events, the author team provided CoP organizers with extensive guidelines and conducted a training session. At the events, organizer teams successfully managed the deliberation sessions, following a mutually agreed data-collection protocol (e.g., informed consent procedures were followed for all participants; all notes taken were electronically stored). After the events, each organizer team prepared a brief report and shared it with the author team and the participants. At the latter's request, organizers also sent in visual material, such as photos of the events and copies of the notes taken during the deliberations. To ensure consistency in the ensuing content analysis, two researchers independently reviewed the brief reports and the translated transcripts of the notes. Data were open-coded and categorized into themes according to the three research propositions. Transcripts were closely read multiple times to gain a broad overview of the discussions and develop an understanding of the key themes related to the participants' perspectives (Adler & Clark, 1999).

3 Results and Discussion

3.1 Phase 1 results

The search in Step 1 yielded 5,597 entries, each of which was assigned to a category depending on the keywords used. We located 588 duplicated records and excluded them from further consideration. Similarly, the selection process in Step 2 prompted us to retain 145 documents in total. Additionally, we had to delete 29 records containing no definition or being of low relevance, attaining a final sample of 114 documents (see Figure 1). The majority of the latter contained more than one definition, however. As a result, as many as 272 definitions were derived. Of course, quite a few of the definitions appeared multiple times. Figure 1 summarizes the selection process.

It should be stressed that no definition was found for SI in SFSCs. Furthermore, a careful inspection of the definitions revealed that only a handful of them related to social living systems. Likewise, although quite a few of the definitions, particularly those that appeared multiple times, were, to some extent, context-based, they remained generic and would probably fuel the discursive fluidity associated with SI conceptualizations (Edwards-Schachter & Wallace, 2017). Hence, we decided to abstain from adopting any of them, departing from the broad redefinition pursuit in which most past studies in SI had engaged (Voltan & De Fuentes, 2016). Instead, attesting to the view that domain specificity advances the understanding of a certain concept and affords additional problem-solving ability to a specific area of interest (Kidwell et al., 2008), we chose to stay close to our original conceptualization and crafted a domain-specific systems-centred definition that would do justice to SFSCs' idiosyncratic elements.

Besides, systems-thinking shows how system outcomes arise naturally from the interconnections between system elements and involves multi-stakeholder collaboration to tackle complex problems and decision-making (Mele et al., 2010). It has a natural fit with SI, whose underlying intent is to trigger a system-level change in order to solve complex social problems (Voltan & De Fuentes, 2016), and whose preponderance

Table 2: Overview of the CoP events

Country ^a	Participants	Gender	Professional representation
France	15	10 female, 5 male	producers, consumers, consultants, policy-makers, academics
Germany	10	5 female, 5 male	producers, co-operatives, non-profit organizations, academics
Greece	15	9 female, 6 male	producers, co-operatives, consumers, consultants, policymakers, academics
Hungary	21	11 female, 10 male	producers, consumers, consultants, policy-makers, academics
Italy (I)	15	6 female, 9 male	producers, consumers, consultants, policy-makers, academics
Italy (II)	15	8 female, 7 male	producers, co-operatives, consumers, policy-makers, academics
Italy (III)	20	9 female, 11 male	producers, co-operatives, consumers, policy advisors, academics
Italy (IV)	9	4 female, 5 male	policymakers, policy advisors, consumers, academics
Serbia	16	9 female, 7 male	producers, retailers, consumers, policy advisors, policymakers
Spain	10	5 female, 5 male	producers, co-operatives, food companies, policymakers, academics
Switzerland	15	6 female, 9 male	producers, co-operatives, policymakers, academics
The Netherlands	8	1 female, 8 male	consultants, policy advisors, co-operatives, producers

^a Countries have been alphabetically ordered.

is the creation of social relationships between multiple and previously separate individuals and organizations (Mulgan et al., 2007). Systems-thinking also enhances our capacity to recognize patterns and interrelationships between parts of a bigger mechanism, and restructure these interrelationships in more effective and efficient ways (Onat et al., 2017). In this sense, a systemic conceptual lens allows us to understand SIs as processes that redesign actors' interactions and result in transformative changes for SFSCs. That said, and in line with the ontological immateriality of SIs (Cajaiba-Santana, 2014), SIs in SFSCs can also be considered as immaterial. In fact, SIs' tangible outcomes (e.g., a new product or service) are fundamentally a supplementary result (Neumeier, 2012), while their essence transcends technological, economic, or organizational artefacts (Rover et al., 2017). Inevitably,

although SIs in SFSCs typically result in some kind of tangible improvement, they are originally manifested in changes of collective attitudes, behaviour, or perceptions of the actors involved (Neumeier, 2012). In a similar vein, the loci of SIs can be expected to lie within the social system inhabited by SI actors and their enterprise(s) (Phillips et al., 2015). Consequently, the stage is set for SI to unleash its true potential, engendering beneficial, transformative change, rather than solely improvements in products and services (Grimm et al., 2013; Moulaert et al., 2017). In view of the above, we put forward the following working definition of SI, in the context of SFSCs: "SIs are processes that change SFSC systems by changing the relationships, perspectives, and ways of thinking and acting of the actors involved, leading to the achievement of, primarily, social goals that benefit all the SFSC actors and

the broader community”.

Right after crafting the new definition, we concentrated on the drivers of SI and the results of the additional scholarly review. Our central finding and what most SI scholars seem to agree on is that when actors are engaged in a manner that solutions are co-developed - and master the corresponding methods and tools to do so - successful SIs are generated (Moulaert et al., 2017; Voltan & De Fuentes, 2016; Westley & Antadze, 2010). What this insight implies is that the drivers of actor engagement that really matter for a successful SI process in SFSCs are those that ensure actor engagement in the co-development or co-design process. Accordingly, some distinctive, bottom-up drivers that matter for a successful SI process in SFSCs and ensure actor engagement in the co-development and co-design process are the following: Commitment of the participating actors (e.g., transparency and trust); an organisational structure that ensures co-ordinating processes and communication (e.g., participative decision making, group of initiators); climate of acceptance/co-operation (e.g., interactive events); enhancing the abilities of the participating actors (e.g., communication, responsibility, training); maintaining social and physical proximity (e.g., sharing spaces, organizing fun activities). Interestingly, all of these are compliant with systems theory, as systems-thinking prompts us to improve our ability to understand systemic elements (e.g., processes, indicators) and their interconnections, ask “what-if” questions about possible future impacts, and mentally prepare for the redesign of our systems (Onat et al., 2017). Hence, embracing a systems-thinking perspective to engage as many actors as possible might be instrumental in producing a successful SI in a SFSC context.

3.2 Phase 2 results: Empirical validation

We started with the first proposition and the validation of SFSCs as social living systems. The main assumption was that SFSCs have all the attributes of such systems. The parts of these systems are groups of stakeholders that are inter-related, interconnected, and interdependent and

form a unified whole that has a specific purpose. World Café participants were asked to evaluate the relative importance of these attributes for their SFSCs. The prevailing thematic was “co-operation/synergies” and “trust”. The value of “creating relationships”, “interconnected ecosystems”, and “trust” among members of the SFSCs (including the customers) was pointed out in the discussions held in all countries. Some SFSC participants proclaimed the worthiness of “sharing the same vision and agreeing on how to reach set goals”, while others insisted that working alone can be an actual barrier to the growth of SFSCs. Building on trustworthy relationships and co-operation has been opted by all World Café discussions as being the ingredient for building successful SFSCs; this is the absolute requirement for staying interconnected, interrelated, and interdependent, and form a whole (system) that has a specific purpose. However, being interdependent does not imply that SFSC participants lose their autonomy; it suggests that attention is paid not only to their own needs but also to the system’s needs and purpose. The validation process acknowledged the value of building strong, trustworthy relationships and the merits of relying on co-operation rather than competition. We could, hence, conclude that if SFSCs are seen as complex social living systems, new lenses are provided to design new business models and strategies as well as novel policy instruments that could create opportunities for SFSCs to grow.

The second proposition we validated was the importance of actor engagement and participation for a successful SI process. Our research question was framed around the notion that the drivers of actor engagement that matter for a successful SI process are those that ensure actor engagement in the co-development or co-design process. The thematic that emerged for this question was again “co-operation/synergies”. SI provides solutions to existing social problems, and these must be developed and implemented by the interested parties themselves (e.g., Moulaert et al. (2017), Voltan and De Fuentes (2016), and Westley and Antadze (2010)). This insight was also validated by CoPs whose participants see communication and co-operation as important factors that drive change and transformation of the old way of doing business. Another thematic that

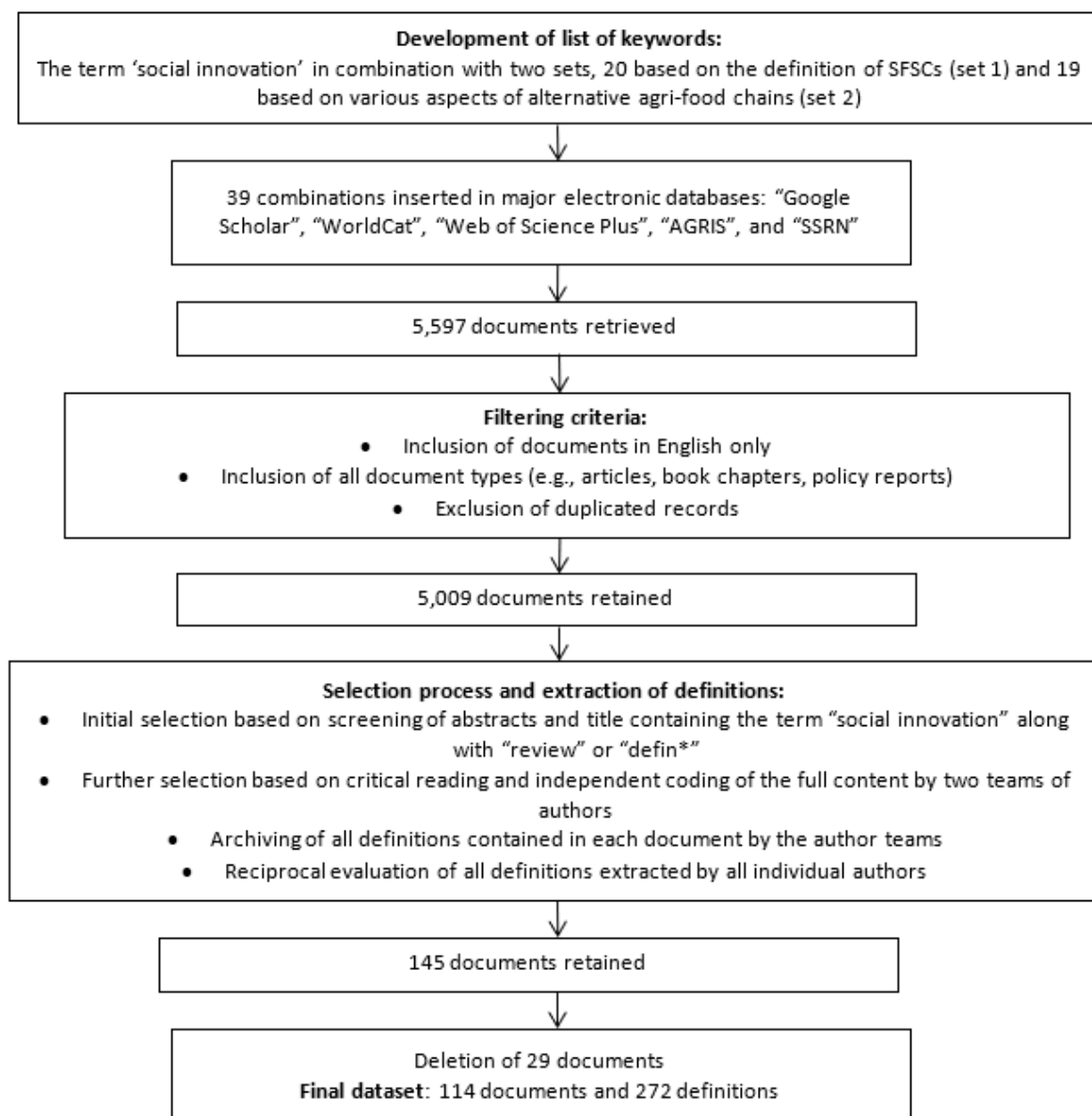


Figure 1: The selection process of Social Innovation definitions

surfaced was “leadership”; it has been argued by many scholars (Senge et al., 2015) that a dedicated leadership or a small group of “initiators” may shift the conditions through which people who share a problem can start learning collectively how to act and resolve it.

The final proposition we sought to validate referred to the definition of SI. The suggested statement was that SI is a process that brings fundamental changes in the way actors think and interact. The thematic that emerged was “co-operation/synergies”. In general, the CoPs agreed that SI is a social process that adds value and creates something new. The development of relationships, networking, and co-operation, is vital for this process. However, there were communities whose members understand SIs as “set of practices and solutions” that aim at achieving social goals; in general, validating the definition of SI proved to be challenging and follows the conceptual ambiguity of SI. We have set to providing a context-based definition of SI since we attest to the view that domain-specificity advances the understanding of a certain concept and affords additional problem-solving ability to a specific area of interest (Kidwell et al., 2008). It seems, though, that practitioners are still puzzled by the concept of SI in SFSCs. This is an essential point to be considered by policymakers who want to encourage SI in SFSCs. Admittedly, more discussions with SFSC actors need to take place to help establish a broader understanding of SI among SFSCs.

Another thematic that emerged from the content analysis was “education and training” in the context of communication and co-operation. This need is a request that could also become a public policy goal: to engage as many actors as possible in co-developing SI, policymakers should consider facilitating their communication and co-operation. Furthermore, throughout the deliberations, the concept of “values” emerged frequently. Although not directly connected to the validation process, many participants recognized the need to re-engineer food supply chains, by altering our perceptions and mental models and embracing social, economic, and environmental sustainability. Notably, one of the participants pointed out the following: “We need to invent new ways to transform food produc-

tion into a sustainable and more humane process. Food has value that goes beyond nutrition; food blends tradition, culture, civilization, humanity, and people need to understand this. . .”.

Finally, both the prevailing thematics linked to the validation of the propositions and the extra thematics that emerged from the analysis appeared to be robust, not only across the different countries but also across the different samples in the same country (i.e., Italy). Besides, we were careful to test our propositions with various SFSC actors in all countries. Nevertheless, there is a need to gather further evidence of generalizability to guarantee our findings’ accuracy.

4 Conclusions

The Covid-19 outbreak is changing consumers’ perspective and demand towards food by directing their intentions into a more local supply. SFSCs are one alternative that is a direct response to these dynamics. SFSCs restore consumers’ confidence in the food chain and offer a fair return to farmers. However, they have limitations, especially when trying to appeal to, let alone to commit, ample actors (e.g., different consumer groups, policymakers). Thus, it is necessary to understand how SFSCs may impact the changing dynamics in society, particularly in the last year, and how SI, which is purported to be a dynamic that fosters adaptive governance by provoking changes in the system (Castro-Arce & Vanclay, 2020), could be used to enhance SFSCs’ capacity to act and engage actors. Hence, the main goal of this study was to understand SI in the context of the SFSCs. To meet our study’s goal, we followed a two-phase approach.

In Phase 1, a systematic review of SI’s definition was conducted. The review offered a wide range of SI definitions, but no definition for SI in SFSCs was available or suitable. As a result, we created a new domain-specific systems-centred definition, conceptualizing SIs in SFSCs as processes that change SFSC systems by altering the ways actors think, relate, and act, ultimately resulting in the creation of sustainable value in the SFSC’s economic and social performance. Moreover, the review allowed us to understand that some of the main SI drivers are those that ensure actor

engagement in the co-development or co-design process. Still, as several scholars have noted, actor engagement is a necessary but not sufficient condition for an innovation process to materialize (Davies et al., 2012). The critical issue is to have a group of dedicated stakeholders that have realized their role as leaders in co-shaping their own future and in collectively “working their way” to secure the benefits of the transformative, albeit elaborate, SI process.

In Phase 2, a CoP method was employed through the “World Café” variant to empirically explore SI in SFSCs. In all 12 World Café meetings and nine countries, trust emerged as the single most important determinant of success in SFSCs and the SI generation. Without trust, any collective endeavour is doomed to fail. At the same time, trust is both an input and an outcome in SFSCs, where trust leads to more trust and vice versa. Sometimes, SFSC actors simply need to begin trusting other SFSC members and promptly reap the rewards of showing trust first. Interestingly, the World Cafés lent partial support for the definition of SI in SFSCs. Of course, although the definition we crafted could not be fully supported, the World Café participants agreed that SI is a process that brings fundamental changes in the way actors think and interact.

Actually, providing a SI definition in the context of SFSCs is complex since organizing SFSCs is also complex, diverse, and dynamic. Besides, SFSCs are living organisms, not merely commercial transactions or technical solutions. The change SI attempts to bring to SFSCs relates to social and living entities, aiming to improve how SFSC actors think, relate, and act. Inevitably, more research is necessary to better understand SI in SFSCs. Such research would be equally instrumental for directing SFSC-related national and international policies, the absence of which is conspicuous.

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Barriers and Facilitators of Purchasing from Short Food Supply Chains in Europe: Insights from a Stakeholder Perspective

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Abstract

Thirty-two expert stakeholder (e.g., consumer advice center, state parliament at regional level, European Network for Rural Development, university and research center, chamber of tourism, rural development association, and social cooperative enterprise) interviews were conducted to examine consumer attitudes, values and preferences in relation to short food supply chains. These stakeholders have expertise in policy, consumer behaviour, the tourism sector and regulation. The interviewees represented the views of consumers, producers, and other actors who work with or within short food supply in seven European countries (Belgium, Germany, Greece, Hungary, the Netherlands, Spain, and Switzerland).

Consumers were generally perceived to be aware of the environmental impact of food production. In terms of preferences, consumers would like to shop for local food the way they shop at the supermarket: having variety of products, accessibility, and availability. The relative lack of convenience and high prices associated with short food supply chains products were seen as the major barriers to their purchase. Consumers were thought to buy the products because of health and environmental benefits, a desire to support their local community, and a preference for tradition. However, relatively few consumers purchase products regularly from SFSC. The main segments are people who believe in short food supply chains values, middle class families with young children and elderly people. More can be done to educate and engage consumers regarding these chains, and market research is needed to inform which strategy is likely to be most effective in specific contexts such as the regional level.

Keywords: Consumer awareness; Consumer behaviour; Environmental impact; Short food chains; Sustainable consumption; Stakeholder interviews

1 Introduction

Recent rapid evolution of the agri-food system has been shaped by new challenges like demographic evolution, leading to an increasing diversity of cultural, political, economic, and social practices. The dominance of the long food chain is progressively moving towards a diversification of the food supply system. Diverse range of food products are available like organic, ready-to-eat, and local products. Alternative food chains like short food supply chains (SFSC) are rising. Although there is no single definition of what constitutes a SFSC we benefit from a definition at the European level. According to the European rural development regulation (1305/2013), SFSC relate to supply chains “involving a limited number of economic operators, committed to co-operation, local economic development, and close geographical and social relations between producers, processors and consumers”. Giampietri et al. (2016) describe SFSC as

face-to-face interactions between producers and consumers who thus can easily interact and share information on the product origin and its production process, so that consumers can make their own value-judgements.

The rising interest for these chains is driven by the evolution of consumer awareness of several subjects, including awareness of the environmental implications of food production, health aspects of local products, support of the local community, consumer activism and awareness of social impact of food production and trust (Baumann et al., 2015).

Local food was studied by Renting et al. (2003), Venn et al. (2006) and numerous authors. Zepeda and Leviten-Reid (2004) found that local food is defined differently by food shoppers. Some of them defined local food in terms of distance in driving time, while others focused on political boundaries and qualitative characteristics. Consumers are increasingly searching for local food for reasons related to higher quality (i.e., freshness, taste), health-related aspects, guarantee of the provenance, environmental impact of food consumption and for economic reasons, such as better market access for producers, higher

value distribution along the chain and reduction of consumers' final price (Belletti et al., 2012; United Nations Industrial Development Organization, 2020). The direct relationships that are created between producers and consumers is one important motivation for SFSC use (Belletti et al., 2012; Benedek et al., 2020). The connection is established through on-farm sales and off-farm sales like traditional open-air markets that facilitate contact between producers and consumers (Chiffolleau et al., 2019). In this context, SFSC are those that consist of a minimal number of intermediaries between the producer and the consumer, whereas long food supply chains (LFSC) are those that involve more intermediaries. This study focuses on interviews conducted with diverse SFSC experts.

The objectives are to examine, from a stakeholder point of view, a) the extent to which consumers are aware of the social and environmental impact of food production; b) consumer understanding, expectations, willingness to pay and concerns related to SFSC; c) consumer profiles that are more likely to purchase SFSC products; and d) uncover obstacles that prevent consumers from purchasing SFSC products.

2 Materials and Methods

2.1 Presentation of the participating countries

This research was conducted using a qualitative research design. A series of interviews were conducted with experts in Europe representing the perspectives of consumers from the point of view of producers, policy makers/policy analysts, and other actors in SFSC such as regulatory authorities, organizers of producers' markets and entities from the Hotel Restaurants and Catering (HoReCa) sector. Twenty-nine interviews were performed in six EU countries: five in Germany, six in the Netherlands, three in Switzerland, eight in Hungary, three in Spain, and four in Greece. In addition, two interviews were conducted at the EU level (EU), and one was conducted within the municipality of Ghent in Belgium (BE). Suitable organisations and interviewees were identified from desk research and joint

network searches.

2.2 Interview procedure

Potential stakeholders were contacted via email for participation in the interviews. Those that participated in the study are listed in Table 1. They received the open interview questions in advance (see Figure 1), allowing them the opportunity to prepare their answers.

The stakeholders were interviewed in their local language except for the EU and BE stakeholders, who were interviewed in English. The interviews took place between June and September in 2019. Each interview took between 17 and 120 minutes. Of a total of 32 interviews, 17 were conducted face-to-face, 12 were conducted via telephone, and three interviewees answered via email. Except for the interviews conducted by email, all the interviews were audio-recorded with the consent of the interviewee, transcribed in the original language, and then translated into English for consistent content analysis. Two independent researchers coded the responses for thematic analysis. Using several data collection methods (i.e., face-to-face interviews, telephone calls and emails) can strengthen the study and foster analysis (Yin, 2011). A guide was used to conduct the study, hence comparison between countries can reveal significant similarities or differences. Even if southern EU countries are underrepresented, the study remains valid through the collection of responses from independent experts coming from different national contexts and having diverse knowledge. Moreover, Yin (2011) claimed the strength of the guide's use in the way that interviewees can reveal elements that would not be revealed in a more informal discussion.

2.3 Data analysis

A database with all the translated interviews was created in Microsoft Excel. A first coding process was performed in order to identify the main themes. Some of the themes were based on the questions themselves (e.g., consumer awareness of the environmental and social impact of food production), and other topics emerged indirectly

from the interview responses (e.g., specific consumer segments).

3 Results and Discussion

The findings of the study include the awareness of consumers about social and economic impact of food production. There are divergences about these topics with an opposition between northern and southern European countries. Consumer understanding of SFSC is tied to the concept of local food, with some confusion around the definition of SFSC, local and organic. Expectations of consumers include similar services to those in longer food chains (i.e., availability, diversity of products, affordability). Authenticity, food hygiene, and origin represent concerns that some consumers may have. Consumers are willing to pay more for better taste, quality, and health benefits. Three consumer profiles were identified in the study. These findings are summarized in Table 2 and described in the next sections.

3.1 Consumer awareness of the social and environmental impact of food production

Stakeholder opinions were divided on how aware consumers are about environmental issues related to food production, although there was a consensus that such awareness is increasing. On the other hand, the social impact of food production was barely discussed. This suggests either that stakeholder awareness of the environmental impact of food production overshadows their awareness of the social impact, or that stakeholders perceive that consumer awareness of environmental impact is greater than awareness of social impact. This may partly be because environmental impact is universally applicable and cause - effect relationships are relatively straightforward. Many initiatives and projects at different scales promote healthy and sustainable diets like the Mediterranean diet. This diet was recognised by UNESCO in 2010 as an intangible cultural heritage. Hence, many projects promote and support its diffusion (ENPICBCMED, 2012; Phull, 2015). The European Union funded a project, MedDiet that aims at raising consumer

Table 1: Stakeholder organisations interviewed

Region	Interviewed stakeholders	Stakeholders' type represented
European Union	European Network for Rural Development (ENRD)	Policy
	Slow Food International	Producer, consumer, retailers, HoReCa
Germany	Consumer Advice Center Baden-Württemberg e.V.	Consumer
	State Parliament of Baden-Württemberg	Policy
	State Parliament of Hessen (Bündnis 90/Die Grüne party)	Policy
	Kaemena Farm Regionalfenster (Regional window) GmbH	Producer, service Certifier
The Netherlands	Organic Farm Landzicht	Producer, consumer
	Philips Fruit Garden	Producer, retailer
	Sustainable Agriculture team from Province South-Holland	Policy
	Wageningen University & Research (WUR)	Policy
	The Premonstratensian Monastery Mariënwaerdt Province Utrecht	Producer, HoReCa Policy
Switzerland	Slow Food Switzerland	Producer, consumer, retailer
	University of Neuchâtel	Policy
	French Federation of Contractual Agriculture of Proximity	Producer, consumer
Hungary	Csoroszlya Farm Kft.	Producer
	Chamber of Tourism	Producer
	Calvary Farm	Producer
	Cooperating Balaton Upland	Service
	Upper-Heathland Rural Development Association	Service
	National Food Chain Safety Authority, Food and Feed Safety Directorate	Regulatory authority
	Pannon Helyi Termék Nonprofit Kft. Research Institute of Agricultural Economics, Office Budapest	Service Policy
Greece	BIOZO	Consumer
	Ecotourism Greece	Service
	GENISEA Social Cooperative Enterprise	Producer
	Hellenic Agricultural Organisation-Demeter/ Ministry of Rural Development and Food	Policy/regulatory authority
Spain	(ENEK) Basque Council for Ecological Agriculture and Food	Regulatory authority
	European Coordination Vía Campesina	Producer
	AUSOLAN	HoReCa
Belgium	Ghent Environment and Climate Bureau (Ghent Municipality)	Policy maker

Table 2: Summary of the main findings

Topics	Summary of findings
Consumer awareness of social and environmental impact of food production	Varied understanding of the environmental impact of food production - Greater understanding of environmental and social issues tied to food production in northern European countries - Concerns about traditional, local specialties in southern Europe Underdeveloped consumer understanding of the social impact of food production
Consumer understanding of SFSC	- Tied to the concept of local food - Focuses on the food origin, the direct connection with the producer, the small scale of food production, and traditional local specialties - Primarily positive, sometimes confused with associated concepts (e.g., organic, 0km) - Need to educate consumers about SFSC
Consumer expectations and concerns of shopping for SFSC products	Consumers: - want a similar price of SFSC than that of the mainstream offer - want a wide range of SFSC product types - expect a reliable supply of SFSC products - expect SFSC produce to be presented in the same way as mainstream products Often confusion between local and organic food Generally positive view of local products Some concerns about the authenticity/origin of the product (particularly in HU, EL, ES) Concern about food hygiene safety, from Hotel Restaurant Catering and consumers
Consumer demand and willingness to pay for SFSC products	Demand is variable and depends on region, product type, and purchase context Need to increase points of sale Having a direct relationship with the producer increases trust and transparency Value supporting the local economy/farmers through purchasing SFSC products Willing to pay more for taste, quality, and health benefits particularly if they are associated with awards/certification
Consumer profiles	Motivations for purchasing SFSC products include health and environment concerns, traditional nature of products, support of the local community The main segments are: - People who believe in SFSC values (SFSC advocates) - Middle class families with young children - Elderly people



Figure 1: Flow chart of the method with interview questions

awareness about the importance of the Mediterranean Diet. This ecological sustainable model has a significantly reduced environmental footprint and health positive impact (Lăcătușu et al., 2019). A non-exhaustive list of projects promoting this diet includes MD.net, the international network of Mediterranean diet communities, ECOSAFIMED aiming at ecosystem conservation and sustainable artisanal fisheries in the Mediterranean basin, or ECOPLANTMED targeting the ecological use of native plants for environmental restoration and sustainable development in the Mediterranean region (EN-PICBCMED, 2012).

In contrast, social implications of food production can vary greatly. These are different for different stakeholder groups, thus consumers may not receive clear and consistent messages about social issues.

Consumers in north-western European countries such as Germany, the Netherlands and Switzerland were perceived to have a greater under-

standing of social and environmental issues than those in southern Europe, where fair trade and organic food was increasingly popular in the former. In Switzerland, consumers may be more aware of issues surrounding food production because two referendums were introduced in 2018, calling for constitutional changes ensuring that Swiss consumers have greater access to locally produced, healthy and organic food, and fair wages for people working in the agricultural sector. This is supported by Gregory-Smith et al. (2017) who found that in North-West EU countries, environmentally friendly products have a more established position in the market.

It is perceived that consumers in southern countries such as Spain and Greece are more concerned about whether products are seasonal, locally produced, and specific to their geographical area, as exemplified by traditional products such as those carrying the labels of Protected Designation of Origin (PDO) or Protected Geographical Indication (PGI). The weight of geograph-

ical indications is particularly important in the Mediterranean basin (14.5% in France, 9.5% in Greece, and 5.7% in Spain) (Chever, 2015). This may have its origins in the Mediterranean diet emphasizing traditional food, production methods, agricultural practices, and seasonality (UNESCO, 2012).

3.2 Consumer understanding of short food supply chains

According to the stakeholders, consumers generally have little understanding of the concept of SFSC, including it into local food. Although there is no standard understanding among consumers of what local food is, the image they have is generally centred on the product origin and buying directly from the producer, ensuring transparency and authenticity of food. A stakeholder from Sustainable Agriculture team from Province South-Holland affirmed that

... When distribution is well organised, more people are reached and stimulated to buy local foods. This makes it easier to change behaviour, which creates more demand.

Furthermore, consumer understanding of local food may differ depending on the product type (e.g., fresh produce vs. processed food) and the region (an urban vs. rural area).

SFSC and local food concepts share many values. One distinction between local food and SFSC that consumers appear to be generally unaware of is that local food is geographically proximal, whereas some products from SFSC may be sourced relatively far away, but still respect the SFSC definition of few intermediaries (e.g., producers selling their products to consumers online, or a restaurant in the Basque Country sourcing oranges from Valencia or bananas from the Canary Islands).

The consumer concept of local food is bound more by regional or national borders, rather than in terms of geographical distance. Local food is perceived as that which comes from one's country, region, or even village. For example, approximately 60% of Flemish people consider regional products and/or Belgian products to

be local, whereas only 13% of Flemish people consider European products to be local (EMF, 2017). The geographic distance associated with SFSC is relative and can depend on where the consumer lives. A stakeholder in Spain suggested that up to 150km may be considered local, whereas in Hungary SFSC cannot exceed 40km by law outside the area of Budapest. Another stakeholder in Switzerland pointed out that because of the size of the country and the geography, food supply chains are often even shorter, on the scale of "very local". This entails that SFSC products are relatively prevalent in Switzerland (compared to other countries) making this concept more salient in the mind of Swiss consumers.

In Hungary, Switzerland, and Greece the consumer idea of local food is thought to reflect food that can be directly purchased from the producer (e.g., farmers' market or agricultural community). There is an increasing trend to put the farmer's name and contact information on the private labels of large supermarket chains (Greece), or the face of the producer on the product packaging (Germany and Spain).

Finally, stakeholders agreed that knowledge about SFSC is increasing, prompted by awareness-raising initiatives. These initiatives range from in-store marketing highlighting local products, documentaries about the financial struggles of local farmers shown on public television sparking public debate on local media (Flanders), to a Hungarian national campaign promoting the Year of Local Food (2015) <http://www.helyboljobb.hu/>. It was noted, however, that awareness and interest are likely to vary according to socioeconomic status. Stakeholders mentioned that consumers who struggle to afford healthy food, and/or who shop at discount supermarkets are less likely to be aware of SFSC or their implications.

3.3 Consumer expectations and concerns

How consumers perceive local food and/or SFSC was felt to be greatly influenced by the mainstream alternative of shopping at supermarkets. When purchasing local food, stakeholders

thought that consumers would like to have the same services offered in supermarkets: availability year-round, having a large range of products in one place, and being able to choose from aesthetically flawless products. The superficial attributes (i.e., flawless appearance) can influence willingness to pay (Grewal et al., 2019). Thus, education campaigns for consumers could be developed to inform them that aesthetically imperfect products are still good quality, leading supermarkets to reject 10-16% of farm crops and causing farmers to overproduce as a result (FEED-BACK, 2018).

The most influential point of comparison between products from long and short food supply chains may be the price. Stakeholders in Hungary, Spain and Greece point out that most consumers do not want to pay more to buy from SFSC. However, the number of consumers who are conscious about the value of local food is increasing. One potential solution could be to lower the price of SFSC products by eliminating value-added tax (VAT) for direct selling or common (direct) selling in the case of small producers who produce marginal quantity. Another alternative is to implement a tax that considers the hidden costs of food in terms of environmental and/or health impact. This could be in the form of true pricing (Sustainable Food Trust, 2017) or a scheme that decreases the rate of tax for labour but increases it for the cost of resources and pollution (Ex'tax Project Foundation, n.d.).

Stakeholders generally felt that consumers have a positive opinion of such products, in terms of quality and production standards. However, the issue of fraud in SFSC was raised as a particular concern of consumers in Hungary, Greece, and Spain (and to a lesser extent, Germany and the Netherlands), where products from longer supply chains are sometimes sold as local products. Consumers may be confused by what is meant by local or by short food supply chains. In the study, SFSC relates to the chain where there is a minimum of intermediaries, while local food refers to food produced and that originates from a close geographical territory. In this regard, many local products are sold through SFSC, however there can be food products that come from outside the geographical boundaries but still be considered as sold via SFSC because there are a few inter-

mediaries.

As there is no certification system and lack of monitoring to safeguard consumers against deceptive practices, one solution suggested is to have a certified quality label or scheme for local food, and regulations. However, too much certification may confuse the consumers. Some countries have a multitude of regional labels, like in Germany, implying much variability between credible seals, untrustworthy seals, and marketing seals, leading to consumer confusion (European Commission, 2019).

Furthermore, one major concern that consumers were thought to have was food hygiene and safety. The products of the long supply chains may be more reliable, because of accreditation and control of products at checkpoints. By contrast, there is often no information like that regarding products of short food supply chains. This presents an obstacle particularly for Hotels, Restaurants and Catering (HoReCa), who are legally bound to comply with food safety standards.

3.4 Consumer demand and willingness to pay for SFSC products

Stakeholders across countries generally agreed that the demand for products from SFSC is much less than that of the mainstream offer. Many stakeholders claim that demand is greater than the existing supply (Germany, Spain, Switzerland, Hungary), although this observation is sometimes specific to a region or to a type of product. For example, some producer stakeholders in Hungary mentioned that the demand for local food is greater in Budapest than in rural areas, and one mentioned that there is not enough local meat supplied. Thus, further research is needed to obtain a more comprehensive picture of the extent to which consumer demand is being met, for which types of products, and in which areas.

Stakeholders suggested that more points of sale are needed to drive consumer demand like Ghent Environment and Climate Bureau. This is particularly the case for supermarkets, and to a lesser extent, restaurants.

Product type plays an important role in influencing consumer demand. Stakeholders emphasised that consumers tend to be more interested in products such as regional specialties (e.g., asparagus from Valais in Switzerland), and quality “gourmet” products (e.g., wine, preserves), rather than ordinary products. Some consumers are conscious that local supply chains can support the maintenance of atypical products and specialties (such as “forgotten” or heirloom vegetables). In restaurants, the variety of the product also matters. As one stakeholder in Hungary pointed out

Demand and supply often don't meet. The producer starts to produce any kind of potato, but there is no demand in a restaurant.

Thus, producers need to identify what the consumer wants, and/or what type of consumer is more likely to buy their products.

There was a strong consensus across countries that consumers are willing to pay more for better taste and quality. Local products are also considered to be fresher (because they have travelled a shorter distance and are sold sooner after harvest). Natural products that are minimally processed are also valued. For Flemish consumers the most important criteria for purchasing food, in addition to price, are the regional, seasonal, and natural character of the food (Coart, 2017). For processed products, it was claimed that consumers value traditional production methods (particularly in Greece and Hungary) and are more willing to pay for products with a taste award. It was highlighted that a greater willingness to pay tended to be a characteristic of more middle-class consumers.

Lastly, stakeholders suggested that some consumers would be willing to pay more for products with certificates of authenticity related to the attributes and production methods, and that they value trust that is established through the direct relationship with the producer. It was felt that consumers are increasingly interested in knowing where their food comes from.

3.5 Consumer profiles

SFSC advocates (“locavores”)

The segment of consumers who believe in the principles of SFSC is seen as being relatively small. This segment is embodied by the “conscientious, responsible consumer, who gives value to the sustainable product from a social, economic and environmental point of view, committed to the producer receiving a fair price for his product. He is also concerned about healthy food.” (stakeholder from Switzerland). They are essentially “locavores” who support local food because they believe it is superior in taste and quality. They are opposed to long food supply chains, and support local communities (Reich et al., 2018). These types of consumers were more likely to maintain their engagement with SFSC initiatives that require more commitment, like Community Supported Agriculture (CSA). As one producer of a CSA initiative in the Netherlands explains, “They give us unconditional support and let our land determine their menu. They don't ask themselves if our products fit their wishes.”

SFSC purchasers to support local community

Supporting the local community was an important motivation for buying SFSC products. This applies not only to purchasing directly from producers, but also from intermediaries like local butchers or grocers. As one EU-level stakeholder noted, “it's about the sentiment, the emotion, about helping someone locally rather than giving money to something that has come 14 steps in the supply chain.” This value was not associated with a particular demographic segment.

Main socio-demographically defined consumer groups

The two main consumer groups that were identified across several countries as being the main purchasers of SFSC products are families with young children and the elderly. Consumer research in Flanders shows that in terms of families, it is particularly those of a higher social and

economic status (SES) and those with young children, who traditionally vote for the green party and/or are more interested in environmental initiatives (VLAM, 2018). The aim of this study was to provide an overview of sales through farm shops and farmers' markets in Flanders, by monitoring the market evolution in Flanders, and the purchasing behavior of 2,750 Flemish households for home consumption. Profiles of consumers and types of food they purchase were identified. Therefore, this study's findings support our findings. This is comparable to research showing that those who buy organic foods tend to have higher education levels and belong to married households or households with young children (Dimitri & Dettmann, 2012). The fact that these families tend to be of a higher SES suggests that the level of education and/or affluence may be underlying their motivation. This can be contrasted with a point mentioned by a stakeholder in Spain that, due to the economic crisis, families with lower-middle income give more importance to price than SFSC values when purchasing groceries.

Families were thought to be interested in SFSC because such chains can offer attractive and educational experiences to their children. In Switzerland, families often take their children to local markets and farms where the public can pick their own produce. It was suggested by many stakeholders in different countries that parents would be willing to pay more to have their children fed from SFSC in nurseries and schools. A stakeholder in Greece observed that health-conscious consumers who can afford to pay something extra are those who buy SFSC products on a regular basis. Another reason could be that children are increasingly being taught about the environment in schools, which may have a spillover effect onto their family. Specific food environment policies can be implemented at the school level to educate children about the environment. This was found to bring improvement of targeted dietary behaviors and habits (Micha et al., 2018). These habits can be balanced by the family environment, in which parents play a gatekeeper role for home food availability and choice. Parents and children have a positive effect on each other (Hebestreit et al., 2017). In contrast, elderly people were thought to have

quite different motivations for buying products from SFSC (in Spain, however it is expected to be similar in other countries). Their engagement appears to be supported by their lifestyle. They have the tradition of buying directly from the producer. They have more time to visit multiple producers, and to prepare meals with local products that are usually raw ingredients. In Hungary, it was mentioned that this segment (elderly but with higher pension) seeks products that are traditional in taste and production methods, and that their motivation stems from a sentimentalism about local products.

Consumers who do not buy local products

Most consumers do not regularly buy products from SFSC. It seems that these consumers are aware of some of the benefits of SFSC products like health benefits. However, their purchase decisions are more often driven by price and/or convenience. Products from SFSC tend to be less convenient than those from longer supply chains for many reasons. We assess that they are less available all year round due to their seasonality, and so require more consideration in terms of meal-planning. They are more often sold as raw ingredients requiring more effort to prepare. Such products are available in fewer retail outlets and there is a limited range of products, which means consumers need to spend more effort to source all their products. As one stakeholder of Philips Fruit Garden, in the Netherlands, asserted:

You have to differentiate in order to attract a wide audience. It is not enough to make people drive all the way here to get apples. You must be able to offer more.

Thus, it appears that SFSC products are not as compatible with consumers' modern lifestyles as products from longer supply chains are. Urban versus sub-urban and rural lifestyles differ in terms of food supply, connection to nature and ways of consumption. The convenience of shopping at long food chains like in supermarkets is in contradiction with buying food at different farms

and short food sales points. This suggests that education about the benefits and price reductions of SFSC products can only have a limited effect on consumer behaviour if the convenience of buying and using SFSC products is not improved.

To increase the convenience of buying from SFSC, producers could form cooperatives offering a larger range of different product types (fruit, vegetables, fresh meat, delicatessen meat, dairy, and bread). This would allow consumers to satisfy more of their grocery requirements at one place. Offering home delivery or local pick-up points would be another solution. For smaller producers, this option may be more feasible within a cooperative structure. However, the culture of cooperatives varies between countries. A stakeholder pointed out that Italy has strong cooperation culture in producing the same types of crops, whereas it was suggested that in Switzerland producers cannot agree on pricing and opening hours for direct selling. In Hungary, the form of cooperative is not available for small farmers and for direct selling, however smaller collaborative legal forms would be requested by SFSC producers.

In Flanders, even consumers who buy from SFSCs at least once a month tend not to travel more than five kilometres for this (Coart, 2017). This suggests that having more accessible retail channels is key to increasing the sales of SFSC products (e.g. at central locations or at large stations). Similarly, supplying large retailers such as supermarkets with SFSC products would boost the visibility of these products and address the problem that consumers often do not know where they can purchase local products (European Commission, 2013).

4 Conclusions

Many consumers value local food for their health and environmental benefits, the support that it provides to their local community, and a preference for traditional tastes and shopping lifestyle. However, the main barriers of price and inconvenience make it difficult for consumers to purchase local food on a wider scale. Furthermore, the attributes that consumers value about local food can also be found via other means, for example,

by purchasing non-local food that is organic or sold by their local grocer.

Hence, consumer and producer perspectives can be related to policy implications in order to suggest solutions to common goals (e.g., supply and sell local products that reflect a fair price for both consumers and producers, or support hygiene standards for implementation through adequate regulations).

Strategies to minimise the practical barriers to purchasing from SFSC include justifying the price of local products, such as through selective taxation to reduce the price discrepancies between long and short food supply chain products, certification, and explaining the benefits of SFSC to consumers. Inconvenience can be decreased by having a wider range of SFSC products in retail outlets, increasing points of sale, and making local food more available at restaurants. Communication and marketing strategies promoting SFSC products should be based on market research identifying the target audience/s and their values and concerns. Furthermore, attributes that consumers care about, like taste, freshness, and naturalness should be highlighted. Finally, the exploratory nature of the study supported the knowledge shared by experts regarding consumer attitudes towards SFSC. Gathering point of views from different countries allowed assessing the situation in Europe. However, the interview methodology with an overrepresentation of northern EU countries led to limited conclusions. Therefore, future studies that examine consumer behavior towards SFSC in Europe should include more countries in the analysis, widening the sample, and taking into account different points of view.

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Barriers and Facilitators of Purchasing from Short Food Supply Chains: Evidence from Consumer Focus Groups in Germany, Spain, Greece and Hungary

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Abstract

This study aimed to identify the barriers and facilitators of consumers purchasing from short food supply chains (SFSC). Eight focus groups were conducted with consumers in the rural and urban areas of Germany, Spain, Hungary and Greece. Participants generally felt that increasing the convenience of purchasing SFSC products (in terms of a proximal location and being able to purchase a wide range of produce in one place) was a prerequisite for them to buy such products. Food quality in terms of taste, freshness and organic status were also taken into account in purchase decisions, and there appears to be a greater focus on health rather than the environmental implications of organic production, although the environmental aspects are also appreciated. Some participants also like the idea of supporting their local community through purchasing from local producers and/or retailers. It was believed that small-scale production and SFSC result in better quality food, but participants had less confidence in the hygiene and food safety standards of SFSC compared to longer chains. Participants thought that consumers would purchase local food if they could more easily access a variety of local food in one place, such as through supermarkets, cooperatives, farm shops and markets, or an online platform that aggregates producers.

Keywords: Consumer awareness; Consumer attitudes; Short food supply chains; Local food; Sustainable consumption; Focus groups

1 Introduction

In Europe the current food system consists predominately of long food supply chains, with most of the population purchasing food from large supermarket chains (Veraart Research Group, 2019). However, there is increasing recognition that supporting short food supply chains (SFSCs) is important for small and medium enterprises and rural development (Kneafsey et al., 2013). One of the more widely accepted definitions of SFSC comes from the Regulation (EU) No 1305/2013 on support for rural development, which defines SFSC as “a supply chain involving a limited number of economic operators, committed to cooperation, local economic development, and close geographical and social relations between food producers, processors and consumers”. Because the consumer perspective has been recommended as the point of departure when designing local food supply chain strategies (European Network for Rural Development, 2016), this study aims to investigate the social and economic factors that underlie consumers’ choices and purchase decisions and what implications this has for SFSCs.

Previous research examining the determinants of purchasing from SFSCs has used top-down approaches focusing on a limited range of factors selected a priori, such as food safety (Yu et al., 2017) or those based on the Theory of Planned Behaviour (Ajzen, 1985; Giampietri et al., 2018). Giampietri et al. (2018) found that the self-reported frequency with which Italians purchase from SFSCs is predicted by how feasible they feel the behaviour is for them to perform (e.g., “Purchasing food at SFSCs is easy to me”), but not by their level of trust in SFSCs (“I trust in purchasing food at SFSCs”). Yu et al. (2017) found that, among US consumers who visited farmers’ markets at least monthly, perceptions of food quality and willingness to support local foods predicted the extent to which they purchased food at the farmers’ market, whereas perceptions of food safety towards farmers’ markets did not.

In contrast, this study adopted a bottom-up approach using focus groups with consumers in Germany, Spain, Hungary and Greece in order to better understand their views regarding SF-

SCs, as well as the risks and benefits they perceive in buying products through these supply chains. This allowed us to determine if there are other (more specific) factors that influence the extent to which consumers shop at long- or short-food supply chains. Identifying these determinants may help researchers and policy makers to find more effective solutions to promote SFSCs to consumers.

2 Materials and Methods

2.1 Study design and participants

Eight focus groups were conducted across Germany, Spain, Hungary and Greece. Each country featured a focus group with participants from an urban region, and another with participants from a rural region (with < 5,000 inhabitants). This distinction was made because of potential variations on how consumers shop for food, as producers are normally more concentrated in rural than in urban areas. See Table 1 for details about the focus group composition.

Participants in Spain and Hungary were recruited by local agencies. In Germany, participants were recruited via a mix of convenience sampling (through personal contacts) and advertisements via the e-mail newsletter of a university and a Facebook page. Flyers were also placed in the surrounding supermarkets and farm shops, as well as a digital flyer being distributed by local associations. In Greece, participants were recruited by producer cooperatives. Participants in urban Greece were recruited by snowballing, and those in rural Greece were part of a convenience sample from the client database of a rural cooperative. As such, these participants were generally affiliated with the respective cooperatives that they were recruited by, and thus can be considered to purchase from SFSCs more regularly than the average consumer (as can be seen in Table 1). Therefore, the results from the Greek groups should be interpreted in the context of consumers who are particularly engaged with SFSCs.

Participants were screened to be (one of the) primary purchasers of food for their household, and they were recruited to ensure a mixed distribu-

tion of participant age and level of education within each focus group (see Table 1). There tended to be a greater proportion of female participants, as females are typically the ones who purchase groceries for the household. The frequency with which participants purchased from SFSC was also varied within the focus groups, with the exception of those in Greece, where most participants purchased from SFSCs at least once a week. Participants in the Greek focus groups were compensated by having their travel expenses reimbursed and were provided with refreshments; the others were paid between 30–40€.

2.2 Structure of the focus group discussion

A funnel approach was adopted for the discussion guide that started with a broad focus on how participants shopped for food, progressively narrowing to what participants thought about particular issues related to SFSCs (See Figure 1).

2.3 Focus group procedure

The focus groups were conducted in October and November 2019 by local moderators in the local language. Participants gave informed consent and were told that they could withdraw from the focus group at any time. The number of participants ranged from 8–11, with one or two moderators per group. Each focus group took up to two hours to complete. All the interviews were audio-recorded with participants' consent, transcribed in the original language and then translated into English to ensure consistent content analysis.

3 Results and Discussion

3.1 Purchase patterns across long and short food supply chains

Across the countries, participants reported mainly shopping at supermarkets, particularly participants in Germany. When urban Germans did buy directly from a producer it tended to

be for specialty products, or during their holidays. In the Spanish urban focus group, only a few participants reportedly purchased from SFSCs, primarily at markets, on site at farms, farm stores, local stores, and in rural areas. From these they purchased mainly vegetables, olive oil, eggs and honey. Participants tended to purchase SFSC products through channels most proximal/convenient for them, whether it was at weekly markets or supermarkets.

When participants in the Spanish rural focus group did buy from SFSCs, they most frequently bought olive oil, eggs, cheese, bread, dairy products, wine and homemade sweets. Markets aggregating multiple producers were a popular SFSC outlet, as consumers can purchase several types of products from different farmers, making this channel more convenient than single-producer outlets. Cooperatives were also visited for homemade wine or dairy products. Some participants also bought specialty products from the internet.

Although the participants in the Greek focus groups were customers of cooperatives, most of them also bought organic fruit and vegetables from producers in open-air markets, often on a weekly basis. Some also sourced onsite from producers directly, but less frequently, and tended to do this for meat and dairy products.

Participants in urban Hungary appeared to be relatively unfamiliar with the concept of SFSCs compared to the other focus groups and did not tend to seek them out. Although they mostly shopped for food at conventional markets, they confessed that they could not distinguish between producers and intermediaries at markets. In rural Hungary, participants felt that small producers could be distinguished by having less produce on offer (as SFSCs were associated with a lower volume of production), having fresher and higher quality products or specialty products, and showing greater personal pride in their products.

3.2 Perceptions of short food supply chains

Participants tended to have positive perceptions of local food and considered it to be sea-

Table 1: Participant characteristics per focus group

Country	Focus group	Gender & age distribution	Number of participants per education level	Frequency of buying from farmers' markets/farm shops/ farm
Germany	Urban: city of Stuttgart (n=8)	5 females (53, 22, 56, 25, 58 years old) 3 males (22, 26, 33 years old)	Upper secondary education: 2	≤ once every 3 months: 3
			Post-secondary non-tertiary education: 4 Bachelor/equivalent: 2	≤ once every 3 months: 1 ≤ once a week: 2 Never: 2
	Rural: communities in the greater Stuttgart area (n=11)	7 females (26, 22, 57, 30, 51, 57, 29 years old) 4 males (33, 80, 36, 32 years old)	Upper secondary education: 3	< once every 3 months: 7
			Post-secondary non-tertiary education: 2 Bachelor/equivalent: 2 Master/equivalent: 3 Doctor/equivalent: 1	At least once every 3 months: 0 ≤ once a month: 1 ≤ once a week: 1 Never: 2
Spain	Urban: city of Bilbao (n=9)	6 females (51, 26, 46, 64, 42, 38 years old) 3 males (54, 43, 36 years old)	Upper secondary education: 2	< once every 3 months: 3
			Bachelor/equivalent: 5 Master/equivalent: 2	≤ once every 3 months: 2 ≤ once a week: 4
	Rural: communities in the Gran Bilbao (Greater Bilbao) area (n=9)	6 females (51, 35, 44, 24, 65, 57 years old) 3 males (34, 62, 51 years old)	Lower secondary education: 1	< once every 3 months: 4
			Upper secondary education: 1 Post-secondary non-tertiary education: 1 Bachelor/equivalent: 6	≤ once a month: 2 ≤ once a week: 3
Hungary	Urban: Budapest (n=11)	7 females (54, 56, 43, 36, 34, 38, 36 years old) 4 males (49, 54, 37, 38 years old)	Lower secondary education: 2	< once every 3 months: 2
			Upper secondary education: 4 Bachelor/equivalent: 4 Master/equivalent: 1	≤ t once every 3 months: 3 ≤ once a week: 6
	Rural: Győr (n=11)	7 females (63, 38, 29, 49, 28, 49, 56 years old) 4 males (43, 44, 32, 61 years old)	Lower secondary education: 1	< once every 3 months: 3
			Upper secondary education: 2 Post-secondary non-tertiary education: 2 Bachelor/equivalent: 3 Master/equivalent: 3	≤ once every 3 months: 2 ≤ once a month: 2 ≤ once a week: 4
Greece	Urban: Corinth (n=10)	8 females (55, 64, 53, 68, 57, 56, 63, 39 years old) 2 males (68, 48 years old)	Lower secondary education: 1	≤ once a month: 4
			Upper secondary education: 3 Post-secondary non-tertiary education: 2 Bachelor/equivalent: 2 Master/equivalent: 2	≤ once a week: 6
	Rural: communities in the greater Chania area (n=9)	7 females (43, 43, 46, 63, 56, 65, 82 years old) 2 males (48, 68 years old)	Upper secondary education: 1	≤ once a month: 2
			Post-secondary non-tertiary education: 5 Bachelor/equivalent: 1 Master/equivalent: 1 Other: 1	≤ once a week: 7

Questions on grocery shopping behaviour

1. *Where do they shop for food and why?*
2. *What is important to them when shopping for food?*
3. *Have they ever bought food directly from the producer (e.g. farmers' markets, from a farm, farm shops). Under what circumstances and how often? What do they buy in these cases and why? If participants do not buy directly from producers, what are some of the reasons for this?*



PowerPoint presentation on SFSC concept including examples of SFSCs

a. Farmers shops, b. (Farmers) markets, c. Agritourism, d. restaurants using local products, e. Community supported agriculture, f. Public institutions/public procurement.



Questions about issues related to SFSCs

4. *What are their knowledge and expectations related to SFSCs?*
5. *Would they consider buying from a SFSC? If yes, under what circumstances? If not, what is the reason/s for this?*
6. *What could SFSCs do to make participants more likely to buy from them?*
7. *Where would participants prefer to buy products from SFSCs (e.g., what format/channels – e.g., farmers' markets, their regular supermarket, at the producer, having it delivered to their home, etc.)?*
8. *How are participants informed or how would they like to be informed about new SFSC initiatives/local products in their region (e.g., social media, newspapers, events).*

Figure 1: Flow chart of the discussion structure

sonal, freshly harvested and more natural (e.g., not artificially ripened, having fewer chemical residues). Some also understood SFSC to be more environmentally sustainable, and many assumed that SFSC products are generally organic. SFSC were also associated with small scale, traditional production, although some participants in the German urban focus group countered that it is possible to have larger producers follow the SFSC principle of short delivery routes, with this being more environmentally sustainable. Additionally, the rural Spanish and Greek focus groups felt that products from SFSCs were more traceable and they trusted shorter chains more than longer ones. Nevertheless, there was also some confusion

about what constituted a SFSC. For example, some in the Spanish urban focus group initially thought that fresh SFSC products could not be found at large chain supermarkets because such places stock food that is harvested at an unripened stage, whereas local producers harvest their products daily, offering products at their peak quality. Other participants pointed out that the difference in product quality between long- and short- food supply chains may vary depending on how perishable the product is and the location of the supermarket. It was concluded that supermarkets could also be part of SFSCs, if the products sold originate from the same region. Some participants understood that producers re-

ceive a greater percentage of the revenue through SFSCs than through longer chains, and they found this aspect quite motivating. Participants in the Greek urban focus group were particularly concerned about the social implications of SFSCs. For example, some of them noted that they prefer to buy directly from producers because in this way they can inspect whether the workers are exploited.

3.3 What do participants care about when shopping for food?

Participants across the focus groups generally agreed that time, money and convenience were their priorities when purchasing food, and that currently the purchase of SFSC products was not compatible with these factors. This is largely consistent with the results of Zepeda and Leviten-Reid (2004) and Giampietri et al. (2018) who found that inconvenience (i.e. time needed) and ease of purchasing respectively influenced consumer purchase of local food. Many participants said that they did not buy directly from producers for practical reasons such as limited opening hours, limited selection of products, inability to pay by credit card, difficulty finding parking, greater effort needed to travel to SFSC outlets and engage with the producer, and lack of knowledge about where to find direct sellers. Instead, most shopped at large supermarkets, which have long opening hours, offer a wide assortment of products covering consumers' needs, are located near where many participants live and have easy parking. Participants in the urban Spanish focus group found it convenient to shop at more local, specialised stores alongside shopping at the supermarket. In contrast, most participants in urban Hungary bought their groceries predominantly at conventional markets, although not specifically from producers. Participants emphasised that they visited markets that were close to where they lived, and that they could buy almost all the food they needed there. This option fulfilled the same convenience criteria that led participants in other focus groups to shop at supermarkets. It was also felt that trust in SFSCs needed

to be strengthened, particularly in Hungary, via tighter regulation and controls, as well as through increasing knowledge and exposure to SFSCs. Participants said that information about SFSCs should be more accessible, and that public institutions had an important role to play in supporting SFSCs and educating citizens about them.

Convenience

Most participants said that they would only buy from a SFSC if it was conveniently located. For some this meant a few hundred metres or no further than their local supermarket to purchase food, whereas others would travel up to 30km. In urban Germany, it was argued that driving long distances to purchase from SFSCs would defeat the point of SFSCs being more environmentally sustainable – it would be environmentally friendlier for there to be few trips between the producer and the consumer, but to purchase large quantities each time. This point is consistent with research suggesting that the distance consumers travel to purchase from producers contributes to much of the food miles and carbon footprint impact of SFSCs (Malak-Rawlikowska et al., 2019).

Participants suggested that SFSC products should be made more accessible by being offered through local stores and supermarkets. Those in the Spanish urban group suggested that having markets open on more days and for longer hours would facilitate the purchase of local food. In Germany and Hungary, participants further felt that the ease of identifying local food should be improved. They suggested that this could include road signs indicating the locations of SFSC producers, having a local product section at supermarkets, providing information to clearly mark the regionality of food and distinguishing producers from intermediaries in conventional markets.

In order to make it more convenient to shop from SFSCs, participants recommended that producers should band together to offer a wider range of products to consumers through various channels. Those in Germany and Spain favoured the aggregation of producers in market halls and online platforms, combined with home delivery,

and cooperatives were also favoured by those in Spain and Greece. In Hungary, most participants would prefer to buy SFSC products from farm shops or markets, followed by home delivery (including delivery from supermarkets).

In Germany, one convenient channel of purchasing from SFSCs is to buy local food from vending machines, particularly at frequented locations such as central train stations. Indeed, half the urban German focus group already engaged in this practice to purchase products such as eggs, apples, cabbage, potatoes, milk, meat and specialty products. It was mentioned that the products are particularly fresh, and farmers supply the vending machines several times a week. Products from vending machines are generally more expensive, and so this channel tends to be used only when the usual retail outlet is closed.

Some also favoured the convenience and time-saving aspect of home delivery. Some felt that home delivery was more sustainable than traveling to the producer to purchase food, whereas others felt that extensive home deliveries would incur an environmental cost. Workarounds were suggested, such as customers picking up produce from collection points (e.g., workplaces) and having specific zones for regional deliveries. It was also suggested that home deliveries could be reserved for those who would benefit from them the most, such as senior citizens who are less mobile. One common concern expressed about deliveries is that consumers cannot personally select their own SFSC products, and thus might receive products of inferior quality. However, participants who had used this channel endorsed it because they felt that they had received good quality products. Consumer trust for home delivery might be gained by: a) offering first-time promotional offers that encourage consumers to try the service so they can be assured that they receive good quality products; b) publishing reviews/ratings of the delivery service; c) allowing consumers to specify their desired best before dates for fresh products; and d) allowing consumers to refuse/return products with the possibility for an exchange or reimbursement.

Price

There was a perception in Germany, Spain and Hungary that local products tend to cost more than those from longer supply chains stocked in large supermarkets, which was a barrier to their purchase. In Germany and Spain, participants expressed more concern about value for money, with better quality generally associated with a higher price. Those in Hungary prioritised price over quality because they felt that they had little disposable income to spend on food. Those in the Greek urban focus group also prioritised price, although the Greek groups felt that it was worth paying more for organic products.

Some Hungarian and Spanish participants had the perception that small-scale production was less resource intensive and felt that this should actually reduce costs. Similarly, they also wondered why organic products tend to be more expensive than non-organic products. Their reasoning was that since organic farmers do not have to pay for pesticides and chemical fertilisers, then their products should not cost more. By contrast, others believed that organic production may increase the costs of SFSC products due to the cost of organic certification, or the fact that organic food has a shorter shelf-life (and so may incur expenses related to its storage conditions – e.g., needing to be stored at certain temperatures).

Some participants in Spain and Hungary felt that the higher price of SFSC products may be due to a lower volume of production and/or a slower rate of production compared to longer chains. For example, many in rural Spain felt that larger producers apply fertilisers and pesticides to increase production rates and volumes, thereby reducing production costs relative to the volume produced in a set amount of time, whereas traditional production methods take more time for a smaller yield. However, it was also believed that such traditional methods have a less negative impact on the environment and animal welfare.

In Hungary, it was argued that the elevated prices of small producers provide a financial reserve to mitigate the low sales during the winter. A participant in Spain mentioned that producers from longer supply chains may employ workers at very low wages, which reduces the costs of the

products at the expense of the workers.

Some participants disagreed with the view that products from SFSC are more expensive. Whereas the foregoing arguments are based on the comparison that SFSC products are more expensive than those from long food supply chains, participants who disagreed based their arguments on the idea that it is cheaper to buy a comparable quality product from a SFSC than from a long food supply chain. It is also worth noting that the relative cost of products from SFSCs compared to longer chains may also vary by product type (e.g., Donaher and Lynes (2017)), which may also lead to inconsistencies in consumer perception.

Participants across all the countries except Hungary discussed that producers benefited more financially from SFSCs, as intermediaries in longer chains take a larger share of sales revenues. Measures to promote fair prices for local producers were suggested, such as having pricing information for consumers make explicit the percentage of profit that goes to the producer and intermediaries, in order to increase transparency in the food value chain, and implementing legislation to set minimum prices for local producers and their products, e.g., “They should promote/establish a minimum value that is paid to the producers/local farmers. As well as establishing a minimum value of such products in accessible local stores.” (urban Spain).

Yet, fair prices for producers were not always a priority for participants. Some participants from Spain felt that information about different production costs associated with different supply chains would only influence their behaviour if they could afford to purchase the more expensive product. It was generally felt that groups that struggle financially are particularly price sensitive, and thus cannot afford to prioritise other considerations such as health and food quality over financial concerns, with one Hungarian remarking “... a lot more people would be more attentive [to health] if average salaries weren't that shameful...”. Many Hungarians were unwilling to pay more for a product from a short chain that was of comparable quality (in terms of appearance, ripeness, taste, and organic status) to that from a longer chain, in contrast to other participants.

There can be two sources of price differences of food from long and short supply chains. One is at the production level, where small scale production is more expensive (e.g., Woodhill et al. (2020)). Another is at the retail level, where longer food chains can be more expensive for the same product because of the accumulation of profit margins from more intermediaries (e.g., Malak-Rawlikowska et al. (2019)). In the production stage, participants seemed to be willing to pay more: a) for better quality; and b) if they know that the producer or small local retailer will directly benefit from their purchase. This is consistent with Yu et al. (2017) who found the perception that local food was of better quality and that its purchase would help support the local community predicted the purchase of local food at farmers' markets. However, they were unwilling to pay more for products at large supermarkets if the price increase is due to a greater number of intermediaries in the food chain. Thus, consumers need to be informed they are buying a better-quality product that will benefit the local community more directly when they purchase from SFSCs. They also need to be better informed about the greater costs associated with these types of production, in order for them to feel that the higher price of SFSC products is justified.

Quality

Participants reported taking quality into account when shopping for produce. Quality was most strongly associated with the taste and freshness of a product, and also whether it was organic or environmentally sustainable. The motivations for buying organic food were referred to mainly in terms of health and food safety, with less emphasis on environmental implications. This is consistent with previous research showing that consumers who regularly purchase food from SFSCs also highlight the values of health, taste and freshness (Vannoppen et al., 2001).

However, Hungarian participants placed less emphasis on whether a product was organic, perhaps because many were suspicious about the authenticity of their production method and did not understand the higher cost. They also mentioned that the appearance of the product was

important, whereas those in urban Germany and Greece did not consider appearance to reflect quality.

In all the countries except Hungary, participants expressed concerns about the seasonality of products, although it was not clear whether consumers valued seasonality because they felt that seasonal products taste better or because of their reduced environmental impact.

Origin

In all countries, some expressed a preference for regional/national products. In the Greek focus group this was because participants wished to support the local economy, although some mentioned that they trusted the quality standards of local products more than those from overseas, e.g. “The local part is very important, because organic ... but now if we take organic from China ... it may not be the residue of pesticides, but they are other issues, which are not detected, or are not controlled regarding the issues of fungi or other aggravating factors, so it doesn’t tell me anything to get it from China just because it’s organic. I want it to be as close to the local market as possible...” (urban Greece).

However, the origin of products was not always a priority, and sometimes other aspects, such as whether a food is organic or its guarantees of ethical employment, was enough to satisfy participants, e.g. “For me, it does not depend on where a product is produced, but how it is produced. Production quality for me is what matters.” (urban Spain).

It is interesting to note that although some Hungarian participants preferred national products, some admitted that such products were not of a premium quality, suggesting that they may have purchased them for other reasons (e.g., to support the local economy).

Personal relationships: The “human factor”

Many participants also valued having a personal relationship and interacting with food vendors, particularly for those who frequented smaller retailers. Some in rural Spain felt that specialised

retailers provide consumers with more knowledgeable service regarding the products which helps to facilitate trust. Similarly, participants from rural Germany mentioned that they would pay more for good service and the specialised knowledge of product experts, and these benefits were felt to encourage customer loyalty. It was mentioned that it is also possible to have personal interactions with producers online, and with staff at supermarkets with specialised departments. However, one participant from rural Germany pointed out “if you only buy online or in the supermarket, the number of small producers decreases: butchers, bakers etc. die out, rural farms die out, because there are not enough buyers nearby. . . .”. This awareness is consistent with the theme of customer loyalty that was mentioned by several participants in rural Germany and could explain why consumers in this focus group tended to source different products at a greater variety of specialised stores compared to their urban counterparts.

Producers/local store owners were considered by some participants in Greece and Spain to be more honest with customers, making them seem more trustworthy, e.g., “...the producers or local commerce, they must contact directly with us, so they have to be sincere, they have to be responsible.” (rural Spain). However, it must be noted that other participants did not necessarily feel that larger retailers were less trustworthy, e.g., “The supermarkets are more impersonal but I still trust the people that are selling to me.” (rural Spain).

3.4 Strategies to promote the purchase of SFSC products

Regulation

Hungarians perceived farmers’ markets to be less regulated than the large retail chains, and that vendors sometimes cheated their customers in a way that was less likely to occur in supermarkets (e.g., products labelled with false claims, sellers rounding-up prices). Some Hungarians also doubted the hygiene of some markets, with one remarking, “. . . nobody could ever sell me meat there [at the market]. What’s out there . . . dust,

coughing, sneezing, gasoline vapor... not covered, not cooled even in summer ...". Similarly, a participant from Germany who lacked confidence in the hygiene of SFSCs remarked "It is not transparent at the farmer's store which hygiene rules have been observed, as the control standards are different. The risk is much higher, especially for milk.". However, other Hungarians trusted the food safety of SFSC, with one from the urban focus group remarking "... all the products must be controlled by the NÉBIH [National Food Safety Authority of Hungary], even the products from old farmer ladies.". Greater input from national authorities regarding SFSCs, and more public communication about how these food chains are regulated, along with clearer consumer protection standards may help to increase confidence in SFSCs.

Information dissemination

Participants generally believed that consumers would be more likely to buy from SFSCs if they had greater access to relevant information, such as food quality and traditional food production methods. In the German groups, it was proposed that there should be improved marketing and clearer communication of the benefits of SFSC products. Relatedly, participants in urban Spain felt that the consumption of more seasonal products should be promoted among consumers.

Many participants felt that schools have a role in educating students and parents about the environmental and social implications of food production, particularly those from urban areas. They suggested that special educational programs could attract the attention of young children, especially if they contain practical components, like vegetable gardens at schools.

Many participants (particularly those in Germany) preferred to learn about SFSC initiatives/local products from non-print sources, such as social media, online newsletters and email; with many preferring to receive this information via mobile phones. Some also favoured outdoor poster advertising, such as those at bus-stops. Those in rural areas also appreciated regional media outlets such as local TV, radio and community newsletters/newspapers. Some also valued personal recommendations (e.g., via

word-of-mouth), whereas others wanted to learn about SFSC initiatives and local products at events such as exhibitions or festivals. Several participants in urban Spain wished to see local stores and products promoted on social media, and to receive reminders about these stores and products, whereas some participants in Germany wanted to receive weekly promotions. Customers of the urban Greek cooperative noted that they typically received information about SFSCs online or contacted the producers by phone directly. Members of the cooperative post special announcements when a seasonal product is available or when something is added to the assortment (e.g., when a product has just been harvested or produced). The customers felt that these measures encouraged their own purchase behaviour.

Government support

Some participants in Spain and Greece felt that it was the responsibility of governments (e.g., local municipalities) to create a legal and administrative framework to support SFSCs. They suggested that this could be done by providing training and subsidies to encourage small producers to adopt organic production. It was proposed that local governments should also create initiatives to support public procurement, with local or organic products prepared onsite, as many institutions currently outsourced their food production.

4 Conclusions

Across all four countries, it appears that participants generally felt that the relative inconvenience of purchasing food from SFSC was a barrier to its uptake, and that having more accessible SFSC and being able to purchase a wide range of produce in one place was a prerequisite for them to buy such products. In some countries such as Hungary and Spain the higher price of SFSC was an additional barrier.

It was believed that small-scale production and SFSCs result in better quality food, and some participants also like the idea of supporting their local community through purchasing from local producers and/or retailers. However, they had

less confidence in the hygiene and food safety standards of SFSCs compared to longer chains. Compared to previous research on the determinants of purchasing from SFSC, the results of this study provide a wider range of potential barriers and facilitators of purchasing from SFSC, covering the urban and rural regions across four EU countries. The multi-country approach used allowed us to identify concerns that were more universal (e.g., convenience) versus those that were more region-specific (e.g., regulation and food safety), and to propose solutions to promote the uptake of SFSC products that consumers themselves felt would be effective. Furthermore, the exploratory nature of the research allowed participants to express their personal concerns and motivations, rather than select from those that were prescribed from an external source. However, the focus group methodology means that only limited conclusions can be drawn, not only because of the small sample size (which in this case conformed to the best practice of 6-12 participants for focus groups; (Onwuegbuzie et al., 2009), but also because the extent to which participant views influence their behaviour cannot be determined. Thus, future studies that examine the extent to which the factors highlighted in this study predict behaviour within a larger sample will be needed to clarify the implications of our results.

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Motivations and Barriers for Engagement in Short Food Supply Chains: Insights from European Focus Groups

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Abstract

The purpose of the study was to identify the motivations and the barriers that stakeholders face regarding Short Food Supply Chains (SFSC). Two focus groups with stakeholders of the agricultural sector and SFSC were conducted in the Netherlands and Switzerland. A first fundamental topic addressed by participants was the one related to the definition of SFSC, which is far from consensual, “short” being often associated and sometimes confused with local, direct, small, fair, ecological, fresh, healthy, etc. However, a series of positive and negative factors influencing SFSC development, and the involvement of agri-food stakeholders were identified. On the one hand, the unique relationship built through direct contact between producers and consumers, the fair distribution of value added in the chain that producers can find in engaging in SFSC, the increasing number of SFSC initiatives, the farm resilience, and territorial strategies that are being developed seem to be the most positive aspects, that can explain the trends moving towards these types of distribution channel.

On the other hand, many hindering factors were also identified, such as weak communication and marketing capacity of producers, and a lack of efficiency and cooperation between peers. The fierce competition of conventional distribution, using green washing, together with a profusion of labels, price issues, and unsuitable standards were mentioned as the main threats faced by SFSC actors.

Keywords: Collaboration; Communication; Mass market competition; Motivations; Short Food Supply Chains; Sustainability

1 Introduction

In Europe, food is mostly distributed through the mass market (i.e. hypermarkets, supermarkets and discounters), which contributes about 54% of total European edible grocery sales. In 2014, more than 60% of the market share was held by five retailers in 13 European countries (Augère-Granier, 2016). Moreover, private labels

account for 30% of the food retail sales volumes in the west of Europe. In 2021, online sales experienced a significant growth due to consumers' demand for safe shopping alternatives during the COVID-19 pandemic (EuroCommerce & MCKinsey & Company, 2021). Furthermore, direct sales between producers and consumers represent 2% of the fresh food market. Among these sales, 15% of producers sell half or more of their

products directly to consumers (Augère-Granier, 2016; Hyland et al., 2019).

For some years now, consumers are increasingly demanding more food of higher quality, freshness, further transparency in the food supply chains, and information on how it is made and by whom (Bentsen & Pedersen, 2020; De Bernardi & Tirabeni, 2018). In this regard, alternatives to conventional food chains are rising, such as short food supply chains (SFSCs) (Bentsen & Pedersen, 2020; De Bernardi & Tirabeni, 2018), especially in Europe and North America (Chiffolleau & Dourian, 2020). The definition of SFSC at the European level is:

according to the European rural development regulation (1305/2013), a ‘short supply chain’ means a supply chain involving a limited number of economic operators, committed to co-operation, local economic development, and close geographical and social relations between producers, processors and consumers.

However, this definition is criticized and there is no consensus among stakeholders involved in the agri-food sector. Issues in this European definition include the ambiguity in “close geographical” relations. What is considered as close can be interpreted differently by diverse actors. As asserted by Renting et al. (2003), different SFSCs types can comprise several proximities. One can be geographical proximity with face-to-face interactions where consumers are purchasing their products at the production place (e.g. pick-your-own, farmers markets) and create interpersonal relationships with the producers. This proximity can be broadened when SFSCs are extending and are based on relations (e.g. Community Supported Agriculture), or cultural proximity (e.g. regional specialties sold to foreigners). Another extended SFSC type consists of extended relations, in which products can be exported and sold outside the region in which they were produced. In addition to the proximity aspect, the economic value is important in this type of food chain. Producers are seeking to improve their revenues and are willing to grab a greater part of the added-value (Kneafsey et al., 2013). Malak-Rawlikowska et al. (2019) found that producers

who sell their products within short and long food chains are benefitting from an economic point of view by using SFSCs. These chains provide a high price premium compared to longer chains, as the margin proportion is captured by producers and not intermediaries of long chains. The variety and richness of SFSC models do not help the reaching of a consensus about the characterization of what is a SFSC. Similar terms can be used with contrary meaning (Massar, 2019). The concepts of “short”, “local” and “organic” can be confusing for consumers. In defining SFSC, besides the proximities, the number of intermediaries and the economic value, the social and organizational aspects are highly important. Renting et al. (2003) highlighted the capacity of new food supply chains as SFSCs to “resocialise” food, allowing consumers to consume based on their own knowledge and experiences.

Previous research has already investigated the factors that are hindering the development of SFSCs. In the European project SKIN, the following bottlenecks were identified: “societal constraints, deficiencies in skills, a lack of resources, policy issues, and geographical fragmentation” (Hyland et al., 2019). Furthermore, research on the drivers of consumers’ behaviour regarding short food supply chains were conducted by Giampietri et al. (2016), using the Theory of Planned Behaviour. The goal was to predict consumers’ intention and behaviour towards SFSCs products purchase. Other studies focused on SFSCs as sustainable development levers, and on their implications on territorial and social innovation (Chiffolleau & Prevost, 2012; Galli & Brunori, 2013). Previous research lacks the depth necessary to be useful to practitioners and policy makers regarding SFSCs. Hence, the current analysis focused on the identification of barriers and facilitators related to SFSCs, together with practitioners and stakeholders in two countries. The identification of these factors aimed to guide researchers and policy makers in the design of adequate and efficient actions, and solutions to support producers in the development of SFSC initiatives.

2 Materials and Methods

2.1 Study design

Two focus groups were conducted during the summer of 2019, one in the Netherlands and one in Switzerland. The main aim was to deepen the understanding of the internal and external driving forces of short food supply chains. The obstacles and facilitators regarding the engagement of actors in SFSCs were identified. An inductive approach was used. Political recommendations were therefore proposed.

The participants of the two focus groups included practitioners (e.g. farmers and processors), representatives of public authorities and experts in the agricultural sector with knowledge in agricultural economics, marketing and knowledge transfer focused on food practitioners. Several food sectors were represented (i.e. fruits and vegetables, dairy, meat and cereals sectors). During the meeting, they were invited to share their point of view, following a rigorous but flexible methodological framework, ensuring the scientific validity of the results and mutual respect between the participants. The focus group approach was selected as it allows the investigation of complex human behaviour, attitudes, and motivations of the participants (Kitzinger, 1995; Morgan & Krueger, 1993). The number of participants in a focus group does not give a statistically representative pool of opinions. Instead, the aim consists of collecting participants' insights and detailed opinions to get qualitative results. The diversity of participants' profiles fostered the identification of key issues in contrasting ways, and highlighted convergences and divergences between the different stakeholders' points of view. A literature review was conducted to complement the findings and outputs from the research report on strategic collective system building within the Dutch SFSCs sector and these, together with insights from the focus groups, were integrated into the research (Maszar, 2019).

2.2 Structure of the focus group discussion

The focus groups were conducted in July 2019, with local moderators, in the local language in

the case of Switzerland and in English in the case of the Netherlands. Each focus group took two to three hours to complete. The sessions were audio-recorded, transcribed in the original language and translated into English to ensure consistent content analysis.

The session started with a short Power Point presentation of the SMARTCHAIN project, and of the preliminary results of the questionnaire about the driving forces of SFSCs. Following this, the discussion was launched with guiding questions that are presented in Figure 1. The European definition of SFSCs was used as a starting point of discussion in the focus groups.

3 Results and Discussion

The internal and external positive and negative driving forces that were found to be acting on the development of SFSCs are presented in Table 1. These elements are developed in the following sections.

3.1 Internal strengths of short food supply chains

The value of a closer producer-consumer relationship

The relationship created between consumers and producers in short food supply chains is an important strength that was cited in the two focus groups. For Swiss participants, the direct link with the consumers allows the producers to tell the story of their products. It becomes possible to educate consumers on tastes and textures, to describe ways of cooking the products and to explain new consumption methods. A Swiss producer asserted:

We also sold organic chicken at home from another producer. Many people complained: chicken is hard. Indeed, we are used to something else! The organic chicken is small, hard and ugly. You have to explain that it is a healthy texture, that it tastes good, and give a recipe, because you have to cook it

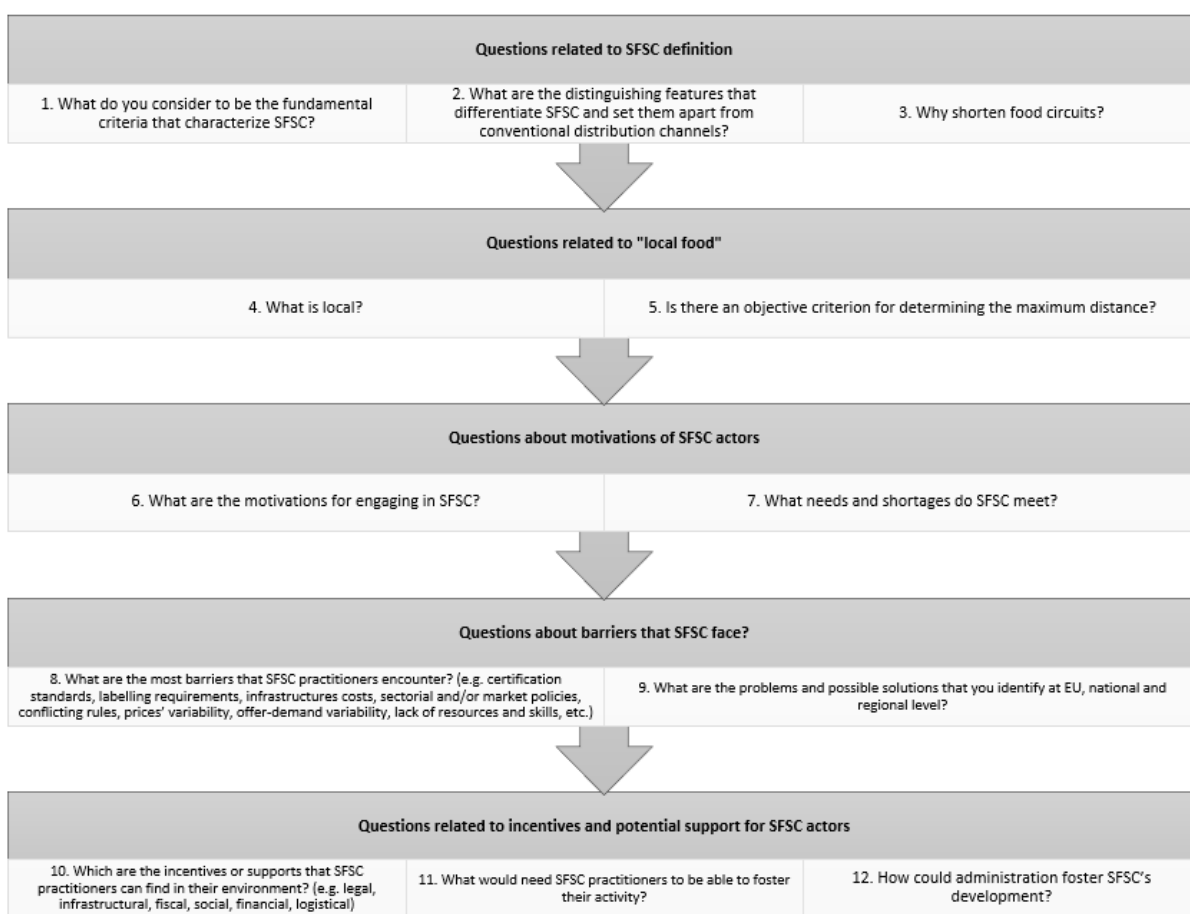


Figure 1: Questions addressed in the focus groups

differently, and it works. So that in supermarkets, I can't sell, because I can't talk to the consumer.

In the Netherlands, participants of the focus group mentioned that a close relationship between producer and consumer implies a "re-appropriation" by consumers of their diet, a better knowledge and awareness about the food they buy, and thus positive nutritional, socioeconomic and environmental impacts. Consumers seem to value food from a nutritional and economic point of view. Besides, they also value food as a common social and cultural good that creates links within a community (EIP-AGRI, 2015).

More fair distribution of value added in the chain

Short food supply chains imply a more balanced distribution of economic value and decisional power within the value chain. Malak-Rawlikowska et al. (2019) found that producers who sell their products within short and long food chains are benefitting from an economic point of view by using SFSCs. The benefits that SFSCs bring to both the production and consumption sides constitute a powerful argument, which resonates with current social, economic and environmental issues. Benefits cited in both focus groups included economic and social empowerment of producers, high-quality food at

Table 1: Composition of the peel and pulp of genipap fruit

<i>Internal strengths</i>	<i>Internal weaknesses</i>
<ul style="list-style-type: none"> · Value of a closer producer-consumer relationship · More fair distribution of value added in the chain · Relationships based on trust and recognition · An aligned network and existing SFSC initiatives · Increased farm viability and resilience 	<ul style="list-style-type: none"> · Lack of coordination and cooperation resulting in bottlenecks (e.g. inefficient logistics) · Lack of a clear and functional definition · Weak communication and marketing capacity
<i>Opportunities</i>	<i>External barriers</i>
<ul style="list-style-type: none"> · Strategies at different levels · Mutual benefits through collaborations · Certifications for transparency and quality guarantee · Consumers' increasing demand and awareness · Increasing sustainability criteria in public procurement rules 	<ul style="list-style-type: none"> · Difficult access to land and reduced access to financing · Consumer choices criteria · Inappropriate legislations and infrastructures · Mass distribution competition

better prices for consumers, more transparency and quality guarantees for consumers, rural and local development, community building and creation of social links.

Furthermore, the domain of food science and technology increasingly focuses on consumer behaviour. Silva et al. (2018) analysed the four main cycles of knowledge development in this domain from the 1950s to the 21st century. They found that scientific and technological development must take into account new consumption patterns. Stakeholders of the food value chain, and in particular the industry, must improve the approach to consumers. Moreover, the number of scientific articles that relate to consumer behaviour increased between 1993 and 2013. Kase-model et al. (2016) found that the main topics that come out of the analysis are sensory, health, safety, willingness to pay, packaging, ethics, and convenience.

Relationships based on trust and recognition

According to the participants of the focus groups, SFSCs guarantee more food safety and trans-

parency, through trust mechanisms. In a direct sale relationship, the pledge of quality relies on personal trust. When the system scales-up, and consumers are no longer in direct contact with producers, other mechanisms are needed to warrant quality, such as blockchain platforms, that “transport evidence” throughout the chain. This argument was highlighted in the Netherlands. A Swiss producer also spoke about “a more rewarding and healthier commercial relationship” for both the producer and the consumer. This implies a notion of social and economic recognition from the producer, and introduce trust and transparency as fundamental elements.

A lot of existing short food supply chains initiatives

There are increasing number of SFSC initiatives in Europe (Jarzcebowski et al., 2020), with a focus social, community and environmental issues. There is a high potential of cooperation and social innovation. However, participants expressed a need for more collaboration and coordination to make logistics more efficient, to reach a critical mass of sales and to enrich the variety of

the supply. In this regard, Dutch SFSCs practitioners seem to be quite efficiently organized and coordinated at regional level. There are over 3,000 farmers selling their local products directly to consumers on farm or via web shops and speciality retailers, including all types of direct sale practices (Massar, 2019). A dozen regional food hubs are working, such as Local2Local in the area of Utrecht or FlevoFood in the province of Flevoland. Therefore, combining city functions with food production will allow the formation of a crux in which regional wholesalers can distribute locally grown food (Massar, 2019). Initiatives in Austria, Greece, France and Norway were reported by Kneafsey et al. (2013) and Vittersø et al. (2019). Their goals are to promote rural development and agriculture, to provide marketing assistance at the regional level, to develop web-based schemes for the management of orders and payments to support farmers with skills (e.g. IT and marketing skills) and to create sustaining traditional networks in which farmers can cooperate with peers.

Increased farm viability and resilience

The concept of SFSCs allows the diversification of the business models beyond the traditional marketing channels used by conventional long food chains. Farms become more resilient and economic uncertainties are reduced to the contrary of the market volatility of long chains (Boutry & Ferru, 2016; Ripoll-Bosch et al., 2012).

Many producers said that they took the decision to change their way of producing and commercializing driven by a feeling of anger towards an unhealthy, socially and environmentally unfair food system. These innovators are used to being highly committed to their community and environmental engagement, who want to retake the control on the value chain of their products. This is supported by *Q1* Vitterso et al. (2019) that found “a sense of community” is appreciated by producers, consumers and other SFSCs actors.

3.2 Weak points of short food supply chains

Lack of coordination and cooperation

In the Netherlands, many respondents pointed out the lack of cooperation and coordination between SFSCs parties, which results in a fragmented, unreliable and uncoordinated supply (insufficient or excessive, unmatched between needs and demand), and an inefficient logistics system (constrained by limited production volumes handled in SFSCs, making it difficult to meet demand from increasing number of customers). Many new initiatives are developing, but the existing ones appeared to have trouble in consolidating and scaling-up. Support provided at the regional and national levels should foster the coordination of actors by encouraging them to think about common interests, reinforcing the network in which they operate.

In terms of logistics, today we have everything we need to do it well. We have never had so many means of transport, communication, but we still have a lot of bad will (a representative of a Swiss sectorial association)

The participants also mentioned the lack of time and skills of producers to develop these aspects. It is necessary to think about complementary partners, while ensuring their good coordination, both at the farm level and at the regional level, in order to be able to offer a wide variety of products to consumers. The development of centralization and coordination platforms was mentioned as an important need to fulfil these functions, structures that should remain in the hands of producers. These platforms could be supported by public funding, establishing pilot phases to identify the most efficient system that will ensure a good coordination between actors.

Lack of a clear and functional definition of SFSC

In both countries, there is a lack of a clear, functional and consensual definition of SFSC. What

is “short”? Is it only a matter of distance or number of intermediaries between the primary producer and the final consumer? Is it related to the size of companies involved? To the production methods? Does short mean organic/biological? To make possible peer-to-peer cooperation and external communication, to consumers and authorities, a functional and consensual definition is needed.

The European definition was the starting point of the discussion. However, it was highly criticized by the participants of both focus groups. Within the Dutch panel, the importance of the collaborative and value dimension was quite consensual. The mere criteria of “maximum one intermediary” was unanimously rated as senseless, even combined with a notion of distance, which is furthermore very difficult to quantify: how many kilometres is “local”? They insisted that a lot about the nature of the intermediaries and of the relationships within the value chain, was with regards to their social impact (in terms of community building, social inclusion, health, etc.) and philosophy. For them, non-profit spirit, fair collaboration and community building were an integral part of SFSCs. They contrasted social impact and community building of SFSCs versus capitalist logic of profit making and competition of big distribution. The nature of the links within and between the value chains seemed to be a key element for most of them.

In the Swiss focus group, the term of “locality” was discussed, and questions like what is local or what is a region were raised. Territory appeared as a rather subjective notion, which does not only imply a determined physical distance, but also questions of identity: Is there an objective criterion for determining the maximum distance? With which territory does the consumer identify him/herself? The territory size can vary considerably from one context to another.

The social component of SFSCs was stressed, with a definition in terms of a close, strong and direct relationship between producers and consumers, in a reciprocal movement from consumers to producers and from producers to consumers. This implies a reduction in the geographical distance between the two, but also a reduction in the number of intermediaries (even if a definition in terms of maximum number of

intermediaries seems too restrictive).

In the Swiss discussion, some participants focused more on the producer perspective. SFSCs imply a restructuring of flows that promotes the economic and social empowerment of producers, giving them more decision-making and financial power. In this perspective, the number of intermediaries no longer seemed important. The question is rather “to whom does the intermediary respond?”. If producers outsource part of the manufacturing of their products, while retaining control and price, then the chain remains short. What matters is the added-value and the decision-making power that is more equitably distributed, and that a larger share go to the primary sector. Other participants preferred to give more weight to the consumer perspective, adding that from a political and strategic point of view, the consumer could be a more powerful lever.

Weak communication and marketing capacity

The lack of capacity and resources (workforce, money, time, skills, knowledge, and expertise) of SFSC actors to tackle the numerous tasks and challenges related to a SFSC activity (marketing, communication, management, networking, logistic operation, etc.) was pointed out in the two focus groups. SFSC actors do not deny the powerful marketing deployed by mass distribution. A representative of a Swiss sectorial association pointed out that communication is an activity that requires skills and knowledge that farmers do not necessarily have. A specific communication strategy should be designed to allow farmers selling their goods.

3.3 Opportunities for short food supply chains

Strategies at different levels

The growing interest towards alternative food chains from different actors are pushing the development of different strategies. They are implemented at different levels: regional, national and international. In Switzerland, five pilot

projects are about to start, two of them in French-speaking Switzerland. Some of the participants of the Swiss focus group saw great potential in urban food planning, where favourable conditions in public procurement could be granted to SFSCs.

In the Netherlands, a strategy for the national collaboration between SFSC actors was set up, relying on a clear vision of transition dynamics and innovation systems theories. This strategy depends on a collective system building approach based on the GAIN transition model. This model is inspired by the Market Transformation Model (Simons & Nijhof, 2020) and the Innovation System transition models (Hekkert & Negro, 2009), aiming at systemic impact. The GAIN transition model consists of the implementation of network formation and strategic niche management by using gamification principles. There are four levels of engagement and collaboration for SFSC stakeholders: local, regional, national and international. The model offers opportunities to increase the competitiveness and sustainability of short chains with practical solutions. For example, the national level brings together a variety of actors (e.g. farmers, experts, authorities, etc.), connecting all the existing regional alliances, to make the SFSC model grow to be more inclusive, betting on a systemic approach to challenge the system. In this perspective, scaling-up will occur through a “compagnonnage” movement and ecosystem approach, using a national hub such as the entrepreneurial initiative Taskforce Korte Keten (TKK) to foster SFSC development. Furthermore, political efforts to relocate the food and agricultural systems are in line with what SFSCs wish to promote (Sonnino, 2016).

Besides the regional and national strategies that are flourishing across all different countries, strategies at the EU level also expand initiatives like the “Farm to Fork” strategy, which is at the heart of the European Green Deal. The main goal is to make food systems fair, healthy and environmentally friendly, to implement a change in the way food is produced and sold (European Commission, 2020).

Collaborations

Several examples of collaboration with communities were mentioned in the Swiss focus group to illustrate the opportunity they represent for local producers. Many schools, businesses and hospitals are interested in supporting the local economy of their region and providing their staff, patients, students with quality, local food. Mass distribution can also be an ally for SFSCs, although ambivalent. The example of its involvement in the development and growth of the Swiss organic sector was cited. Collaborations with universities of food engineering were also mentioned as potential resources that are rarely exploited. They can provide advice and information to farmers on production, processing and marketing methods. Universities of Applied Sciences in Switzerland are interested in working on practical cases, which could also help to fill the gap that often exists between research and firms, and reduce the delay to provide concrete solutions.

Certifications for transparency and quality guarantee

For a majority of participants, since the relationship between producers and consumers is based on trust, products sold through direct sales do not need labels. Trust is enough to guarantee the transparency and quality of the products. However, when the network expands and the producer is no longer in direct contact with their customer, other mechanisms can take over, such as a rating system or certification through criteria collectively defined by producers and consumers.

Consumers’ increasing demand and awareness

In a study by Eurobarometer (2011), a survey carried out on 26,713 EU citizens showed that 90% of respondents agreed that buying local food is beneficial and that the EU should promote their availability (Eurobarometer, 2011). It has been demonstrated that consumers like to buy local foods (i.e. food that is locally produced and/or locally consumed) for several reasons, “including environmental concerns, health

reasons, perception that local foods are high quality, the enjoyment of shopping at local outlets, and to support local farmers, economies and communities” (Kirwan, 2004; Kneafsey et al., 2013; Seyfang, 2007). This is supported by Nunes et al. (2020) that asserted that the demand for healthier and sustainable food is growing all over the world. The shift from the importance of food quantity towards food quality through differentiation has been identified by the authors. Moreover, social and community recognition were mentioned as important supports for SFSC in the focus groups.

Increasing sustainability criteria in public procurement rules

Public procurement rules are still quite unfavourable to SFSCs. However, sustainability criteria are increasing in the Netherlands. One actor stated that the sustainable procurement policies for governmental organisations are mentioned as an opportunity for SFSCs to gain governmental support fulfilling all the sustainability criteria. This opportunity is being addressed officially by the Dutch Minister of Agricultural in collaboration with the 12 Provinces and the TKK in order to supply governmental and semi-governmental catering companies with local supply (Taskforce Korte Ketten, 2020). This example ought to be implemented in different national contexts that aim to support SFSCs in different regions in the EU.

3.4 External obstacles for short food supply chains

Difficult access to land and reduced access to financing

Nowadays, the number of farms decreases while the size of the remaining ones increases. The lack of available space is a real threat for the agricultural sector, in terms of access to land and capital. This is the case for any farmer who wants to establish themselves, especially for those who do not have a background in farming or are from land owning families, regardless of the chain length (e.g. short food chain or long

food chain) and the chosen distribution model. This obstacle was discussed by many actors of the Dutch focus group. They mentioned the difficulty of access to public or private financing. Kneafsey et al. (2013) wrote about different instruments of the rural development policy targeting short and long food chains. These include “restructuration, modernization support, different measures supporting the development of local markets (measures on ‘adding value’, ‘quality schemes’, ‘microenterprises’ or ‘off-farm diversification’) and private-public partnerships in local development”. These examples of policy measures should be considered at different level (i.e. regional and national) to help farmers developing their enterprise and participating in the dynamics of SFSCs.

Consumer choices criteria

In Switzerland, the average consumer generally spends only a small part of their budget on food. Price and practical accessibility remain decisive criteria for the vast majority of consumers, at the expense of SFSCs that remain a non-dominant organization chain compared to the long chains. Some producers express a need to understand the consumers’ motivations to direct their sales and communication strategy. Others insist on the importance of educating consumers (e.g. training cooks of collective restaurants). Public campaigns could be designed to “educate” consumers on the basics of food commodities (e.g. seasonality of production, environmental issues of agricultural production and food consumption, packaging, and other several topics that consumers are aware of but they do not know in detail the why and wherefores).

Inappropriate legislations and infrastructures

The infrastructures are highly developed in the Netherlands. However, they are tailored to suit large-scale practices and the export model of the country. They do not fit SFSC needs in terms of logistics and distribution. The laws and regulations focusing on agricultural practices and on food retail practices (i.e. hygiene regulations,

product liabilities, food safety plans, hygiene protocols, waste processing and transport restrictions) “create barriers for SFSC actors, accompanied with the high costs of the control protocols which are irrelevant for SFSCs” (Massar, 2019). The example of a small chicken farm that has commercialized its own production by selling directly to the final consumer was discussed in the Dutch focus group.

On this topic, specific regulations for SFSCs should be developed to facilitate farmers’ activities. This could include adapted hygiene and food safety standards, simplification of transport and logistics restrictions, reduction of control protocols and other administrative duties, to reflect the local and sectoral specificities.

Mass distribution competition

« Green washing » and labels

The mass retail sector has a great capacity to pick up new trends, following the increasing demand of consumers for eco-friendly, local and socially fair food. The sector integrates these trends into marketing and communication strategies, without a substantial change in the business strategy. The focus group participants compared SFSCs situation with the boom in organic farming several years ago. Small producers started to propose organic and local products to interested consumers. Supermarkets used marketing strategy to communicate on these products, without transparency. SFSC actors see it as an imposture, because the essential goal of SFSC is missing (i.e. having a positive social impact on local communities and society).

Uncompetitive prices

Large-scale distribution has a high level of logistical efficiency, together with critical volumes that enable it to achieve economies of scale and offer out-of-competition prices to the consumer.

For a product like meat, supermarkets can afford economies of scale that we can’t afford; the local butcher is still expensive (a Dutch producer).

It seems very hard for SFSC actors to compete on price. They are forced to

find other sales arguments. For comparable quality, products sold through direct sales are not always necessarily more expensive than in mass distribution, depending on the product type.

It’s easier to explain the price, because there is this direct contact. My pasta is expensive, but people keep buying, because there is history with it. It’s easier to have a price that corresponds to the cost of production, because you can tell it, explain it” (a Swiss producer).

Difficulty to reach standards

Participants pointed out that the mass-market system set very high standards and a wide range of services offered, which consumers are used to and that they then expect from SFSCs. However, it is difficult for SFSCs to reach those standards (opening hours, offered product range, delivery services, etc.), especially at these prices. This is linked with the need for more cooperation and collaboration between producers, to share costs and investments (e.g. to run a shop).

4 Conclusions

The understanding of the factors that support and hinder the development of SFSCs is a vast programme, since each type of SFSC and each local, regional and national context have their own features and challenges. However, the results of these two focus groups, together with a literature review, gave interesting insights. They allowed us to draw some preliminary conclusions that can contribute to the adjustment of the actions intended to foster the shift towards SFSCs. These chains that were considered alternatives of the conventional long food chains are gaining consideration by a variety of stakeholders that are concerned by environmental and socio-economic issues. Indeed, although the focus groups took place in two specific contexts, the comparison between both helped to draw conclusions beyond these specific environments and to the design of targeted solutions to promote SFSC models. Among the positive supports in SFSC development, the interaction between producer and con-

sumer was mentioned as a key element, since it gives the opportunity for producers to get feedback from consumers, allowing an “organic matching” between supply and demand, through small adjustments based on feedback. This direct relationship, based on trust, also guarantees transparency, and allows producers to attain a larger part of the product value. In addition, growing SFSC initiatives and strategies across regions in Switzerland and the Netherlands are forming an increasing critical mass within the agricultural sector. In doing so, they are creating a huge potential for cooperation and scaling-up, attracting more and more attention and interest from consumers and public authorities, and challenging the conventional agri-food system that they want to escape from.

On the other hand, the most prominent bottlenecks underlined in this study included societal constraints (e.g. legislations, regulations, hygiene standards and infrastructures), deficiencies in skills, lack of resources, policy issues, and geographical fragmentation. The growing number of SFSC initiatives are still missing coordination, in terms of logistics and advocacy. Indeed, they need more political union to defend their interests at political level and to change unsuitable legislations and standards, which were conceived for big distribution and severely disadvantage SFSCs.

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An Online Innovation Platform to Promote Collaboration and Sustainability in Short Food Supply Chains

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Abstract

A sustainable Short Food Supply Chain (SFSC) requires collaboration among all actors, which nowadays is facilitated by information and communication technologies (ICT). However, not all SFSC stakeholders network with others in this way, and it is not clear what will draw them to ICT interaction. A simple, user-friendly website, the SMARTCHAIN Innovation Platform, evolving since March 2019, may facilitate interaction and cooperation among SFSC stakeholders. This article presents the Platform's development and evaluates its efficacy and impact by analysing data from Google Analytics (GA) and other sources. Primary Platform features promote communication and information sharing: these are the **1**) Innovation Hubs in 9 European countries, **2**) Inventories including 150 SFSC innovations and 50 SFSC initiatives, **3**) Resources databases of Publications and Weblinks, and **4**) Training section. GA showed that visitors to the Platform increased slowly in the 16 months since its start, and the number of page views increased with the amount of time on the Platform. The most visited page of the Platform was the information-providing Innovation Inventory. Most Platform users were in partner countries of the SMARTCHAIN project, but not all Innovation Hubs had high numbers of users. Most users arrived at the Platform by direct link, but LinkedIn was the most important originating social network. Taken together, these data suggest growth potential for an easy-to-use website that provides useful and up-to-date information but little inclination for SFSC stakeholders to use an online Platform for communication.

Keywords: SMARTCHAIN; Agri-food; Innovation platform; Short food supply chain; Local food systems; Sustainability

1 Introduction

The number of short food supply chains (SFSCs) such as farmers' markets, community-supported agriculture and direct farm sales has increased in recent years worldwide, and in particular throughout Europe (Jarzebowski et al., 2020). The SFSCs present a sustainable alternative to

large chain supermarkets and offer consumers food that is fresh, has less packaging and whose origin can be traced to a certain producer or area. They offer producers the opportunity to get a fair(er) price for their goods and to organise marketing amongst themselves (Malak-Rawlikowska et al., 2019). A "short supply chain" may be defined as a supply chain

involving a limited number of economic operators, committed to cooperation, local economic development and close geographical and social relations between food producers, processors and consumers (European Commission, 2013). Yet, according to Paciarotti and Torregiani (2021), until now (2021) there is no consolidated definition of SFSC within the scientific community. Whereas different stakeholders use different definitions, the main attribute of a SFSC is sustainability.

More than a conventional food supply chain, a sustainable SFSC is built upon communication: Producer and consumer communication is paramount and if there are any intermediary stakeholders, e.g., transportation or organisers of farmers' markets, they too should participate in this regular and open communication. In fact, communication and collaboration between SFSC actors and logistics services are counted among the main strategic tools for the development and sustainability of SFSCs (Paciarotti & Torregiani, 2021). Furthermore, market failure of conventional food supply chains is hypothesised to be associated with limited information flow (Jarzebowski et al., 2020). Good collaboration and communication among the SFSC stakeholders may work in both directions as, for example, farmers supply consumers with information and receive their feedback in return. With the necessity of transparent, continuous and multi-faceted communication for SFSC success, modern information and communication technologies (ICT) may have a role to play in enhancing SFSC sustainability by providing new ways of communication and collaboration among the different stakeholders (El Bilali & Allahyari, 2018).

A lack of communication and collaboration among SFSC stakeholders may lead to flaws in the development and effectiveness of a SFSC. While there is no official count, in part due to the small, local and perhaps "unofficial" nature of many SFSCs, word of mouth has it that SFSCs are often isolated geographically and with few obvious networking possibilities. In order to compete with large and well-established supermarket chains, the SFSC faces challenges including effective marketing, providing consumer convenience and hiring specialised

employees to implement food supply-related policies. The typical small SFSC producer likely has little opportunity to network with others and profit from shared talents and experiences, and such networking, realised via ICT, has recently emerged on the research agenda (Svenfelt & Zapico, 2016).

Nowadays, technology is infiltrating all venues – the SFSC, even if it is a small, local "mom and pop" supplier must, in order to thrive, adapt to the internet for linking producers to consumers and creating knowledge networks among food producers (Svenfelt & Zapico, 2016). An online communication and collaboration platform, one that is user-friendly with a simple interface and accessible both on a phone and on a computer, may help both the producers and the other stakeholders (mainly consumers) to better profit from their participation in the SFSC. Online platforms have gained immensely in popularity for shopping, especially since the March 2020 onset of the COVID-19 pandemic, and in particular online grocery shopping has flourished and this demands proper investments in infrastructure while keeping in mind consumers' preferences for local food supply chains (Hobbs, 2020).

This article reports on the creation and monitoring of an online platform geared not towards food sales but towards communication and information sharing among small food producers and other stakeholders (policy makers, researchers, etc.) in the SFSC. The Platform was born as a part of the SMARTCHAIN project and initially geared towards project partners, especially the 9 Innovation Hubs and the two case studies in each Hub. The aim was to create an interactive easy-to-use and easy-to-maintain intuitive website that is flexible enough to continue after the project's end. Here we present the creation and evolution, including updates, new material and new approaches, of the website. We further evaluate different engagement patterns of the website through analyses, including number of users and returning users, time spent on the website, number of pages visited, geographical distribution of visitors and registrations that give an unbiased view of the successes and challenges of the Platform.

View the current version of the SMARTCHAIN Platform here: <https://>

[//www.smartchain-platform.eu](http://www.smartchain-platform.eu).

2 Materials and Methods

The SMARTCHAIN Platform was, and continues to be, designed through iterative discussion with project partners and other stakeholders. The Platform is a living website and constantly evolving – both via small additions to existing pages and major reorganisations of structure. The first version of the Platform went live in March 2019, with some basic sections including the Home Page (with social media and contact links) and the following menu bar: News & Events, Innovation Hubs, Innovation Inventory, Training, GAIN Model, Register/Log In. There was one major reorganisation of the Platform, in May 2020, when it became apparent that the quantity of information was more than the current structure could adequately display. The Platform continues to evolve and some of the sections described below may well be further elaborated by the time this article is published. The SMARTCHAIN Platform is installed on the ISEKI-Food Association server where it will be sustained throughout the SMARTCHAIN project lifetime and after the end of the project. Development of the content of the current Platform, and the history of this development, is detailed in the following sections.

2.1 Home Page

The home page of the SMARTCHAIN Innovation Platform was designed to favour interaction and cooperation of stakeholders in the SFSC. It was designed using Drupal 7 as the content management system, to contain a top menu bar, a central text block introducing the SMARTCHAIN project and differentiating the SMARTCHAIN Innovation Platform, a series of SFSC stakeholder icons, an interactive map of SMARTCHAIN partner locations and a bottom bar of general information (newsletter subscription, contact link, project legal identification), including a plug-in allowing choice of language which, when chosen, led to a page of translated text.

Stakeholder icons

Stakeholder groups were defined through iterative discussion and final unanimous agreement of key partners in the SMARTCHAIN project. The stakeholders currently highlighted are:

1. consumers,
2. farmers and cooperatives,
3. industry and retail,
4. policy makers, and
5. technology providers.

In earlier versions of the Home Page, group 3) “industry and retail” was simply labelled as “industry” and later “industry and HoReCa” and group 2) “farmers and cooperatives” evolved from simply “farmers” and then “farmers and producers”. Initially, the Platform was designed for different stakeholders to enter specific and targeted pages via an icon representing the stakeholder group, i.e., consumers followed a shopping-basket-style icon to find pages with SFSC information geared towards consumers. Within 13 months of the Platform being live and online, it was apparent that much of the information posted for stakeholders was appropriate for more than one stakeholder group, e.g., the results of a consumer survey on behaviours and attitudes towards SFSCs could be interesting to both “consumers” wanting to know more about SFSCs and to “industry and retail” aiming to increase SFSC sales. This realisation of multiple stakeholder interest in a single bit of information led to a major Platform reorganisation: the stakeholder icons became not points of entry but indications of who the Platform could serve and how, e.g., clicking the consumer icon now shows “We all eat every day, and the 150 million+ households in the EU can benefit from SFSCs. Studies on consumer groups and SFSC initiatives around the world are available on the SMARTCHAIN Platform!” rather than leading to consumer-gearred pages. In the new Platform organisation, the information previously on the individual stakeholder pages was reclassified as

1. Publications (videos, presentations, infographics) and

2. Weblinks (websites, organisations).

Databases were developed for these two Resources, as detailed below, and the entry to them was moved to the menu bar.

Menu bar and registration

The current menu bar has 6 categories: Innovation Hubs, Inventories, Resources, Training, GAIN Model, and Register/Login. The methods of developing the content of the first four categories is detailed in the sections below. The GAIN Model is the subject of an independent article in this issue.

Development of the Register page began with an open call to all project participants (approximately 120 persons) asking what information was desired about Platform users. The resulting Registration form contained 10 required fields, including typical such as “Surname” and more unusual such as “Motivation”, and 13 optional fields, including for example “Academic degree” and “Stakeholder identification”. At the major Platform reorganisation in May 2020, with the desire to increase the number of registrants, the Registration page was simplified to 6 required and 8 optional fields. All completed registrations are reviewed by a website administrator to ensure that the appropriate role (stakeholder, project member, hub member, hub leader, editor) is assigned to the applicant.

Interactive map

The Home Page also contains, since its inception, an Interactive Map linking to the 9 Innovation Hubs of the SMARTCHAIN project (in France, Germany, Greece, Hungary, Italy, the Netherlands, Serbia, Spain and Switzerland). In the first months of the Platform, the 9 country Hub pages contained the same basic description of generic Hub goals and activities extracted from the project proposal and posted in English. Hub Managers updated this text to include specifics about their Hub and translated it to the local language; they also provided a photo and direct contact information for their Hub.

Each SMARTCHAIN Innovation Hub is the home of two case studies of successful, local SFSCs. Through each Hub’s page, a user can access

the case study pages which contain logos, links to websites and descriptive text. This text was initially available in English and now, through the translation plug-in, in the local Hub language.

2.2 Innovation Hubs

The 9 Innovation Hubs of the SMARTCHAIN Project aim to facilitate cooperation among different SFSC actors within their country. They are located in France, Germany, Greece, Hungary, Italy, the Netherlands, Serbia, Spain and Switzerland. Links to the Hub pages are easily accessible since the first version of the Platform via a drop-down menu and via the Interactive Map. Hub managers were asked to update their pages on the SMARTCHAIN Platform with local information, and a 1-hour online workshop held shortly after the Platform launch gave specific information on how to do this.

Each Hub page links to two SFSC case studies in that country. Here, users can find information about working SFSCs for the most commonly consumed foods in Europe, e.g., fruits and vegetables, meat, dairy and bakery products. Stakeholders in the case studies will also be able to access a Social Innovation Assessment Template (SIAT) organised and implemented by the leaders of the project’s work package 3.

2.3 Inventories

Innovation Inventory

The SMARTCHAIN Innovation Inventory was designed to be a novel system for storing, generating, searching, sharing and ultimately utilizing information on SFSC innovations, as well as facilitating communication between innovators and those interested in the innovations. In its early development stage, three main parts of the system were identified:

1. an interactive online portal oriented towards the stakeholders,
2. an inventory (database) of available innovations, solutions and/or recommendations, and

3. an underlying information technology (IT) infrastructure to ensure redundancy, backups, improved fault-tolerance, availability and accessibility of the system.

The interactive online portal was made with an interface that is attractive (a photo of each innovation) and functional (a search request field). It was designed to welcome a wide range of communities, both inside and outside of the SMARTCHAIN project.

The inventory of available innovations, on the contrary, was planned for project participants, i.e., the project's hub managers who stored new and edited existing information on the inventories from their case studies. Using the innovation description template, an online web form, hub managers created the main content of the inventory to include innovation description, geographical location, technology readiness level, potential customers, patent information, related documentation, photos, videos, etc. Later, the placement of each innovation in the GAIN model (see separate article in this issue) was added. Currently, the inventory stores 150 descriptions of innovations ranging from agriculture monitoring drones to new types of cheese.

Information stored within the IT infrastructure of the innovation inventory is used to better gauge the relevance of each innovation to various search queries and end-users. All this information was indexed and deposited within an Elasticsearch-based engine that makes them fully searchable either via free-form queries, which do a full-text search, or structured queries, which give more specific match criteria.

Initiative Inventory

The SMARTCHAIN Initiative Inventory was designed to store information about SFSC initiatives throughout Europe. To achieve this, a Drupal "content-type" was created with the following fields: *Title (Text field), *Title in original language (Text field), *Logo (Image field of type JPG, GIF or PNG), *Region (single choice select "EU, CH, DE, HU, ES, NL, EL, BE, IT, UK"), *Stakeholder type (multiple choice select "Consumer, Farmer & Cooperative, Industry & Retail, Policy maker, Technol-

ogy Provider, Other"), *Description (Text area), *Extract from text (Text area), *Initiative category (multiple choice select "App, Campaign, Catering plan, Cooperative, Distribution, Education, Event, Experience, Expo, Intermediary, Labelling, Network, Online-shopping, Organisation, Placement, Platform, Policy, Programme, Project, Quality scheme, Restaurant guide, Support programme, Tourism, Travel, Vision"), *Website (URL), and *Website additional (URL). All registered users of the SMARTCHAIN Platform may add initiatives to the inventory by completing an online form. New initiatives are reviewed by a website administrator before being published.

The output page of the Initiative Inventory was created using the SQL query builder "Views". When opening the output page, the full result set (sorted alphabetically) is displayed (paged after 26 entries). Only the following fields are displayed on this page: Logo, Title (in English), Region, and Stakeholder type. To see the full entry with all information, a click on either the title or the "Read more..." button takes the user to the dedicated page of the initiative in question. It is possible to filter the results to narrow down the result set. The filters can also be used in combination. For example, it is possible to show only entries for Region "DE" with stakeholder type "Farmer & Cooperative" and category "Campaign". Currently, the inventory stores 50 successful SFSC initiatives throughout Europe, which were collected after interviews with SFSC stakeholders.

2.4 Resources

The Resources Database is comprised of two parts: Publications and Weblinks.

Publications

To store publications, a Drupal "content-type" was created which contains the following fields: *Title (Text field), *Indicator whether the publication originates from the SMARTCHAIN project or not (single choice select "Yes, No"), *Year of publication (Date field that collects Year only), *Stakeholder type (multiple choice

select "Consumer, Farmer & Cooperative, Industry & Retail, Policy maker, Technology Provider, Other"), *Work Package (multiple choice select "WP1 – WP10"), *Short description (Text area), *Author (Text area), and *File upload (allowed file types: JPG, PDF, MP4, M4V, DOC, DOCX, XLS, XLSX, ZIP).

The output page (<https://www.smartchain-platform.eu/resources/publications>) of the Publications database was created using the SQL query builder "Views". It displays the full result set on one page and shows all entered information. The results can be filtered by the following fields: *From SMARTCHAIN? (single choice select "Yes, No, Any"), *Year, *Stakeholder type (multiple choice select "Consumer, Farmer & Cooperative, Industry & Retail, Policy maker, Technology Provider, Other"), *Author name (Operator: "Contains"), and *Search Terms (Text field). The filters can also be used in combination.

Weblinks

To store the weblinks a Drupal "content-type" was created which contains the following fields: *Title (Text field), *Name in original language (Text field), *Logo (Image field of type JPG, GIF or PNG), *Region (single choice select "EU, CH, DE, HU, ES, NL, EL, BE, IT, UK"), *Stakeholder type (multiple choice select "Consumer, Farmer & Cooperative, Industry & Retail, Policy maker, Technology Provider, Other"), *Website (URL), and *Short description (Text area).

The output page (<https://www.smartchain-platform.eu/resources/weblinks>)

of the Weblinks database was created using the SQL query builder "Views". It displays the full result set on one page and shows all entered information. The results can be filtered by the field "Stakeholder type".

2.5 Training

The Training tab of the Platform leads to the ISEKI-Food Association's Moodle learning platform. Here there are 3 types of training materials: documents from workshops held in autumn 2020 in each of the 9 Hub countries of the

SMARTCHAIN project, a video tutorial on how to use the Platform, and an e-learning course on "Best Practices in Innovation".

The workshop documents include presentations on the work of the SMARTCHAIN project, in the local language of each of the 9 Hubs and personalised by Hub managers to be relevant for local activities. Presentations cover inventories of SFSC needs and of SFSC technological innovations, social innovation in SFSCs, consumer behaviours and attitudes towards SFSCs, sustainability concerns of SFSCs, policy and business recommendations for SFSCs, and SFSC communication. There is also a generic version of these presentations available in English. Presentations were made public in February 2021.

The video tutorial on how to use the SMARTCHAIN Platform is under development and will be available in July 2021.

The "Best Practices in Innovation" e-learning course consists of 5 sessions, each with approximately 1 hour of activities. Learning outcomes of the course are:

1. to understand how SFSC innovations apply individually and at local, regional, national/international levels,
2. to apply SFSC innovations from the perspective of technological, social, environmental and other advances, and
3. to benefit from SFSC interactions according to the GAIN model of engagement and collaboration.

The overall course objective is to learn, through SFSC innovations now in use, to grow an individual SFSC initiative and to participate in larger communities of SFSC stakeholders.

The first week of the course introduces the SMARTCHAIN project, innovation and smart specialisation, and the GAIN model. Weeks 2, 3 and 4 provide practical examples of SFSC innovations, presented as a mix of interviews, videos, readings, website visits and infographics, and focused on innovations at the local, the regional and the national/international level of collaboration. Week 5 is a summary and review of participants' progress. In addition to the course material, participants will be required to participate

in the course forum and to use the “Short Food Chain EU Community” page on LinkedIn. The course will be moderated once per year and, at that time, participants may receive a Certificate of Completion if they finish all components of the course within 6 weeks and receive a grade of 75% or better on the final exam. At other times, participants may follow the course on their own.

3 Results and Discussion

Understanding results, i.e., efficacy or impact of a website or platform is a relatively new endeavour. Few European projects have published an analysis of the efficacy of their websites and there is no standard for evaluation (Lazzeretti et al., 2010; Mc Guckin & Crowley, 2012). In fact, most literature on the topic refers to the efficacy of online shopping sites and, while the measures can be useful, the different goals of the websites make direct comparisons of questionable value (Pakkala et al., 2012).

The most common and easiest method for analysing a website is through data on quantitative measures that show, e.g., the number of visitors per day, how long a visitor stayed on the website, etc. These come primarily from Google Analytics (GA) which has 100+ website analytical measures. One can consider where visitors are, the device visitors use (phone, PC) and even the interests that visitors have. A major drawback to the use of GA data is that ad blocking tools, used globally by an average of 27 percent of the internet-connected population in early 2018 (Statista Research Department, 2021), block GA from collecting data. Thus, GA user data underestimates true website visits by close to 30%. Nonetheless, GA data has been used as the primary source to evaluate the impact of European projects (Mc Guckin & Crowley, 2012) and it is useful here too. The content management system, in this case Drupal 7, can also be a source of quantitative data. Here we may know the number of people who are registered users of the website and information about them (sex, education and stakeholder role). Information collected at project meetings, where users were asked directly for their opinions on the website and their suggestions for improvement, provide both quantitative

and qualitative data for website evaluation. Finally, for any website to remain relevant it must be continuously updated with new information, thus the sustainability plan for website management is a crucial part of website impact.

3.1 Users and Overall Use

New users and returning users

Number of new users and number of returning users are a primary measure of the success of a website. Here, total users per month, and in the insert graph, returning users per month, from October 2019 through January 2021 are from GA data (Figure 1). Both metrics show an overall trend towards more users with time, as the linear regression shown displays a goodness-of-fit or R^2 of 0.44 and 0.48 for total users and returning users, respectively. This positive correlation between time, or maturity of the website, and users, is moderate and it is too soon to say if this trend will continue. There is little in the literature to allow a comparison of the SMARTCHAIN Platform with others for increase in users over time (Pakkala et al., 2012). The slightly increased trend towards more returning users per month than total users per month suggests that more new users become returning users now than did at the Platform’s start. This is an important goal of the Platform on two fronts:

1. returning users suggest satisfaction with Platform content and ease of use at the first visit, and
2. building relationships among SFSC stakeholders requires that users return to the Platform, e.g., to post an innovation from their organisation or find information from a workshop.

The large differences between returning users and total users, e.g., 53 of 806 in January 2021, the month with the biggest difference, is likely exaggerated due to inflation of the total users’ figure. Since it is estimated that 50% of all web traffic is from bots (Zeifman, 2017), the true number of new users was likely closer to 325 than to 750 in January 2021. Returning users are highly unlikely to be robotic visits or bots, as bot visits

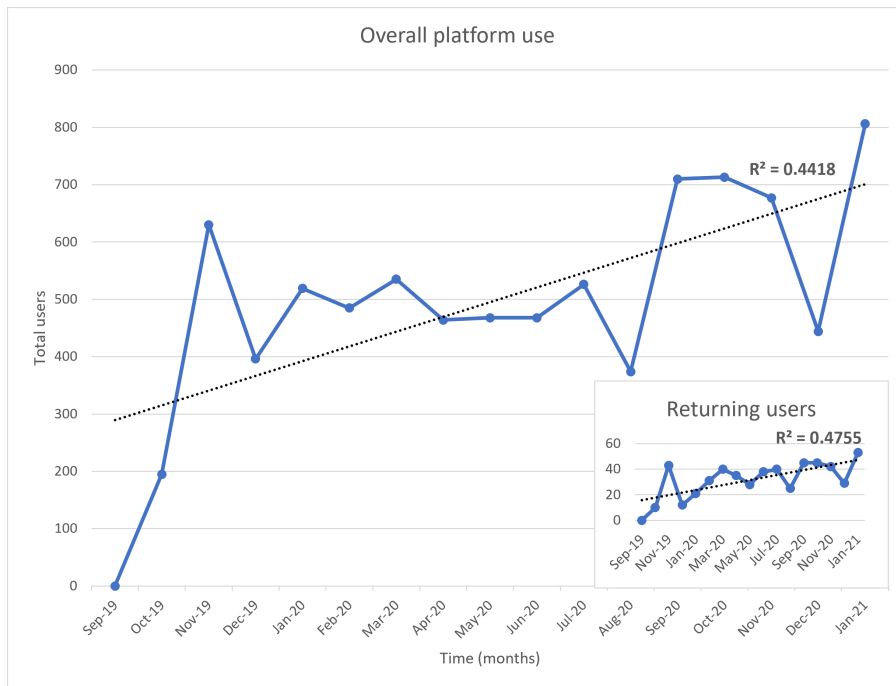


Figure 1: Overall use of the SMARTCHAIN Platform by total and returning users.

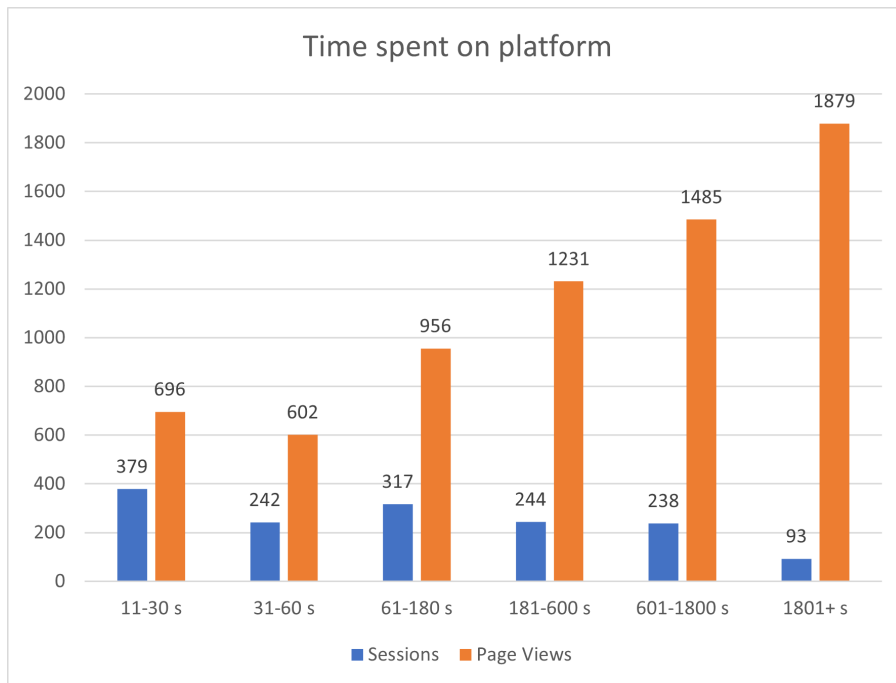


Figure 2: Time spent by users on the SMARTCHAIN Platform.

are from software applications that crawl the web to fetch, analyse and file information from novel web addresses. Thus, a truer picture of the proportion of users that are returning users would be approximately 50 of 325 or 15% in January 2021.

In the first month, September 2019, the data show no active users because GA was not yet in place, so use was not recorded. There is an unusual peak of use in November 2019, 630 total users and 43 returning users. An internal meeting of Platform contributors in mid-October 2019 seems the likely explanation.

Length of time

As important as the number of users of a website is the amount of time a user spends on it. As expected from the previous discussion about robotic visits, most users of the SMARTCHAIN Platform stayed between 0 and 10 seconds, that is 8035 of all 9548 users during the 16 months of website monitoring reported here. This group would include both bots and some who come to the website and quickly decide it is not what they expected.

Looking only at users who stayed at least 10 seconds, an important relationship is revealed (Figure 2). The number of page views increases with the amount of time spent on the Platform. This is a strong indication of engaged users who are actively exploring the website and not long-lasting automated visits or users clicking on the website and leaving it open without using it. In online sales, where most studies on website interaction have been done, an average session duration of 2-3 minutes is considered successful and longer sessions are generally understood to indicate more engaged visits (Spinutech, 2015). Very strong support of a group of active users comes from the last pair of bars in Figure 2, which show close to 100 visits when users stayed on the website for more than 30 minutes.

3.2 Page Preferences

As would be expected, the home page of the SMARTCHAIN Platform is the most visited page, over 4200 visits in the 16-month reporting period. This number is inflated by robotic

visits (approx. 50% of web traffic) but does not include ad blocking users (approx. 30% of all users), therefore, it would be fair to estimate the true number of home page visits at 20% less than 4200, or approximately 210 visitors to the home page per month (Figure 3). This is certainly a respectable number of true visitors to the home page of a newly implemented Platform, and it agrees with the 325 visitors in January 2021, the month of highest use, as estimated in Section 3.1. The Innovation Inventory is the most visited internal page of the SMARTCHAIN Platform with 1559 visits over 16 months. These visits are not likely to be robotic as several clicks are required to reach the page, however, as is true for all analytics the approximately 30% of web users with ad blocking apps are not counted here, making true visits to the Innovation Inventory more likely to be approximately 2025 or 125 visits per month. The Innovation Inventory is a “heavy” page as it contains pictures and information of more than 150 innovations, thus it loads slower than the average page on the Platform. Despite this slow load speed, the page is by far the most appreciated, with close to 60% more visits than the next most-appreciated page, the GAIN Model. Despite the high hopes at the start of the SMARTCHAIN project to use the Innovation Platform as “an essential tool for the interaction and effective communication between the SMARTCHAIN Hubs”, the Innovation Hubs Overview page was not among the top 5 pages that users visited. Of course, this does not imply that there was little communication among the Hubs. Implementing a new tool for interaction and communication when there are many already available that users are already comfortable with is not an easy task and perhaps not a worthwhile goal (Khalifa & Liu, 2007).

3.3 Geographic Patterns

The SMARTCHAIN Platform was developed to interest all stakeholders in SFSCs by starting with information for and about partners in the SMARTCHAIN project. The project has 43 partners, 27 of which were intimately involved in providing information for the nascent SMARTCHAIN Platform; these were the lead-

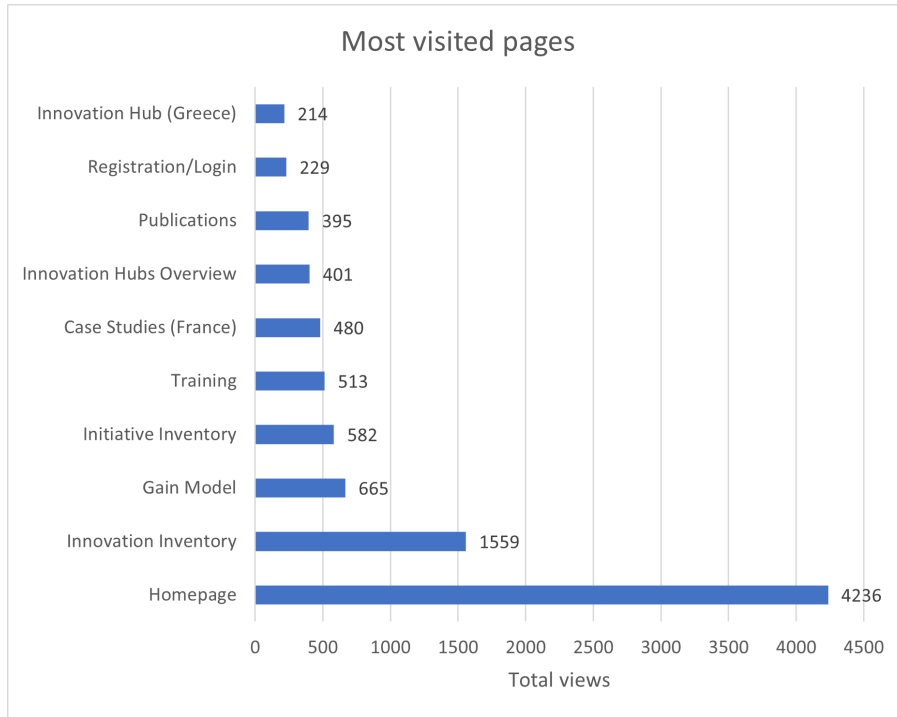


Figure 3: Most visited pages of the SMARTCHAIN Platform.

Table 1: Geographical distribution of SMARTCHAIN Platform users

Country	Users	Pages/ Session ^a	Avg. Session Duration (s)
Netherlands	1090	1.38	60.82
Germany	886	1.92	118.01
Spain	680	1.59	65.36
Italy	674	1.60	80.66
Belgium	606	1.30	31.45
France	522	2.16	129.20
Hungary	436	1.53	47.43
Austria	382	1.59	44.81
Greece	351	2.13	80.57
United States	315	1.46	49.30
United Kingdom	286	1.44	53.61
Serbia	280	3.49	300.66
Switzerland	181	1.35	33.09
Portugal	129	1.28	25.53
India	100	1.24	36.12

^aAverage number of pages viewed during a session.

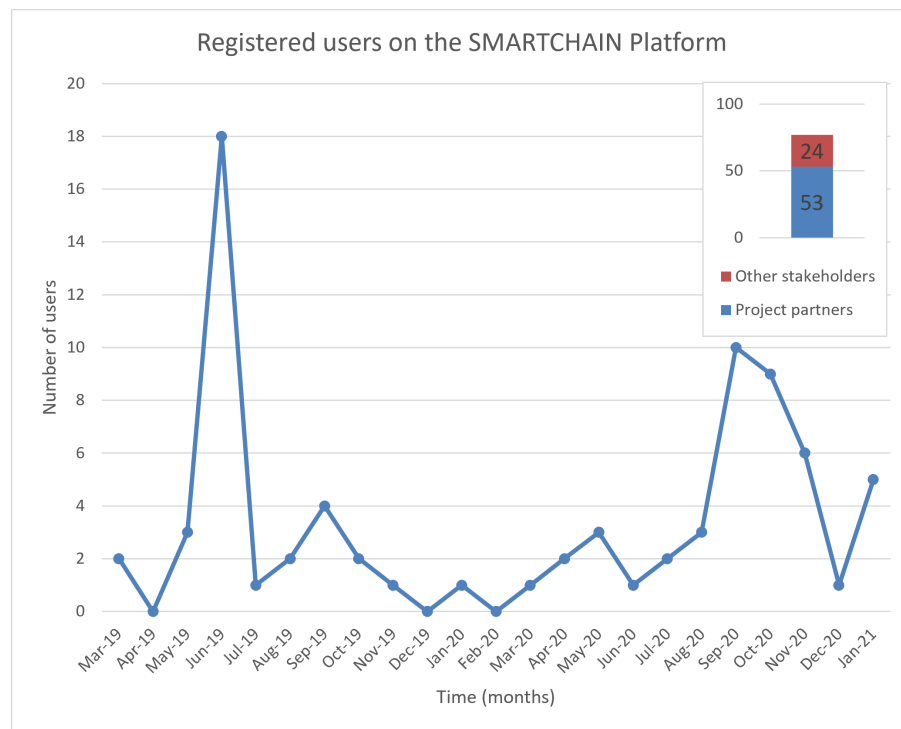


Figure 4: Registered users on the SMARTCHAIN Platform.

ers of the 9 Innovation and Collaboration Hubs and the 2 case studies at each Hub. These partners, and later their colleagues, were the first to be targeted to use the Platform and likely the first visitors of the Platform. In September 2019, shortly after the Platform went live, 49% of partners attending the annual project meeting stated that they had visited the Platform ($n=49$). By September 2020, 97% had visited the Platform ($n=29$). Not surprisingly, GA data show that 9 of the 15 countries with the most Platform users are countries with SMARTCHAIN Innovation and Collaboration Hubs (Table 1), namely the Netherlands, Germany, Spain, Italy, France, Hungary, Greece, Serbia and Switzerland, with between 1090 and 181 users in the 16 months of data collection.

The Netherlands had the most users, but with a lower-than-average number of pages viewed per session, namely 1.38. On the other hand, Serbia had the highest average number of pages viewed per session, 3.49, but was among the lower third

in number of users at 280. Serbia had a noticeably long average duration of sessions, over 5 minutes (300 seconds), more than double the second country (France). This is likely due to the long amounts of time spent on the website by the developers of the back end of the Innovation Inventory, the Institute of Physics located in Belgrade, Serbia, but does not explain the high number of pages as Innovation Inventory developers likely stayed on the Innovation Inventory page. Serbia also has a SMARTCHAIN Innovation Hub and 2 case studies and these participants likely also contributed to the time spent on the Platform. Noticeably, the top 15 countries with more than 1 minute average time on the Platform are countries with Innovation Hubs and case studies. Only Hungary and Switzerland have a Hub and case studies but less than 1 minute average time on the Platform. It would be interesting to find out what might be different about these two locations, e.g., smaller, local businesses as case studies that are less internet-

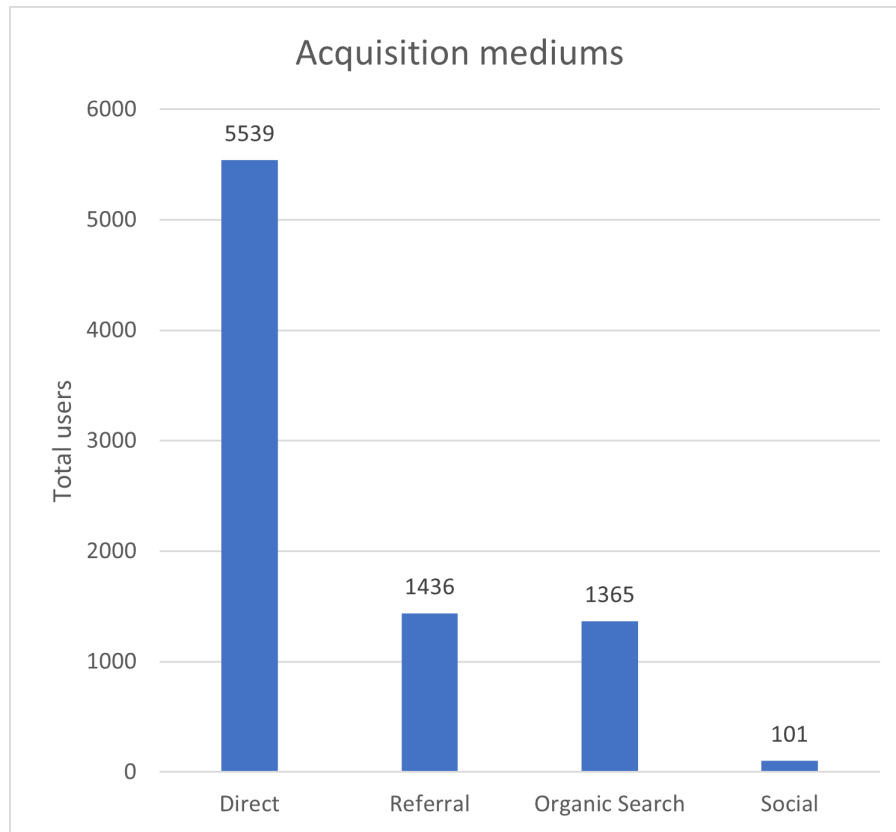


Figure 5: Origin of the users of the SMARTCHAIN Platform.

connected.

Further support for the hypothesis that most users of the SMARTCHAIN Platform are project partners comes from data on registered users. There are 77 registered users of the SMARTCHAIN Platform and nearly two thirds of them are project partners (Figure 4). As is typical for a website, registered users enjoy fuller access and expanded website features, here for example, they may upload innovations and/or initiatives. In exchange they must complete a short registration form providing some personal data. There were two peaks in registration during the lifetime of the Innovation Platform, in June 2019 when 18 users registered and in September 2020 when 10 users registered. The September 2020 peak coincides with a SMARTCHAIN project meeting where the Innovation Platform was presented and registration

encouraged. The origin of the June 2019 peak is not clear.

3.4 Interaction with Social Media

How users find the Innovation Platform is one indication of the interaction of users in the SFSC community with the Platform. By far, the largest group of users, approximately 63%, arrive directly (Figure 5). Direct arrivals are users who have saved the website in favourites or typed the website URL directly – this group also includes robot visits and, as referenced earlier (Section 3.1.1.), it is likely fair to say that 50% of direct users are robotic. The next most common ways to find the Innovation Platform are through a referral or an organic search, with approximately 17% of users arriving this way. A referral user is one who arrives from another website, likely

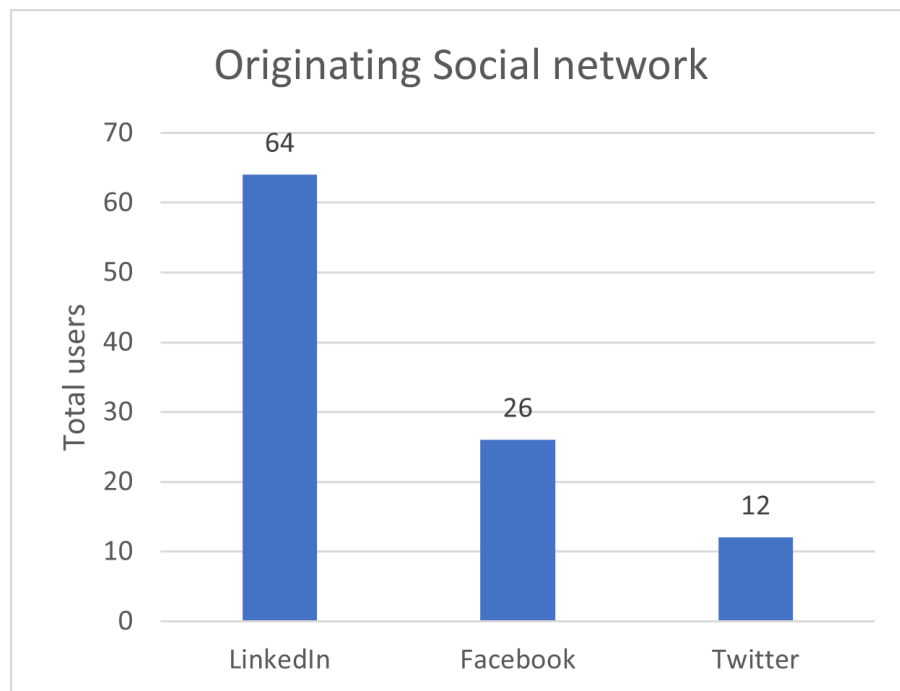


Figure 6: Originating social networks of the users of the SMARTCHAIN Platform.

from the SMARTCHAIN project webpage, and an organic search user is one who uses a Google or Bing search engine to get to the Platform. The smallest group is the one that arrives from Social Media; even considering that half of direct users are robotic and 30% of users are uncounted due to ad blocking software, the social media users do not surpass 3% of all users.

One explanation for the small number of users arriving from social media is the late implementation of a direct social media link to the Innovation Platform through LinkedIn. It was not until June 2020 that the LinkedIn group “Short Food Chain EU Community” was formed. This group began via the SMARTCHAIN project with the aims of fostering interaction and collaboration among SFSCs, same as the Innovation Platform, and of growing member networks by GAIN model implementation (see article by Fredericks et al. in this issue). The LinkedIn group sent members to the Innovation Platform via lively posts about Platform happenings. The LinkedIn group has grown to over 250 members, and more

than 60% of social media-inspired visits to the Innovation Platform now originate from LinkedIn (Figure 6). Facebook on the other hand, which has had a direct link to the Platform since the Platform inception, is responsible for 26% of social media-inspired Platform visits and Twitter for less than 12%. LinkedIn, generally regarded as a tool for professionals, may be primarily sending researchers to the Innovation Platform and further data analysis would be necessary to reveal who LinkedIn group members are. Importantly, the Platform should reach not only researchers, but also producers and other stakeholders and this suggests that while LinkedIn seems an effective gateway to the Platform it should not be considered the only nor the best.

3.5 Platform Sustainability

It is well-known that many of the activities, including websites, of European projects are neglected and lose relevance once the project is over. The SMARTCHAIN Innovation Platform

including the use and growth of the Innovation Platform in future proposals.

The content of the current Platform will be integrated with new project outcomes, including the removal of content not widely used and not transferable to new projects, e.g., the Innovation Hubs, and the improvement and enlargement of the most popular content, e.g., the Innovation and Initiative Inventories. From FAIRCHAIN, the Platform focus will be broadened to include not only short but also intermediate and non-traditional agri-food value chains, and from CO-FRESH, the idea of redesigning the agri-food chain. From other projects a focus on reducing food waste, food system circularity and data-driven food systems will further expand the original SMARTCHAIN Innovation Platform and contribute to its, perhaps very long-term, growth.

4 Conclusions

To our knowledge, this is the first paper to detail the creation and evolution of a website aiming to be an interactive and collaborative Innovation Platform for SFSC stakeholders. The growing use of internet in all aspects of daily life makes a strong case for a website dedicated to agri-food, a place where stakeholders will turn for the latest information on food chain innovation. The slow but steady growth of the SMARTCHAIN Innovation Platform, to an average of approximately 210 visits per month, and the peak visits of 325 in the most recent month (January 2021), together suggest that the Innovation Platform is filling a need in the SFSC community.

The data here support the use of GA, especially when combined with direct inquiries to users, as an effective method of analysing website success and planning improvements. GA provides a wide variety of analytical choices, making it likely that website developers cannot easily compare their websites. It could be useful to define a standard set of GA measures so that comparisons of websites and their features could be easily accomplished. The direct inquiries used here allowed a more direct evolution of the website towards user needs, e.g., to provide more content and simplify registration, and this source of data is one that

should not be overlooked in website evaluation. Although the sample is small, the desire for content and information rather than interaction may be a point to consider in the design of future websites and updates of current ones, including this one. Interaction is a key word these days, but is perhaps best left to already existing, and successful, methods such as emails, text messages and the myriad of social media accounts available, while focussing websites on providing, and allowing users to share, innovative information.

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Gamification for Sustainable Food Transitions: Supporting Multi-Level Cooperation in Short Food Supply Chains Through GAIN

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Abstract

The food system has become globalized and industrial. As a consequence, food travels long distances to reach consumers and its production is over-reliant on chemicals, leading to high levels of carbon emissions and soil degradation. Short food supply chains (SFSCs) have been advocated as more sustainable alternatives and have been explicitly mentioned by the Dutch government and the EU as a strategy towards achieving sustainability goals. While SFSCs are viable on a small scale, scaling and mainstreaming them has proven difficult due to low margins, high costs, and steep learning curves. Their economic underperformance is particularly glaring when compared to the highly cost-efficient - albeit energy and resource intensive - conventional commercial supply chains. In practice, SFSCs therefore remain isolated success stories, failing to contribute to systemic change in food systems. In efforts to enhance the performance of SFSCs, this paper introduces the GAIN transition model, a novel framework based on gamification which provides a holistic and actionable framework for SFSC actors to coalesce and strategize around a common vision. We illustrate the underlying principles of GAIN and its potential for institutionalizing SFSCs. We find that thus far, GAIN has helped to catalyze action and has proven a useful tool which provides a common language for actors to navigate this complex space. Future research and more dissemination are needed to conclude with more certainty on the quantitative impact of GAIN in terms of enabling and strengthening SFSCs.

Keywords: Short food supply chains; Governance; Multi-actor collaboration; The Netherlands; Gamification

1 Introduction

Short food supply chains (SFSCs) have been advocated as more sustainable alternatives to the current industrial and globalized food systems

(. There are several definitions of SFSCs, but achieving increased geographical and social proximity, bridging the gap between food producer and consumer, is the common denominator (Bazzani & Canavari, 2013). The EU's rural develop-

ment regulation 1305/2013 defines SFSCs as

supply chains involving a limited number of economic operators, committed to cooperation, local economic development, and close geographical and social relations between food producers, processors and consumers.

Strengthening and enabling SFSCs is broadly motivated by reasons of economic resilience, human health, and environmental sustainability (van der Gaast et al., 2020). Stimulating the local economy is seen as a move towards resilience in the face of an ever more tumultuous global economy, the result of both political and climate instability (Mundler & Laughrea, 2016). Improving citizens' diets by increasing the intake of whole and seasonal foods can also be achieved by promoting SFSCs (). Lastly, short supply chains are associated with the elimination of several resource-intensive processing and transportation steps in the supply chain, thereby reducing food's environmental footprint (Wertheim-Heck et al., 2018). While the carbon dioxide savings associated with SFSCs is still contested in the literature (Loiseau et al., 2020), moving towards having a greater share of food supplied by SFSCs is almost unanimously considered a desirable path towards a more sustainable food system, evidenced by its support from local and national governments as well as international organizations (Paciarotti & Torregiani, 2021). SFSCs *can* provide food that is healthier, has a lower carbon footprint, and whose procurement stimulates the local rural economy. The *extent to which* SFSCs realize the prescribed benefits depends on a set of complex entanglements of many internal and external factors. As Freitas et al. (2019) (p.2) note:

despite the success stories that have been reported in the literature (...) many implementations are not satisfactory, considering the benefits that are initially expected.

Performing below potential and coming short of expected outcomes is a frustration to many in the SFSC field. This has created a wave of efforts to better systemize and strategize around

SFSC formation. While SFSCs are by-default formed from the bottom-up, in order to have impact on a larger scale and prove a viable alternative to the status quo, independently operating initiatives need to be integrated in an overarching strategy.

Several barriers exist to successful scaling of SFSCs (Jarzebowski et al., 2020). These can be broadly classified into:

- lack of consumer awareness and demand;
- lack of data; and
- lack of collaboration.

The latter is particularly problematic as it underpins other significant barriers such as low margins for small scale farmers, high logistical costs, lack of knowledge, and lack of diversity in regional foodsheds. This also however means that collaboration is a powerful leverage point that has the potential to transform.

Indeed Runhaar (2021) (p.1) notes that “food system transitions require regime change” where ‘regime’ refers to a “semi-coherent set of rules that orient social groups and encompasses markets, technologies, regulations, policies, networks, and cultural expectations”. Pertinently, Restrepo et al. (2014), (p.39) relate the need for collaboration to transitioning complex socio-ecological systems noting that

if the changes needed are beyond the scale of individual control, collective or coordinated actions of multiple actors are required.

The growing recognition of collaboration as a key asset in food system transitions has resulted in multiple efforts to better understand and mobilize collaboration with the explicit aim of enabling actors in alternative food spaces (including SFSCs) to achieve a competitive edge against conventional supply chains. Mittal et al. (2017) have sought to formalize supply chain collaboration through implementing a flexible and affordable inventory tracking system to allow participants to actively share logistics information in real time, Freitas et al. (2019) have published a conceptual framework to help actors choose from a range of types of collaboration with which to

engage in, and Matopoulos et al. (2007) published a framework to be used as “a conceptual landmark for further empirical research” narrowing in on the grower-processor interface. While these and other examples from the literature help solve a part of the puzzle, they are generally limited either by scope or audience: targeting one dynamic in the supply chain or one actor type. Furthermore, these frameworks tend to be more conceptual, of interest for researchers but difficult to absorb and implement by SFSC practitioners themselves.

To further such efforts to mobilize collaboration as a tool for systemic change, we introduce the GAIN transition model (GAIN), a conceptual framework used to enable and enhance collaboration, deemed necessary for the successful implementation, institutionalization and upscaling of SFSCs. GAIN has two unique characteristics: it is based on gamification, embedding within it a distinct understanding of human behavior drivers and it was created by SFSC practitioners, making it tractable in the real-world.

First we outline the underlying theories which validate the model. We subsequently describe the model in detail and illustrate its usefulness and potential by reflecting on its application in the Dutch SFSC context.

2 Theoretical Background

GAIN brings together a variety of theories and concepts. Here we will describe the most important ones.

It is important to note that GAIN was created by SFSC practitioners largely unaware of sustainability transition theories, thus the analysis is somewhat retrospective, embedding this model within Sustainability Transition literature.

2.1 Innovation ecosystems

The conventional food system subscribes to the agribusiness approach (Davis & Goldberg, 1957) where value creation stems from an ever-greater specialization of processes along the supply chain, maximizing the economic efficiency of each step in isolation, decreasing holistic knowledge of the entire process, and increas-

ing dependency on other, often anonymous actors along the supply chain to create a product. In the ecosystem approach, value creation stems from knowledge sharing and increasing symbiosis and mutually beneficial relationships amongst all supply chain actors. As such, the ecosystem approach is distinct in that it emphasizes and welcomes interdependence and relationships as opposed to dependence and isolation.

GAIN provides SFSC actors with strategic insights into the structure of the ecosystem within which they operate as well as guidance and tools for strategic collective system-building. Here, ecosystem is

a loosely interconnected network of actors (a community), including companies and other entities, coevolving their capabilities around innovation, sharing knowledge, technologies, skills and resources, cooperating and competing (Gomes et al., 2018, p. 39)

whereas strategic collective system building entails

the strategic activity of networks of entrepreneurs and entrepreneurial managers to build up a supportive environment and infrastructure for their innovative sustainability technology” (Planko, 2018, p. 46).

The key aspect of this concept is the creation of value within a collective ecosystem of businesses, with value creation understood as “the collaborative processes and activities of creating value for customers and other stakeholders” (Ritala et al., 2013) (p. 5). Value creation through strategic collaboration within the ecosystem is the aim of GAIN, with the overarching goal of enabling the development and diffusion of SFSC practices within the agri-food system.

In an ecosystem, in order to design such strategic collaboration, it is important to differentiate between various actor-types based on their function. Actors that are relevant for SFSCs include farmers, food processors, retailers, consumers, banks, policy makers etc. Dedehayir et al. (2018) present an overview of several key roles for actors in an innovation ecosystem. First,

leadership roles, which are indispensable for genesis, ensure ecosystem governance, the creation of partnerships, and the distribution of value. Second, direct value creation roles, which refer to stakeholders that collectively supply, assemble and complement key components, products or services. Third, value creation support roles, which can provide fundamental knowledge or are specialized in forming connections between stakeholders to help formalize the ecosystem. Last, entrepreneurial ecosystem roles, which facilitate and support the creation of ventures in the ecosystem. Knowledge of these actor-types and their associated functions helps coalesce individuals in innovation ecosystems into strategic partnerships, where each knows his or her role and works symbiotically with others to maximize the benefits of their union. The idea of capitalizing on the unique contribution or function of an individual actor for the benefit of the community through strategic partnerships is a key process in the GAIN model.

2.2 Gamification

Gamification is a term used for applying game-like elements in a non-game context. A known example is eBay's bidding and feedback system. Gamification appeals to fundamental human drivers like impatience, curiosity, and eagerness and works to guide human behavior. Indeed, gamification has a lot of overlap with the application of human-focused design principles (Chou, 2014).

The idea of intrinsic motivators, those that are based on intrinsic and fundamental human drivers as opposed to external rewards, are key to understanding the power of applying gamification to non-game contexts. Five such motivators are autonomy ("I control"), mastery ("I improve"), purpose ("I make a difference"), progress ("I achieve"), and social interaction ("I connect with others") (Paharia, 2013). Gamified socio-technical systems can use several techniques that video game designers have used par excellence to induce certain behaviors, hence the origin of the term. Described here are several techniques found in the GAIN model.

First are several common approaches to guid-

ing behavior such as giving users goals to accomplish, engaging them with competition, encouraging them to collaborate in teams, giving them status by leveling up, and enabling them to earn points (Paharia, 2013). Second is the idea of tapping into the potential of collective brain power. There are ample examples that illustrate the power for collecting data and exploring solution space (e.g. citizen science initiatives), conveying knowledge, or changing attitudes and behavior. Schrier (2016) gives a comprehensive overview. In particular, the big data being generated by the SFSC constituents as they interact with each other, and the data-driven motivational techniques of gamification, harness the power to achieve and support collaboration at various levels of organization (local, regional, national, and international). Third is the introduction of levels. GAIN consists of a number of levels, which is a well-known game mechanic, also seen in other settings such as the WordPress model where one starts with free use of the WordPress website hosting, next there are paid features, next co-creation of features, ultimately building your own publication platform using WordPress open-source software.

There are many ways we can look at and analyze gamified socio-technical systems (Schell, 2019). Overall, GAIN can be seen as a combination of two stylized game types:

- the survival game, where participants must team up, go out on a scavenger hunt to collect weapons and
- the strategy game, where decision-making skills and situational awareness are highly valued.

Just as in the actor-archetype argument, it helps to work with game archetypes to engage 'players' or ecosystem actors in deliberate behavior which leads to predictable outcomes, however it is important to emphasize that the GAIN model is not a game but uses game mechanics to trigger desirable human behaviors.

3 The GAIN Transition Model

3.1 Theory of Change

Four major challenges faced by SFSC practitioners in the Netherlands prompted the creation of GAIN, namely:

- getting and coordinating support;
- data sharing and analysis;
- access to markets and consumers;
- infrastructure and logistics.

The inability to overcome these challenges led to low margins, high costs, and steep learning curves making it difficult to scale and become a viable alternative to the current food system. Lack of strategic collaboration is believed to underpin all of the challenges, therefore enabling collaboration is expected improve SFSC actors' ability to overcome them.

GAIN fosters SFSCs by enabling collaboration among all relevant actors-types by:

- providing a clear stepwise framework to instruct on desired actions at various levels of ecosystem maturity, thereby reducing the ambiguity of this complex ecosystem and associated risk of engagement; and
- providing a set of tools for maximizing the benefits of collaboration.

3.2 Description of GAIN Levels

This section describes the entire GAIN model and the dynamics at play on every level. The model (Figure 1) presents four levels of engagement for SFSC-actors with each level presenting unique opportunities to increase the competitiveness and sustainability of short food supply chains. At level 1, the individual participants experience autonomy in their local food supply chain. At level 2, social interaction builds trust and loyalty. At level 3, the 'weapons' or inventory are collected and shared, leading to increased mastery with all participants. Moving from level to level demonstrates progress

in upscaling, with the end goal being the institutionalization and mainstreaming of SFSCs whereby they are robust enough to create systemic change.

Level I – Local Start

Level I is the level of individual short chain initiatives. This initial stage is focused on the close network of the actor or stakeholder in the short chain. In the center is a very strong individual or team that determines what happens in their world. At this level, a freemium service is in play. This means that SFSC actors only have to 'register', meaning they have to make themselves known and become part of an active group of SFSC actors. In exchange for 'registering', the SFSC actors get access to a network of others doing similar work.

Level II – Connecting Regionally

On Level II the short chain entrepreneur has already gathered a connected network of SFSC actors and is now interested in alliances consisting of multiple actor types. Here building a chain of trust around a regional food system based on transparency and cultural values is the aim. Participants should seek to provide shared services for collaboration and cross-sectoral value creation based on a common reference point such as the Sustainable Development Goals.

An important activity at level II is mapping regional alliances and supporting them with knowledge in order to encourage collaboration and create a stronger regional SFSC ecosystem. Level II eventually becomes a paid service model when to 'register' your network a number of actions and investments are expected including network analysis, inventory analysis (tools, data, money, range, authority, expertise) and finally the establishment of a governance structure. In essence it requires a little extra effort to map and present what you can bring to the table.

Valley of Death

Most short chain parties act on level II, but the bigger questions of systematically changing the

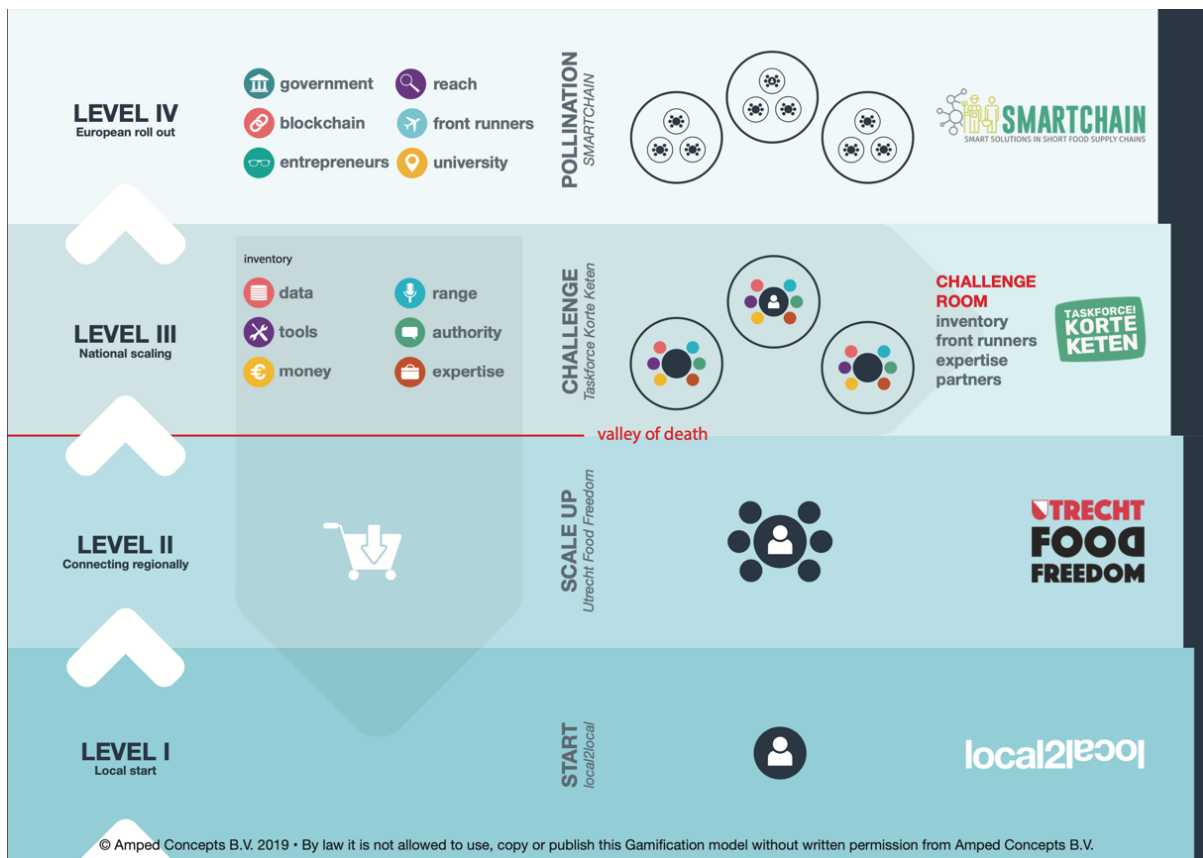


Figure 1: The GAIN Transition Model

food system are not addressed here. This is because of the Valley of Death which refers to common barriers to scaling SFSCs that are difficult to overcome without collaborating at scale. As a short chain entrepreneur, if you make the leap to level III and really think about the necessary changes to the food system, then you will not be able to take up the challenge by yourself.

Level III – National Scaling

Level III is the cooperation level with the aim of creating an ‘innovation ecosystem’ of smart cities. Here data come together, analyses are made of the overall picture, and insights can be gained about the missing parts. Active data can also be made available here for the various level I and level II initiatives.

Interregional collaborations aligned on a certain governance structure are also key. The implementing organization links up with other committed Level II parties and works from the analyzed networks, making use of the expertise from the ecosystem analysis and classified inventory. Level III connects what is already there and helps realize what is lacking based on common needs.

Challenge Room

The Challenge Room is a separate component within level III. Here a variety of participating actors identify a problem and make their resources and strengths known to devise a strategy to solve it. At this point each actor-type continues in their own path armed with the tools and strategies that were developed. Trust and trans-

parency are key for the Challenge Room to bear fruit, and thus the selection of participating actors influences to a great extent the outcome of this process. If a party is not willing to agree to these rules, then they are not welcome within the challenge room.

Inventory

The inventory is the arsenal at disposition to take on SFSC challenges. These come in the form of data, tools, money, range, authority, and expertise. The inventory should identify the tools that each stakeholder brings to the table and is willing to share in order to achieve a common goal. One cannot take on the challenge of scaling SFSCs individually. You must work together, and the inventory showcases the collective power of a given consortium.

Level IV – European Roll Out

Level IV concerns connecting on the EU Level, integrating the goals and projects with EU mandates. This is where learnings are cross-pollinated and adapted to other national contexts. Knowledge is further exchanged with other European projects on the basis of a shared structure, eventually influencing European Union policy to create an enabling environment for short food supply chains. Here SFSC practitioners present themselves as a strong consortium with solutions.

4 Results

Within the Dutch context, the primary intended benefits of GAIN are:

- enable collaboration between actors and stakeholders on multiple levels (local, regional, interregional, international);
- consolidate a network of hundreds of e-commerce platforms for local products to enable sharing added value models, data, networks, expertise, reach, etc.;
- boost social engagement and empower networks to re-establish the connection between consumers and farmers;

- apply blockchain technology for value-based business models; and
- structure a community-empowered campaign strategy to transition from ‘early adopter’ to ‘early majority’ by creating demand driven markets.

4.1 Real-world Uptake of the GAIN Transition Model

GAIN was developed by the founders of Local2Local (L2L)¹, a SFSC company located in the Utrecht region. Local2local started in 2014 by setting up a pop-up store for locally sourced goods and after many re-iterations, is now operating an online wholesale shop for local goods, with targeted sales to the wholesale market, catering companies, and healthcare institutions. Local2Local started by working with 20 farmers. It managed logistics and delivered to consumers in the region, all on a very small scale. It was only after 5 years of operating that the company managed to break even (a success in and of itself for many SFSC initiatives). At this point, L2L was managing relationships with over 300 farmers. In 2020 the company experienced a surge in demand and was able to turn a profit with the increased volume of sales. While the demand was in large part due to the Covid crisis, L2L’s ability to adapt to such a surge in demand was in large part thanks to their surpassing level 2 of GAIN (Valley of Death), being an active member in various communities and organizations with access to a shared inventory. The demand for and interest in local food continues to grow; buyers have committed 20 million euros in revenue in the coming 3 years and the company is in the process of extending farmer networks, onboarding new producers onto their web shop, both in the Netherlands and abroad.

Today L2L is the leading SFSC-company in the province of Utrecht (Level I). It has brought together SFSC actors in the regional alliance Utrecht Food Freedom (Level II) and is currently seeking strategic partnerships with five other provinces. It is a founding member of the national Task Force Korte Keten (Level III) and is

¹Check local2local.nl for more insight on the organization and ongoing projects.

the Dutch case study for the European Commission's SMARTCHAIN H2020 Consortium (Level IV). We will describe in more detail the various events that took place at each level, in essence a timeline of how Local2Local progressed from Level I to Level IV, a success journey which informed the GAIN model itself, and which the model hopes to catalyze for other SFSC initiatives.

Level I – Local2Local

Local2Local acts as an intermediary between farmers in given regions and multiple market channels, adjusting to constantly changing supply and demand. For many years it functioned within a small network of farmer and buyers. However, by staying within Level I, namely where an initiative is successful with a strong community, but operating in isolation, Local2Local struggled to really extend the successes of its operation beyond its immediate environment. Furthermore, Local2Local faced very real challenges – logistical costs, HACCP compliance, financial support – and needed to collaborate with a variety of actors to work towards solving these. To transition to the next level, Local2Local invested a lot of time and money in networking and creating regional alliances.

New collaborations evolved through establishing a stronger connection between consumers and farmers. Here, facilitating the storytelling and branding of local producers, conducting various marketing practices through events, local product tastings, food trucks, product development, farmer markets, weekly local vegetable subscriptions etc. were key activities. Over the years, these community-building and sales activities have evolved to become strategies and smart technologies for a SFSC service that is scalable.

Level II – Utrecht Food Freedom

The facilitation of collaboration among regional SFSC actors is fundamental in Level II. Local2Local established such regional alliances by organizing several multi-actor events. For example, the organization worked with the Utrecht Science Park to try to address logistical issues and formed a strategic partnership with Stichting

Reinaerde, a day care center supporting disabled people, to hire them in transportation and packaging, a way to both reduce costs and give meaningful employment to those at the margins of society. These early collaborations at the Utrecht Science Park generated various projects including weekly local vegetable boxes, harvest support events at farms, student excursions, and projects with local farmers. This evolved in the establishment of a student community offering students in sustainability, geo- and agri-sciences, media, and the arts the opportunity to work at local farms, acquire skills and insights on food production and exchange their knowledge with farmers. After collaborations are facilitated, they need to be enshrined. Parties need to formally come together, create a vision, and set up a consortium-forming event where the parties involved sign the shared vision. In the case of the Utrecht region the Food-y-fort (www.food-y-fort.nl) event was an important step towards alignment. After several events, Operation Food Freedom (www.operationfoodfreedom.nl) was established. Involved parties drew up a shared vision and signed for agreement. This concept later developed into a regional implementation, Utrecht Food Freedom (www.utrechtfoodfreedom.nl)

Building on Utrecht Food Freedom, Local2Local has been able to extend strategic partnerships beyond the Utrecht region. In collaboration with FlevoFood and the Amsterdam Metropole Region, Local2Local is working to supply Amsterdam with more local food. This has led to a regional alliance between the provinces of Flevoland, Utrecht, and Noord-Holland. In the next GAIN level, collaborations among multiple regional alliances are facilitated on a national scale.

Level III – Task Force Korte Keten

To get to Level III from Level II one must pass the Valley of Death. This is where most SFSC initiatives fail to scale further, remaining as an alternative, still experimental idea as opposed to infiltrating the mainstream. As such, Level III hosts many features that are meant to really boost SFSC performance but also requires a lot more trust and collaboration among involved actors.

Level III is also the level where the GAIN model becomes a real important resource, it is the common language and set of rules that actors can follow as they try to make it through the Valley of Death. The dissemination of GAIN started by presenting it to the Transition Coalition Food Network, a coalition of frontrunners within the agri, food, nature, and health sectors working on sustainable solutions for the food system. This presentation led to a national stakeholder event of SFSC frontrunners where six SFSC leaders established an overarching workforce named the Taskforce Korte Ketten (TKK) or Taskforce Short Chains (www.taskforcekorteketen.nl) which in turn has adopted the GAIN model as its guiding document. TKK was later designated by the Dutch Ministry of Agriculture as a leading organization for guiding the transition for circular agriculture.

TKK forms a unique collaboration that aims to support and strengthen the regional dynamics of short food chains by sharing knowledge and working all along the supply chain. With input obtained from the short chain actors in the different regions, TKK created three challenge rooms: logistics, data, and multichannel marketing. TKK facilitates a co-creative process within these challenge rooms, drawing from the available inventory of participating actors. Eventually, a national governance structure was also set up for TKK to align with level IV consortia and programs, being the work packages and themes in existing European research programs.

Level IV – SMARTCHAIN H2020

The introduction of GAIN on a European level started when Local2Local became the Dutch hub manager for the European Commission's SMARTCHAIN H2020 Consortium. The GAIN model was presented as a tool for collaborative short food supply chains.

5 Discussion

The GAIN method, emphasizing community, relationship, collaboration and data sharing has been instrumental to quickly identify shared challenges, opportunities, and sustainable ambitions. It resonates across disciplines and scales,

it has been embraced by the Dutch Ministry of Agriculture as a supplementary framework for policy makers in the Amsterdam region seeking to strengthen SFSCs, it is being used by the SMARTCHAIN Consortium on the EU level as a tool for assessing progress towards SFSCs (www.smartchain-platform.eu/en/gain-model) and is embraced by farmers who are keen on working effectively towards a food system which includes the local producer as a key actor. It prescribes a role for all relevant actors, making it an extremely useful tool for much-needed cross-sectional collaboration, a common language for turning a long-term vision into practical interventions. Here we reflect on the impact of GAIN and future priorities.

5.1 Reflections from Engaging with GAIN

Food system transition specialist

In the case of a food transition specialist, GAIN worked to strengthen his conviction about the need to collaborate strategically and shifted the way he looks at the playing field. As somebody who acts as a connector, a networker, GAIN has helped him to tailor knowledge and advice to players on each level, and to inform players operating at their distinct level of the realities at the other levels. It helps the people he works with gain the bigger picture of their ecosystem. He claims that he can contribute more effectively to the transition by having a clearer picture of the way each level functions, and what the people at each level should be doing to succeed. He adds: "In concrete terms, this means that I can give farmers from Texel access to markets far beyond their own reach."

More specifically, GAIN has changed the way he views the role of data in the transition, emphasizing the importance of data ownership by farmers and citizens, rather than the big players in the system; access and control over data become very important through the lens of GAIN.

One of the major limitations he sees is that GAIN starts on the assumption of trust, without really giving tools to achieve this trust. He says, "What I have not discovered within GAIN is a

method or model for achieving this trust.” He suggests that adding the Theory U - which seeks to better understand how individuals and communities can continually renew and reinvent, become more resilient through flexibility and openness, as we face an uncertain and turbulent future (Scharmer, 2018) - would provide a very good process in conjunction with GAIN to connect that missing link.

Founding chairman of the Milk Supply Association in Scotland

In the chairman’s words: “Most food supply chains are based on a least cost ethos. I found myself perpetually in a race to the bottom. When I discovered the concept of GAIN it was a light bulb moment.” What it did for Mr. Christie was create a logical system to help build a new supply chain, one which he never saw feasible before. It is a supply chain that is both economically viable but also moves the food system in the right direction in terms of reducing environmental impacts. GAIN put things in perspective, it gave clarity to the frustrations of working as an individual to no avail and paved a more facetious path for actually creating supply chain change. He said “if I followed GAIN I could in fact build a new transformational supply chain by working with other motivated actors in our industry” implying an interpretation of GAIN as guidebook, a set of steps taken to achieve a predictable end goal.

5.2 Limitations & Suggestions for Future Research

The GAIN model presents a simplified and stylized version of reality, and thus does not address all issues faced by SFSCs nor does it presume to. Nonetheless, the application of GAIN has contributed to the mobilization of actors and fostering collaboration as a precondition for the functioning and upscaling of SFSCs. Looking to the future, several challenges and limitations need to be addressed in future research and continued improvement of the model:

- **Overcoming competition** within ecosystems, enabling even more collaboration.

GAIN is a first step, but there is a lot of resistance among relevant actors and a lot of work needs to go into further communicating the benefits of collaborations and convincing them to join the effort of building collaborative SFSCs.

- **Free Riders.** What are the incentives within the GAIN levels to share information and to try as hard as the rest? What is the incentive to participate and the reward for sharing valuable inventory elements such as data, knowledge, or reach? How will this input be valued? How do we go about tokenization? What is the incentive to share my data within the ecosystem, what are the mechanics behind this?
- The **rules of collaboration** must be better defined such that actors have a clear idea of how to progress up each level. This is of course a work in practice and will emerge from real experiences of players. With time, a best-practice handbook can be made.
- **Healthy competition** needs to be addressed. While GAIN stresses collaboration, within the levels there must be a form of competition to bring out the best in each level and thus stimulate the further development of the entire system across levels.
- The **extent to which we take the game ‘literally’** is still to be determined: is this just a framework for people to structure thoughts and actions, or are there going to be literal points that actors can gain or lose depending on their behavior and contributions? For example: you can get experience points per inventory type, before participating in a challenge room you have to have 3 of the 6 inventory types, you must constantly keep your points at a certain level in order to be motivated to keep performing, etc.
- **Disseminating and implementing GAIN** is a time intensive process. It requires a skilled communicator to explain the logic and deliver the vision, and it often takes a while for all the aspects of GAIN to sink into the audience.

6 Conclusion

Despite their promise of contributing to a more sustainable food system, SFSCs play a very minor role in the production and consumption of food. There are various barriers to their implementation and upscaling. In this paper, we focused on one specific barrier, namely a lack of collaboration among farmers, traders, consumers, banks, policy makers etc. Such collaboration is needed in order to establish durable relationships and to create a favorable institutional context for SFSCs.

We presented GAIN as a stepwise approach to organize and structure such collaboration and to gradually upscale collaboration from the local to the national scale. Gamification elements were used to facilitate the interaction process. The dissemination of GAIN in the Dutch context made clear how the use of the model can look in practice and what it can achieve, and what not. Whereas the steps within GAIN can be replicated elsewhere, its achievements will probably differ from place to place. Also, additional tools will be needed to overcome other barriers, such as a lack of consumer awareness and demand. Nevertheless, the experiences in the Netherlands are promising. We therefore encourage practitioners elsewhere to disseminate GAIN to foster SFSCs, while we suggest researchers conduct follow-up research along the lines touched upon above in order to further enhance the usefulness of GAIN and to get a better understanding of critical success conditions.

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