



Graduate Institute of International Development, Agriculture and Economics

Analysing the role of alternative food networks in promoting sustainable farming practices: Insights from Switzerland

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I dedicate this work to all people, communities and nations fighting for the recognition of their values and beliefs in a time where money, power, hypocrisy, and selfishness are compromising their dreams of a shared future.

Acknowledgements

I would like to thank all participants who invested time in my study and agreed to become my objects of study. My gratitude also goes to Peter Dorward for his sound advices, Erica for her meticulous proofreading and thoroughly thought feedbacks, and to all colleagues and teaching staffs from the Graduate Institute for International Development, Agriculture and Economics for having built a warm environment which nourished my curiosity and where it felt good to learn. Lastly, a special thanks to my family and close friends for their daily support and without whom none of this would have been possible.

Abstract

With agricultural modernisation, product standardisation and food market liberalisation, local food networks and small farmstead numbers have declined dramatically in Switzerland over recent decades. In parallel, the Swiss agricultural sector's effectiveness in mitigating negative impacts on the environment seems to be stagnating despite the widespread adoption of agri-environmental schemes. Many actors have therefore pursued alternatives to the 'infamous couple' of industrialised agriculture and mass retailers, encouraging a resurgence of 'shorter' supply chains such as farmers' markets and producers cooperatives, and also the emergence of new models such as community-supported agriculture. While the socio-economic impacts of these initiatives have been acknowledged by practitioners, researchers, and policymakers throughout Europe, there is less evidence on their potential to provide farmers with the ability to respond to current and future environmental challenges.

With the aim of contributing to a better understanding of short food supply chains' (SFSCs) potential for sustainability, this study focuses on implemented production practices across SFSCs schemes and their underlying motivations. A mixed-method approach combining a survey on adopted practices and in-depth interviews with farmers was used to analyse the extent of environment-friendly practices across SFSCs and identify their main drivers (or barriers). The research was conducted in the French-speaking part of Switzerland using 104 survey respondents and four key informants involved in direct marketing or SFSCs.

Results show a strong relationship between the SFSC development and organic agriculture adoption. Survey figures also suggest higher proportions of farmers implementing soil conservation practices without herbicides, and a greater area dedicated to biodiversity promotion than figures from national statistics on the overall sector. Moreover, results suggest

that SFSCs have numerous outcome characteristics such as proximity, trust and autonomy that enable a broader redefinition of farmers' values and goals in relation to food production and the environment. Besides economic benefits and strong incentives to diversify farm operations, the study has demonstrated that decreased economic pressure, regained autonomy and increased exchanges amongst producers and consumers create safe and healthy spaces for innovation. However, interviews also highlighted several barriers such as public awareness, increased requirement for time and material investment, and lack of policy support.

Despite limitations on the research scope, this study provides insights on environmental views and practices across SFSCs schemes in Switzerland. Overall, it contributes to a better understanding of their potential regarding a sustainable shift in food production, which will hopefully lead to further awareness from a research and policy standpoint.

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¹ Picture retrieved from Maréchal & Spanu (2010)

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List of acronyms

AFNs	Alternative food networks
CSA	Community Supported Agriculture
SFSCs	Short food supply chains
LFSCs	Long food supply chains
AES	Agri-environmental schemes
MLP	Multi-Level Perspective

1. Introduction

Short food supply chains (SFSCs) have always existed since the development of trade. However, with the modernisation of agriculture, standardisation of products, and the development of the mass retailing industry, the number of intermediaries has multiplied, and short retailing routes have declined dramatically. Since the 1970s, however, many actors have looked for an alternative to the 'infamous couple' of industrialized agriculture and mass retailers in order to maintain and develop a local agriculture providing food to the community and curb the loss of small farms (Porcher, 2011). This year, the COVID-19 pandemic also brought into focus the importance of a strong and safe local food supply (Girard, 2020; Mares, Oppliger, & Rullier, 2020). Therefore, numerous alternative food networks (AFNs) developing shorter supply chains as well as promoting closer producer-consumer relationships have emerged in opposition to the dominant agri-food industry (Forssell & Lankoski, 2014). More recently, the number of such alternatives has increased dramatically and now include a range of different forms such as online vegetable baskets, farm shops, farmers' markets, producer cooperatives, local groceries or more complex initiatives such as participative supermarkets and Community Supported Agriculture (CSA) which are often built on a producer-consumer collaboration.

1.1. Initiatives across Switzerland

In Switzerland, this resurgence of interest for direct marketing of agricultural goods (both from producers and consumers) is growing and an increasing number of farmers have established their own farm shop. While 7,084 farms were offering their products through direct marketing in 2010, by 2016 this had grown to 11,358, an increase of more than 60% (Helfenstein, 2020). Today,

around 25% of all Swiss farms practice direct sales, but there is still room for growth as this represents no more than 7% of the agricultural revenue (Boisset et al., 2020).

More recent initiatives are characterised by the development of collective schemes: food baskets, cooperative or participative grocery stores, farmers' markets, etc. (Chiffolleau & Prévost, 2013; Roque et al., 2008; Mühlethaler, 2004). Unfortunately, it is difficult to have an exact overview of the spread of such initiatives across Switzerland. They often operate under various forms (informal networks, associations, cooperatives, private companies, etc.), and apart from direct marketing, national statistics do not have accurate figures on such merchandising strategies. Nonetheless, for CSA alone, there are between fifty and sixty initiatives active across the country (Vuilleumier, Forney, & Fresia, 2020; Scharrer & Rist, 2017).

As with direct marketing, the occurrence of CSA has blossomed during the last fifteen years; in the French part of Switzerland, CSA schemes grew from 13 in 2003 to 28 and a total of 6,300 members in 2016 (Vuilleumier, Forney, & Fresia, 2020; Porcher, 2011).

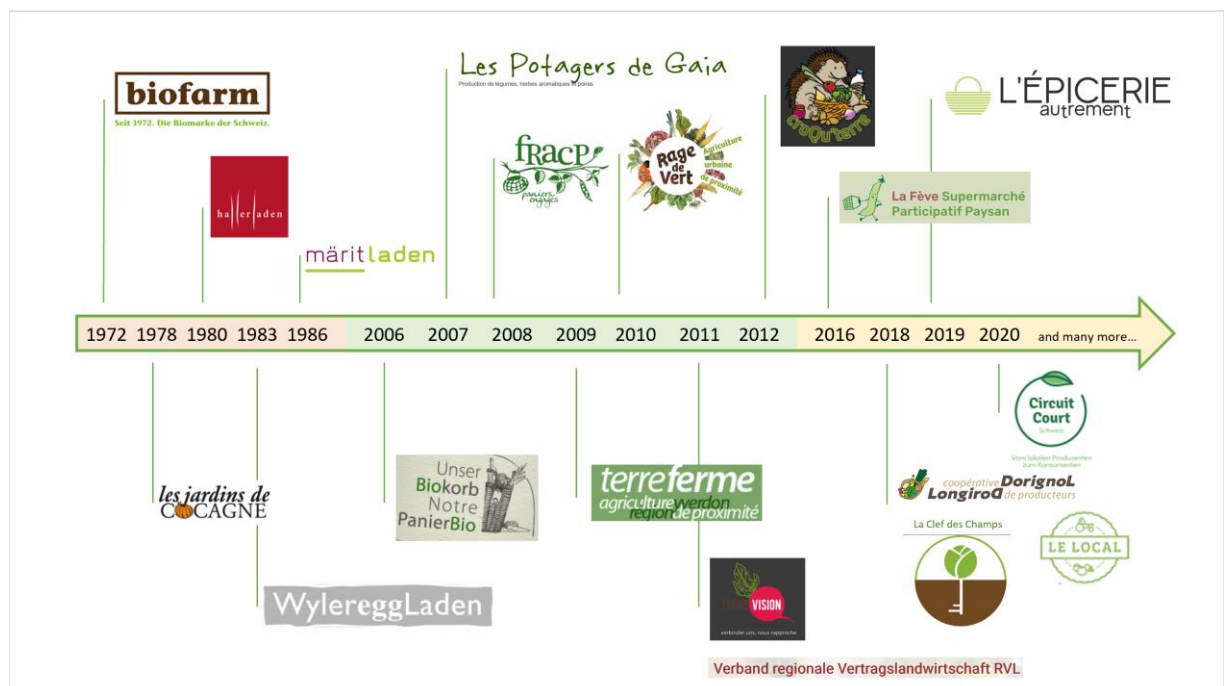


Figure 1. Overview of the emergence of cooperatives and associations promoting short food supply chains or direct marketing in Switzerland (non-exhaustive).

Figure 1 illustrates three distinct emergence phases of collective initiatives promoting SFSCs in Switzerland. The first wave began with the emergence of organic agriculture and sovereignty movements after the 1970s. If Switzerland witnessed the creation of the first European CSA initiative (Les Jardins de Cocagne²), it was mainly the foundation of small cooperatives that signed the beginning of the promotion of *circuits courts* (the French term for SFSCs). Their aim was to offer a range of organic products to the consumers within their stores, which were not yet commercialized by mass retailers³. At the start of the new millennium several movements promoting CSA schemes emerged to offer alternatives to the conventional agri-food retailing industry⁴. While some of them explicitly promoted specific farming practices such as organic agriculture, socio-economic aspects of the exchanges between producers and consumers are at the heart of their approach. More recently, there was also a rebirth of small grocery stores offering locally produced and often unpackaged food⁵. Those stores have different forms and can vary between regular private-owned groceries, participative supermarkets, and cooperative stores. They can also promote organic products or mobilize zero-waste concepts but the majority of them operate under the banner of 'localness' as a guarantee of a more climate- and producer-friendly way of consuming food.

1.2. Context of emergence

In parallel, the market power of mass retailers such as Migros, Coop, Manor, Lidl, and Aldi has never been as high as it is today (Swissinfo, 2017). Migros and Coop which merchandize the majority of national and international agricultural goods control around 70% of the Swiss retail

² <http://www.cocagne.ch/>

³ Biofarm, Hallerladen, Märitladen, WylereggLaden amongst others.

⁴ Notre PanierBio, Les Potagers de Gaia, Rage de Vert, TerreFerme, TerreVision, Croqu'terre, La Clef des Champs and their umbrella association FRACP are all initiatives from the French part of Switzerland. Other parts of the country have also witnessed the emergence of CSA scheme, though to a smaller extent.

⁵ La Fève, L'Épicerie Autrement, Le Local, Dorignol amongst others.

sector (DFAE, 2017) and 82% of the food market share (Albrecht, 2017). In 2014, trade and transport as well as the food industry accounted for respectively 50.7% and 21.8% of the national food value chain while the agricultural sector had a share of 11.8% only (Bokusheva et al., 2019). With an increased market power, the influence of the trade sector over prices, quality standards as well as production volumes has direct consequences for farmers.

Rising supermarket prices and decreasing purchase prices by wholesalers make it very difficult for producers to survive and more than 20,000 farms have disappeared since the year 2000, with larger numbers amongst small farms (10 to 20 ha) (Widmer, 2019). As a result, the development and implementation of sustainable innovations in response to current and future social, economic, and environmental challenges often call for more supportive policies, making it a slow political process. Indeed, many farmers have become dependent on governmental subsidies and the country has increased its food imports to become one of the biggest net importer in the world (RTSInfo, 2017; Porcher, 2011). Moreover, despite the strong incentives provided by cross-compliant agri-environment schemes (AES), the effectiveness of the Swiss agricultural sector in mitigating negatives impacts on the environment seems to be stagnating since 2000 (Frei, 2019).

In that regard, the duopolistic concentration of retailers in Switzerland seems to be putting more pressure on producers but also allows room for more direct sales than in other European countries (Roque et al., 2008). By reorganising food supplies and food production on a local scale, SFSCs initiatives represent new opportunities for farmers and consumers looking for alternatives providing 'associated services' such as trust, transparency, cultural identity and food heritage (Galli & Brunori, 2013; Chiffolleau, 2008).

1.3. Objective and aims of the research

While the socio-economic impacts of SFSCs are increasingly being acknowledged by practitioners, researchers, and policymakers (Boutry & Ferru, 2016; Chiffolleau & Prévost, 2013; Galli & Brunori, 2013; Renting, Marsden, & Banks, 2003), there is, so far, less evidence on their potential to provide farmers with the ability to respond to current and future environmental challenges. Nonetheless, by regaining control over their enterprises as well as increased exchanges of experiences carrying new ideas and values, farmers using SFSCs may well be better equipped to face ecological challenges and initiate changes (Boutry & Ferru, 2016).

This research, therefore, intends to assess the potential ecological benefits of SFSCs by analysing current practices, as well as their implications values and goals shared by the actors. The objectives are two-fold. Firstly, the research aims to provide information on the actual extent of environmentally-sound production practices and processes within SFSCs farms (Research Question (RQ) 1, Table 1). Secondly, an analysis of the narratives mobilized by farmers (and initiatives) should provide additional insights on the underlying motivations linked to their decisions on merchandising strategies and production practices (RQ2), as well as the effect such decision might have on farm operations and the actors' views and practices (RQ3).

Table 1. Overall aim and research questions addressed by the study

Research questions and aim of the study	
<i>To what extent are short food supply chains in Switzerland also drivers of an environmentally sustainable agriculture production?</i>	
RQ1	What types of production practices are implemented by farmers selling their products directly or through SFSCs and has there been a shift to more sustainable practices?
RQ2	What are the reasons and motivations, amongst farmers, for developing direct or 'shorter' marketing strategies and how important are sustainable production practices?
RQ3	What are the main implications of SFSCs on farm operations, production practices as well as views and aspirations?

In order to understand if SFSCs can also be regarded as ways to promote sustainable farming practices, this study will be based on a mixed-method approach combining a survey on farming practices and merchandizing strategies adopted by farmers within SFSCs as well as in-depth interviews and secondary data on farmers' motivations and aims. Combining quantitative and qualitative data offers a holistic approach on the subject, which will hopefully contribute to a better understanding of the potential and role of SFSCs in the promotion of sustainable farming practices.

2. Theoretical background and review of relevant literature

This chapter gives background information on short supply chains and summarizes part of the main findings around SFSCs and, to some extent, the broader picture of alternative food networks. The scene is set by suggesting useful definitions to what is meant by 'short food supply chains' as well as their associated strategies before exploring their innovative characteristics, the role and perspectives of the actors involved and their sustainability potential.

2.1. Identification of short food supply chains

In the public and scientific discourse, SFSCs are often associated to various terms such as "local food systems", "direct sales", "sustainable food chains", "alternative food chains" or "alternative food networks" (Malak-Rawlikowska et al., 2019; Galli & Brunori, 2013). The latter is typically used as a broad embracing term to cover newly emerging networks of producers, consumers, and other actors that embody alternative modes of food supply and consumption as opposed to more conventional industrial modes (Marsden, Banks, & Bristow, 2000). Nonetheless, as presented by Renting, Marsden, & Banks (2003), the SFSC concept is more specific than AFNs and covers the interrelations of actors directly involved in the production, processing, distribution, and consumption. SFSCs 'short-circuit long, anonymous supply chains' and give 'clear signals on the provenance and the quality attribute of food by constructing transparent chains in which products reach the consumer with a significant degree of value-laden information' (Renting, Marsden, & Banks, 2003: 398). They are often perceived as a means of re-establishing social relationships and authenticity between producers and consumers (Malak-Rawlikowska et al., 2019; Deverre & Lamine, 2010). This direct link between producer and consumer involves the construction of knowledge, value, and meaning about the product (its provenance, production, and consumption) and the actors involved (producers and consumers) rather than solely an

exchange of products (Galli & Brunori, 2013). Depending on the initiatives and their actors, SFSCs carry a range of different values and meanings, which some of them are illustrated in Table 2.

Table 2. Meanings attributed to SFSCs (Galli & Brunori, 2013)

Meaning of food in SFSCs	Meaning of production-distribution system in SFSCs
<p>“fresh”, “diverse”, “organic”, “slow”, “quality”, “seasonal”, “traditional”, “local”, “regional”, “taste”, “delicious”, “food heritage”, “cultural identity”, “fair”, “sustainable”</p>	<p>“small scale”, “short”, “traditional”, “local”, “environmentally sustainable”, “embedded”, “fair”, “transparency”, “traceability”, “corporate social responsibility”, “local economy”, “lower emissions”, “rural-urban linkages”, “self-esteem” “social acknowledgement”, “prestige of food producers”, “sustainability”</p>

2.1.1. Towards a definition

As ‘short’ indicates, distances in SFSCs are reduced in comparison to conventional food chains and their basic definition criteria are physical and social proximity (Galli & Brunori, 2013). Here physical distance refers to the distance between the place of production and the point of sale or food miles (Pretty et al., 2005), and social proximity is expressed in the number of intermediaries between producers and consumers.

Following the definitions of *circuits courts* used in the French literature (Chiffolleau, Millet Amrani, & Canard, 2016; Porcher, 2011; Maréchal, 2008), there are four important key features to define SFSCs.

- First, studies on SFSCs focus only on **commercial practices** with monetized exchanges. This excludes all ‘producers as consumers’ practices included in AFN’s such as self-consumption or barter systems, even if they might share similar aspects regarding social relationships, proximity, and ‘localness’.

- Those types of supply chains include a **territorial approach** of products. The ‘localness’ of the latter may vary between the regions, but, here, the concept of proximity includes both the place of production and consumption. The territory therefore also becomes a place of consumption.
- Even if short supply chains involve a territorial perspective, *circuits courts* are defined, not by the physical distance between producers and consumers but by the number of retailers. Here, SFSCs involve retailing routes of **a maximum of one intermediary**.
- Finally, short retailing schemes are able, through their outlets and limited volume of goods, to develop **social connections**. This might be illustrated by exchanges between producers and consumers but also by the collaboration of several producers within the same initiative or retail point.

Although the number of intermediaries is the most often cited criterium to differentiate SCFCs from other supply chains (e.g. Galli & Brunori, 2013; Maréchal, 2008; Renting, Marsden, & Banks, 2003; Marsden, Murdoch, & Morgan, 1999) this should be taken with caution. Here, intermediaries are meant to connect rather disconnect producers with consumers (Galli & Brunori, 2013), which is crucial given that reducing the number of intermediaries has also been a widespread strategy of large commercial food distribution which does not necessarily promote a closer kind of relationship between producers and consumers. On the other hand, some producers’ cooperatives might sell their products through shops managed by consumers’ cooperative or association. There, the number of intermediaries can be regarded as high and related to a ‘long’ supply chain, but their configuration might still allow close exchanges between consumers and producers. Therefore, although the number of intermediaries is important in the definition of SFSCs, it should not be the main factor (Galli & Brunori, 2013).

2.1.2. Classification and merchandising strategies

SFSCs are not new, but new forms are emerging while older ones are renewing themselves (Chiffolleau & Prévost, 2013). Following the work of French scholar Yuna Chiffolleau (Chiffolleau, Millet Amrani, & Canard, 2016; Chiffolleau & Prévost, 2013) and the EC IMPACT project (Renting, Marsden & Banks, 2003), useful indicators to identify the different types of SFSCs include the number of intermediaries, the physical or geographical distance between production, distribution, and consumption, and organisational arrangements such as the collective or individual nature of the approach (figure 2). Renting, Marsden & Banks (2003) identify three main categories of short food chains:

- SFSCs based on **face-to-face interactions** where consumers purchase products directly from the producer and authenticity and trust are mediated through personal interaction (e.g. on-farm sales, farm shops, farmers' markets, 'pick your own' or online sales).
- Proximate SFSCs based on **relations of proximity** which extend their reach beyond direct interaction but where production and retail take place within the same specific region or place (e.g. consumers' cooperatives, CSA).
- SFSCs with **spatially extended relations** in time and space where products are sold to consumers outside the region of production. Here value and meaning-laden information is transferred and enables consumers to make connections with the place/space of production and, potentially, values and methods involved.

If the latter classification can be useful to characterize the exchange of value-laden information between producers and consumers it is less useful to analyse relations and exchanges between producers. In that regard, Chiffolleau & Prévost (2013) and Maréchal (2008) have developed a typology of SFSCs based on their individual or collective characteristics. This is crucial as collective

and individual initiatives might have quite different potentials regarding the promotion of innovative practices, both in merchandising as well as production methods.

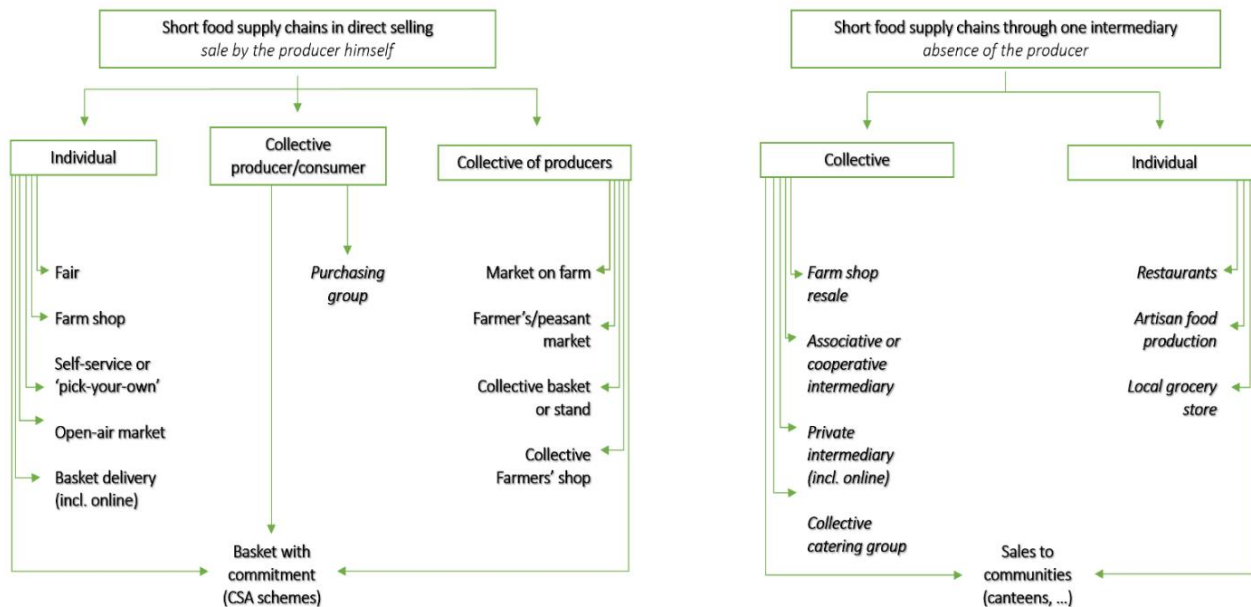


Figure 2. Diversity of short food chains in Switzerland.

(those in italics, chains not necessarily local; adapted from Chiffolleau, Millet Amrani, & Canard, 2016; Chiffolleau & Prévost, 2013; Porcher, 2011).

Figure 2 illustrates the various merchandising strategies adopted by producers within SFSCs in Switzerland, based on the work of Chiffolleau, Millet Amrani, & Canard (2016) and Porcher (2011). It is worth noting that several characteristics of the presented merchandising strategies have been omitted here. This does not mean that they do not have important implications for farm operations. For instance, more than half of farmers devoted to direct sales in Switzerland (6,252 farms according to Helfenstein) are also developing processing operations such as cheese-making, slaughter and butchering, preparation of pasta, juices, liquor, and many more. This requires important investments in terms of time, money, knowledge, and logistics. Also, farmers usually use a blend of various strategies to sell their goods (Chiffolleau, Millet Amrani, & Canard,

2016) and their implications might very well vary between farms, operation types, and the products sold.

2.2. Development of sociotechnical 'alternatives'

The development of SFSCs initiatives has mainly been carried out by farmers wanting to regain a reasonable margin over selling prices, but also by actors (from the public or the agricultural sector) interested in strengthening the relationship between producers and consumers for better guarantees and transparency regarding quality and freshness of products. Therefore, both producers and consumers have an essential role in SFSC innovations. In direct selling, for instance, producers often use direct contact with consumers to test and improve innovations, and this relationship between farmers and customers is often listed as the main driver of innovations in direct marketing (Roque et al., 2008). If SFSCs aim to restore exchanges between consumers and producers in response to health crises, increased economic pressure, and mistrust towards mass retailers (Chiffolleau, 2008), motivations of the actors regarding more direct marketing of farm products can vary.

In Switzerland, Roque et al. (2008) and Mühlethaler (2004) found that from the farmer perspective, the main reasons to innovate are;

- economic (increase in sales, higher margins, better price, securing clients),
- and social (direct contact with consumers and between farmers).

But motivations can also be

- organisational (gaining time, organisation of the work),
- technical (new product, new processing),
- and environmental (biodiversity, less energy consumption).

This concurs with findings from the French context, where Chiffolleau (2008) argues that by avoiding part of the constraints of agro-food supply chains, SFSCs are understood as ways of countering 'economic fragility' by many producers or supporting institutions. They provide options for holders of 'alternative' projects (organic agriculture, peasant movements, etc.), farmers wanting to 'revalorize' their profession, and actors reclaiming power over the food value chain and regaining some autonomy (Vuilleumier, Forney, & Fresia, 2020; Porcher, 2011; Chiffolleau, 2008). Furthermore, values and goals embodied by farmers play a crucial role in the 'innovativeness' of initiatives (Walder et al., 2019). In this regard, qualitative case studies across France, Switzerland, Italy, and the Netherlands within the EU IN-SIGHT project (Dockès et al., 2008) show a diversity of farmers' profiles practicing direct marketing:

- traditional farmers who have always sold to neighbours or the local market,
- entrepreneurial farmers looking for new marketing practices in order to get better margins,
- farmers pushing personal and ethical projects at a 'more human' scale who find balance and independence in their system thanks to direct marketing,
- and, finally, creative farmers, who wish both to develop a personal project and succeed in an economic one. They have often been pioneers of collective selling, and agro-tourism and are still searching for innovation.

Even though producers are clearly at the heart of SFSCs innovation systems, motivations of consumer groups can be the basis of the innovation (Dockès et al., 2008). The latter may decide to engage in SFSCs for various reasons. 'Hypermodern' citizens, while consuming evermore, are looking to restore meaning over their behaviour and reinforce their identity through social relationships and ethical values, seen as 'consumption-associated services' (Chiffolleau, 2008). Galli & Brunori (2013) have identified seven different types of 'services' that consumers are looking for within SFSCs:

Table 3. Overview of 'consumption-associated services' provided by SFSCs (Galli & Brunori, 2013)

1. <i>Localness</i>	The origin of products and the identification of the farm and the farmer (name, location, etc.), as a compromise with the local and regional development. The concepts of locality and territory, closeness (lower distance and fuel requirements) and fewer emissions are at the base of this issue, but also the ideas of cultural identity and food heritage are embedded.
2. <i>Quality</i>	Food quality features, hygiene and sanitary guarantees, especially after the food crisis outbreaks related to highly intensified production systems.
3. <i>Health and safety</i>	Healthier and safer composition, regarding the content with higher quality ingredients (less saturated fatty acids), less additives, and preservatives.
4. <i>Organoleptic features</i>	Taste, flavour, etc.
5. <i>Production specifications</i>	Management practices (traditional, organic, extensive, pasture-based systems, etc.) and utilisation of inputs (usually lower utilisation of herbicides and pesticides) linked to more sustainable food systems.
6. <i>Values and ethics</i>	biodiversity, local breeds, and vegetal varieties, GMO-free, tradition, seasonality, landscape preservation, etc.
7. <i>Governance of the food system</i>	Transparency, food sovereignty, fair prices, etc.

It is interesting to note that, unlike producers, economic arguments such as low price are seldom mentioned as a motivation by consumers (Roque et al., 2008).

2.2.1. Niche-innovation and transition theories

The 'alternative' characteristics of AFNs towards conventional agri-food systems and positionality of its associated researches is a matter for discussion (Tregear, 2011). However, SFSCs have largely been acknowledged as initiatives claiming 'new' links between producers and consumers as well as sustainable transitions at odds with the 'dominant' system (Deverre & Lamine, 2010). In this regard, many scholars have analysed the potential of such 'niche-innovations' (SFSCs and sustainable agriculture) to provoke and sustain transitions within the dominant 'sociotechnical regime' (Brûlé-Gapihan, Laude, & Maclouf, 2017; Ingram et al., 2015; Galli & Brunori, 2013; Lamine, 2012; Deverre & Lamine, 2010; Dockès et al., 2008). This approach refers to the Multi-Level Perspective (MLP) on socio-technical transition pathways proposed by Geels and Schot (2007):

- The (dominant) **regime** is characterised by the notion of 'socio-technical system' based on knowledge, technologies and formal, cognitive and normative frames (here conventional or industrialised agriculture). Once established, those socio-technical regimes are typically stable because subject to self-reinforcing dynamics (Brûlé-Gapihan, Laude, & Maclouf, 2017).
- **Niche**-innovation is the 'place' where innovations can emerge and contest the dominant regime (Schot & Geels, 2008). Here, 'niche' is often meant as a domain of application where actors work with specific functionalities, accept teething problems such as higher costs (or work and time investment), and are willing to invest in improvements of new technologies and development of new markets, such as sustainable agriculture and SFSCs (Brûlé-Gapihan, Laude, & Maclouf, 2017). Most importantly, the MLP defines niches as intended to provoke transitions at the regime level.

- Following Geels and Schot (2007), the sociotechnical **landscape** is a set of socio-economic driving forces external to the regime that influences regime and niche actors' decisions. This indirect influence is embodied in the historical, environmental, and cultural dimensions of the social context, which, generally, changes slowly over many decades (Brûlé-Gapihan, Laude, & Maclouf, 2017). Here, the sociotechnical landscape is characterised by increasing social demand for more transparent and shorter supply chains as well as an 'environment-friendly' agriculture, which limits its impact on the environment.

As Renting *et al.* (2003) suggest it, SFSCs, therefore, need to be seen as developments (niche-innovations) contributing to the current transitions in the conventional intensive and 'productivist' agriculture (the dominant regime) under the public consumer pressure for a larger variety of distinctive 'quality' food products. Originally, alternative initiatives lose part of their alternative characteristics or 'innovativeness' through professionalization and regulation pressures (Galli & Brunori, 2013). As highlighted by Mastronardi *et al.* (2015) this happens when 'short supply chains' or 'zero miles' become part of the everyday language or are used by businesses and institutions that often apply them in a simplified way. Here, the persistence of their core values will much depend on the actors carrying the innovations and the discussions about food and nutrition, producers and consumers, the environment, and social relationships embodied in SFSCs.

2.2.2. Actors and transition process

The interaction between consumers and producers is typically the most important driver of innovation within SFSCs and are involved most of the time since the beginning of the development of innovations. However, members of such initiatives are evolving within a network

of actors whose role and importance depend on the sector and the scale of the innovation (see figure 3).

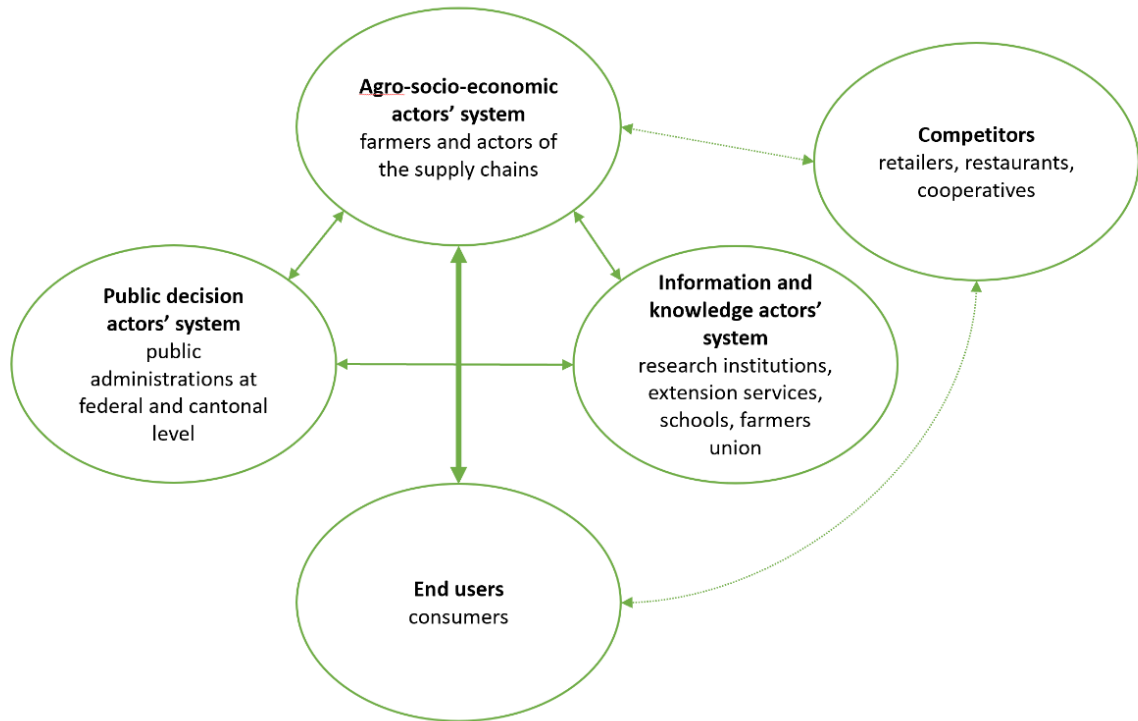


Figure 3. Actors in short food supply chains initiatives (adapted from Roque *et al.*, 2008; and Dockès *et al.*, 2008)

Dockès *et al.* (2008) suggest that when SFSCs initiatives and their innovations on direct marketing are scaled up (from novelties to a niche), policymakers start to be involved as they must adapt regulations and framework to those new forms. In Switzerland, the public decision system usually has very direct consequences for farmers and their operations. The widespread use of federal subsidies on given practices such as agri-environment schemes (AES) is indeed a very influential driver within farmers' strategies and decision making (Herzog *et al.*, 2017). Furthermore, research or support institutions of the knowledge system can provide financial or technical support to secure the development of innovation at the state of niche (Dockès *et al.*, 2008). Finally, as many actors of new SFSCs initiatives often use a blend of short and long supply chains to sell their products (Malak-Rawlikowska *et al.*, 2019; Chiffolleau, Millet Amrani, & Canard,

2016), competitors can also have important implications (to a limited extent) on producers and therefore the innovation process. Similarly, consumers can also influence competitors through various aspects so that (direct and indirect) interaction between short and long supply chains still exist and can shape the delivery of the innovation.

Roque et al. (2008) raise awareness on the importance of the context in which actors have different roles and the perception of such by farmers is crucial. Therefore, actors of the different systems can be analysed both as drivers and barriers to innovation. Table 4 proposes a classification of actors and their positive and negative perceptions based on the results of the EU IN-SIGHT project and the Swiss context (Dockès et al., 2008; Roque et al., 2008).

Table 4. Assessment of context for direct marketing initiatives (Roque et al., 2008).

<p><i>Positive elements or drivers</i></p>	<p>Customers: increasingly open to and interested in new forms of direct marketing</p> <p>Agricultural extension services: role is to spread innovations (rather than initiate them)</p> <p>Tourism offices: generally, agricultural direct marketing innovations are perceived as interesting activities to enrich the tourism offer</p>
<p><i>Neutral or contradictory elements</i></p>	<p>Neighbours: can either be favourable to innovative activities or be against what they can interpret as a nuisance</p> <p>Farmers: there are as many contexts as local groups</p> <p>Communities: some of them welcome and support innovations aiming at contributing to the maintaining of farms, others do not care about it or even try to prevent them</p> <p>Farmers unions: the role of the large and mainstream organizations is to support the majority of their membership, which are currently not SFSCs farmers</p> <p>National parliament: decisions can make the legal and institutional context more favourable to innovations in direct marketing, while others may increase the constraints</p> <p>Cantons (political and administrative regions): the situation may considerably vary from one canton to another one</p>

<p><i>Negative elements or barriers</i></p>	<p>Banks: generally, not oriented to support innovative farming projects</p> <p>Federal Office for agriculture: even with the application of existing legal tools, the office is not pro-active in proposing new opportunities which would be favourable to innovation; in addition, official principles guiding agricultural public policies are mainly oriented towards the consequences of cost-based competition (growth farm size, yield increase, etc.)</p> <p>Big retailers: logically try either to prevent innovations in direct marketing or to recuperate them to the detriment of producers</p> <p>Restaurants: farmers are often perceived as unfair competitors when they develop initiatives potentially representing an alternative from traditional restaurants (<i>note that this perception could be different for SFSCs where restaurants become active actors within initiatives</i>)</p> <p>Fenaco (Swiss union of agricultural cooperatives): the cooperative organisation is driven by principles of integration into a highly industrialised food chain</p>
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When considering the development of SFSCs it is crucial to analyse their ability to provoke a transition of the dominant regime and transformation into agricultural policies. Here, Galli and Brunori (2013) draw attention to the increasing interest in local products from the side of conventional chains and a potential adaptation/appropriation by the current dominating food regime with the loss of some 'alternative' characteristics of SFSCs. On the other hand, Roque et al. (2008) found that the biggest barrier in Switzerland is that direct marketing, and ultimately SFSCs, are not considered as serious alternatives to the traditional supply chains both by policymakers and extensionists. If support for promotion is theoretically available at the regional level, it is difficult to obtain.

2.3. Contribution to a sustainable food system

Despite challenges in their development, interest in SFSCs is growing due to their potential to contribute to more sustainable food systems, rural development, and healthier communities (Galli & Brunori, 2013). Sustainability aspects of short supply chains are often analysed through their alternative features in comparison to more conventional food systems. However, beyond

the broad view of balanced economic, social and environmental dimensions, what sustainability really constitutes within the food system is much less clear and often loosely defined in practice amongst producers and consumers (Forssell & Lankoski, 2014; Ilbery & Maye, 2005). This is often related to the difficulty of balancing contradictory environmental, social, and economic aspects. The great diversity of SFSCs, makes it very difficult to provide a common description of their sustainability impacts, as they may vary from chain to chain (Malak-Rawlikowska et al., 2019; Galli & Brunori, 2013). Recent findings have also suggested that their sustainability impacts seem to be very important regarding social aspects but that their economic (affordability, costs) and environmental (effectiveness, transport) performances were sometimes lower than longer industrialised food chains (Schmutz et al., 2017; Brunori et al., 2016; Schmitt et al., 2016).

Despite the difficulties to define sustainability, there are background issues commonly considered as central to sustainability in food networks (Forssell & Lankoski, 2014).

Table 5. Background issues central to sustainability in food networks (based on Forssell & Lankoski, 2014)

Economic issues	Social issues	Environmental issues
<ul style="list-style-type: none"> ▪ Incomes and livelihoods of producers and others involved in the network ▪ Employment ▪ Local economic development (particularly in rural areas) 	<ul style="list-style-type: none"> ▪ Labour rights and the safety of workers ▪ Consumer health ▪ Food culture ▪ Food security: accessibility, availability, and affordability of nutritious food 	<ul style="list-style-type: none"> ▪ Environmental impacts: production, processing, packaging, distribution, and consumption ▪ Use of resources ▪ Pollution damage: soil, water, and air ▪ Biodiversity and ecosystems ▪ Animal welfare

In response to mixed conclusions Forssell & Lankoski (2014) have further highlighted the need to consider the relevance of characteristics of food networks in promoting sustainability rather than

focusing on the scale of networks and their general aspects. Figure 4 presents three main characteristics of AFNs and their potential sustainability impacts.

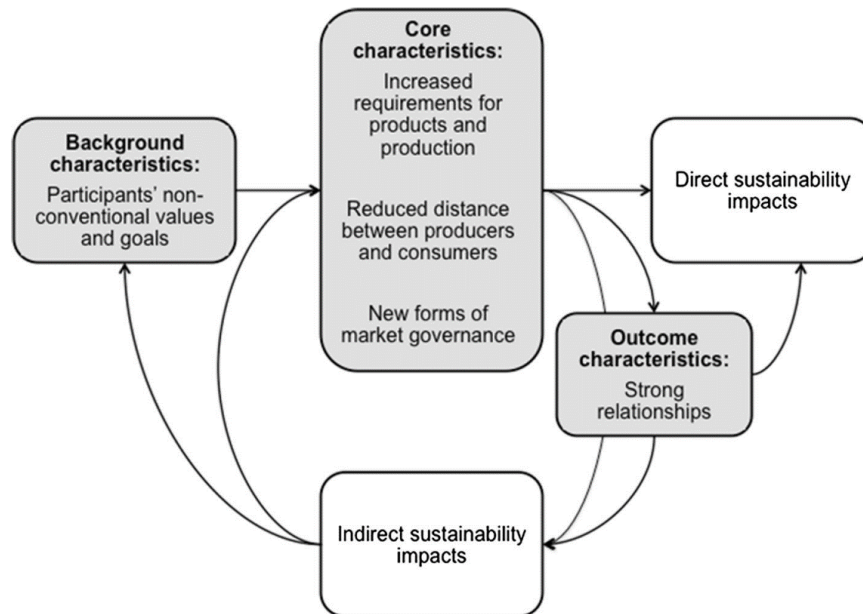


Figure 4. Direct and indirect linkages between AFN characteristics and sustainability (Forsell & Lankoski, 2014).

In their review of the sustainability aspects of AFNs, Forsell and Lankoski (2014) found that background characteristics such as participants' morality and commitment to sustainability and the 'non-industrial' logic are not necessarily present or mobilized, and where they do, their presence alone does not directly contribute to sustainability. However, they still have a significant role in influencing what types of practices are adopted (core characteristics), which results in indirect sustainability outcomes (often through trust and social embeddedness). Core characteristics such as increased requirements for products and production ('natural', 'territorially embedded', 'small scale', 'diversity', 'quality'), reduced physical, value chain and informational distance between producers and consumers ('localness', 'small size networks', 'transparency', 'information', 'shortening the supply chain') or new forms of market governance ('ideas of redistributing power in the food network') can be linked directly to several specific

sustainability impacts, but can also have indirect contributions to sustainability which often reinforce participant values and choices on production methods, form and length of supply chains, and governance arrangements (Forssell & Lankoski, 2014).

2.3.1. Socio-economic implications

SFSCs and their core characteristics have crucial direct and indirect impacts for farmers and local communities. According to Galli and Brunori (2013), evidence shows that sustainability impacts are often a result of both close physical and close social proximity.

First of all, SFSCs foster social (and economic) cohesion between producers and consumers on one hand and between producers from the food chain on the other hand (Boutry & Ferru, 2016). According to Chiffoleau and Prévost (2013), closer producer/consumer links strengthen the farmer's social position, promoting pride in the profession, but can also improve quality, production practices and raise awareness on food and the environment. Moreover, cooperation between producers within SFSCs can bring them to share resources or experiences and, therefore, develop new 'places' of solidarity, exchanges, and 'democratic debate' (Chiffoleau & Prévost, 2013; Maréchal & Spanu, 2010).

Freeing oneself from the sales process has long been seen as a relief for many farmers (Maréchal, 2008). However, with rising constraints, the disintermediation on which SFSCs are based has become an opportunity (and a motivation) for producers to regain independence in their work and build less asymmetrical relationships (Vuilleumier, Forney, & Fresia, 2020; Boutry & Ferru, 2016). This 'autonomisation' process contributes to a fairer trade which allows to better control costs, and with closer links to food origin and production, promotes transparency of the supply chains (Chiffoleau & Prévost, 2013). This autonomy is a central aspect of many initiatives across

Switzerland that focus on promoting food sovereignty at a national scale and better liberty of decision for farmers (Vuilleumier, Forney, & Fresia, 2020; Porcher, 2011).

From an economic standpoint, SFSCs also seem to open up new opportunities to redistribute added value through the close links between territory, customer, and product (Boutry & Ferru, 2016). As a result, direct marketing seems to foster a greater margin for producers (Malak-Rawlikowska et al., 2019; Chiffolleau, 2008) and helps preserve small farms from economic pressure (Chiffolleau & Prévost, 2013). Also, those synergies between actors appear to underly more stable and less nomadic long term territorial projects and sustained rural development (Boutry & Ferru, 2016; Renting, Marsden, & Banks, 2003). As a result, this seems to facilitate the installation of new farms but also the appreciation and promotion of local varieties, local grocery stores, regional restaurants, and traditional practices (Chiffolleau & Prévost, 2013).

2.3.2. Environmental considerations

While there is growing evidence of the socio-economic implications of SFSCs, there are fewer indications of their environmental impacts, and available studies show conflicting results (Kulak et al., 2015). On one hand, SFSCs are seen as ways to preserve natural resources through more 'environment-friendly' production modes and reduced distances from production to consumption (Boutry & Ferru, 2016; Maréchal & Spanu, 2010). Looking beyond profit and the autonomy of the organization foster high concern and flexibility to reduce food waste (Poças Ribeiro et al., 2019). On the other hand, geographical proximity between producers and consumers is not necessarily synonymous with efficient systems and lower energy consumption (Aubry & Traversac, 2010). There are situations in which 'longer' supply chains can have lower environmental impacts per unit of production when measured in terms of food miles and carbon footprint (Malak-Rawlikowska et al., 2019).

Looking at the mixed findings on the actual environmental impacts of AFNs and SFSCs and the difficulty to properly define sustainable practices, it would be arduous to draw any conclusion on their potential regarding ‘environment-friendly’ practices so far. Some researchers have, therefore, advocated and made use of more ‘qualitative’ methods to determine the ecological aspects of certain food chains (Rétif & Chevallier, 2018; Boutry & Ferru, 2016). For instance, various studies on the sustainability of food chains have drawn on the concept of embeddedness as developed by Karl Polanyi (Pinna, 2016; Penker, 2006). In this regard, Morris and Kirwan (2011) have listed four important dimensions of ecological embeddedness to be considered within empirical studies mixing conceptual and more practical analysis (see table 6).

Table 6. The four dimensions of ecological embeddedness (Morris & Kirwan, 2011)

1. <i>Understanding</i>	The way in which the producers understand the role of important ecological relations within their farming systems and food enterprise: what motivations? (Intrinsic and instrumental values of nature, economic considerations, or a wider range of factors such as ‘tradition’, ‘quality’, etc.)
2. <i>Realising</i>	The way in which particular production processes and practices realise ecological benefits: this implies a more “practical” assessment of production practices (extensive low input practices, breeds selection, ecological management of features such as hedgerows and watercourses, ...).
3. <i>Utilising</i>	Various ways in which information about the ecological conditions of production is utilised to influence the exchange process: analysis of the discourses and narratives within and across

networks or initiatives as well as from producers to consumers.

4. *Negotiating*

Point of view from the consumer: how consumers negotiate the ecological dimensions of foods within AFNs and their relative importance on purchasing decisions.

Presented as such, this concept of ecological embeddedness calls for an assessment of the environmental sustainability of SFSCs through the lens of actual practices but also values and meanings carried by actors within those chains. Note that this concurs with the suggestion by Forssell and Lankoski (2014), discussed in section 2.3, that participant's values and goals and their chosen practices play a crucial role in the sustainable outcomes of AFNs (see figure 4).

2.4. Towards 'environment-friendly' practices

Per definition, SFSCs do not specify any method of production nor the type of products exchanged. Nonetheless, they often imply exchanges of so-called "peasants" or "farmers" products that convey authenticity as well as traditional values. Also, consumers often expect to find products carrying certain artisanal practices in opposition to industrial processes (Porcher, 2011). As a result, the public often associates buying food from local farmers through SFSCs with organic farming. However, as stated by Maréchal & Spanu (2010), it is not necessarily true for every actor who uses SFSCs. In France, for instance, only 10% of farms practicing SFSCs are certified organic (Girard, 2020).

The public's assumptions are not as wrong as they appear, as 10% is a much higher number than the 2% of organic farmers within the whole French agricultural sector and Chiffolleau (in Girard, 2020) has shown that young and newly installed farmers often privilege SFSCs (especially for vegetable farming) and that in many cases, farming practices changes with greater consideration

for the environment. The interest of young farmers for environmental-friendly practices has also been confirmed by Aubert and Enjolras (2016), who also found that, conversely, farmers who adopt an organic farming certification are more likely to sell their products through short food supply chains. In that sense and despite an increased requirement of labour, the quality of agricultural products and processes can be enhanced in several ways, either through the commercial channel or the adoption of environmental labels (Aubert & Enjolras, 2016). Findings, therefore, suggest that there is indeed a relation between SFSCs and environmental-friendly practices. As stated by Brûlé-Gapihan *et al.* (2017), innovation in direct marketing and 'shorter' food chains looking to reduce the distance between producers and consumers have, in fact, also developed in response to the 'conventionalisation' and adaptation of organic agriculture to the dominant industrial agricultural regime (Brûlé-Gapihan, Laude, & Maclouf, 2017; Darnhofer *et al.*, 2009). Following that statement, it becomes clear that the development of innovation on direct marketing might very often happen within the same niches (producers and their customers) which have witnessed the emergence of organic agriculture.

Nonetheless, Aubert & Enjolras (2016) have demonstrated that quality of agricultural process could also be enhanced outside the use of certification schemes. Moreover, qualitative researches have also shown that actors practicing organic agriculture did not necessarily mobilize environmental arguments or values (Rétif & Chevallier, 2018). This clearly demands an examination beyond the technical dichotomy of conventional and organic agriculture and a reconsideration of the socio-economic context and the actors' perceptions. This also recalls the concept of ecological embeddedness of food chains, where the way actors 'understand' and 'utilize' environment considerations (values and goals within the socio-economic context) is as important as the way they 'realize' ecological benefits within a particular production process (see Morris and Kirwan, 2011). Therond *et al.* (2017) have also argued that assessment of the

sustainability potential of agriculture models seeking to address environmental issues arising from the development of industrial agriculture need to encompass both biotechnical and socio-economic aspects. Here, they have for example proposed a classification using the territorial embeddedness and the dependence on external inputs or global market prices as important proxies for the sustainability of farming systems.

Reflecting those previous issues, researchers have adopted qualitative or mixed-method to analyse the relation between SFSCs and 'environment-friendly' practices (Rétif & Chevallier, 2018; Boutry & Ferru, 2016; Maréchal & Spanu, 2010). Here, the ecological embeddedness of SFSCs has been seen as closely related to their social embeddedness, where the appreciation of the environmental dimension closely depends on social, economic, and environmental capital (Rétif & Chevallier, 2018; Morris & Kirwan, 2011). Those studies have achieved broader understanding of the subject and suggested important findings on the socio-economic drivers of sustainable practices within SFSCs.

First of all, contact with the consumers is often cited as an important driver of change within production practices (e.g. Chiffolleau, 2008; Dockès et al., 2008) but this is not necessarily true (Maréchal & Spanu, 2010). Rétif and Chevallier (2018) found that consumers rarely question producers on their production practices and prefer to refer to 'quality' indicators. Therefore, many SFSCs initiatives chose to emphasise transparency so that consumers can make their own judgement, which often calls for a mobilisation of environmental and cultural values or representations. This reliance on trust gives the advantage to relational and psychologic aspects over the definition of norms and labels (Maréchal & Spanu, 2010) and allows farmers to valorise environmental values and practices through channels other than certification (Boutry & Ferru, 2016; Aubry & Traversac, 2010).

While consumers only have an indirect influence on production practices, contacts between producers within collective SFSCs scheme seem to delimit an arena that is very conducive to change (Maréchal & Spanu, 2010). Investments in innovations such as direct marketing or environment-friendly practices often represent a sign of 'deviance' in many agricultural circles and the ones who chose to break off from so-called 'norms' need to find new spaces of solidarity and professional relations. When turning towards alternative networks, those are likely to stimulate a further separation (Maréchal & Spanu, 2010). However, Rétif and Chevallier (2018) also found that many actors of SFSCs prefer not to give environmental considerations too much exposure so to prevent exclusive logics. Here, the environmental capital is challenged by other logics where the socio-cultural dimensions ('solidarity', 'tradition', 'nutrition', 'taste') outweigh environmental and health issues (Rétif & Chevallier, 2018).

Finally, it appears that producers' environmental considerations are strongly linked to their financial benefits (Boutry & Ferru, 2016). Here, reduction of environmental impacts is not a motivation in itself but the result of economic reasoning (Maréchal & Spanu, 2010). On one hand, ecological practices can become effective sales pitch and, on the other hand, as prices in SFSCs are not determined from 'outside' anymore, farmers are also keen to increase their added value by decreasing dependence and expenditures on external inputs (fertilizers, pesticides, etc.). Nonetheless it is important to note that financial incentives to adopt environment-friendly practices can also be greatly supported by the added-value of certification schemes such as organic agriculture or AES from agricultural policies, the latter being very familiar in Switzerland (Herzog et al., 2017; Aviron et al., 2009).

2.5. Summary

Overall, this chapter has not only helped to define what is really meant by 'short' food supply, but it has also raised awareness of the complexities of such innovative process and the implications they might have for the actors involved, and vice-versa. Indeed, SFSCs are shaped by their interaction with other spheres (policies, research and knowledge, the market, etc.) or the dominant agri-food 'regime' and have crucial socio-economic implications for farmers and their operations offer sustainability promises. However, their sustainability impacts are often regarded as unclear or even controversial, especially regarding the environmental dimension. This review provided evidence of the limited knowledge available regarding farming practices associated to SFSCs. On this point, the literature has often discussed the broader environmental impacts and has rarely gone beyond the dichotomy of conventional and organic farming when analysing production practices. The relation between SFSCs and organic agriculture has been quantitatively and qualitatively illustrated, however, few studies have gone beyond those broad specifications in order to understand what underpins farmers' decisions and changes in 'environment-friendly' production patterns. Boutry & Ferru, (2016) and Maréchal & Spanu (2010) adopted qualitative or mixed approaches to identify important socio-economic drivers within SFSCs initiatives, and provided useful insights on the importance of increased social exchanges and recognition amongst consumers and producers as well as economic factors in farmers' motivation and ability to develop 'environment-friendly' practices.

Looking at the limited availability of literature on the Swiss context and the need for qualitative approaches on the implications of SFSCs, the next chapter presents how the methods selected in this research will try to address this gap.

3. Research methodology

The methodology selected in the present study is based on a mixed-method approach for data collection. A mixed-method approach uses both qualitative and quantitative research, in combination, to provide a better understanding of the research problem or issue than either research approach alone (Creswell & Plano Clark, 2007).

While quantitative methods give systemic results and allow testing for links between variables (SFSCs and 'environment-friendly' practices in this case), their results can be misinterpreted without the help of qualitative data. On the other hand, qualitative approaches allow a deeper understanding of complex issues but are prey to potential bias related to the subjectivity of the actors involved. Following Boutry & Ferru (2016), mixed-method approaches on SFSCs have, therefore, the ability to disaggregate complex social and economic aspects and provide original and innovative data to enrich existing knowledge.

In the present research, a primary insight of views and practices has been achieved using an online survey distributed to farmers involved in SFSCs or direct marketing. Quantitative data were gathered to reflect the implemented 'short' merchandizing strategies developed by farmers as well as the extent of 'environmental-friendly' production practices across SFSCs. Results on the implications of SFSCs for farm operations and production patterns obtained from the survey, were then completed by in-depth interviews with selected farmers. The aim was to identify the actors' pathways, discuss their motivations as well as environmental considerations and analyse their implications on farm operations. Finally, analysis of secondary literature (initiatives' guidelines, newspaper articles, documentaries and television reports) and notes taken during observation of a meeting for the creation of a producers' grocery store helped put farmers' discourses in perspective and reveal how their goals and values might be mobilised in different contexts.

3.1. Study area and selection of respondents

The present research focuses on SFSCs schemes across Switzerland. However, as a compromise between time, organisational workload as well as quality and representativity of the results, the research was conducted on the seven cantons representing the French-speaking region of Switzerland (Bern, Jura, Neuchâtel, Fribourg, Vaud, Genève, Valais; see blue area on figure 5).

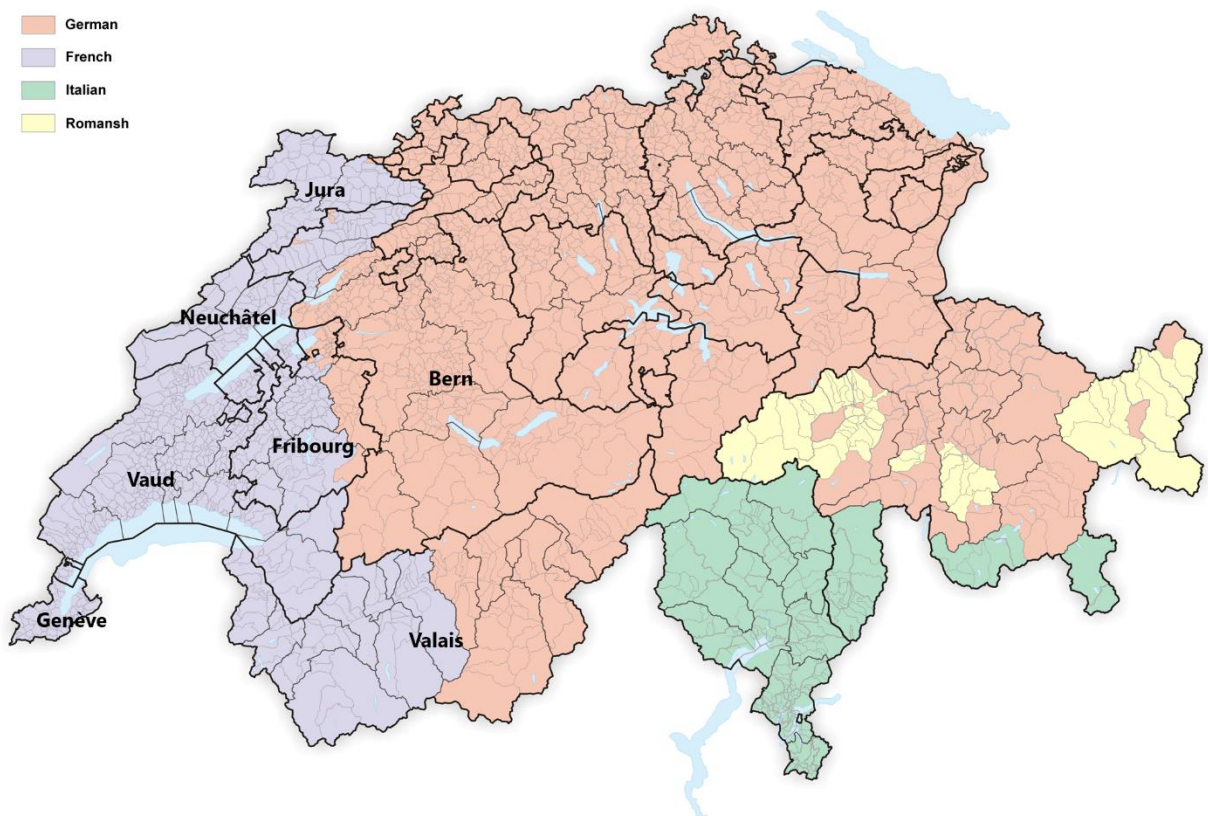


Figure 5. Country map with the area covered by the study in blue (retrieved from wikipedia.org)⁶

Selection of respondents and interviewees is of crucial importance for the representativity and comparability of the data set. Here, participants in the online survey were identified with the help of official lists of farmers involved in direct marketing or municipal markets (obtained from the Swiss farmers' union USP, cantonal and municipal authorities) as well as through their membership in initiative such as CSA schemes, cooperatives or local grocery stores (see figure 6).

⁶ https://en.wikipedia.org/wiki/Languages_of_Switzerland

Overall, 479 farmers were invited to take part in the survey with the aim of reaching as many farms involved in direct marketing or SFSCs as possible regardless of their merchandizing strategies or farming practices. The overall objective was to reach a representative set of respondents from which data could be compared to the broader sector and other data such as national statistics on AES.

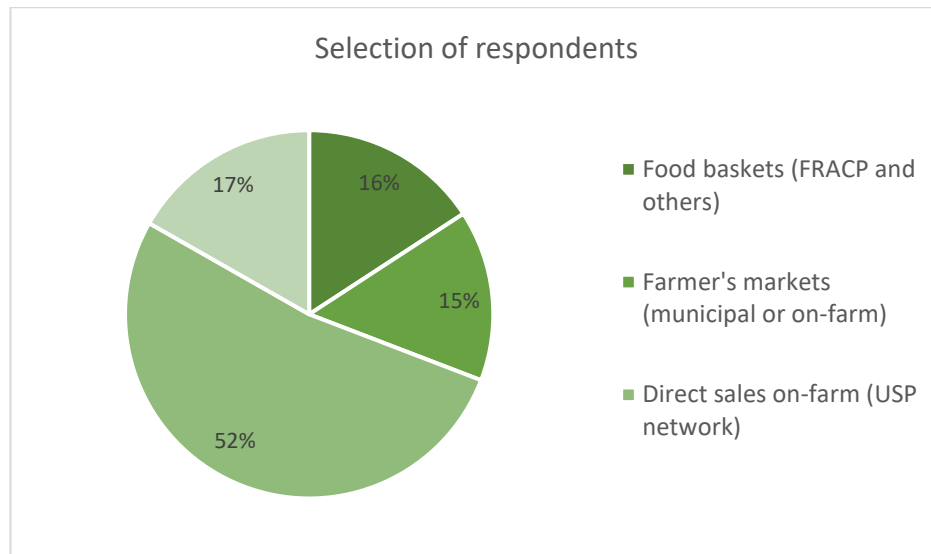


Figure 6. Sampling of selected respondents according to the distribution channels (N=479)

While the goal for the survey was to cast a wide net, participants of the in-depth interviews were selected on a much more specific approach. In order to understand motivations of farmers to innovate and the implications this might have on their operation, it was important to select participants according to their agricultural pathway and innovation process. Here, all four interviewees that took part in the study had undertaken changes in their sales channels (from LSFCs to SFSCs or diversification and intensification of SFSCs), production (change in the main farm operation or mainly diversification to supply SFSCs) or certification (to organic agriculture, Demeter or IP-Suisse) since they were operating the farm. They also represent a broad range of different merchandising strategies, production patterns and certification schemes (see table 7 and appendix 1 for further details):

Table 7. Merchandising strategies, production patterns and certification schemes covered by interviews' participants

Merchandising strategies	Production patterns	Certification schemes
<ul style="list-style-type: none"> ▪ Direct marketing: farmers' market (3), on-farm shop or self-service (3), and CSA baskets (association) (2) ▪ SFSCs: local grocery stores (2), producers' store (cooperative) (1) or online baskets (1) ▪ LFSCs: regional mill (3), wholesalers (2) 	<ul style="list-style-type: none"> ▪ Livestock: pigs (2), dairy (1) and meat (1) sheep, and poultry (2) ▪ Vegetables (4), fruits and berries (3), and grapes (1) ▪ Field crops such as potatoes (1), rape (3), maize (4) and grains (often ancient varieties) (2) 	<ul style="list-style-type: none"> ▪ Organic agriculture (2) ▪ Under conversion to organic agriculture (1) ▪ Demeter (biodynamic) (1) ▪ IP-Suisse (1) ▪ Proof of Ecological Performances (AES) (all 4)

3.2. Data collection

3.2.1. Questionnaire survey

Data on farming practices and implemented SFSCs strategies were collected through a questionnaire survey in French and German combining descriptive data on practices and more 'sensitive' content on farmers' motivation and decision making. The descriptive data set involves questions on the farmers' profile (gender, age, background), farm specifications (type of production, surface area, certification scheme), adopted practices (in terms of merchandizing practices and environment-friendly production patterns) and direct payments (AES). More qualitative data was collected through ranking of selected hypotheses (Likert-scale type) or open-ended questions on farmers' motivations and aspirations as well as the expected benefits or implications of SFSCs (see appendix 3). Respondents were invited to take part in the survey and informed of the consent and participation specifications through their personal or professional

email addresses. Note that pilot test with four farmers was undertaken to verify the question phrasing and the accuracy of responses before launching the survey.

3.2.2. In-depth interviews and observation

In-depth interviews were held in French and were a mix of open and close-ended questions. Open-ended questions were structured to stimulate the conversation and enable the interviewee talk freely around the topic questions while close-ended questions were asked to clarify specific points or identify missing points in the participants' narration. The interview questions were developed to explore the farm specifications, adopted sales channels, farmers' motivations values and goals regarding farming practices (see appendix 2). Discussions usually lasted around 45 to 60 minutes and were recorded and transcribed with the consent of the participant. As interviews were held in person at the participants' farms, the researcher offered his help for the rest of the workday in exchange for the interviewees' time and participation. This also allowed further discussion and observation to take place on the farm in the form of participative observation. Here, paper and mental notes were taken and then added to the transcripts of the interviews.

3.2.3. Producer meeting observation

In addition, research notes were also conducted by attending a meeting between five producers wanting to create a cooperative producer shop and two university researchers involved in the study of AFNs in Switzerland and Europe. The aim of the meeting was to launch the creation of the producers' shop and discuss the relevant clarification points and steps to follow. The meeting lasted around two hours and discussed expectations, aspirations, planning and organisational structure of the participants and helped provide additional insights on producers' motivations, views and aspirations and their representations within the creation process of an initiative.

The research was conducted in French and to a lesser extent in German. Responses were translated to English by the researcher prior to analysis and presentation.

3.3. Data analysis

Most of the quantitative survey data were simply analysed to give a descriptive overview of background information and occurrence of certain practices or to compare results with other data sets such as national statistics. For this purpose, data were mainly transformed in percentages and illustrated as charts. The survey did not involve any grouping of respondents. However, clusters were created according to merchandising strategies, and participation in a collective scheme in order to test their correlation with other practices. Here, Pearson's chi-square interdependence test was used to test there was a significant correlation between the latter socio-economic variables and production specifications (organic and non-organic). This nonparametric test is a procedure to statistically evaluate if two categorical variables (from a given sample) are associated in some population (van den Berg, 2020). Tests were run using the IBM SPSS statistics software (version 26; see appendix 6).

The analysis of qualitative data was done through a mix of structured qualitative content analysis for transcripts and observation notes and a case study approach on participants' agricultural pathway. The case study approach based on in-depth interview, observation notes and secondary data helped identify and compare transitions in merchandising strategies and production practices between actors. On the other hand the structured approach, as proposed by Mayring (1994) helped achieve a balanced analysis of transcripts and note in light of the existing literature and create telling categories presenting and discussing the key findings.

3.4. Limitations

This research is strongly dependent on the availability and willingness of farmers to participate, which determines the composition of the study sample and therefore representativity and relevance of the results.

Firstly, reaching a great number respondents for the questionnaire was not an easy task. However, 104 responses were received from 479 contacted farms, which represents over 20% participation. A larger list of suitable farms could have been achieved using available lists from the national organic agriculture certification scheme and its regional groupings, but this would certainly have biased results on farming practices. It is likely that farmers who took time to respond to the questionnaire are more interested or implicated in the development of SFSCs and production innovation, potentially biasing the results.

The questionnaire survey was also designed to provide a balance between the quality of information collected and an acceptable filling time. As a result, minimal numeric data were requested and no statistical analysis to test results has been carried out.

Secondly, for the interviews the data sample was rather small (four respondents) and therefore could not include a broader variety of viewpoints.

The study was conducted during the busiest time of the year for many farms, as well as under exceptional circumstances given the COVID-19 pandemic, which also made it difficult to reach more farmers. Moreover, the researcher's positionality might have influenced the studied actor's behaviour and discourse, especially regarding 'sensitive' environmental topics. Observational notes and a reflective field-diary were used to inform on such potential bias during the analysis process.

Translation of interview and survey responses from French and German into English may have resulted in loss of information, as words and expressions carry various underlying values and meaning in their original language.

4. Results from the data collection

Findings presented in this chapter are the results of the analysis of primary data from the online survey on adopted practices, in-depth interviews and observations on farms and secondary data on SFSCs initiative in Switzerland (see appendix 7). The first section summarizes descriptive findings on the widespread of environmental-friendly practices as well as motivations of farmers within SFSCs schemes in the French-speaking part of Switzerland. The second section compiles findings from primary data on farmers' motivations, views and further implications of SFSCs on farm operations with the help of categories drawn previous literature and secondary data (media reports, documentaries, initiatives guidelines; see appendix 7).

4.1. Survey on adopted practices

Out of the 479 farms contacted to take part in the survey on supply chains and production practices, 104 responded to the online questionnaire. Table 8 summarizes data on participation and respondents' profile for the seven different cantons included in the survey.

Table 8. Number of respondents and respondents' profile, grouped according to canton

Canton	Respondents	Gender			Average age (range: 23-67)	From a farmer family	Average years of experience
		♂	♀	Not specified			
Bern	13	8	5		44	9	15
Fribourg	11	9	2		52	9	25
Vaud	45	29	16	1	45	35	23
Valais	2	1	1		32	2	8
Neuchâtel	8	5	3		51	7	30
Genève	9	6	2		43	6	17
Jura	16	10	5	1	42	14	18
total	104	68	34	2	44	82	18
		65%	33%			79%	

Overall, 65% of respondents were men and 33% were women, and 79% of them come from a farmer family. Age of respondents varies between 23 and 67 years old with an overall average of 44 years and 18 years of experiences in the profession. Moreover, 33% of respondents mentioned to have a second employment with a mean occupation of 30%.

The following sections summarize the main results of the online survey and important findings from the interview regarding SFSCs and their implication for farm operations and production practices. Descriptive data on selected merchandizing strategies and farming practices are presented in sections 4.2. and 4.3. while more sensitive data on implications of SFSCs and farmers' motivations will be summarized under section 4.4.

4.1.1. Merchandizing strategies

Most farmers in the survey are using a combination of SFSCs and long supply chains to sell their products. On average, 64.8% of their production is commercialized through SFSCs, whereas the rest is sold to wholesalers. However, as presented in figure 7, many of them have specialized into direct marketing and sell more than 80% of their production through SFSCs (47 respondents). The distribution of the proportion of production sold through SFSCs shows a midpoint of 85% (median) and 29 respondents also mentioned using only SFSCs.

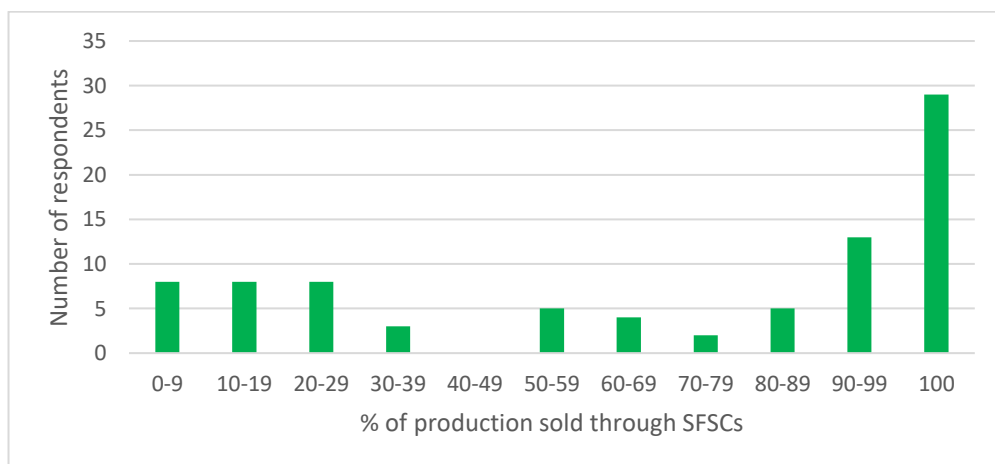


Figure 7. Percentages of production volume sold through SFSCs by respondents (N=85)

If SFSCs have a greater importance, in terms of volume, than longer supply chains for 68% of respondents, their economic importance varies between selected strategies. The merchandizing strategies selected by respondents not only show a mix of long and short supply chains but also a combination of different SFSCs strategies. On average, respondents use three different selling channels between mass retailers (LFSCs), direct sales, online sales, CSA baskets, collective selling points (small retailer of max. one intermediary), catering (restaurants and canteens), and farmers' markets.

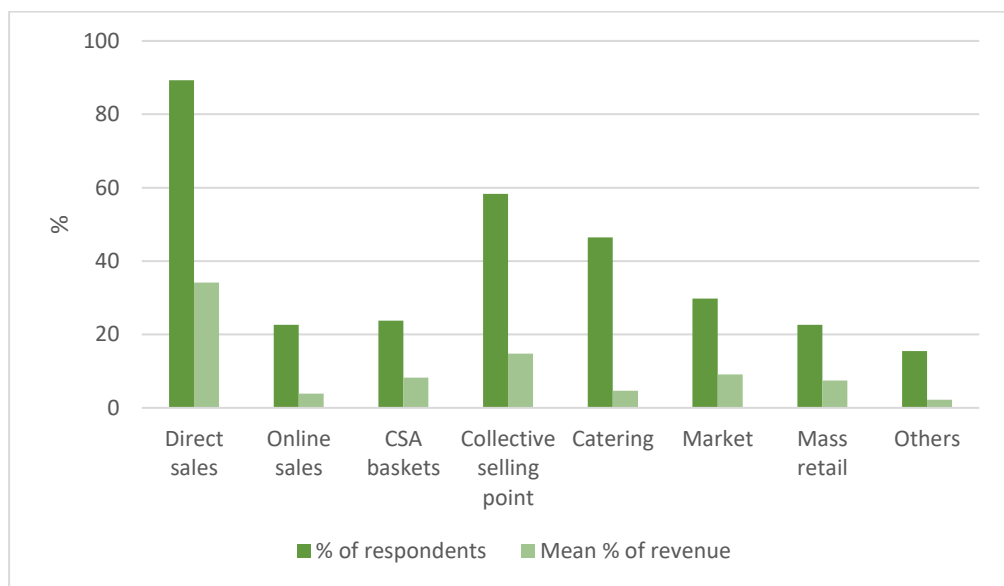


Figure 8. Distribution of selected merchandizing strategies (N=84)

Numbers summarized by figure 7 indicate that 66.7% of respondents use three or more strategies with direct sales (on-farm or deliveries) being the most important in terms of volume and revenue.

While most of merchandizing strategies are individual initiatives (64%), around 36% of farmers indicated being part of a collective SFSCs scheme that includes either producers or producers and consumers (see figure 9).

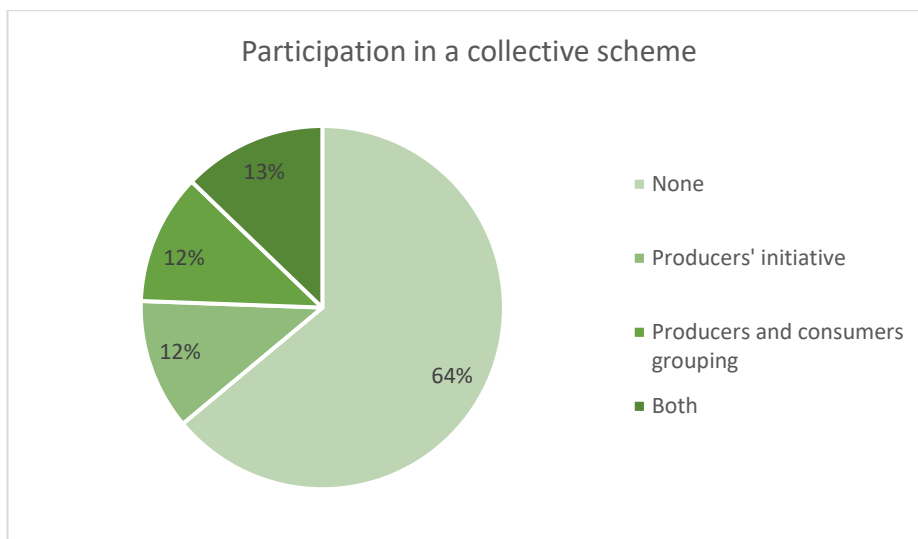


Figure 9. Participation in a collective initiative regrouping consumers and/or producers (N=86)

Most of respondents became member of such collective initiative within the last 10 years (Figure 10).

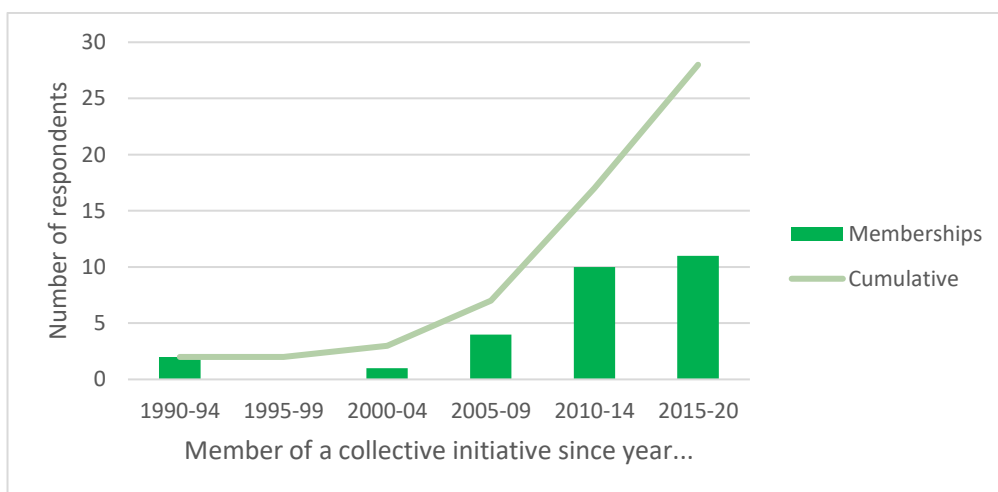


Figure 10. Date of joining a collective initiative (N=86)

4.1.2. Farming practices

In addition to merchandizing strategies, the survey was also designed to give an overview of farming practices implemented by farmers within SFSCs. Production practices may vary depending on the socio-economic structure of the farm but also on the type of operation in which respondents have specialized themselves.

Key farm attributes are important background information in regard to production patterns. The main activities in which farms have specialized have been categorised into four main production types: plant production (vegetables, field crops, and fruit production in parallel), vineyard and arboriculture, livestock rearing (dairy, meat, eggs, ...) and mixed farming (plant or fruit production and livestock).

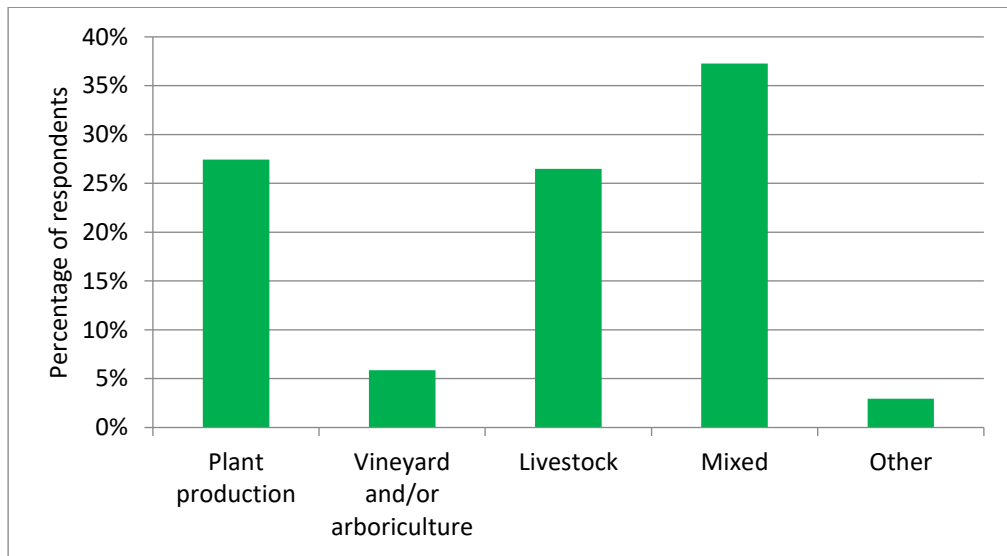


Figure 11. Type of the primary farm operations (N=83)

Figure 11 shows that over a third (37%) of respondents practice mixed farming with both cropping and livestock keeping, while a significant percentage of respondents have specialized either into plant production (27% or livestock farming (26%). (37%). Others have also specialized in further activities such as arboriculture/viticulture (6%), or slaughter and butcher operations or socio-therapeutic activities.

For their operations, farmers from the survey own on average 18.4 ha of land and are renting a further 15.5 hectares. Overall, farms from the survey cover on average 33.9 ha. Half of them operate in lowland regions (50%), while the rest are distributed between hilly (22%) and mountainous (28%) regions.

One important attribute to determine production practices is the labelling of farm products following different certification schemes. In this regard, a majority (57%) of respondents reported to be following the production specifications of Bio Suisse (organic agriculture), while others are operating under the principles of biodynamic agriculture (Demeter), integrated production (IP-Suisse) or ‘only’ applying the cross-compliance requirements for direct payments (Proof of Ecological Performances) without further specific certification (see figure 12).

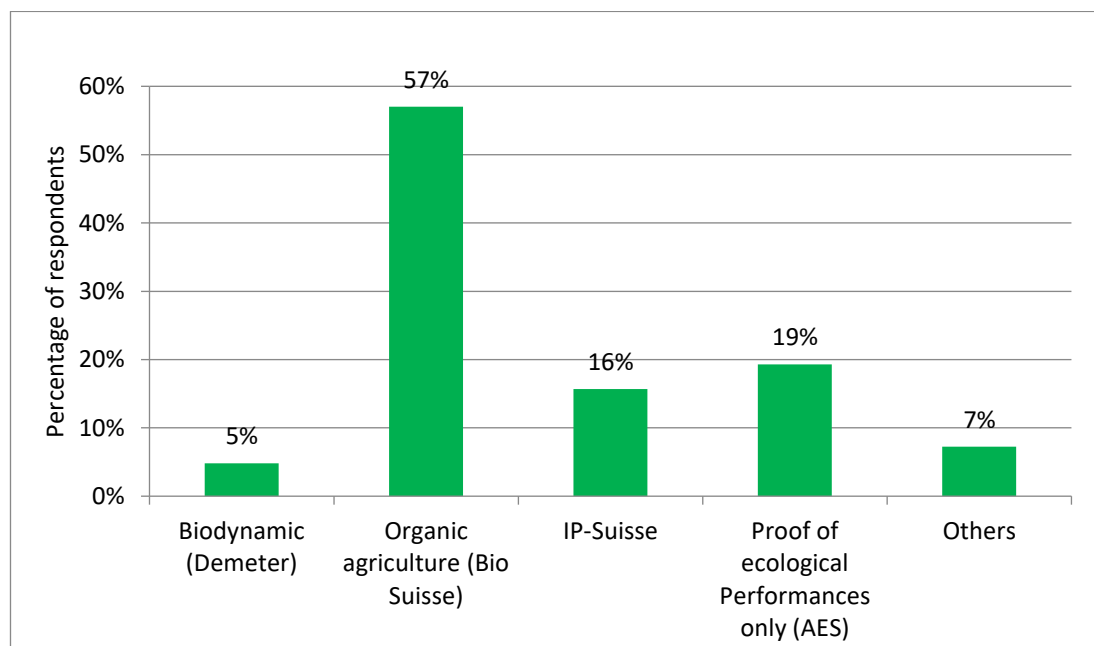


Figure 12. Types of certification schemes adopted by respondents (N=83), ordered by stringency of environmental standards

Other production modes mentioned by respondents were certifications specifying the origin of the products (GRTA, Swiss Garantie and SwissGap) or “many ‘bio’ practices without certification” (respondent comment).

Certification schemes give information on implemented farming practices but do not always cover all aspects of production and farm management. This section provides additional results on adopted strategies regarding energy consumption, integrated livestock farming, cropping practices, fertilization, pest management and biodiversity promotion.

A majority of respondents mentioned using renewable energy sources such as photovoltaic panels, biogas, wind, hydroelectric or wood for their production operations, transport, or infrastructure. Re-utilisation of animal wastes or green wastes as feed, compost, or energy (biogas) is another widespread practice, while investments in human or animal powered machinery or electrical tools and vehicles seem less frequent (see figure 13).

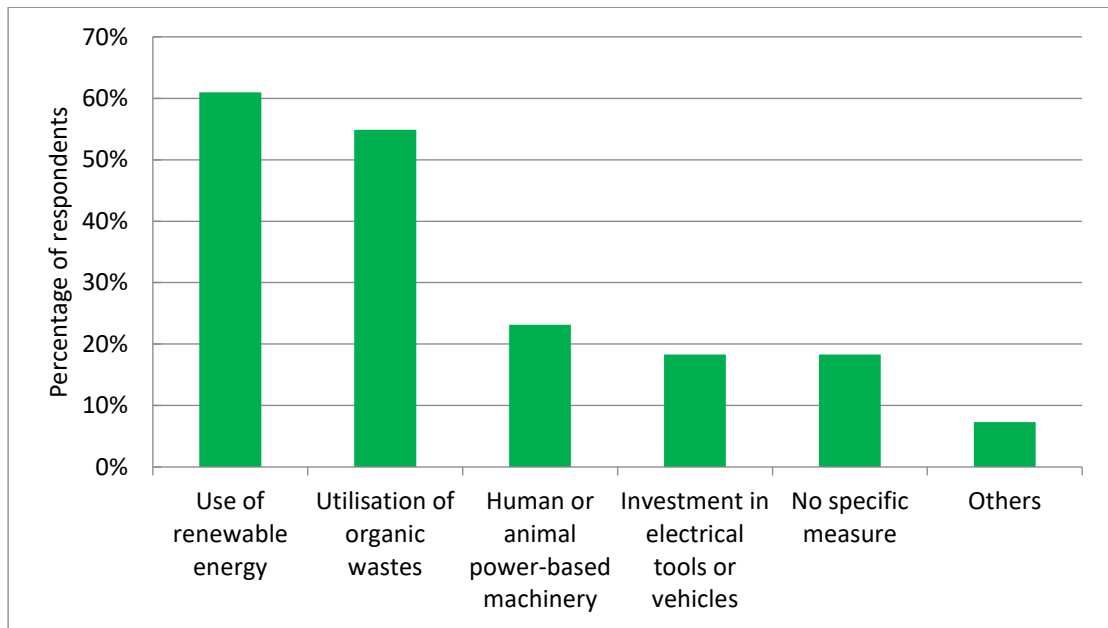


Figure 13. Investments in infrastructure and process reducing energy consumption (N=82)

Other mentioned doing as much work as possible by hand (4), investing in fuel-efficient vehicles (1) or developing closed-loop farming systems to limit need for external inputs (2).

Another important tool to limit dependence on external input is represented by integration of livestock with cropping practices. As presented in figure 14, 44% of livestock farmers have implemented integrated farming practice combining cropping and grazing by livestock.

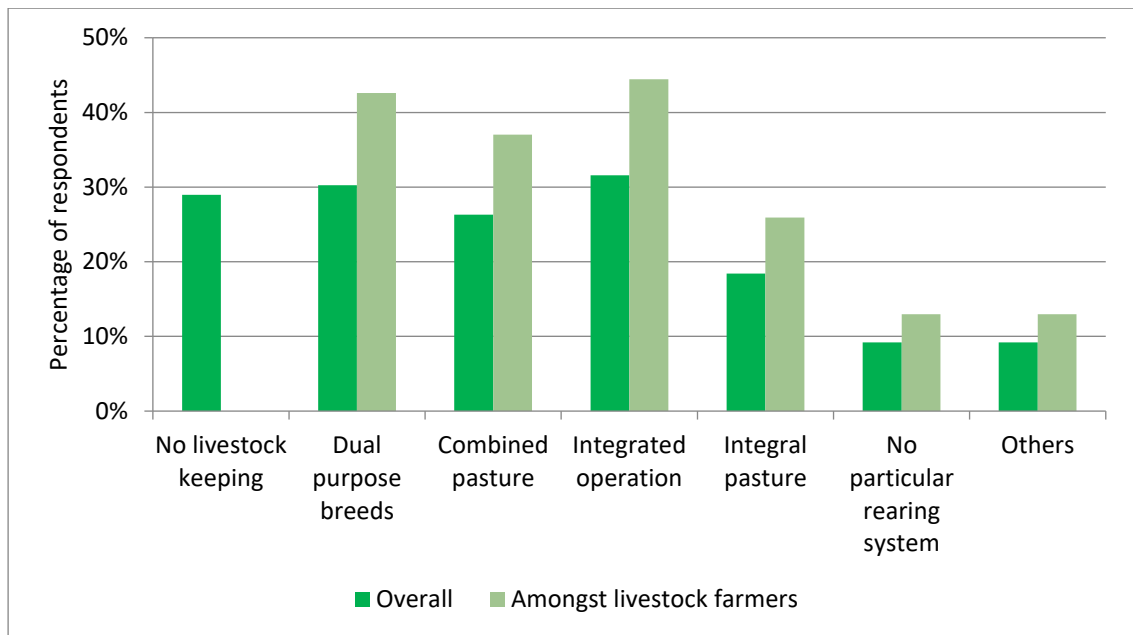


Figure 14. Specific livestock rearing systems in terms of integrated operations (N=76)

Many respondents also indicated rearing dual purpose breeds (meat and milk, eggs or wool) or combining pasture and grazing with various livestock (association or rotation of cattle, poultry, pigs or other on pasture), and 26% of farmers keeping cattle (18% overall) only use feed produced on farm (integral pasture). Overall, the main feeds mentioned are hay, grass and to a lesser extend maize, silage, and few other grains (barley, lupin). Numbers show that a majority of feed is produced on farm (90% on average (mean); median of 95%) while only small proportions are purchased (mean 10%; median 5%). Here, 37% of farmers rearing livestock declared producing all feed on their own farm.

Regarding cultivation, respondents were asked to indicate their cropping practices, management of fertility as well as their pest management strategies. Overall, more than 90% of farms practice cultivation of some type and amongst them, results show a limited use of herbicides (32%), but important reliance on tillage (57%) as well as hand or mechanical weeding (73% and 65%). However, soil conservation practices such as direct seeding or band and litter under-sowing (44%) as well as intercropping or mixed cropping (52%) are also used (see figure 15).

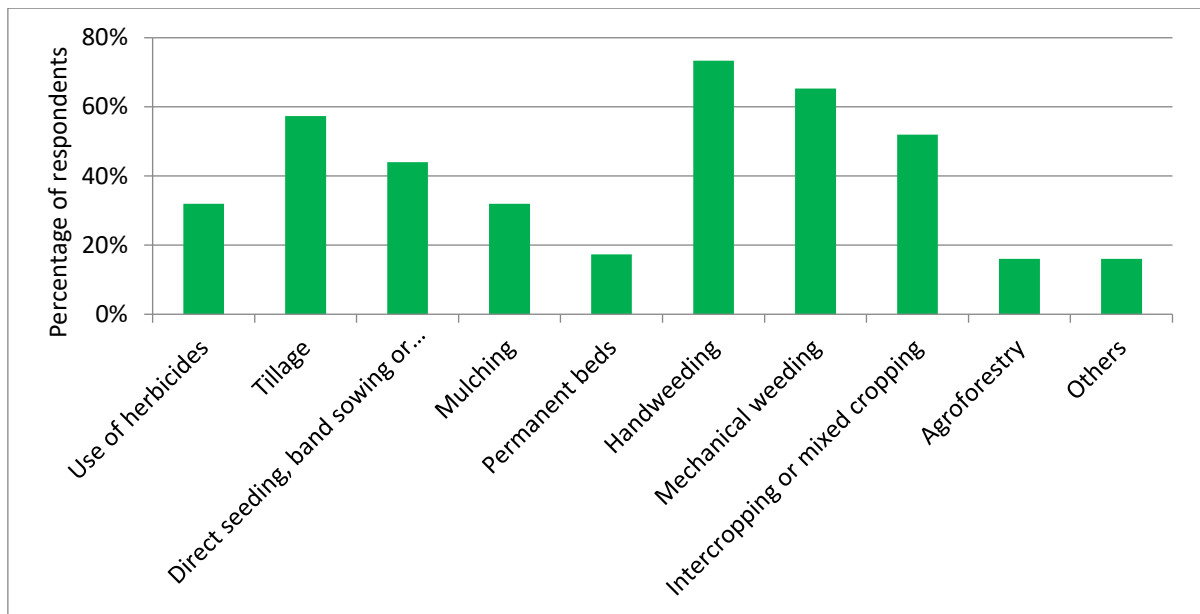


Figure 15. Overview of cropping practices implemented by farmers (N=75)

Further practices mentioned by respondents include permaculture (1), biodegradable plastic cover (2), light equipment (1), terrace cultivation (1) or zero irrigation (1).

For the fertilization of crops or pastures, use of animal manure or slurry is by far the most common practice (78% of respondents). A majority of respondents also rely on compost (59%) and the use of green manure (e.g. cover crops) (51%), while industrial fertilizers and fertilization through rotation with livestock are both implemented by approximately 30% of farmers (see figure 16).

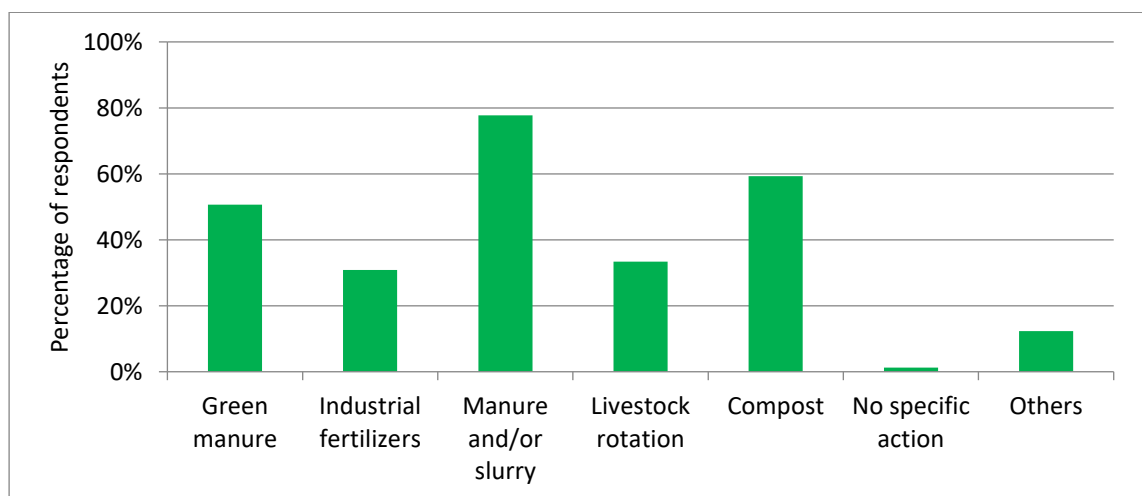


Figure 16. Overview of products and practices used for the fertilization of crops and pasture (N=81)

Note that some also mentioned using industrial fertilizers certified ‘organic’ and other inputs such as digestate (from the methanation of organic wastes), mulch and horn manure.

Another important aspect of cultivation are the adopted approaches regarding pest regulation. In the survey, only 26% of respondents declared using pesticides while more than 60% use biological treatments (figure 16). Moreover, almost 70% of respondents also base their approach on biodiversity or natural regulation, with 24% prioritizing biodiversity management as their exclusive strategy.

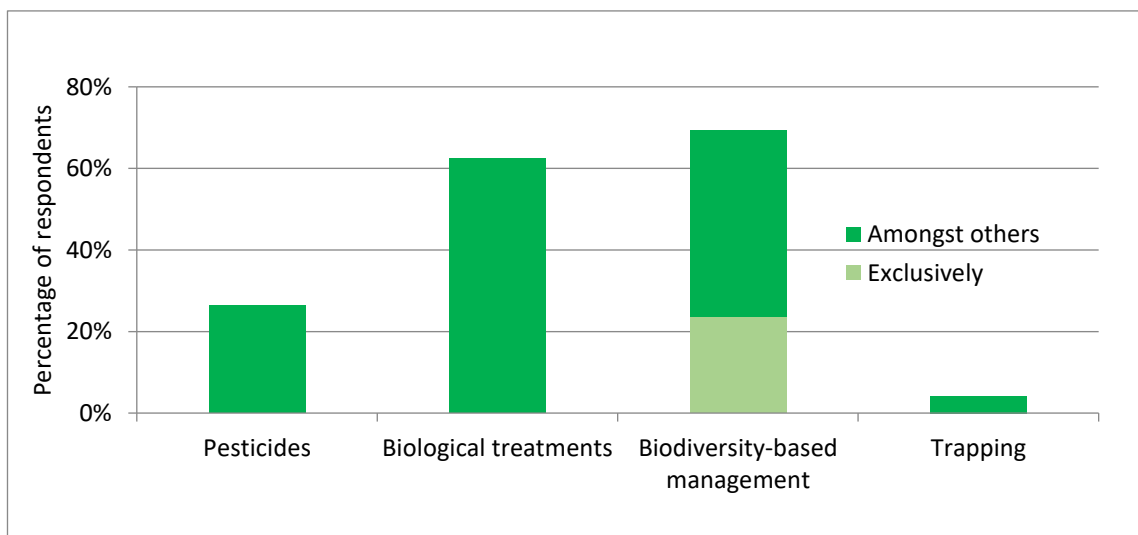


Figure 17. Overview of selected pest management strategies (N=72)

Here, biodiversity-based management includes the introduction and support of auxiliary species but also the promotion of habitat and cultivations diversity. The diversity of cultivated varieties can therefore also be an indicator of ‘biodiversity-sensible’ practices. Results indicate a wide range number of varieties cultivated by farmers going from 1 to more than 800 and with around 40% of old or local varieties on average.

Promotion of habitat diversity and the creation of biodiversity-promoting structures also seem to be widespread practices amongst respondents. All of the respondents mentioned implementing at least one of the measures listed in figure 18 with extensive grasslands (80%) or

pastures (65%), hedges or groves (76%), birdhouses or insect hotels (72%), wood or stone piles (79%) as well as high-stems orchards (77%) occurring in a large majority of farms.

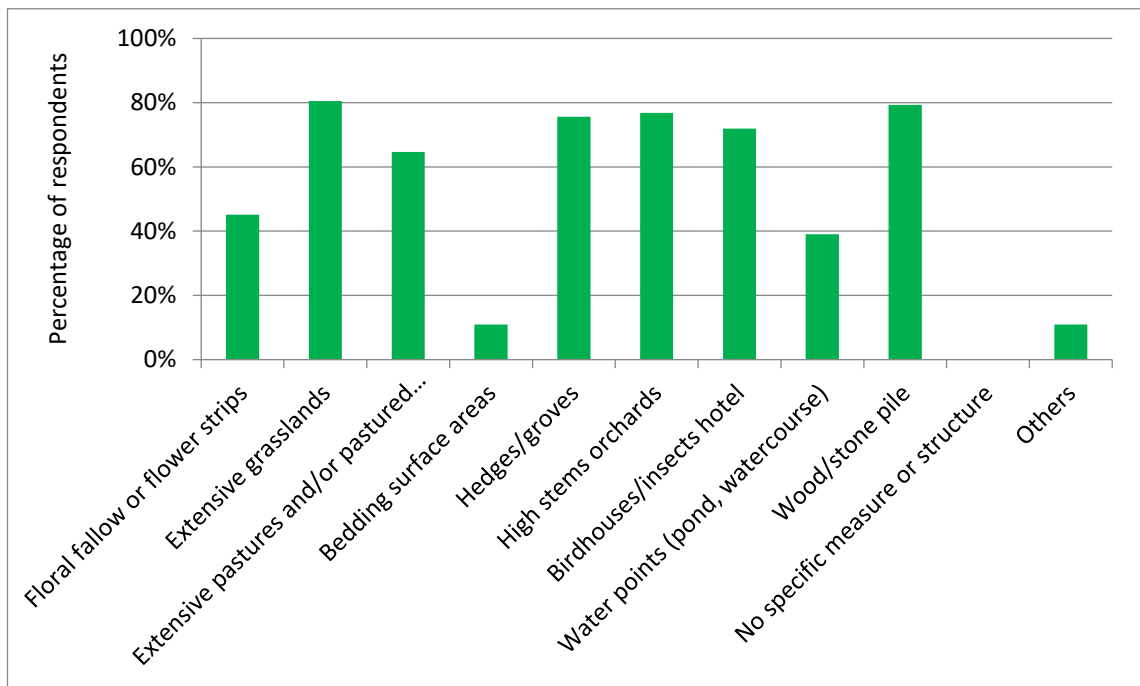


Figure 18. Overview of implemented biodiversity-promoting structures (N=82)

More than 90% of respondents indicated applying three different actions or more with the average per farm being 5.5 measures (median of 6). Further actions mentioned by respondents include specific measures promoting the connectedness of biodiversity-promoting areas, promotion of targeted species through specific habitats as well as late mowing or sowing of wildflowers on cropping areas to promote plant diversity as well as pollinating insects.

As other practices, measures for the promotion of biodiversity are often closely linked to cross-compliance AES, where farmers receive monetary contributions when applying given measure or farming practices. In the survey, 89% of respondents indicated receiving direct payments. Biodiversity-promoting surface areas (80%), pasture-based milk and meat production (55%) as well as soil conservation practices (41%) were the most widespread practices amongst farmers (see figure 19).

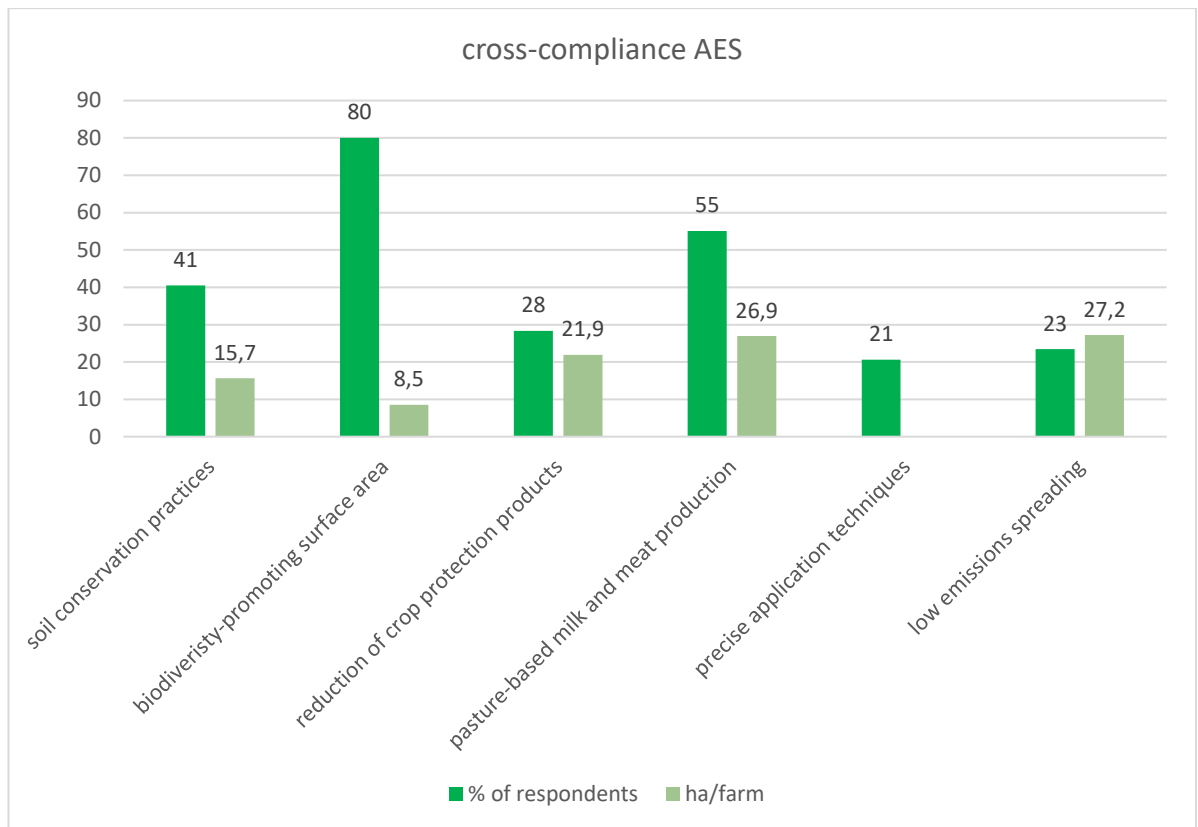


Figure 19. Overview of the adoption of cross-compliance AES by respondents

In addition, respondents were asked to indicate the surface area for each measure they were receiving direct payments for (see red on figure 19). Those can be useful indicators of the importance of such practices and represent an interesting benchmark for further analysis and comparison (see chapter 5).

4.1.3. Motivations and implications of SFSCs

Various hypotheses on the motivations for and implications of developing SFSCs and direct marketing were tested through scale-type questions.

Tested hypotheses on motivations all seem to represent important dimensions for respondents when choosing to sell their products through SFSCs (see figure 20).

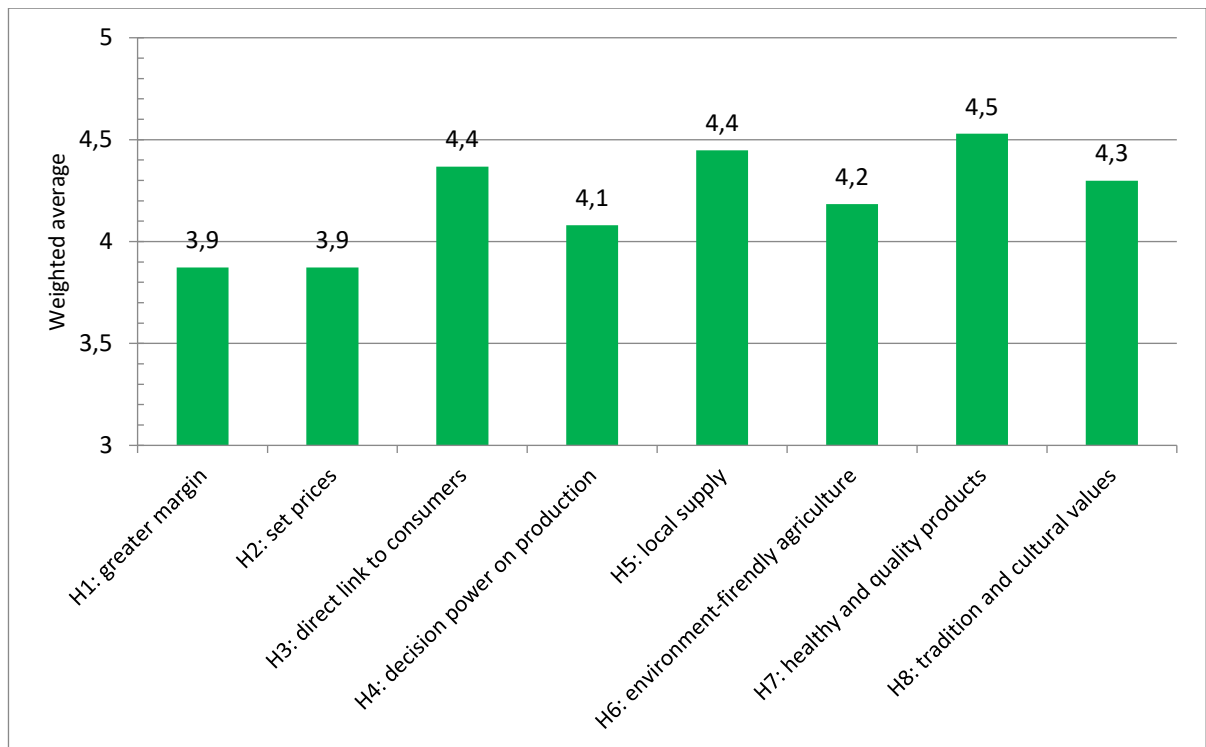


Figure 20. Relevance of specific benefits of SFSCs in farmers' decision making (N=87)

Ranking: 3 = important; 4 = very important; 5 = extremely important.

Importance given by respondents to the specific characteristics or expected benefits of SFSCs mostly ranges between 'moderately important' and 'extremely important'. Overall, all eight hypotheses averaged at 'very important' with demand-associated and cultural aspects (more direct exchanges with the consumer, supply local communities, offer healthy and good-quality products, or tradition and promotion of the 'terroir') having a slightly higher importance than production-associated aspects (greater decision power on production patterns, develop environmental-friendly practices) and financial benefits (hold a greater margin, ability to determine the selling price of products). Further motivations mentioned by respondents include the possibility to better inform consumers and foster public awareness, limit transportation as well as the ability to create jobs and provide employment at a local scale.

Tested hypotheses on the implications of SFSCs for farm operations show more differentiated results (see figure 21). Here, the contact with consumers (H2) seems to be once again an

important factor which has implications on the exchange of ideas and development of practices. Moreover, regaining autonomy from an economic (H1) as well as social perspective (H2) seem to be relevant, while increased exchanges with other producers seem to have more limited effects (H3).

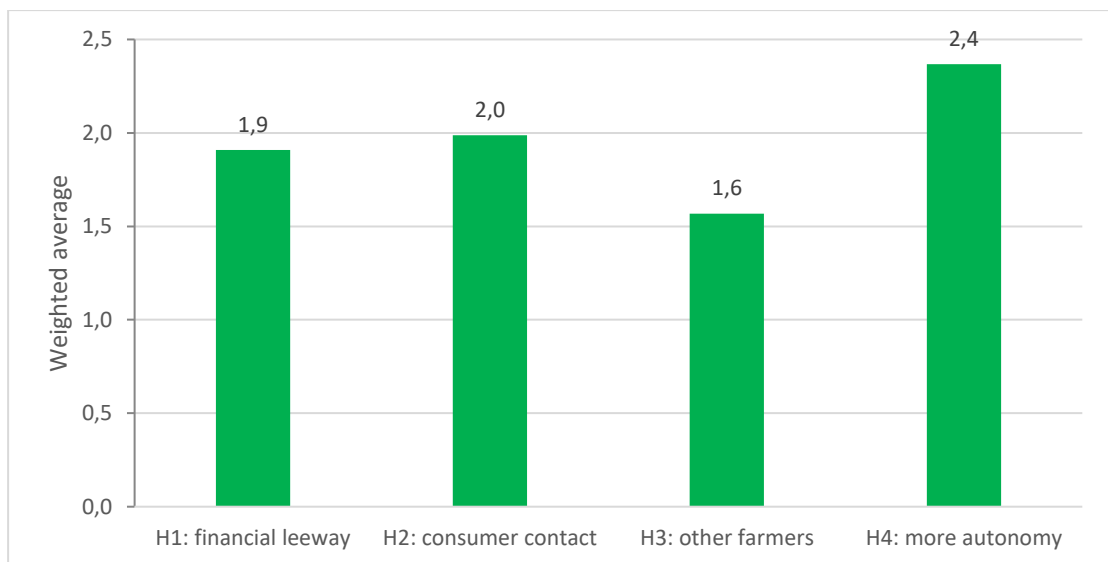


Figure 21. Relevance of expected implications of SFSCs for farming practices (N=77)

Ranking: 1 = rather/maybe; 2 = much; 3 = totally

H1: I have more financial leeway, so I have more options; H2: Direct contact with consumers makes my ideas and practices evolve; H3: Getting together with other farmers allows for the exchange of ideas and the development of new practices; H4: More autonomy allows me to develop my ideas and practices

Other implications mentioned also include the freedom of choice on practices or products used, as well as the promotion of greater diversification in production patterns in parallel of increasing labour and organisational requirements.

Further implications of SFSCs were analysed by looking at the correlation between socio-economic factors such as the implemented merchandizing strategy and production specifications. No significant tendencies were found related to the age or years of experiences of respondents, but other factors were found to be positively correlated with production mode. First, the importance of SFSCs in terms of volume sold has been found significantly correlated with organic production specifications (P = 0.015; see appendix 6). Organic and biodynamic

farming shared greater proportion amongst farmers selling 85% or more (over median value of % sold through SFSCs) of their production through SFSCs than those selling less than 85% (under the median) through SFSCs (see figure 22).

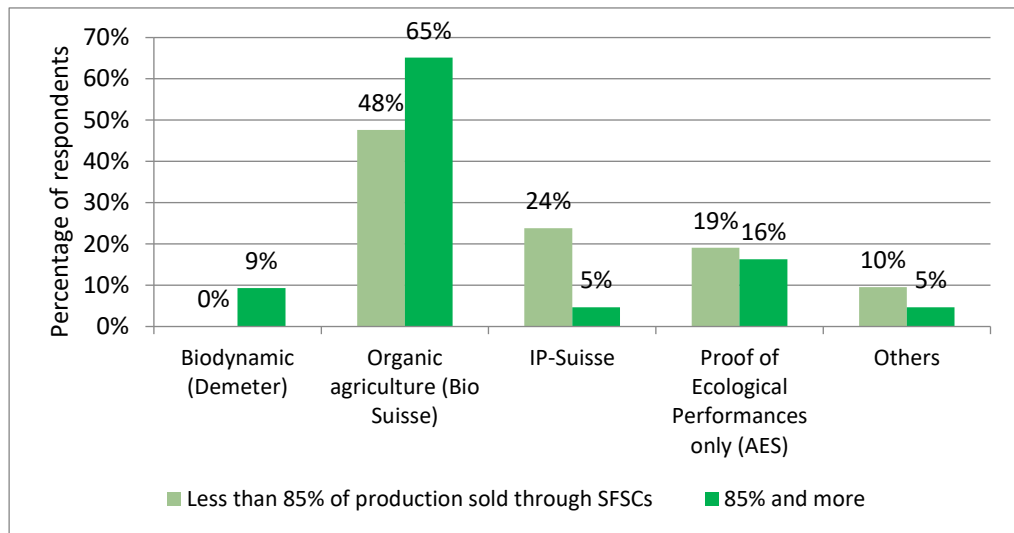


Figure 22. Production specifications according to % sold through SFSCs (<85% N=42; >85% N=43)

Second, the correlation between participation in a collective SFSCs scheme and organic agriculture has been found statistically significant ($P = 0.000$; see appendix 6). Here, Organic agriculture (Bio Suisse and Demeter) is comparatively over-represented at the expense of other specifications (Proof of Ecological Performances only, IP-Suisse; see figure 23).

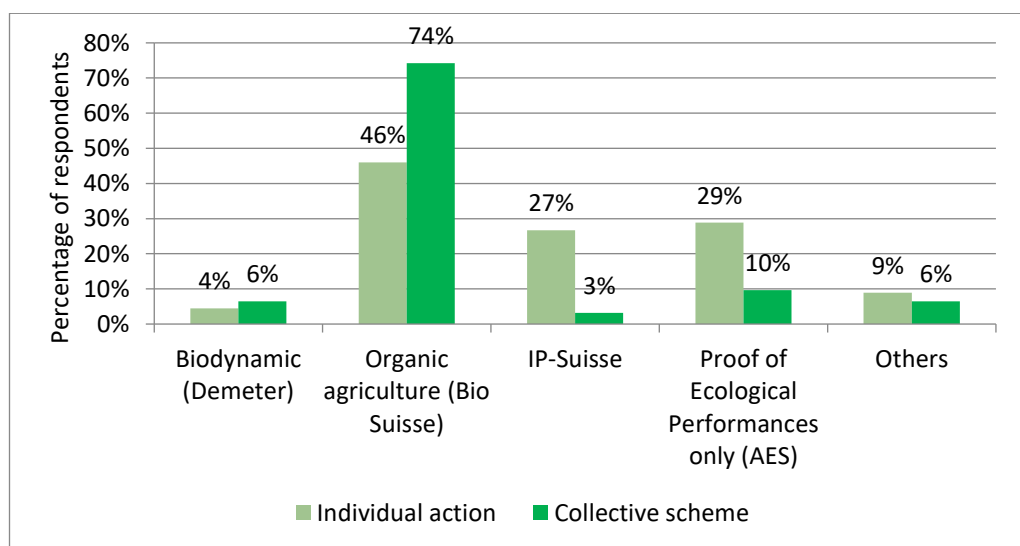


Figure 23. Production specifications according to participation in a collective initiative (indiv. N=50; coll. N=31)

Note that figures represent collective schemes involving either consumers and producers or only producers with some respondents also indicated being part of both types (see figure 9).

Looking at the implications of SFSCs and collective initiatives on production patterns, figures also show a correlation between changes in merchandizing strategies (development of direct marketing or short supply chains and collective schemes) and farm operations (production type and/or certification). Overall, 36% of respondents indicated having undertaken a change in production patterns and/or certification, within which 75% had operated changes in addition to the development of selling through SFSCs and/or a collective scheme (within a time span of less than ten years). Also, 60% of respondents made changes after having implemented SFSCs strategies. Moreover, almost all changes of certification (95%) were a shift to organic agriculture and more than 85% of those changes are linked to SFSCs or the development of a collective approach (see appendix 4).

4.2. Interview case studies

When exploring the development of innovation in 'shorter' supply chains or more 'environment-friendly' practices with practitioners or researchers, a broad range of arguments are mobilised to describe their aims, characteristics, and implications. This section draws on previous findings on SFSCs within the literature analysis of secondary data (see appendix 7) and the identification of recurrent topics and concepts raised during the data collection to present a combination of categories summarising the main traits embodied in actors' values, motivations and discourses.

4.2.1 Financial considerations and the market structure

The use of financial terms such as prices margin or added value was recurrent when justifying the adoption of SFSCs or certifications schemes.

“The whole added-value stays here, and our selling prices are higher than when we supply wholesalers so we can have margin of 30 to 40% over production costs.” (FBV, interview)

“For example, potatoes, the wholesalers buy them for approximately 2fr (per kg). I sell them 5fr and when I sell to a small shop, I accept to put the price down to 3fr, but I cannot go further down. You see the difference is huge.” (PLP, interview)

Financial and economic arguments often carry a broader questioning of structural issues regarding conventional agri-food supply chains. Here, all four producers raised awareness of the negative impacts of LFSCs, especially supermarkets and intermediaries.

“Even if I have to hire someone to manage the sales, I still earn more. I think it [SFSCs] is the only way to be able to sell and still make a living. The more intermediaries there are, the worse it gets.” (PLP, interview)

SFSCs were therefore perceived as a way for producers to sell their products at better prices and escape the economic pressure exerted by LFSCs and their intermediaries.

“Given my financial situation, it’s clear that without direct marketing I would not even have been able to take over the farm.” (LC, interview)

This importance of margin and added-value was also expressed when choosing to adopt certification schemes such as organic agriculture along with other competition-related arguments.

“There weren’t any organic vegetable producers at the market in Yverdon, thus we told ourselves this is how we are going to distinguish ourselves.” (FBV, interview)

In their consideration about the structure of the market, producers often highlighted the competition between local production and cheaper ‘foreign’ products. Farmers mention the

reluctance of consumers to pay an appropriate price, but also acknowledge that alternative decisions could be made by the agri-food sector in regard of the origin of products.

“If supermarkets do not decide that people should buy Swiss products then it will not happen. It is a political decision, because supermarkets have understood very well that by buying bio in Spain and selling bio in Switzerland their margin would be huge. It is necessary to accept that the price we pay to the consumer is the Swiss price and not European or Spanish price. That’s the issue in my opinion.” (PLP, interview)

This also shows that while organic agriculture once provided new niches, economic pressure has risen. Actors mention imports has having effect on downwards prices for organic products (not only) making it increasingly difficult to benefit from an added value when using LSFSCs. They also report a lack of transparency on how supermarkets set their selling prices

Where demand is absent and this added value can’t be obtained, certification is unlikely to be adopted as it involves “too many constraints” (PLP, interview). However, others also see a way to better manage costs and increase the value of their products by adopting ‘ecological’ process.

“Often what we don’t calculate is that when animals eat all the vegetables scraps, they valorise the co-products of market-gardening.” (PM, interview)

4.2.2. Food sovereignty and rural development

The reflection triggered by a precarious financial position often moved beyond commercial boundaries and raised political and ideologic issues regarding food sovereignty and territorial attachment in opposition to a solely commercial vision of agriculture.

“Self-supply is at the heart of the idea. For me we can do much better in terms of self-sufficiency and produce much more food for humans and less feed. On one hectare of maize which takes you six month [to grow], you can do two to three harvests of vegetables in less time and on a smaller area” (PLP, interview)

Those arguments also often came with new considerations for concepts of 'localness', where proximity becomes the primary value.

"Ultimately I see the local aspect crucial in terms of the sales system, more than a label" (PM, interview)

Thinking with a sense of proximity and self-supply also encouraged new thoughts and practices in regard to the environment and product quality.

"When I got kids the idea became to produce food for my family and since I took this path I told myself: yes but I am not going to spread pesticides on what my kids will eat, so I decided to switch to organic production." (PLP, interview)

In parallel with self-sufficiency, producers also see in SFSCs a way to regain independence.

"That's why I became farmer, it is precisely to be independent, not necessarily being employed and I find that direct marketing is the essential side for a healthy and sustainable production." (PM, interview)

4.2.3. Diversification and innovation

One of the main implications that SFSCs have had on farm operations for all of participants is diversification. In order to be able to propose an appropriate range of products, farmers have to produce a variety of vegetables but also fruits and livestock products. Conversely, direct marketing and SFSCs makes it possible for producers to sell small volumes of no interest to wholesalers. Moreover, a broader range of smaller operations is a way to minimise risks.

"One crop gets lost every year and we learn, that's what agriculture is about for me. Financially, as we are very diversified and that those are only small areas it's reasonable." (PLP, interview)

Diversification provides a sort of insurance against losses, but also minimises pressure, which can also foster innovation.

“When you change to organic agriculture it’s complicated because you have to change a lot of things at the technical level but also on how to work. The advantage is that we have many cultures so if we fail somewhere others can make up for the loss.” (FBV, interview)

Finally, one participant observed that lower pressure on yields can also mean that one can implement “near to organic” practices such as no chemical inputs even when investment in machinery or further equipment is inconceivable (LC, interview).

4.2.4. Identity, exchanges, and collective action

Adoption of alternative methods are often regarded as ‘deviant’ behaviour by other farmers. However, exchanges with other farmers can lead to collective actions that often play a facilitative role regarding the spread of new practices such as organic agriculture.

“We can feel there is a bit of curiosity, people are observing us, they judge, it’s funny. They also started to use our weeder because, it’s true, there is this whole pressure on the use of pesticides and herbicides and as they are not bio there is a whole reflexion going on, they try a bit of new ways of working, the weeder and things like that.” (FBV, interview)

Those exchanges also become an important aspect, actors want to promote to counter social and economic fragmentation amongst farmers.

“We have to stop pulling dirty tricks on each other.” (PLP, interview)

However, this is also exactly why actors sometime avoid mentioning ‘sensitive’ topics such as organic agriculture.

“The agricultural world is already at the separation point between the industrial production and people that practice direct marketing. If we also divide people amongst the one practicing direct sales, we will not have any cohesion anymore. That really frustrates me because I think of fragmentation.” (PM, interview)

4.2.5. Role of the consumer

While collaboration between producers often has positive effects, consumers can be helpful too. For instance, they can provide support in form of labour or play the role of the bank when farmers are looking to enlarge or diversify their activities, especially in the case of CSA (LC, interview). Also, contact with the consumers is often cited as the one of the main goal of the approach.

“For me, it is important to tell what I am doing, [...] humans need to exchange. If I do direct marketing, it’s especially to be in contact with people.” (PLP, interview)

Together with the public’s opinion, consumers also provide the essential basis for the emergence of SFSCs or more ‘ecological’ ways of producing food through their purchasing habits.

“I think this is where it’s stuck, the demand. [...] The day where 50% of the demand will be for organic products, there will be 50% of organic production.” (FBV, interview)

Satisfying the consumers expectations seem to be a central concern amongst producers selling through SFSCs.

“We have organic and non-organic products and there is no problem. We have to let the consumer choose”. (PM, interview)

Consumer can have direct and indirect benefits (through the market) over innovation practices, but they can also embody several challenges, especially regarding quality of the products.

“They [the consumers] wish to consume differently but at the same time they either don’t have the budget or they want to have organic produce because yes with products without treatments there are complaints. It’s true, radishes have worms, and that’s how it is. [...] they are expecting certain standards, BUT not too much products yeah?!” (LC, interview).

5. Discussion of key findings

The present chapter will compare the main findings from the research process with relevant literature in order to give an overview of the main traits of SFSCs regarding sustainable farming practices. The aim here is to discuss the answers to the research questions (see table 1) and reflect on their implications in order to draw informed conclusions on the ability of SFSCs to facilitate or motivate an 'environmental-friendly' production.

5.1. Ecological dimension of views and practices

Firstly, the survey provided a useful overview of adopted practices across SFSCs schemes, revealing widespread adoption of practices regarded as more sustainable or 'environment-friendly'. Those include the use of renewable energy on farms (61% of respondents), integrated livestock management and a large majority of feed produced on farm (over 90%), hand or mechanical weeding or soil conservation practices (mulching, intercropping) to limit use of herbicides (30%), great proportion of biodiversity-based (69%) or biological (62%) pest management and a reduced use of pesticides (26%), as well as widespread application of measures and structures for the promotion of biodiversity, with an average of more than five different strategies per farm. Unfortunately, the lack of official statistics on production practices in Switzerland and the limited reach of the survey make it difficult to validate these results. Nonetheless, they can attest to the overall effort taken by farmers involved in SFSCs in the development of sustainable practices.

Adoption of cross-compliance agri-environmental schemes gave interesting points of comparison. Implementation of AES is widely used and documented in Switzerland, providing a good overview of practices across the sector (Ryser, 2019; Herzog et al., 2017; Aviron et al., 2009). When compared to official figures from the federal office for agriculture (OFAG) and the

federal office for statistics (OFS) (OFS, 2020; Ryser, 2019) results from the survey shows a greater proportion of farms applying soil conservation practices, precise application techniques, reduction of crop protection products as well as much greater percentage of organic farms (see figure 24) than national averages for all farms, which include commercial ‘long chain’ systems. Moreover, results show a generally greater surface area dedicated for biodiversity promotion or soil conservation practices.

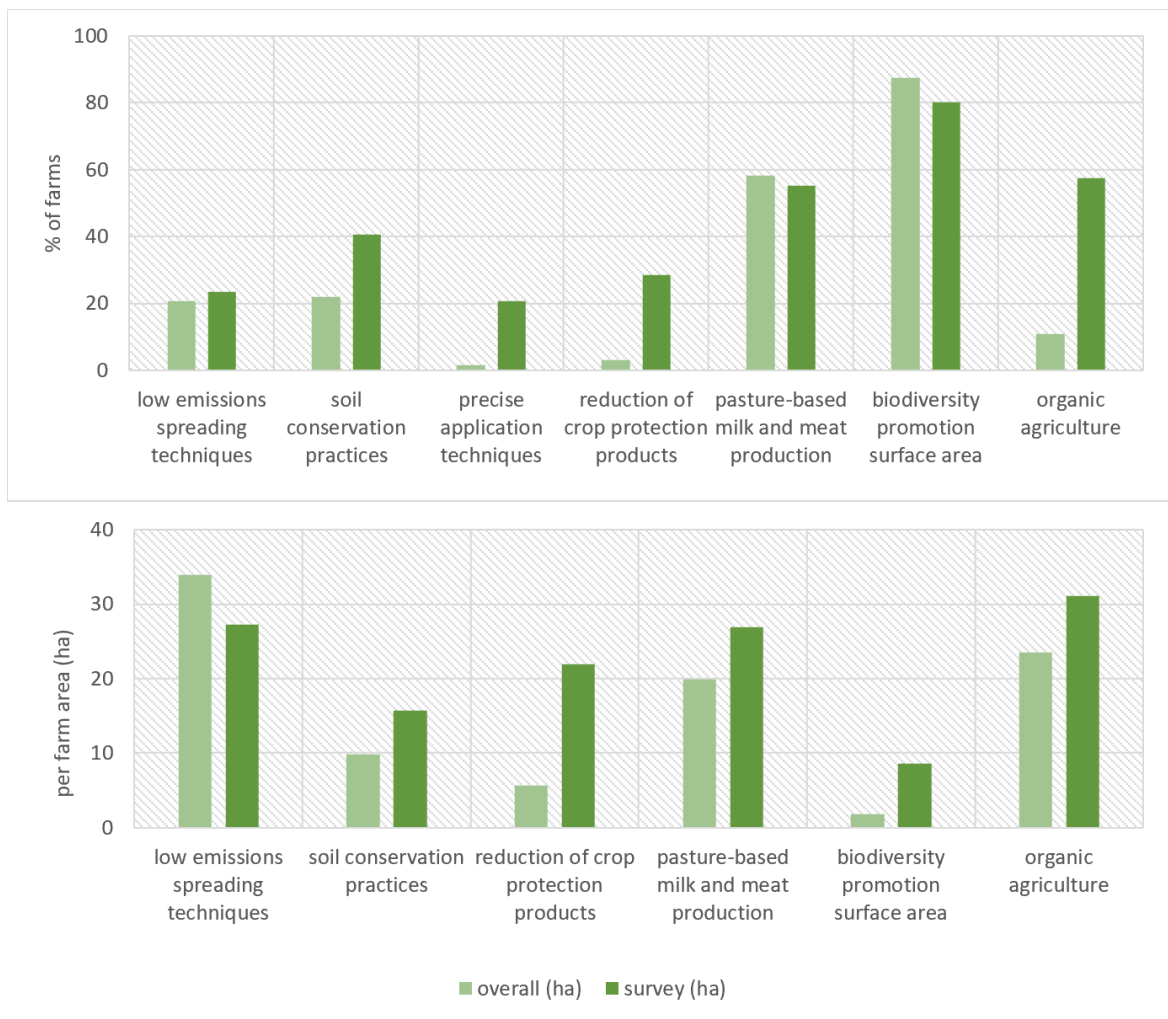


Figure 24. Comparison of the adoption of specific AES measures between survey respondents and national statistics

Overall, this clearly show greater adoption of AES amongst SFSCs farmers and suggests a greater willingness to implement innovative and sustainable practices. To further substantiate this claim, results have also shown that amongst respondents of the survey who apply soil conservation

practices, only 37% indicated using herbicides against more than 88% of farms for the whole country (see appendix 5). Also, the number of farms producing under organic specifications within SFSCs is much higher (63%) than for the overall agricultural sector (11%). Previous findings have presented a similar tendency across regions of France (Boutry & Ferru, 2016; Maréchal & Spanu, 2010). This also concurs with the idea of Brûlé-Gapihan, Laude, & Maclouf (2017), that SFSCs initiatives are closely related to organic agriculture as the former often emerge in response to the 'conventionalisation' of the latter. Results from the survey showed a statistically significant higher tendency to adopt organic specifications for farmers selling more than 85% of their products through SFSCs (see figure 22). This correlation has also been demonstrated by Aubert and Enjolras (2016) who found that 'farmers who adopt organic farming label are more likely to sell their produce through SFSCs' and farmers 'who sell their production using this channel are more likely to implement environment-friendly practices' (p. 17). This willingness to develop a more sustainable agricultural production was also a particularly important motivation to develop SFSCs for respondents of the survey (see figure 20).

Interviews and case studies on farmers' pathways also gave further insights on the views and motivations shared by actors of SFSCs. Clearly, environmental production practices seemed to be a 'sensitive' topic that farmers tended to avoid during discussions. Nonetheless, interviews clearly showed that for some, environmental considerations were at the heart of their operations. They developed various integrated operations, worked to close energy and material cycles as much as possible, while trying to limit external inputs. Others showed environmental considerations that were more linked to a responsibility to propose safe and quality products to their customers or their family. Indeed, quality of the product was also a central aspect of survey respondents' motivations on SFSCs (see figure 20), which has also been widely acknowledged in the literature on AFNs (Rétif & Chevallier, 2018; Forssell & Lankoski, 2014; Galli & Brunori, 2013;

Morris & Kirwan, 2011). Finally, only one example was identified where environmental considerations were minimal and for which organic certification was merely seen as an economic asset and a strategic argument on the market. Here Boutry & Ferru (2016) found similar results where SFSCs and organic agriculture is first and foremost a way to diversify and expand sales. Overall, it becomes clear that SFSCs involve various dimensions of environmental views and practices. However, their role in promoting sustainable alternatives is not yet clarified.

5.2. Implications of SFSCs for innovation and alternative practices

As exposed in the previous chapter, figures from the survey suggest that development of SFSCs by farmers is often associated with further changes in production or certification (see appendix 4). Furthermore, over 60% of those changes are related to organic certifications, thus following Aubert & Enjolras (2016) on the correlation between SFSCs and organic agriculture. Nonetheless, understanding the potential of SFSCs in the promotion of such practices requires analysis of their implications and identification of primary drivers of sustainable practices. Here, the case studies on farmers pathways helped clarify the main traits of farmers' decision process and identify three main 'paths' each involving specific motivations.

5.2.1. Economic benefits and diversification

Interviews showed that financial benefits and references to the economic pressure exerted on the agricultural sector are very often the primary arguments for adoption of SFSCs. As suggested by Maréchal & Spanu (2010), those actors are likely to change some of their operations without fundamentally questioning existing views and practices. This seems especially true when the proportion of SFSCs remain moderate in farm operations. Survey results showed a significantly lower occurrence of organic agriculture amongst farmers selling less than 85% their production through SFSCs (see figure 22). Nonetheless, the absence of full conversion to organic production

is not to say that practices do not change. Direct marketing requires the ability to produce a range of different products to propose a larger offering to customer. Therefore, it often leads to diversification of activities. Beside the greater time and material investments it may require, findings from the interviews have shown that diversified operations with smaller productions and less pressure on yields can also have positive implications. Those include the possibility of operating less 'industrial' or 'intensive' practices or cultivating greater variety of breeds, including ancient and local breeds (40% according figures from the survey). Hence, diversification can help limit negative impacts on the environment, foster (bio-)diversity, reduce risk regarding uncertainties and economic instability (Boutry & Ferru, 2016; Cerrd, 2010; Chiffolleau, 2008; interviews LC, PLP, and FBV). Following Forssell & Lankoski (2014), diversification can, therefore, be seen as a specific outcome characteristic of SFSCs having indirect sustainability impacts on farm operations.

5.2.2. A means and an end

Another outcome characteristic of SFSCs and direct marketing is regaining autonomy on operations, granting farmers the liberty to develop their ideas and shape production patterns (see figure 21). As stated by Boutry & Ferru (2016) and identified in the interviews (LC, PM), this can enable 'bypassing' standardisation processes for agricultural products and can, amongst other benefits, foster the rehabilitation of locally adapted and less input-dependent breeds or practices. Survey results demonstrated the recurrence of dual-purpose breeds, local and ancient varieties or integrated livestock rearing (see section 4.1.2.). While organic agriculture benefits from policy support, other practices (either more relaxed, or more restrictive, such as permaculture or agroecology) generally do not. Interviews and literature have shown that further outcomes of SFSCs such as trust or relationships allow farmers to add value without need for

certification schemes (Galli & Brunori, 2013; Lamine, 2005; interview LC). Therefore, SFSCs can be identified as a means to achieve innovative and alternative practices.

However, SFSCs are also often cited as the 'only way' to develop a profitable, sound, sustainable agriculture business (interviews PLP and PM). Here, SFSCs are not just a strategic move but become an essential objective. This makes causalities such as SFSCs => Organic or Organic => SFSCs difficult to distinguish. This mirrors findings from the literature where environment-friendly practices and a commercialisation that is 'close to the people' stem from the same approach or niche-innovation (Brûlé-Gapihan, Laude, & Maclouf, 2017; Maréchal & Spanu, 2010). Farmers often show a high level of commitment to innovation and their goals reflect political and ideological aspirations towards forms of rural development or food sovereignty (interviews PLP and PM).

5.2.3. Redefinition of views and practices

Core characteristics of SFSCs such as proximity often provoke outcomes of relationships and trust. These relationships can also trigger the questioning of actors' views and practices while strengthening their confidence to innovate. Here, the literature highlights the role that consumers play in promoting sustainable practices within SFSCs schemes (Chiffolleau, 2008; Dockès et al., 2008). The consumers' influence on practices can be applied directly through demand-related aspects (interview, FBV) as well as indirectly through discussions and exchanges fostering and supporting new values and practices. Indeed, respondents from the survey declared seeking contact with customers as a primary goal when developing SFSCs (see figure 20) and results also highlighted the important implications of this exchange for development of new practices (see figure 21).

However, where customers' expectations are high and not always realistic, they can also hamper the innovation process (interview LC). Statements from interview participants also suggested that exchanges with the consumers are not common, outside of a few CSA schemes. Maréchal & Spanu (2010) came to the same conclusion and argued that it is mostly the 'democratisation' of discussion and new solidarities amongst producers that enable the development of environmental views and practices. Examples were also found in the interviews where farmers explained how exchanges with others inspired them or brought others, despite initial reluctance, to test new practices or innovations (interviews PLP, FBV). Overall, this highlights the potential of SFSCs to promote sustainable practices when involving the development of a collective scheme. A tendency that has proven to be statistically significant by results from the survey (figure 23). Nonetheless, such redefinition of views and practices can also be fostered by individual reflection.

Often, initiating a change towards the development of SFSCs is also driven by aims of local supply (figure 20) and this implies thinking locally and, sometimes, involves ideas around self-consumption. When effects can be seen or felt more directly farmers may be more reticent to apply pesticides or herbicides on crops eaten by their family or neighbours (interview PLP). Here, agriculture is not seen solely through the lens of industrial principles but also in terms of subsistence and self-sufficiency and this has the power to redefine what acceptable practices are.

6. Conclusion

The surveys and interviews for this research, together with wider literature all provide evidence that SFSCs offer great potential for the promotion of environmentally sound production practices. The mixed-method approach used in this study enabled qualitative identification of promising traits while quantitatively verifying most of them on a larger scale. Findings have also demonstrated that the potential of SFSCs to promote sustainable farming practices goes beyond references to organic farming. Indeed, such merchandising strategies seem to have numerous outcome characteristics such as proximity, trust and sovereignty that enable a broader redefinition of farmers' values and goals, i.e. views and practices in relation to food production and the environment. Proximity fosters increased exchanges between actors of the food chain and can, especially when creating new community networks for farmers, provide a safe and healthy space for environmentally sound innovations and alternatives which are 'closer to the people'. Trust enables new solidarities and new specifications to emerge from those spaces, which in return can help the emergence of, and add value to, innovations (alternative farming practices for instance), by-passing standardisation and conventionalisation. Finally, regained sovereignty on production, processing and merchandising specifications allows actors to diversify their operations, and better manage risks and uncertainties, thus reducing the pressure on resources and the environment.

The study also highlighted several challenges. SFSCs initiatives promoting environmental-friendly practices sometimes face difficulties in educating the public, and indeed other farmers, about the wider value (but associated higher costs) of the new methods, despite demands for more 'natural' products. Direct marketing operations also require more time and material investment. Some farmers find it harder to excel in production, merchandising and management activities

simultaneously, and face difficulties finding financial or administrative support. Besides a few organic agriculture schemes, CSA networks and peasants' movements, support on the development of SFSCs has been very limited so far and more needs to be done from a research and policy standpoint.

To that end, the present study has generated further questions for research:

- What are the interactions between consumers and producers that lead to the adoption of environment-friendly practices by the latter and/or greater awareness of the former?
- Where are collective actions taking place and how can they be promoted to foster the development of environment-friendly production?
- What are the specific contexts and farm characteristics favourable to the development of SFSCs and environment-friendly practices? How can innovation be encouraged and how can cultural disruption be avoided?

The lack of research on positive impacts of SFSCs means that they have not yet been fully acknowledged by authorities and policymakers. This is where the present work aimed to contribute, and despite evident limitations on the scope of the research, it has provided evidence of the relation between SFSCs and a shift towards sustainable practices involving organic agriculture, diversification or less input-dependent production patterns. Hopefully, this will raise awareness on their potential regarding the promotion of environmentally sound practices and provided a basis for more research on such innovations across Switzerland.

7. Appendices

Appendix 1: Interview participants and main farm characteristics

	FBV	PLP	LC	PM
<i>Surface area</i>	52ha	20ha	20ha	34ha
<i>Production</i>	Mixed: <ul style="list-style-type: none"> ▪ field crops ▪ vegetables ▪ fruits ▪ laying hens ▪ milk sheep 	Plant production: <ul style="list-style-type: none"> ▪ field crops ▪ cereals ▪ vegetables 	Mixed: <ul style="list-style-type: none"> ▪ field crops ▪ cereals ▪ vegetables ▪ fruits ▪ laying hens/ broiler 	Mixed: <ul style="list-style-type: none"> ▪ cereal crops ▪ vegetables, fruits ▪ aromatic plants ▪ pigs ▪ lamb
<i>Certification</i>	Organic agriculture	Organic agriculture (previously Demeter)	IP-Suisse	Organic agriculture 'in conversion'
<i>Sales channels</i>	<ul style="list-style-type: none"> ▪ SFSCs: Farmers' markets, on-farm market, small grocery stores, food baskets, ▪ LFSCs: wholesalers, mill 	<ul style="list-style-type: none"> ▪ SFSCs: CSA baskets, farmers' markets, small organic stores, restaurants, bakery ▪ LFSCs: Fenaco 	<ul style="list-style-type: none"> ▪ SFSCs: CSA baskets, on-farm self-service ▪ LFSCs: mill 	<ul style="list-style-type: none"> ▪ SFSCs: producers' shop, self-service, farmers' markets, online baskets ▪ LFSCs: mill
<i>% sold through SFSCs</i>	<ul style="list-style-type: none"> ▪ Vegetables 80% ▪ Fruits 50% ▪ Cheese and milk 50% 	<ul style="list-style-type: none"> ▪ Vegetables 100% ▪ Field crops 50% 	<ul style="list-style-type: none"> ▪ Vegetables 100% ▪ Fruits 100% ▪ Meat/eggs 100% 	<ul style="list-style-type: none"> ▪ Vegetables 100% ▪ Fruits 100% ▪ Meat 100% ▪ Cereals 50%
<i>Collective SFSCs scheme</i>	Not really (only minor supply of CSA)	CSA initiative with consumers	CSA initiative with consumers and one other producer	Cooperative shop with other producers

Appendix 2: Interview questionnaire

Reference number:

Part I. Background

1. What do you produce on the farm? And How?
 2. How do you commercialize your products? What are your selling channels or points?
 3. Do your selling prices cover the cost of production?
 4. Do you receive any governmental contributions and how important are they for your farm?
-

Part II. Merchandizing strategies and implications

5. When did you decided to commercialize all or part of your products through short retailing schemes?
 - a. *What were the reasons, motivations or objectives? (economic, social, technical, philosophical)*
 - b. What are the advantages and disadvantages of short retailing schemes?
 - c. Direct sales or transformation of products also demand more investment how do you cope with this increased demand in time and financial investment?

-

Part. III Implications for production practices and values

6. Did you change any production patterns recently?
 - a. What has changed in your production?
 - b. What motivated this change or what motivates you in the way you produce now?
7. What role did the short retailing scheme play in this transition?

Does short retailing scheme bring more room (financially and socially) for innovation (higher work demand but also can be sold at higher price) or does it mainly require more investment from the farmer (money, time for transformation, marketing, etc.)?

Change involves sometimes difficult decisions and often meet resistance or reluctance, does the collaboration with other producers help overcome it? (in collective short retailing initiatives for example)

8. What are the important values in your production?
 - a. do direct marketing help better valorise those values (without having to switch to Bio label)?
-
-

Appendix 3: Survey questionnaire (online)

A. Farmer profile

1. Gender:

- Woman
- Man
- Prefer not to mention

2. From a farmer family:

- Yes
- no

3. Canton:

4. Age:

5. Start of the agricultural occupation:

- Family succession
- creation of a farm
- other:

6. Number of years in the farming profession:

7. Other employment:

- No
- Yes (%) :
.....

B. Description of the farm

8. Type of operation:

- Plant production (vegetables, field crops, and fruit production in parallel)
- Vineyard and/or arboriculture as main production
- Livestock rearing (dairy products and meat)
- Mixt (plant/fruit production and livestock rearing)
- Other:

9. Have you change the type of main operation?

- No
- Yes (please enter the year):

.....

10. Total area (ha):

In ownership:

In lease:

Other:

Total arable land:

11. Zone:

- Lowland region
- Hilly area
- Highland (mountainous) region

C. Merchandizing channels

12. Percentage of production sold on short retailing routes (direct sales or max. one intermediary):

13. Sale Strategy and percentage of revenue:

Direct sales on farm (incl. deliveries, pick-your-own, etc.):

Online sales:

Food baskets under contract (CSA):

Collective selling point (local grocery store, cooperative, participative supermarket, ...):

Catering:

Market:

Mass retail:

Other:

14. Number of years selling through short retailing routes:

15. Are you part of a collective short retailing scheme (initiative or grouping: association, cooperative, ...)?

- No
- Producers' initiative
- Producers and consumers grouping
- Both

Since (please specify the year):

16. Motivations to develop direct marketing or SFSCs?

	Extremely important	Very important	Important	Moderately important	Not or slightly important	Insignificant
Enable to hold a bigger margin on the selling price	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Possibility to determine prices	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rebuild a more direct exchange with the consumer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
More decision power on productions patterns (what and how)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Contribute to a local supply	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Develop an agriculture that is more respectful of the environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Propose healthy and good-quality products to consumers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Continue a tradition and reconnect with values of the "terroir"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other reason (please specify):						

D. Production

17. Production mode

- Organic agriculture (Bio Suisse)
- Biodynamic (Demeter)
- IP-Suisse

- Proof of ecological Performances only (AES)
- Other:

18. Have you operated a change in the certification?

- No
- Yes (please enter the year):
.....

19. Water resources:

- Water source
- Underground water table
- Watercourse
- Rainwater catchment
- Grid

Annual consumption (please specify in liters or m3):

20. Energy consumption management within the production

- Use of renewable energy (solar, wind, hydroelectric, biogas, wood, ...)
- Revalorisation of organic wastes (composting, feed, biogas, ...)
- Human or animal power-based machinery
- Electrical tools or vehicles
- No specific measure
- Other (please specify):

21. Livestock and rearing system:

- No livestock keeping
- Dual purpose breeds (meat and milk/eggs, ...)
- Combined pasture (association or rotation of cattle, poultry, pigs or others on pasture)
- Integrated operation (association or rotation between cultivations and grazing by cattle, poultry, pigs or others, e.g. high-stems orchards)
- Integral pasture (and seasonal calving)
- No particular rearing system in terms of integrated production

Other specific practice(s) in terms of livestock rearing:

22. Feed:

Type:

Feed produced on-farm (%):

Feed purchased (%):

23. Cultivation practices:

No crop cultivation practices

Use of herbicides

Tillage

Direct seeding, band sowing or litter undersowing

Mulching

Permanent beds

Hand weeding

Mechanical weeding

Intercropping or mixed cropping

Agroforestry

Other specific practice(s) in terms of cropping or soil conservation:

24. Cultivated area (please specify in ha/ares/m2):

Greenhouses:

Fields:

Irrigated area:

25. Diversity of cultivated varieties:

Total number of cultivated varieties (approx.):

Number of local or ancient varieties (approx.):

26. Crop and/or pasture fertilization:

- Green manure
- Industrial fertilizers
- Application of manure and/or slurry
- Fertilization of cultivated areas by rotation or association with cattle, poultry, pigs or others
- Compost
- No specific action
- Other specific action(s) in terms of fertilization:

27. Pest management strategy:

- Use of pesticides
- Use of biological treatments
- Biodiversity-based management and/or natural regulation (diversity of habitats and cultivations, support or introduction of auxiliary species, etc.)
- Other (please specify):

28. Biodiversity and landscape management:

- Floral fallow or flower strips
- Extensive grasslands
- Extensive pastures and/or pastured woodland
- Bedding surface areas
- Hedges/groves
- High stems orchards
- Birdhouses/insects hotel
- Water points (pond, watercourse)
- Wood/stone pile
- No specific measure or structure
- Other specific measure(s) promoting biodiversity and landscapes:

E. Subsidies

29. Are you recipient of federal contributions (subsidies)?

○ Y
e
s
○ N
o

30. Contributions for soil conservation practices:

- No
- Yes (area in ha) :

31. Contributions for biodiversity promotion areas:

- No
- Yes (area in ha) :

32. Reduction of the use of crop protection products:

- No
- Yes (area in ha) :

33. Pasture-based milk and meat production:

- No
- Yes (area in ha) :

34. Precision application techniques:

- No
- Yes

35. Low emission spreading techniques:

- No
- Yes (area in ha) :

36. Other subsidies received :

F. General

37. In your case, which role does the commercialization through short retail channels play or has played in the choice or evolvement of production practices?

	Totally	Much	Rather / maybe	Not really	Not at all
I have more financial leeway, so I have more options	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Direct contact with consumers makes or has made my ideas and practices evolve	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Getting together with other farmers allows for the exchange of ideas and the development of new practices	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
More autonomy allowed me or allows me to develop my ideas and practices	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other role(s) of short retail channels in the evolution of production practices:					

38. Encountered difficulties and envisaged improvements:

39. General comment:

Appendix 4: Correlation between changes of operations and SFSCs (survey)

	Respondents	% from total	% from changes
% total	88	100	
changes of production type or certification	32	36.3	
in correlation with SFSCs or a collective initiative (within 10 years)	24	27.3	75.0
together or after taking part in SFSCs	19	21.6	59.4
after taking part in a collective initiative	2	2.3	6.3
changes to SFSCs after change in type of production or certification	3	3.4	9.3
changes in certification	20	22.7	% from changes in certification
to organic agriculture	19	21.6	95.0
changes in certification linked to SFSCs or a collective initiative	17	19.3	85.0

Appendix 5: Comparison table for AES data between survey and national statistics

total		cross-compliance direct payments (AES)															
		low emissions spreading techniques		soil conservation practices		precise application techniques		reduction of use of crop protection products		PLVH (pasture-based milk and meat production)		SPB (biodiversity promotion area)		organic agriculture			
canton	farms	SAU (ha)	SAU/farm (ha)	farms	ha	farms	ha	farms	farms	ha	farms	ha	farms	ha	farms	ha	
BE	10 396	191 878	18	2877	86228	2523	16208	93	207	413	6876	107587	9718	n.a	1277	23416	
FR	2 762	75 033	27	717	38052	713	6689	46	78	245	1605	39249	2403	n.a	192	5331	
VD	3 680	108 656	30	533	14659	1115	18146	111	186	1260	1512	34264	2935	n.a	285	9037	
VS	2 756	36 870	13	74	2040	22	223	14	118	954	1426	25171	2104	n.a	313	6759	
NE	796	31 526	40	133	5826	113	1155	8	22	333	541	23066	682	n.a	85	2656	
GE	386	11 314	29	10	185	123	2523	13	33	409	56	1150	247	n.a	32	1175	
JU	1 014	40 446	40	160	5715	178	2098	12	5	35	643	20824	928	n.a	162	6872	
Total	21 790	495 722	23	4504	152705	4787	47042	297	649	3649	12659	251311	19017	78'000 (whole country)	2346	55246	
		% (from total)		20,6700321	30,8045731	21,968793	9,48959582	1,363010555	2,97843047	0,73609828	58,0954566	50,6959699	87,2739789	7,46 (whole country)	10,7664066	11,1445562	
		ha / farm		33,9043073	8441,76	88,42 (out of whole country)	9,82703154	5,62249615	19,852358	1,78 (whole country)	23,5490196						
				% farms with use of herbicides:		8441,76 (whole country)		9547 farms									
	farms	SAU (ha)	SAU/farm (ha)	farms	ha	farms	ha	farms	farms	ha	farms	ha	farms	ha	farms	ha	
Survey	104 (number of respondents varies depending on the question)	3258,44	33,94208	15	381 (from 13 respondents)	30	454,3 (from 29)	14	19	416	38	970,13 (from 60)	503,74 (from 80)	20,0370718	47	1462	
		% (from respondents and SAU total survey)		23,4375	15,1548901	40,5405405	18,070516	20,5882353	28,358209	16,5470716	55,0724638	38,5884871	80	20,0370718	57,32	44,8680964	
		ha / farm		27,2142876	15,6655172	36,6666667	15,6655172	21,8947368	26,9480556	8,5379661	31,106383						
				% farms with use of herbicides :		11											

Figures for each canton have been retrieved from the Federal office for agriculture (*Rapport agricole 2019: Paiements directs*, Ryser, 2019) and the Federal office for statistics ('Exploitations agricoles, emplois et surface utile par canton', 2020).

Appendix 6: Output tables of chi-square independence tests

Chi-square independence test on **% of production volume sold through SFSCs and organic agriculture:**

Case Processing Summary

	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
SFSCs * Organic?	79	100.0%	0	0.0%	79	100.0%

SFSCs * Organic? Crosstabulation

Count

		Organic?		Total
		No	Yes	
SFSCs	85% and more	9	31	40
	less than 85%	19	20	39
Total		28	51	79

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2- sided)	Exact Sig. (1- sided)
Pearson Chi-Square	5.932 ^a	1	.015		
Continuity Correction ^b	4.842	1	.028		
Likelihood Ratio	6.030	1	.014		
Fisher's Exact Test				.019	.013
N of Valid Cases	79				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 13.82.

b. Computed only for a 2x2 table

Chi-square independence test on **participation in a collective SFSCs initiative and organic agriculture:**

Case Processing Summary

	Valid		Cases Missing		Total	
	N	Percent	N	Percent	N	Percent
Collective scheme * Organic?	104	100.0%	0	0.0%	104	100.0%

Collective scheme * Organic? Crosstabulation

Count		Organic?			Total
		No	Yes		
Collective scheme		23	0	0	23
	No	0	25	25	50
	Yes	0	5	26	31
Total		23	30	51	104

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	116.087 ^a	4	.000
Likelihood Ratio	119.976	4	.000
N of Valid Cases	104		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.09.

Appendix 7: Analysis of secondary data on SFSCs and organic agriculture

C. Chézeaux (in Ribì, 2017)

6:19. *People look at me differently now and I have to accept that. I don't belong to the same farmers' group anymore and they are certainly critical (et ils ont un regard sur moi qui est peut-être un peu lourd). I indirectly hear about it and it is sometimes tough. But I build myself with that. The important thing is, that I, at the bottom of my heart, feel what is coherent. I have to repeat myself: "It's your choice, continue on this way."*

7:30. *My ultimate goal is to bring more of these products to our table to reclaim an agriculture that produces food not money (se réappropriier une agriculture vivrière, pas une agriculture commerciale). It's also important to me to offer this quality to a majority of the population which surround us. Finally, I'd like to show that this is a real solution for other farmers and society at large. Ce qui me tient vraiment à Coeur c'est créer un modèle pour plus de liberté de l'agriculteur.*

U. Gfeller (in Urs Gfeller, *der Gemüseproduzent ganz nah am Kunden*, 2015)

0:30. *C'est important pour moi de soutenir l'économie et le social dans la région.*

01 :14. *Pour moi c'est très important d'avoir la vente directe, d'avoir le contact direct avec la clientèle et d'avoir directement aussi le feedback de la personne.*

02 :55 *Dans le maraîchage bio, nous avons la difficulté que les cultures nous donnent plus de travail, surtout pour le désherbage. Et l'autre difficulté est aussi que le rendement est légèrement inférieur, et cela se traduit dans le prix du produit final.*

D. Beyeler, G. Roch and R. Stalder (in T.T.C., 2019)

DB, En reconversion Bio. 15 :30 *Sur le marché du vin est quand même assez serré, pour l'année prochaine je ne pense pas pouvoir augmenter mes prix. Je pense qu'il aurait fallu commencer il y a bien dix ans pour vraiment pouvoir profiter d'une valeur ajoutée. Mais avec les nouveau paiements directs (la prime au bio), ses investissements en temps, matériel et contrôle peuvent être amortis. Même s'il espère décrocher des nouveaux clients avec le label bio, ce n'est pas sa première motivation. Avec mon fils on s'est posé la question, on a aussi un peut été influencé par nos voisins. À Auvernier on a plusieurs voisins qui ont démarré dans du bio et puis le fait qu'on aie les vignes à proximité d'eux, ça rendait service à tout le monde que tout le monde se mette à faire du bio. Et puis c'est vrai qu'après est venue cette prise de conscience aussi par le public. Parce*

qu'on a quand même des échos qui nous viennent du public, du consommateur. Et puis j'ai un peu attendu la venue de mon fils pour faire le pas.

GR. Ben on dit, on a souffert, plusieurs années parce que le non-recours aux produits de traitement, notamment les herbicides c'est impressionnant la différence de travail et au départ on ne s'y attend pas.

En moyenne, le bio c'est 30% en plus de main d'œuvre, mais aussi 25% de plus en subventions. Au final un jeu à somme quasi nulle. En fait si le revenu est supérieur, c'est que les prix payés au producteur sont plus élevés qu'en conventionnel, en tout cas jusqu'à présent, mais l'écart pourrait se réduire.

RS 21 :20 Maintenant, les prix ont tendance... on voit déjà une première diminution. Alors on met sur le fait qu'on est de plus en plus (à produire bio), qu'on a plus de production, mais je pense que le problème vient d'autre part. C'est que à l'heure actuelle il y a encore 40 ou 50% de produits bio qui sont importés, mais étant donné que la production suisse augmente elle prend un part du marché étranger. Donc nos distributeurs, qui veulent garder leur même marge, ben qu'est-ce qu'ils font, ben ils diminuent not prix pour avoir leur même revenu. Alors pour l'instant ça va encore, mais on espère que ça va pas aller en s'amplifiant comme au conventionnel.

Une tendance à laquelle GR devrait échapper. Autrefois il écoulait tout ça production dans la grande distribution, depuis 15 ans c'est terminé. Il vend tout en direct entre marchés, paniers et magasins locaux à un prix plus avantageux pour lui, comme pour ses clients qui sont toujours plus nombreux.

Des études de la RTS ont montré que les marges de la grande distribution sont beaucoup plus élevés pour les produits bio (parfois 75% ou même 100%) et on comprend pas très bien pourquoi.

La grande distribution ne dévoile pas ses secrets du business, mais ils essaient de justifier ça par le fait que les transformations sont différentes, il y a des emballages différents, la gestion de plus petites quantités etc. Une motion politique qui demandait plus de transparence sur les produits bio à même été rejetée au parlement.

Also see:

Les Jardins du Flon, <https://lesjardinsduflon.ch/> (CSA)

Les Jardins du Mont, <http://www.lesjardinsdumont.ch/> (CSA)

FRACP, <https://www.fracp.ch/> (CSA)

DorignoL, <https://www.dorignoL.ch/> (Producers cooperative)

Ferme Iseli (in Frioud, 2016)

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