

How do small farms contribute to food and nutrition security? Linking European small farms, strategies and outcomes in territorial food systems

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ABSTRACT

Despite a longstanding literature on small farm-households, there is limited consideration of small farms' role in food and nutrition security (FNS) at territorial level. The purpose of this study is to provide insights about how small farms contribute to FNS at different territorial scales, by focusing on farmers' strategies and consequential FNS outcomes. Analysis is based on two years (2017–2019) of field work done with farmers and food system actors in SALSA reference regions culminating in a workshop done with research partners. We find that small farms deliver food and nutrition security and other socio-economic and environmental outcomes for the farm-household, at local, regional and global levels. The regional level is shown to be critical for small farms, as it provides the scale at which their diversity is realised. Understanding this diversity is a goal for both research and for effective support mechanisms for small farm integration, and the multiple public and private functions small farms can deliver should be higher on the policy agenda.

1. Introduction

In recent years a large body of literature calls for the adoption of systemic approaches to address food security (Ingram, 2011; Sonnino et al., 2014; Moragues-Faus et al., 2017; Bené et al., 2019). Food system approaches enable the understanding of the dynamic interactions between actors, activities and outcomes, including food security (Hinrichs, 2014; Richards et al., 2016; Kopainsky et al., 2018; Hebinck and Oostindie, 2018). The food security concept has evolved over time and

across disciplines (Burchi and De Muro, 2016). Initially centered on the supply of food and increased production (availability), food security has been extended to include 'access', 'utilization' and 'stability' dimensions (Pinstrup-Andersen, 2009; Pangaribowo et al., 2013). The concern over nutritional and environmental aspects of food, particularly in high-income countries (Acharya et al., 2014) led to considering 'food and nutrition security' (FNS). FNS is delivered in a 'sustainable' way when the food system is consistent with environmental, economic and social principles (Zurek et al., 2018; Galli et al., 2020).

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Territorial and ‘place-based’ approaches to agri-food systems connect food systems and food security in a spatial perspective (Rees, 2019; Brunori et al., 2017). Scholars have adopted territorial approaches to evaluate the extent of the foodsheds for the self-sufficiency of the communities served (Zasada et al., 2019; Brinkley, 2013) or, more recently, to overcome oppositions in agri-food systems transitions (Lamine et al., 2019a, 2019b). Other authors focus specifically on urban farming (see Warren et al., 2015 for a review) and the role of peri-urban farming systems to urban food security (Opitz et al., 2016; Filippini et al., 2018).

‘Small’ holders are defined in terms of structural and economic sizes but also in relation to the production sector and local agro-system conditions (Potter and Lobley, 1993; Hubbard, 2009; Davidova and Thomson, 2014). While smallholdings are often seen as impediments to productivist agriculture and bound to disappear (Tilzey and Potter, 2008), FNS is recognized as a benchmark to assess the persistence of family farming (Brunori and Bartolini, 2016), particularly after the 2007 price crisis and the “International Year of Family and Smallholder Farming” (FAO, 2014) and with the Decade of Family Farming (FAO and IFAD, 2019).

The role of small farms (SFs) in food security has been widely considered in relation to the farm-household, where consumption choices and business decisions coexist (Singh et al., 1986; Davidova, 2014). Farming contributes to farm households’ food access by providing self-provisioning and a source of income through market integration (Meert et al., 2005; Varga, 2017; Vávra et al., 2018) while the contribution of SFs to other FNS outcomes is under-explored or assumed to be of limited relevance at local, regional, and global scales. The SALSA project, by taking into account SFs’ relevance in the context of each region (Guiomar et al., 2018), specifically considers the ways SFs are a relevant source of sustainable food production (availability), provide food and incomes for households (access and utilization’s assets and capacities) and increase food systems’ diversity thereby contributing to their resilience (stability), for many regional food systems (UNEP, 2016).

This paper explores the relations between small farming, territorial food systems and FNS. The purpose of this study is to provide insights about how SFs contribute to the FNS at different territorial scales, by focusing on farmers’ strategies and the consequent FNS outcomes. To achieve this purpose, the analysis is based on two years (2017–2019) of field work done with farmers and food system actors in selected reference regions culminating in a participatory workshop with SALSA research partners. During the collective reflection researchers were asked to indicate who small farmers are in their regions, how they connect to the food system in which they operate and how they contribute to FNS outcomes. We captured diverse exemplars on the roles played by SFs in regional food systems towards FNS, with reference to Europe.

The main novelties of this study are both related to contents – i.e. contrasting differences and integrating knowledge on the mechanisms that describe SFs’ contribution to FNS in Europe – and methodology, with reference to the involvement of researchers’ perspectives in the analysis, alongside transdisciplinary (Thompson Klein, 2004; Vandermeulen and Van Huylenbroeck, 2008) and farming system approaches (Darnhofer, 2012).

We lay out the key concepts on SFs connections to food systems and contribution to FNS outcomes (Background), then present the structure of the reflection exercise with researchers (Methods). We present the small farm cases (Results), by illustrating who SFs are, which strategies they adopt to integrate in their food systems and their contributions to FNS and other outcomes. Discussions and Concluding sections close.

2. Background and concepts: small farms’ connections to food systems and contribution to FNS outcomes

Small farm households build relations within the food systems in

which they are embedded and contribute to FNS in different ways. Based on HLPE (2013), Fig. 1 presents three nested sub-systems: i) the small farm-household and the local exchanges (the inner circle), ii) the connections between the small farm and the regional food system (the middle circle) and iii) the relations between the small farm and the global food system (the outer circle). In each sub-system, the actors (SF households), engage in a set of strategies, delivering sets of outcomes at different territorial scales.

The inner circle shows the exchange relations between the farm and the household, where the latter provides labour and capital in return for farm income and food provisioning, in a specific local agro-ecosystem context. The household members may also offer labor for off-farm income or else, receive a supplementary income from the State (e.g. retirement benefits). Differently from ‘professional’ or ‘genuine’ farmers, small farming is often related to a hobby, part-time and non-commercial activity, although small farming can also be carried out for subsistence purposes or as a lifestyle choice (implying some form of profit seeking, see Sutherland et al., 2019). From an FNS perspective, SFs are referred to as ‘self-provisioners’ or ‘subsistence’, depending on the family income and the social context (Davidova et al., 2012). The farm-household is also involved in a network of proximity relations that lead to informal exchanges of products and resources (Sutherland and Burton, 2011). The relation between smallholder production diversity and farm-household dietary quality and nutrition security is being assessed (Sibhatu et al., 2015; Ecker, 2018; Sibhatu and Qaim, 2018). As small farm households typically consume a substantial share of what they produce, production diversity may directly translate into consumption diversity and thus improve dietary quality. Studies also indicate that this is not the only mechanism underlying the production-consumption relationship and market incentives can be more important for farm household nutrition than production diversity, where markets function and are accessible to rural households. Questions on the measurability and on the magnitude of these effects remain.

The middle circle, in turn, illustrates the connections between the small farm household and the regional economic and socio-ecological conditions in which they are embedded. Small family farms activate different strategies to commercialize their products (see for instance Moreno-Pérez et al., 2011) and diverse ‘farming styles’ may be observed even where structural characteristics are similar (Van der Ploeg, 2009). The way the small farm carries out its business, views its customers’ needs and intends to respond to those needs is the essence of its business model (Vorley et al., 2009; Kelly et al., 2015). Hence, farmers balance their participation into conventional and alternative food chains, contributing to the local supply markets (Filippini et al., 2016). The rural environment is particularly relevant to SFs, whereas scale enlargement and specialization contributes to a disconnection between local farms and communities (Smithers et al., 2005). In the rural environment, household members get involved in the local community –where shared knowledge, social norms, reciprocity and cooperation relations take place –and engage in off-farm labour markets, critically contributing to the continuation of the farm through pluri-activity (Lyson, 2004; Shucksmith and Rønningen, 2011). SFs are also involved in rural-urban relations with the urban centers, as in the case of food exchanges, income transfers, in and out-migration and business opportunities (Djurfeldt, 2015; Blay-Palmer et al., 2018). At regional level, FNS outcomes that SFs contribute to, include regional availability of food, autonomy of the regional food system, from global economic fluctuations, and instability and food diversity, as an indicator of food system resilience (Gustafson et al., 2016).

Finally, the outer circle links those SFs that are integrated in and commercialize through globalized markets. In long agri-food value chains, buyers set the ‘rules of the game’ as they organize, coordinate and control the activities, often capturing the largest profits (Fernandez-Stark et al., 2012; Nájera, 2017). SFs develop strategies in an effort to integrate production and business environments, in which they have a relative disadvantage (Vorley et al., 2012). They also face new risks

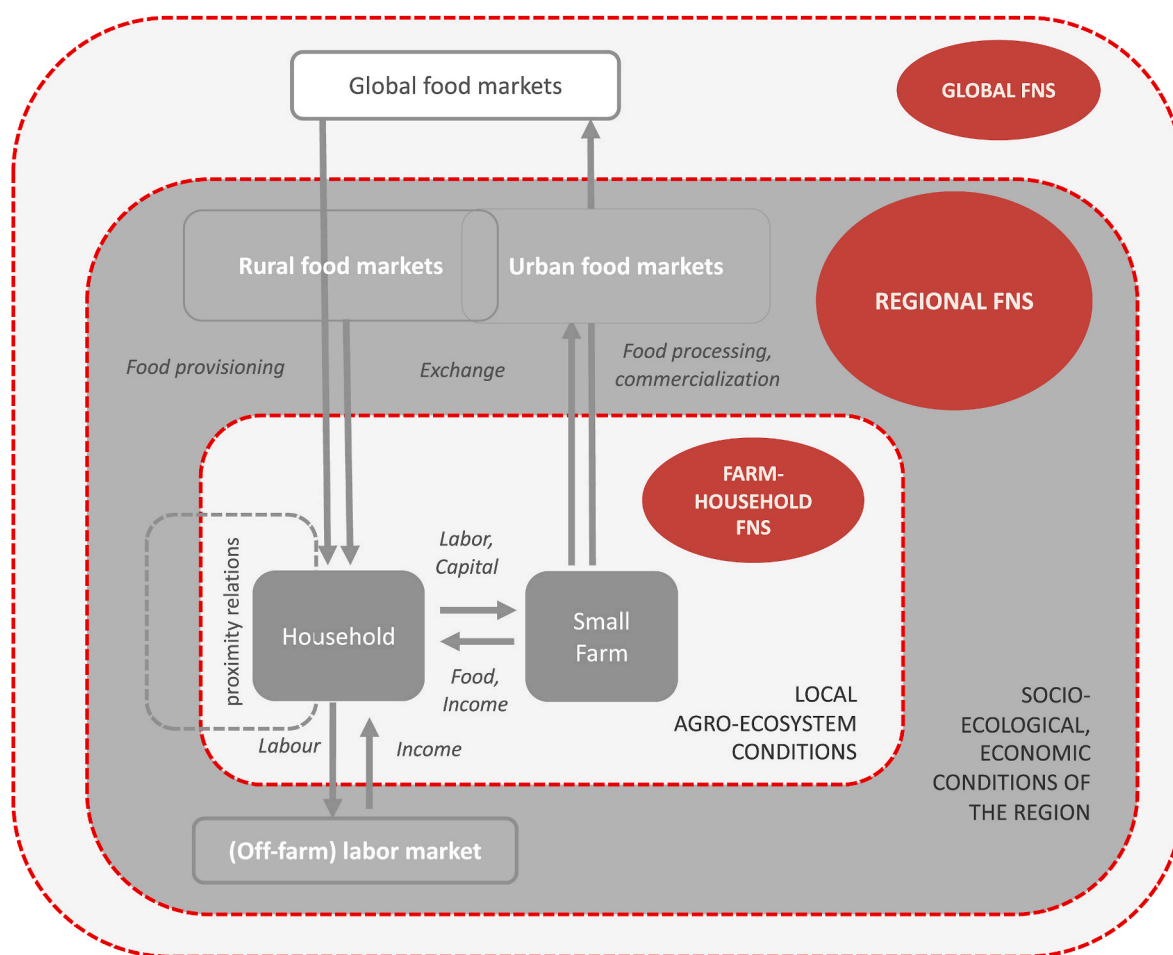


Fig. 1. Small farm households' connections to local, regional and global food systems and contribution to Food and Nutrition Security (FNS) outcomes. Source: Authors'.

linked to global drivers, such as economic, social, health-related, political and environmental changes.

3. Materials and methods: a reflexive approach to knowledge integration and learning

This paper builds upon the outcomes of previous research studies on the role of SFs in regional food systems (NUTS 3 Reference Regions, RR) analysed within the Horizon 2020 'SALSA' project. We developed a collective reflection among the research partners, after two years of field work (2017–2019), with the ultimate aim to steer mutual learning and integration of previous knowledge, developed in contact with farmers and food system actors in the respective regions, building on other works (for example, Raymond et al., 2010; Lardon, 2013; Moonen et al., 2016; Šūmane et al., 2018). We organized a half day workshop (in Brasov, Romania in May 2019) as a setting to facilitate the exchange of diverse experiences and perspectives and foster the emergence of a shared understanding regarding the different ways in which SFs contribute to FNS.

The researchers were encouraged to develop an "instantiation of concepts" exercise. Instantiation is a process that involves specifying concrete instances of abstract concepts in order to help clarify their meaning and refine theoretical ideas (Jaccard and Jacoby, 2009). Researchers were asked to provide examples from SFs to briefly share their characteristics in the regional context, the main strategies adopted to link to the food system and the main FNS outcomes that they contribute to.

The participants were divided into four groups, each one with a facilitator. Each group had a whiteboard (Fig. 2), and a set of cards, each

indicating an action (or 'strategy') that the small farm performs. In turn, researchers presented examples of SFs from their field work. For each case (e.g. Small Farm 1, SF1), they were asked to tell a brief story (with reference to product X and the region Y) and select cards (e.g. Strategy Cards B and D) to explain the main strategies that the small farm enacts to integrate in its food system, how it contributes to given FNS outcomes and, if relevant, its impact on other socio-economic and environmental outcomes (e.g. Outcomes 2 and 4). This was graphically represented through oriented lines, as in Fig. 2.

Some strategy cards were related to the farming activity and market, others were relevant to the household (Table 1). The FNS outcomes were determined from a preselected list either related to the farm-household, to the regional context, or to the global food system. It should be noted that the analysis of the utilization dimension, requiring a consideration of consumer behavior, was beyond the scope of the SALSA research. Other outcomes (positive and negative) could be indicated by the participants if relevant to the situation (Table 2). Each farm case could be linked to multiple strategies and FNS outcomes.

Each group gathered researchers that had worked in different contexts across RR in 13 European countries, spanning selected products relevant to small farming in several categories (i.e. cereals, fruits and vegetables, olive oil, meat, wine production sectors, see Rivera et al., 2020 for a complete overview). The average size of the small farm differs according to the production sector (with overall sample average being 23ha, median of 5ha, showing a large majority of smaller farms, e.g. for vegetables, and a smaller number of larger farms, e.g. for cereals). 25 researchers were present, with backgrounds in agricultural sciences and economics, rural sociology, geography and statistics, agricultural and

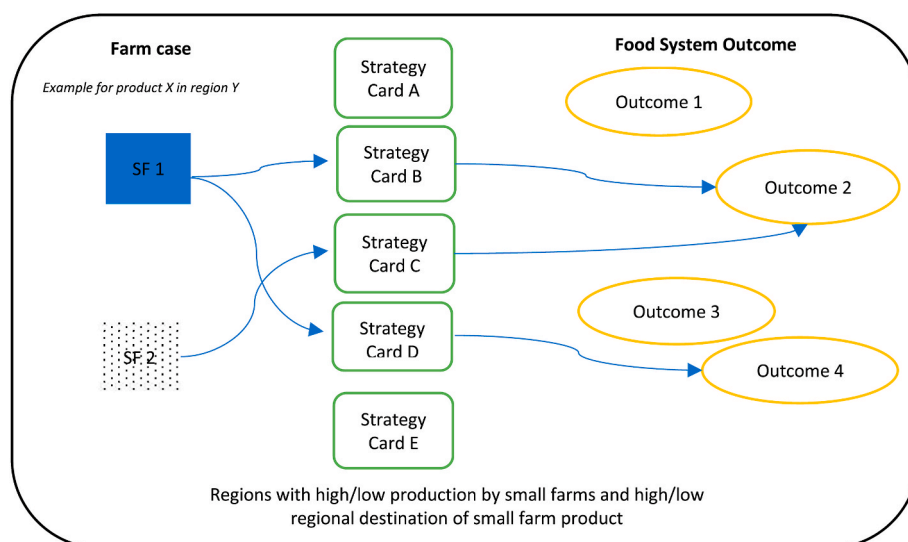


Fig. 2. Board with the key elements for discussion in each working group: generic example with small farm cases (e.g. SF1), with reference to product X in region Y, the main strategies adopted (e.g. Strategy Cards A) and the main outcomes (e.g. Outcome 1). Each group involved those products and regions characterised by high/low production by small farms and high/low regional destination of small farm product (based on Rivera et al., 2020).

Table 1
Strategy cards.

Small Farms Strategies Cards	
Relevant to Farming	Technological innovation Specialization Cooperative Membership CAP support Organic farming (PDO, PGI) quality production Multifunctionality On/Off-farm processing Short chain networks Upscaling Downsizing
Relevant to Household	Pluri-activity Informal cooperation and sharing Reliance on public welfare Household self-provisioning Hobby farming Reduced income acceptance

Table 2
Outcome cards.

FNS Outcome Cards		Other Outcomes
Farm-household and Local level	Self-provisioning Household Income	Socio-economic and environmental outcomes (to be specified by researchers, case by case)
Regional level	Availability Autonomy Diversity	
Global level	Availability Diversity	

food policy and development studies.

The four groups were formed based on two criteria: (i) the extent of the supply produced by SFs at regional level (i.e. percentage of regional product by SFs, high or low) and (ii) the extent that small farm product is consumed within the reference region (i.e. percentage of small farm product that is sold in the region, high or low). These criteria were developed to provide a common ground for discussion across a very diverse group of researchers and SF contexts. These criteria draw on

Rivera et al. (2020), which reports an analysis of the socio-economic and agricultural characteristics of the regions, SF products and market linkages. We emphasize that the exercise does not claim to be representative of all SFs in either the respective reference regions and countries, or Europe more generally and recall that the examples are used to identify some of the diversity of SF profiles, business strategies and FNS outcomes.

To overcome time and participation constraints during the workshop, the exercise was followed by a questionnaire to partners, to suggest additional cases from their regions. A comparative reading of the regional reports (see Rivera et al., 2019) was performed to cross-check and integrate the evidence provided by partners.

4. Results

Each group provided a set of cases across different products and countries. The 25 SF examples come from 16 RRs in 9 countries (Spain – 5, Poland – 5, Italy – 4, Portugal – 3, UK – 2, Latvia – 2, Greece – 2, Romania – 1, Norway – 1). Table 3 summarizes the cases, across the two criteria used to group the partners.

Group 1 identifies cases from the regions where the contribution by SFs to regional production, for a specific product, is significant and where that product is mostly marketed inside the region. Only two examples were cited in this group, from North and Eastern Europe: a Potato farmer in Rzeszowski, (Poland) and a Honey farmer in Latgale (Latvia). At the other extreme, Group 4, is the most numerous cluster and identifies cases from the regions, from all over Europe, where the contribution by SFs to the regional production of a specific product, is limited and where that product is mostly marketed outside the region.

As for the intermediate cases, Group 2 identifies cases from the regions where the contribution by SF to the product regional production is significant, often involving processing, and marketed outside the region. This group gathers mostly, but not exclusively, Mediterranean cases identifying export-oriented production for global markets. Lastly, Group 3 identifies cases from the regions where the contribution by SF to regional production is limited and where the product is mostly marketed inside the region. These include generally small producers providing both subsistence and supplying local markets, which cut across Europe from East to West, and Southern countries.

Tables 4–7 present the cases in Groups 1 to 4, by indicating the products and regions of reference, a description of the SFs, the main

Table 3

Small farm case study examples identified by research partners in the four working groups.

Grouping criteria	Cases from regions where small farm product is mostly marketed inside the region	Cases from regions where small farm product is mostly marketed outside the region
Regions where contribution by small farms to regional production is significant	Group 1 Potatoes farmer in Rzeszowski (Poland) Honey farmer in Latgale (Latvia)	Group 2 Citrus farmer in Castellon (Spain) Lamb farmer in Nowotarski (Poland) Potatoes farmer in Oeste (Portugal) Apple farmer in Nowosadecki (Poland) Vegetable farmer in Lucca (Italy) Peach farmer in Imathia (Greece)
Regions where contribution by small farms to regional production is limited	Group 3 Poultry farmer in Rzeszowski (Poland) Orchards and mixed cropping farmer in Bistrița-Năsăud (Romania) Vegetable farmer in Pieriga (Latvia) Mixed cropping farmer in Oeste (Portugal) Fruit farmer in Lucca (Italy) Pulse farmer in Larisa (Greece)	Group 4 Lamb farmer in West Scotland (UK) Pork farmer in Rzeszowski (Poland) Olive oil farmer in Córdoba (Spain) Wine producer in Córdoba (Spain) Cow milk producer in Córdoba (Spain) Olive oil farmer in Alto Palancia, Castellon, (Spain) Lamb farmer in Alentejo (Portugal) Lamb producers in Bute, Scotland (UK) Potatoes and vegetables farmer in Hedmark (Norway) Cereal farmer in Pisa (Italy) Meat producer in Pisa (Italy)

strategies characterizing their business models and FNS and other outcomes.

The next sections present the small farm cases, consider who small farm-households are (section 4.1), discuss their strategies (section 4.2) and focus on how SF contribute to different FNS and other outcomes (section 4.3).

4.1. Small-scale farming between livelihood and lifestyle

The examples of SFs across Europe demonstrate the tight relations between the farm and the livelihood of the household linked to the farm, with many small farmers depending on farming as their main source of

income. Nevertheless, there are also variations in the formal and informal arrangements pursued by smallholders to ensure supplementary income without excessively compromising their farming practices.

Small farming continues to exist in many parts of Europe due to a sense of tradition and attachment to the land, which checks the gradual (and to some extent inevitable) exit from agriculture (Potatoes farmer in Rzeszowski, Poland; mixed cropping farmer in Bistrița-Năsăud, Romania; vegetable farmer in Lucca, Italy). The balance between on-farm and off-farm occupation can be particularly hard to handle, due to the significant work needed on the farm, especially when it is not possible to fully employ the household's workforce (Sheep farmer in West Scotland, UK). At the same time, the requirements of the production process can be balanced to achieve a satisfactory relation between farm work and other activities, by relying on informal exchanges of land and work (Sheep farmer in Alentejo, Portugal).

When farming is embedded in a lively labor market, the size of the farm can be adapted to the household's needs, with farming contributing supplementary income and stability (Wine producer in Córdoba, Spain). Alternatively, when farming is developed as a lifestyle choice (Sheep farmer in West Scotland), the small size of the farm may enable specific business models, compatible with the farm household's lifestyle (Vegetables farmer in Hedmark, Norway).

The destination of the farm products to household self-consumption is often a norm and a non-negligible share of the production. When the amount of the output is limited, this may generate a tension between food self-provisioning and selling farm products. For example, when the household relies mostly on agriculture, the benefit of selling all the available product may be higher (Fruit producer in Lucca, Italy).

Informal relations between the farm-household and relatives or the local community often play a key role in ensuring SF livelihood (Potato farmer in Oeste, Portugal). The relations between SFs at community level are very diverse and dynamic: it is hard to capture the very frequent exchanges between SFs at local level, or the food gifts offered to the children and relatives living in urban areas. Also, there are still cases of barter, where SFs "pay" with food (vegetables, cereals) for goods brought by producers from other parts of the country bringing for instance, fruits or clay pots and wooden kitchen objects (from regional report, Giurgiu, Romania).

4.2. Small farms' strategies

While SFs sometimes fall outside the conventional perception of entrepreneurship, they actively employ various business strategies to ensure that their farm business keeps functioning. Though there are numerous challenges associated with the limitations posed by the small size of the farms around the scope and spectrum of the available strategies, examples also show various sets of strategies put in place by these farms allowing not only to survive but also to ensure successful commercial performance.

Many of the reviewed examples show how the small size hinders the opportunity to take advantage of economies of scale, for instance, when

Table 4

Small farm cases in Group 1 contribute significantly to regional production and market it mostly inside the region.

Case study	Main features	Main strategies	FNS outcomes	Other outcomes
Potatoes farmer in Rzeszowski (Poland)	"The farm covers a small surface of UAA (2–5 ha) and produces for self-provisioning, almost exclusively. The farmer holds the land due its value and family tradition, despite shifting to hobby farming and gradually reducing agricultural activity. It relies on CAP subsidies and other public welfare linked to agriculture but does not integrate into markets. There is a gradual reduction of agricultural activity, increasing dependence on food bought on the market"	House self-provisioning (shift to) Hobby farming, Pluri-activity Downsizing Reduced income acceptance CAP support Reliance on public welfare	Self-provisioning, Autonomy	Household welfare (linked to subsidies)
Honey farmer in Latgale (Latvia)	"The farm covers several dozens of hectares, but honey producers are small by definition. He is an entrepreneur that relies almost exclusively on family labor, predominantly sells through direct sales to individual clients and focuses on rare varieties of honey and taste qualities."	On/off farm processing, Organic farming (and Integrated production) CAP support	Household income, Regional availability	Limit rural depopulation, Environmental preservation

Table 5

Small farm cases in Group 2 contribute significantly to regional production and market it mostly outside the region.

Case study farm	Main features	Main strategies	FNS outcomes	Other outcomes
Citrus farmer in Castellon (Spain)	"He is a part-time farmer, not very young. He is 'small' considering the time dedicated to the farm (i.e. part time or retired) beyond the economic and physical size. To be able to access markets, he is forced to join a cooperative in order to externalize production and commercial functions. He is constrained by retailers' quality and quantity standards. He does not do self-provisioning."	Cooperative membership and Externalization Downsizing Reduced income acceptance Pluri-activity	Household income	Land abandonment mitigation Preservation of the traditional agricultural landscape Economic Development
Lamb farmer in Poland (RR Nowotarski)	"He is small not only in terms of physical and economic size: land is highly fragmented and scattered, limiting access to CAP funding. Lamb meat is not traditionally consumed by locals, therefore it is mostly exported. Because of their limited size, access CAP support is not possible, therefore lamb farmers are encouraged to engage in an informal practice of exchanging/sharing plots with other similar farms, in order to get to the minimum size eligible for CAP support. Institutions, even when they know, do not complain or contrast this practice, as they anyway have to pay for existing and utilized land, and only once for each plot."	Informal cooperation and sharing CAP support Cooperative membership Pluri-activity	Household income	Economic development, Maintaining cultural traditions Environmental preservation Social welfare
Potatoes farmer in Oeste (Portugal)	"Differently from other very small potatoes producers (around 600 sq metres), who farm for mainly self-provisioning, he is larger (around 8 ha) and more market-oriented. Nonetheless he is engaging in a range of informal exchanges (e.g. barter and work or good in exchange for services). He might turn towards intensification and market connections with retailers (not necessarily local) in the aim to have more profitable business."	Informal cooperation and sharing Household self-provisioning Downsizing Reduced income acceptance Short-chain networks	Self-provisioning Regional availability Diversity	Economic development Social welfare
Apple farmer in Nowosądecki (Poland)	"He is not only small in terms of farmed area and scale of production but mostly in terms of possibilities to product processing. He often uses machinery from bigger farms, for instance juice presses."	Cooperative membership Quality production (PDO, Private Trademarks) Short-chain networks	Regional provision Household income Self-provisioning Food system diversity	Economic development Social welfare Improved image of SF Maintained tradition of agricultural (orchards) production
Vegetable farmer in Lucca (Italy)	"He is a middle-aged farmer, produces zucchini on the land he received from his parents, together with his brother. He sells products individually and exclusively through wholesalers. Very limited investments were done on the farm over time. He produces vegetables in his backyard garden for self-consumption and also works as a gardener to integrate income."	Household self-provisioning Pluri-activity	Self-provisioning Household income	Land abandonment mitigation Preservation of the traditional agricultural landscape Maintaining cultural traditions
Peach farmer in Imathia (Greece)	"He is a peach farmer with 4 ha that has adopted modern cultivation methods (i.e. dens planting, anti-hail nets, cloud seeding, integrated production, recently the sexual confusion of insects). He sells his peach production to wholesalers for canning and then exporting to Germany and Eastern Europe, through multinational companies (e.g. Del Monte)"	Specialization Technological innovation Cooperative membership Integrated production	Household income	Economic development Mitigation of negative environmental outcomes through integrated production

the set-up costs to buy the means of transport for animals outweigh the benefits (Pork farmer in Rzeszowski, Poland). Farm production may be insufficient to harness the potential of processing plants, which are often not technically available for the small scale (Cereal farmer in Pisa, Italy). SFs attempt to link to larger farms to process products, allowing the use of assets (e.g. milling plants, presses, slaughtering facilities) required in peak seasons (Apple farmer in Nowosądecki, Poland).

Access to land is a well-recognized problem, and formal and informal solutions are practiced. For example, because of their too small size to access CAP support, farmers exchange or share plots with other similar farms, in order to get to the minimum size eligible for CAP support. The exchange and re-assignment is then formalized to gain access to CAP support. Institutions, even when aware of such arrangements, do not report on or counter this practice, as they would, in any case, have to pay for existing and utilized land, and pay only once for each plot (Lamb farmer in Nowotarski, Poland).

The prevalence of manual work over land and capital allows the farmer to closely monitor farming processes, as in the case of animal care (Cow milk producer in Córdoba, Spain). Sometimes the small scale allows carrying out accurate operations or taking care of the quality of animal feed, improving the quality of final products, by sustaining higher costs (Poultry farmer in Rzeszowski, Poland). For some products,

the small scale may be the only option for successful niche production (Honey farmer in Latgale, Latvia).

SFs rarely establish a direct relationship with larger retailers, due to the required quantity and stability of deliveries, compliance with standards and availability of logistics suitable to offset the remoteness of the farm. Cooperation, externalization of production functions and collective marketing are some of the strategies employed by SFs to overcome these limitations (Citrus farmer in Castellon, Spain; Peach farmer in Imathia, Greece; Meat producer in Pisa, Italy). Similarly, the costs of product certification may be disproportionately high in relation to the size of the output, therefore smallholders may comply with the production specifications but eventually decide not to undergo formal certification (Mixed cropping farmer in Oeste, Portugal). Nonetheless, cases show that direct access to markets – favored by direct sales or on-farm processing – are more challenging to farms of larger size. Specialized horticultural farms tend to be too large to access profitable markets through direct selling, while they are too small to supply large retailers (Vegetable farmer in Lucca, Italy). Nonetheless, there are also cases of SFs that are leading actors for some international value chains and global markets, for example the specialized orange producers in Castellón (Spain) and peach farmers in Imathia (Greece).

Table 6

Small farm cases in Group 3 contribute limitedly to regional production and market it mostly inside the region.

Case study farm	Main farm type	Main strategies	FNS outcomes	Other outcomes
Poultry farmer in Rzeszowski (Poland)	"He is a small farmer in a highly concentrated poultry meat sector; therefore, he adopts direct sales channels (i.e. personal contacts with customers, sale via the Internet). His approach is for high quality production: he raises noble breeds of poultry and uses natural animal feed."	Quality production (PDO, Trademarks) On/off-farm processing Short-chain network CAP support	Household income Diversity Regional availability Self-provisioning (limited)	Preservation of rare, noble poultry breeds (biodiversity)
Orchards and mixed cropping farmer in Bistrița-Năsăud (Romania)	"He is a middle-aged farmer, runs an extensively managed farm with his family, on around 2 or 3 ha of land aimed at family provisioning. He keeps working on the farm integrating with income from rural tourism, which delays the decision to exit farming."	Downsizing (towards abandonment) Household self-provisioning On-farm processing Multifunctionality (rural tourism)	Self-provisioning Household income Regional availability Diversity	Economic development Social welfare Environmental preservation
Vegetable farmer in Pieriga (Latvia)	"He is a professional middle-aged farmer on less than 5 ha helped by family members. He aims (dreams of) on-farm processing and hopes to diversity in order to maintain a stable income."	CAP subsidies Quality production Organic/integrated production (On-line) Short-chain networks	Self-provisioning Household income Regional availability Diversity	Economic development
Mixed cropping farmer in Oeste (Portugal)	"She is a business-oriented farmer, relatively young and new entrant, which runs mixed-cropping on a diversified farm. She carries out organic production, not certified, and processes her products on farm, to be sold in local agri-food local networks."	Quality production Organic/integrated production, Pluriactivity Short-chain networks On-farm processing (moving towards) Intensification and upscaling Short-chain networks	Self-provisioning Household income Regional availability Autonomy Diversity	Economic development Environmental preservation
Fruit farmer in Lucca (Italy)	"He is a business-oriented farmer, relatively young, received the farm from his parents. After losing his previous job, he decided to turn to farming. His wife has another job but helps on the farm when she is not taking care of the small children. He sells mainly through the local retailers and farmers markets and avoids consuming products at home not to reduce total sales."	Quality production Pluri-activity Cooperative membership (for input provision)	Household income Regional availability	Continuing the family tradition
Pulse farmer in Larisa (Greece)	"He is a small lentil, chickpea and bean farmer. Pulses are traditional crops which had been almost abandoned with the post-war agricultural modernization of the region, but during the last decade they are on the rise again. He sells to one of the three small local enterprises which process, pack and market the product. He is engaged in the cultivation of traditional varieties (local landraces) of pulses, with excellent results in terms of quality of products, satisfactory income, etc. The superiority of the local varieties in comparison to the imported ones is affirmed by local residents, who increasingly re-appreciate their quality characteristics, such as taste and easy digestion."	Specialization Off-farm processing	Self-provisioning Short chain networks Household income Regional availability Diversity	Old-traditional varieties of pulses are 're-invented' and re-used by young and new entrants in farming (valorization of biodiversity)

4.3. Small farms, their contribution to FNS and other outcomes

Considering FNS at farm-household and local level (the inner circle in Fig. 1), the SFs reported were, to some extent, both market-oriented and self-provisioning. This implies that a share of the production is kept for household needs and never reaches the market. Exceptions to this trend, are exemplified by situations in which there is a tradeoff between selling and self-provisioning, for example in specialized SFs (Fruit farmer in Lucca, Italy). The choices to 'first eat then sell' versus 'first sell then eat' reflect different ways of managing the farm, different levels of transaction costs required to reach the market and different household economic situations.

Farm-generated income can be the sole source of income, for instance when the local population do not have significant alternatives. This can also be a source of autonomy which some farmers take pride in: "Small farmers work for themselves and do not queue for social allowances" (from an interview in Latgale, Latvia). Otherwise, farming can represent an important source of income bringing half or more of the household revenues. In other cases, farm-generated income can represent just an

additional, or marginal, source of income, the other sources being represented by off-farm jobs, retirement pensions, and social welfare, as observed in most of the regions. Multifunctional activities (e.g. agro-tourism), on-farm processing, or selling to independent processors and intermediaries, serve as additional sources of income, depending on the SFs' capability to build effective linkages with food businesses.

It should be noted that household self-provisioning does not necessarily mean 'self-sufficiency'. It depends on specific farm-household features and products, that can be relevant, to a varying degree, for the households' daily consumption. Farms with backyard gardens and a diversified production of fruits and vegetables may have higher and more important self-provisioning (mixed cropping farmers in Romania, Italy, Portugal) than those specialized in one product (particularly non-staple foods such as meat from livestock, e. g. West Scotland). More specialized farms can have low self-sufficiency levels, but a full self-provisioning of their product, as the part-time or hobby olive oil farmers in Italy, who sell the surplus after fulfilling the household's needs. Moreover, provisioning concerns the extended family networks rather than the immediate household: this is witnessed in several regions

Table 7

Small farm cases in Group 4 contribute limitedly to regional production and market it mostly outside the region.

Case study farm	Main farm type	Main strategies	FNS outcomes	Other outcomes
Lamb farmer in West Scotland (Scotland)	“He is a business-oriented crofter, managing around 10 ha. His croft was intentionally created small so that he would work part of the time for the landowner or ‘laird’. He specialized in sheep breeds for internet marketed wool, but it is impossible to support a family with his little business and a few hundred sheep. Therefore, he is also a professional estate agent. Not likely to rely on hired labour, he doesn’t use cooperatives nor invests in certification. Farming is a lifestyle choice which aligns with wanting to raise kids in an idyllic location and shows commitment to upholding (community/family) traditions.”	On/off-farm processing Specialization (breed sheep for internet wool business)	Self-provisioning Household income Autonomy	Environmental preservation Lifestyle dimension
Pork farmer in Rzeszowski (Poland)	“He is a farmer with around 20 pigs. He is small in relation to the value chain and the limited possibility of choosing sales channels, he lacks bargaining power (as price is set by intermediaries). He transports his animals to a nearby large farm to access markets. Unitary costs of production are high and he lacks a specialized means of transport to transport pigs to the collection point or to the processor, while the costs for renting would make the production much less profitable; also the costs for veterinary services are relatively higher than for larger farms. He feeds pigs with more natural feeds. However, higher quality of meat is not well priced by the market”.	Downsizing (towards) Abandonment CAP support Quality production (feed)	Self-provisioning Household income Regional availability Diversity	Social welfare Animal welfare Limiting gradual disappearance of farms carrying out traditional animal production due to low profitability
Olive oil farmer in Córdoba (Spain)	“He is a business-oriented farmer with 15 ha (above 20 ha would be considered medium-large). The assets and mechanization of the farm, family labor, the dispersion of land parcels or the number of plots that make up the farm are also critical factors.”	Cooperative membership Organic, integrated production CAP support	Self-provisioning Household income Regional availability Diversity	Environmental preservation Economic development Limiting rural de-population Local Knowledge and cultural heritage
Wine producer in Córdoba (Spain)	“He is a small farmer as a secondary activity, with the help of his family, nonetheless he is business oriented, increasingly involved in wine tourism and recreational activities and supplements other sources of income, like many other local farm neighbors do.”	Technological Innovation Quality production (PDO, Trademarks) On/off farm processing	Self-provisioning Household income Regional availability	Economic development Recreation, wine tourism
Cow milk producer in Córdoba (Spain)	“This small dairy farmer manages approximately 75 cows and works full-time, as the tasks of handling livestock and milking require it, preventing them from practically any activity other than the care of their animals. In some cases, small farmers usually have other animals, such as sheep or pigs, or there are cases in which they own small areas of crops that do not require much dedication (cereal crops). Overall, his activity is very intense and full-time labour is required (1 AWU).”	Downsizing (towards) abandonment Cooperative membership CAP support	Self-provisioning Household income Regional availability	Economic development Limiting rural de-population (where abandonment doesn’t occur yet)
Olive oil farmer in Alto Palancia (Castellon, Spain)	He is a small part-time farm, specialized in olive oil production, very small in relation to olive farms found in Southern regions of Spain. He is located in Alto Palancia, and covers less than 5 ha, can be considered an extensive productive system (though sometimes irrigated) located in a semi-mountain area. He carries out other gainful activities located close to the urban centers. He is clearly oriented towards high quality extra virgin olive oil, processed and bottled at the local mills”.	Pluri-activity Cooperative membership Quality production (PDO, Trademarks)	Self-provisioning Household income, Regional availability	Environmental preservation There maintenance of current production systems, based on small farms with their diversity among sub-regions contributes to the conservation of unique valuable landscapes and the rural environment
Lamb farmer in Portugal (RR, Alentejo)	“He is a hobby farmer, very frequently found in this area. The household is composed of a couple with children, living in the village and employed in different sectors than agriculture. The farmer holds around 60 sheep for the production of lamb meat, with some help from the family. The meat produced is part of the diet of the household. Most of the land used for grazing is acquired on a temporary basis through informal agreements with the owners of the land (in exchange of lamb meat as payment). The	Short-chain networks (sells to different buyers) Informal cooperation and sharing, (land barter) Household self-provisioning CAP support for grazing Pluri-activity	Self-provisioning Household income Regional provision	Environmental preservation Economic development (limited)

(continued on next page)

Table 7 (continued)

Case study farm	Main farm type	Main strategies	FNS outcomes	Other outcomes
Lamb producers in Bute (Scotland)	producer sells the meat to intermediaries (based on the best price) as well as through auctions." "He is a part-time family farm, like many others in the area. The family holds 80 sheep. All family members help in the activities of the farm, despite having an employment also off-farm. The meat produced contributes to the diet of the household. The meat is mainly sold through auction markets and sales importantly contributes to the household income. The use of the land for grazing is strongly regulated by the state. The availability of land indirectly contributes to the local economic development."	Household self-provisioning CAP support Pluri-activity	Household income Self-provisioning (limited)	Environmental preservation; Economic development (limited)
Potatoes and vegetables farmer in Hedmark (Norway)	"This is a hobby farm producing mainly potatoes and few other vegetables on 0,6 ha of land. This is a family farm with adults working in sectors different than agriculture and where all the family helps in different tasks. The farm is practicing organic agriculture. The main products (potatoes) are washed before sale. The products are labeled with the farms own trademark and then sold to local retailers, restaurants, catering, a local paddle steam ship (which is a tourist attraction), and on farm (boxes). The farm has access to government subsidies but does not apply for it because they are too limited."	Quality production (private label) Semi-organic On farm processing Short-chain networks (retailers, boats, boxes outside the farm) Pluri-activity	Household income Regional availability Autonomy Diversity (limited)	Environmental preservation
Cereal farmer in Pisa (Italy)	"This is a specialized cereal farms, operating on several dozens of hectares, considered small compared to other cereal farmers and in relation to its value-chain. Ancient cereal varieties are produced on farm in limited quantities, but processed out of the farm, as he lacks the necessary machinery to process cereals himself (flour and bread), while the product is mainly marketed in local circuits."	CAP support On/off-farm processing Short-chain networks Multifunctionality	Regional availability Household income Self-provisioning Diversity	Landscape preservation Biodiversity of ancient cereals
Meat producer in Pisa (Italy)	"This livestock farm had to interrupt selling directly to retailers, due to increasing quality and safety requirements. He then joined a collective strategy, technically supported by the producer association, which linked him the local meat supply and, therefore, allowed producers to sell their products to supermarkets through a collective labeling scheme."	Cooperatives membership Quality production (private label)	Household income Regional availability Diversity	Economic development

confirming the importance of proximity-based relations and reciprocity in informal food chains regarding the access to fresh quality food, as for the pulse farmer in Larisa, (Greece).

These dynamics are likely to influence the 'utilization' dimension of FNS. Quite often, diets in some farming households tend to be strongly influenced by their farming activity, as they produce most of what they consume, basing their food intake on what they grow and selling only their surplus, exchanging food with other small farmers as long as it is needed. For instance, small farmers in Alentejo (Portugal) or in Larisa (Greece) maintain a high diversity of products on their farm, for family and neighbors or informal exchange, and sell the surplus at the farm gate or in local markets. This encourages fresh food consumption also beyond the inner circle of the farm household, potentially also influencing the forms in which food is processed and utilized. For example, some farms retain some raw products for self-consumption and sell the remainder for processing, for instance keeping milk and fresh cheese for self-consumption and selling milk to dairies for processing into butter and hard cheese, as in Stirling region (UK). In other cases, SFs engage in on-farm processing for self-consumption, like the pork producers in Rzeszowski, (Poland). The survival of local food-related traditions regarding food preparation, storage and consumption can be seen as another specific SF contribution to FNS: in Latgale (Latvia) on-farm small-scale processing represents not only a profitable niche market, but also a way to value old recipes and to preserve local culinary traditions.

Regarding the contribution to FNS at regional and global levels

(identified by the middle and the outer circles in Fig. 1) the extent of the contribution of SFs to the availability of different products was implicit in the criteria used for sub-division of partners into the groups. The relatively more numerous examples from groups 3 (Table 4), and group 4 (Table 5) indeed indicate that the contribution to the availability of several products, spanning all European macro-areas from North to South, East and West is limited. Exceptions are more evident in Eastern and Southern European regions, where for some products most of the availability in fact comes from SFs, and such products stay in the region (e.g. the potato farmer in Rzeszowski, Poland). Despite this being less marked in Northern European regions, exceptions can be found as well, like honey production in Latgale, (Latvia), which is by far a sector led by SFs.

Particularly where product is prevalently destined to the regional markets (Groups 1 and 3), SFs contribute to regional food and nutrition security by fulfilling a demand for products not always met by larger and more conventional supply chains, contributing to a non-standardized food availability for local consumers, in farmers' markets and farm shops. When prices are affordable these farms also contribute to food access of nutritious food on the consumer side. SFs contribute to the diversity of food systems when rescuing local, heritage varieties (e.g. the mixed-cropping farmer in Oeste, Portugal; the pulse farmer who recovers traditional, high quality varieties of chickpeas and lentils in Larisa, Greece). SFs are often characterised by specific qualities, reflecting some peculiar food knowledge, farming methods, processing

skills, rooted in the local context. For instance the case of “pimentão”, a meat seasoning creme produced on farm, out of red pepper, as a frequent element of the regional recipes, only used in the Alentejo, (Portugal): with no legal processing facilities, SFs are informally allowed to sell this product, being an integrative part of the local food habits (from regional report, Alentejo, Portugal). Also, SFs contribute by farming on smaller, remote and fragmented farmland, often unattractive for larger farms and industrial agriculture, increasing the farmed surface and local production potential (fruit and vegetable, mixed cropping farmers in Italy and Romania).

Lastly, SFs contribute to a set of other outcomes, spanning economic, social and environmental domains. Beyond representing businesses that support regional economic development (e.g. fostering rural tourism), other relevant outcomes concern the enduring presence of small farmers in rural areas, slowing land abandonment and rural depopulation, despite the harshness of the conditions. Further, several examples mention the preservation of biodiversity and landscapes and not least, of the cultural value linked to continuing family traditions and preserving almost forgotten skills.

5. Discussion

The exercise of reflecting on the SF examples leads to some key considerations regarding the role of small farming in ensuring FNS within food systems.

The first relates to the definition of ‘small farms’ in a regional food system perspective: the diversity of farms’ profiles and the conditions in which they operate makes any simplistic criterion to define the ‘small farm’ problematic. The farms mentioned in the examples can be considered small in relation to structural and economic aspects, land fragmentation and accessibility, prevalence of labor over capital, (limited) time dedicated to farming activity, and/or pluri-activity. These are all categories widely acknowledged by a long-standing body of literature on small farm-households (Nagayets, 2005; Lowder et al., 2016; Fanzo, 2017).

Looking at the farm in a food system perspective suggests that the farm is small when the relative size of one or more of its resources (i.e. land, labour, financial capital) hinders or enables it to perform a range of functions in the food system. SFs can be defined in terms of their ability, or inability, to overcome their limits by performing key functions in relation to the farm-household livelihood, as integrating income through pluri-activity, and to market access, for instance by linking to larger farms with technological endowments, or externalizing functions to larger businesses. In other situations, “smallness” can be considered an enabler to performing specific functions, such as reconnecting with consumers, delivering goods and services to markets of limited size (as with small food businesses), directly managing farms’ operations and engaging in informal food exchanges.

The second consideration relates to FNS and other outcomes. Examples show that SFs engage in multiple strategies and business models, delivering composite outcomes. At the level of the farm household, the combination of food self-provisioning and income provision contributes to food availability and access, enabling SFs to avoid or exit economic poverty situations, achieve subsistence or to attain access to fresh food with special qualities not available on other markets. At regional food system level, SFs access to markets is mediated by formal mechanisms - for instance, farmers’ markets both responding to consumers choices and supporting the small local farm - or informal proximity relations and local networks. Informal connections, built on social capital and trust, enhance the diversity of ways in which SFs contribute to local food system outcomes, such as dietary diversity and healthiness. The examples also show that SFs contribute to the global availability of food (i.e. outside the region of reference) when they are embedded in global value chains, and, as pointed out by Vorley et al. (2012) this has implications over small farm’s autonomy.

The last consideration follows the previous ones: out of the multiple

SFs’ contributions to FNS, the regional dimension in which they are embedded plays a key role. Scholars have long described SFs as a continuum between ‘subsistence’ and ‘commercial’, particularly with reference to eastern Europe (Davidova et al., 2009, 2012; 2014) and Mediterranean countries (Ortiz-Miranda et al., 2013; Salvioni et al., 2014). More recently, smallholdings have been assessed as complex adaptive systems capable of adapting to different contexts and changes (Orr et al., 2018). Rivera et al. (2020) suggest that the contribution of SFs to regional production is related to the density of SFs in the agricultural landscape, and their contribution to the regional food availability is driven by the characteristics of supply chains and market connections. Our examples show how SFs fulfill a ‘demand fitting’ function, reflected by the survival and flourishing of local short chains and (formal and informal) networks. These experiences contribute to food systems’ diversity, making the territorial system better equipped to reach all consumers with fresh and diverse food. Examples also show that SFs carry out a function of adaptively inhabiting the territory, whereby they farm on marginal plots of land, with ecological implications.

Concluding, SFs’ role in FNS cannot be fully appreciated, without considering both the rural environment in which they are embedded and the connections with the urban environments that allow them to flourish. Exploring the characteristics that shape regional food systems implies asking what are the conditions that hinder or enable the integration of SFs therein. In line with the more recent debates on food and rural development policies and city region food systems (Galli et al., 2020; Blay-Palmer et al., 2018; IPES, 2016), we believe that understanding how to strengthen the resilience of regional food systems is a policy relevant question, particularly in the current challenging times, as this will be beneficial to both SFs and FNS.

6. Conclusion

This paper contributes to recognizing the heterogeneity of SFs in regional food systems in Europe by explicitly addressing who are SF households in a food systems’ perspective and by characterizing their role in FNS. Farm business models are the outcomes of adaptation to the different contexts wherein farms are embedded (see also Palmioli et al., 2020; Orr et al., 2018). In this regard, we observe that size limitations allow farms to deliver multiple functions in relation to the contextual opportunities and constraints. Farms actively play across three types of contexts - local, regional, and global - trying to maximize the value for the farmer and the household. Thanks to their embeddedness in household and regional systems, SFs, depending on the context, produce private and public goods in terms of FNS, food systems’ diversity and resilience.

Policies should contribute to shaping the context at the various levels in which small farming can be adapted and contribute to a stronger provision of such private and public goods. To this end, the intermediate level of context (regional) is of critical importance, as it provides the setting where farms can play their diversity as a food system asset and get a better share of the added value in food systems.

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