WP3

Deliverable 3.3.

Synthesis report on the main insights gained from the in-depth assessments in 30 regions

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Table 0: D.3.3 Abbreviations

Acronym	Full term
AF	Analytical Framework
AFR	Africa
BG	Bulgaria
CF	Conceptual Framework
CV	Cabo Verde
CZ	Czech Republic
EE	Eastern Europe
ES	Spain
FG	Focus Group
FNS	Food and Nutrition Security
FR	France
FS	Food System
FSM	Food System Map
FSR	Food System Report
GDP	Gross Domestic Product
GH	Ghana
GR	Greece
SFS	Household
HR	Croatia
IT	Italy
KI	Key Informants
KN	Kenia
LT	Lithuania
LV	Latvia
M-R	Macro-regions
M&LF	Medium and Large farms
MW	Malawi
NE	Northern Europe
NO	Norway
PL	Poland
PT	Portugal
RO	Romania
RP	Regional Production
RQ	Research Question
RR	Reference Region
SE	Southern Europe
SF	SF
SFB	Small Food Businesses
TN	Tunisia
UAA	Utilized Agricultural Area
UK	United Kingdom
WP	Work Package

Executive Summary

This document presents an in-depth comparative assessment of the local and regional food systems analysed in SALSA. Its aim is to improve the understanding of the current and potential role of SF in regional Food and Nutrition Security (FNS). This deliverable is a synthesis report on the main insights gained from the analysis completed for the 30 reference regions.

The data used in this report was gathered in five major steps from WP3, combined with the different steps of the work in WP2, described in the respective Deliverables. The steps in WP3 are the following:

Step 1 led to the selection of four key products per region and provided the first overview of the regional food system with a first sketch of the food system map, per key product, for further analysis; this step was based on a simple descriptive analysis based on available statistical information combined with semi-structured interviews to key informants (KIs) in each region.

Step 2 provided direct information on SF (SF) and small food businesses (SFB) from a survey based on questionnaires to a diversified sample of SF in each region, where the key products are produced, and to small food business owners.

In Step 3 the food system maps were further validated and refined using inputs from focus group discussions, being one focus group per key product organized in each region.

In Step 4 the draft regional reports were prepared, peer-reviewed, and revised by each team.

Finally, in Step 5, the data from the reports on the food system actors and activities was extracted and analysed comparatively to produce this document as the main outcome using the food system maps as the main information source. The data analysis was done through descriptive statistical analysis and multiple component analysis.

The results are divided into 6 different subsections, each providing a different analysis contributing to answer SALSA's main research questions: first, a summary of the key socio-economic and agricultural profiles of the regions analysed is provided; second, the production estimations obtained in WP2 are compared to official statistics; third, an innovative approach to quantifying SF' contribution to their regional food and nutrition security (availability dimension) is presented; fourth, a comparative analysis of SF' market linkages is provided and the key patterns discussed; fifth, the key factors shaping food systems are identified; and finally, the small farm typologies obtained in D.3.2. are contrasted against the key characteristics of their particular regional food systems. At the beginning of each section, the key highlights are provided. A summary of those highlights is presented in the following bullet points:

- Three food system groups have been created depending on SF's contribution to regional availability of the products analysed: Small farms in group A are generally part of shorter chains that keep SF production locally. In group B SF are also part of short food chains or alternative food networks, but also some part of their production goes into mainstream commercialisation pathways. SF in group C are generally export oriented.
- Food systems found in group A are more prevalent in Africa and Eastern Europe. Group B is more common in Eastern and Southern European Food Systems. And group C is most common in Southern European FS.

- A balanced distribution is observed across 3 types of food systems: 34% of the food systems are locally oriented; 34% of them are export oriented, and 32% are balanced in terms of both locally sourcing food and exporting it;
- South European small farms establish, in average, a lower number of commercialization pathways for their products than the other 3 macro-regions. In SE, the agricultural sector is specialised and organized, thus, easily granting access to SF to mainstream markets. This could imply a lower need for SF to find alternative paths to commercialise their products;
- Key actors for SF in SE and FS group C are cooperatives and processors; for SF in NE and SF group B, proximity consumers are the key actor; and for SF in EE and AFR, and FS groups A and B, arm and HH self-provisioning is the main actor.
- The self-consumption flow is present in 92% of the food systems analysed. The relative importance of this connection diminishes from AFR to EE to NE to SE progressively. The more specialised and export oriented the food system is, the less important is the self-consumption flow for small farms
- Large farms play an important role for SF's mainly in food systems where the sectors are well organised and specialised. In those cases, changes on, or the absence of medium-large farms could break the sector's organisational structure, causing shocks to SF who would struggle to access the markets they access nowadays through cooperatives, processors and distributors. This also means SF have less control con their production, prizes etc. and depend on the governance arrangements created by the more powerful farmers.
- "Conventional strugglers" are the most common type of farms in food systems where SF contribute most to regional FNS, followed by "business specialised". "Conventional entrepreneurs" are the most common type of small farms in food systems where SF contribute least to FNS. Conventional strugglers" together with "business multifunctional" small farms are those who stablish largest number of direct connections with the market.

Our results bring new insights to the current debate around SF and their contribution to FNS, which argues that SFs are still a key element of global FNS. Our results are in line with these arguments and bring a much needed focus on European small farm, evidencing that there are still many SF in Europe supporting regional FNS with locally supplied and produced food.

1. Introduction

1.1. Background

Food and Nutrition Security depends to a great extent on the capacity of the food system to ensure access to sufficient, nutritious and culturally acceptable food to people (Grando, 2018; Ericksen 2008a; Ericksen 2008b). In order to understand the current and potential contribution of SF to FNS, the concept of food system is the necessary link to connect them. According to Ericksen (2008a) and Ingram (2011) a food system is constituted of actors and activities that interact in order to produce a series of outcomes. One key outcome of the food system is FNS (Ericksen, 2008a).

FNS is composed of 4 major components (FAO 2006, 2008). In SALSA's conceptual framework (Grando, 2018), these components are defined as follows:

- **Food availability** is the availability of sufficient quantities of food of appropriate quality, supplied through domestic production or imports (including food aid)
- **Food access** is the access by households and individuals to adequate resources (entitlements) for acquiring appropriate foods for a nutritious diet.
- **Food utilisation** is the use of food through adequate diet, clean water, sanitation and health care to reach a state of nutritional well-being where all physiological needs are met.
- **Food stability**. To be food secure, a population, household or individual must have access to adequate food at all times. They should not risk losing access to food as a consequence of sudden shocks (e.g. an economic or climatic crisis) or cyclical events (e.g. seasonal food insecurity). The concept of stability can therefore refer to both the availability and access dimensions of food security.

All these concepts are addressed by SALSA's different WPs with more or less detail and through the use of a territorial approach[1] (Brunori, 2018). The use of a territorial approach responds to one of the key recommendations of the OECD (2016), where a claim to look at the regional and context-specific nature of FNS is made, arguing that a paradigm shift is needed in addressing FNS, in a way that it embraces multi-sectoral, bottom-up and place-based interventions. A territorial approach allows for a wider analysis where within-country inequalities and disparities can be detected, as well as allowing for the exploration of the multi-dimensional, multi-actor and multi-level nature of FNS (Cistulli, 2014).

The contribution of SF to FNS can strongly depend on the way they are connected to food systems (Grando, 2018). There are different flows that are activated through specific connections to the food system, i.e. marketed surplus can be sold to cooperatives, local markets, national or global supply chains, while non-marketed surplus can be distributed through reciprocity networks (HLPE, 2013). Farms also activate flows of labour, information and money, as well as flows related to the different strategies SFs follow. The relational configurations farmers develop with other farms and with other actors shape the properties of the food systems to which they are connected. For example, a strong proportion of local production connected to global value chains may put local food security at danger (Grando, 2018). Thus, the contribution of SF to FNS needs to be explored mainly through analysing SF connections and links to the market.

[1] Territorialised food systems are a set of dynamic interactions between human (households, enterprises, institutions, etc.), natural (ecological, spatial, biophysical) and technological elements which results in a range of activities and outcomes, such as FNS (Brunori, 2018)

Thus, this specific report aims to analyse, precisely, the contribution of SF to the **availability** dimension of regional FNS. This is done by looking from a **regional** level perspective at the **activities and flows** activated by SF, or in other words, small farm's market linkages, through the analysis of different key food products in 30 reference regions in Europe and Africa, which in total lead to 109 food products systems (being each product in general analysed in more than one region).

1.1.1. Market linkages

The role of SF in the food system is, to a great extent, shaped by the way in which farms are linked to value chains (also called commodity chains). At its most basic, this refers to the linkages that connect production with processing, trade, retailing and finally, consumption (Jackson *et al.,* 2006). A commodity chain approach looks at how the different parts of the chain are linked together – who buys from whom, how much, and at what price.

Modern agricultural value chains are characterised by a great degree of power and concentration at the retail and distribution end, i.e. the chains are dominated by a few large supermarket firms (Vettas, 2007; McCullough *et al.,* 2008). This concentration has resulted in a number of features of modern supply chains: 1) procurement systems tend to be centralized, meaning that most food passes through large aggregation and distribution centres; 2) private standards (in addition to government regulation) play an important role governing the quality and hygiene of food; these standards are set by the retailers, and transmitted by way of contracts to suppliers; 3) retailers rely on economies of scale to drive efficiency and reduce costs; and 4) prices at the retail end have been driven down (Vettas, 2007).

These characteristics of modern agro-food chains pose unique challenges and opportunities to smallholder farmers. On the one hand, SF can have a competitive advantage in products that are labour intensive—as they can mobilize cheap or free family labour—and because they have "intensive local knowledge" (Poulton et al., 2010). On the other hand, the concentration of retail and distribution has also driven concentration and increases of scale at the production stage, meaning that procurement chains prefer large-scale suppliers. SF are at a disadvantage for a number of reasons: they are only able to produce at small scales, and thus have relatively high transaction costs and cannot benefit from economies of scale; due to their limited assets and capital, they are potentially less able to comply with stringent quality and safety standards; and the lack of coordination among farmers reduces their bargaining power with their buyers (van der Meer & Ignacio, 2007).

Facing these obstacles to supply modern, supermarket-led supply chains, SF must employ a number of different strategies to access markets. The first has been through improving their collective action, i.e. to get organized in associations or cooperatives that help them to solve the problems of scale, market power, and transaction costs (Markelova et al., 2009). Second, there has been a shift from the production of undifferentiated commodities to a greater focus on differentiation and specialization as a means to add greater value (Vettas, 2007). Finally, SF have sought to bypass modern procurement chains by selling directly to consumers, for example through farmer's markets and other forms of community supported agriculture (Brown & Miller, 2008). Food self-provisioning has also become an important adaptive strategy, by being a source of food independent of global changes, market fluctuations and economic crisis (Renting, Schermer, and Rossi 2012). Food Self Provisioning is important to all four dimensions of FNS described by Erickesen (2008), though mainly to food access and food utilization. Through the food produced by themselves, households can more easily afford food, in particular the food that suits their habits and preferences (access), which at

the same time has a social value and reduces food safety problems (utilization) due to less need of conservation and transport (Ingram 2011).

The analysis of food systems presented here derives many conceptual and methodological elements from value (or commodity) chain analysis. We have structured our analysis largely around key products, with the understanding that their supply chains provide insights about distinct relationships between farmers and their markets. We have thus sought to develop detailed maps of the commercialization pathways available to SF, both within modern procurement systems and within local systems.

1.2. Introduction to WP3 D.3.2. (Objective of Deliverable)

As stated in Deliverable 3.1. section 1.2. this WP aims at carrying out, in the 30 reference regions selected in WP2, an in-depth assessment of local and regional food systems. The assessment aims to improve the understanding, in a very diverse set of regions, of the current and potential role of SF and other small and medium-sized food businesses in regional Food and Nutrition Security (FNS), paying particular attention to the diversity, complexity and context-specificity of local and regional food systems.

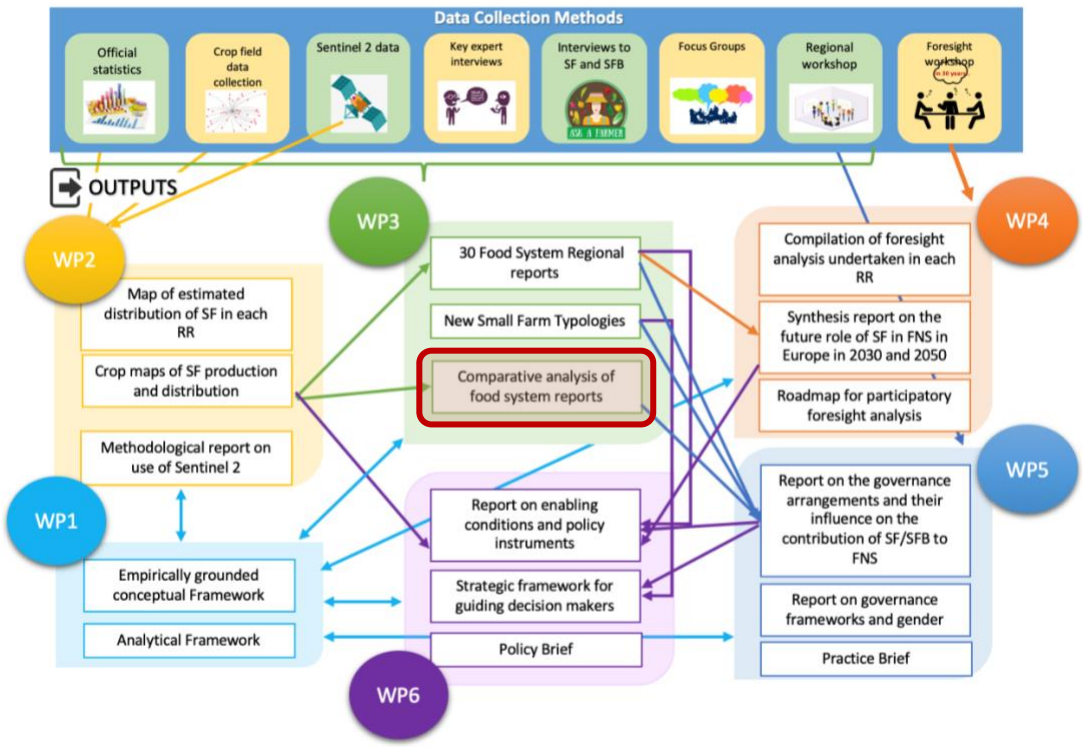
The results from WP3 analysis will be presented in 3 deliverables:

- **D.3.1** – Set of 30 regional reports with the results of the validated in-depth analysis of regional food systems and the contribution of SF and related small food businesses to FNS (reports based on a common reporting template). M33
- **D.3.2** – Report on diverse small farm situations and livelihood strategies, for all regions, identifying similarities and trends, and requirements for the improvement of existing typologies. M36
- **D.3.3** – Synthesis report on the main insights gained from the in-depth assessments in 30 regions (Synthesis report).M36

This document is **D.3.3. Synthesis report on main insights** and responds particularly to task 3.5. Comparative analysis and synthesis. Its main aim is to highlight the key results from the in-depth assessment as presented in the reports for each of the 30 reference regions, putting particular emphasis on identifying commonalities and context specificities, and on extracting the more generalizable lessons learned. For the full list of reference regions analysed please refer back to Deliverable 3.1. section 1.2.

Figure 1 below shows the main interconnections between all SALSA's WPs. Output for deliverable 3.3. is highlighted with a red square.

Figure 1. Main outputs per WP and data flows



1.3. Research Questions

Table 1 represents an updated, simplified guide to indicate how WPs, analysis and research questions are aligned. There are a few differences compared to the table presented in D. 3.1. section 1.3. which are due to a structural reorganisation of deliverables and internal talks within SALSA's partners. SALSA's research questions addressed in this deliverable (3.3) are those highlighted with the red square below.

Table 1. FNS dimension, hypothesis, related research questions and reporting WP

FNS Dimensions	Hypothesis	Research Questions	Reporting WP	Deliverable
Food Availability	**Hypothesis 1.** SF is a relevant source of sustainable food production (availability) for many regional food systems	1. Which food system actors and activities are involved in the generation of the FNS outcome in the reference region?	WP3	D 3.1 (Regional level) D 3.3 (Comparative analysis)
		2. What is the estimated production capacity of SF in each region	WP2	D.2.4.
		4. What is the position (and importance) of SF in the Regional FS	WP3	D.3.1 (Regional level) D.3.3 (Comparative analysis)
		5. How are SFB connected to SF and the regional food system?	WP3	D.3.1 (Regional level) D.3.2. (Comparative analysis)
Food Access	**Hypothesis 2.** SF and SFB provide food and incomes for rural households (access and utilization) in many regional food systems	3. What is the relevance of non-marketed SF production for rural SFS?	WP3	D.3.2.
Food Utilization				
Food Stability	**Hypothesis 3.** SF and SFB increases food systems' diversity thereby contributing to its resilience (stability)	7. What supports and threatens the role of SF in the food system?	WP5	To be provided by WP5 leader
		8. What have been the trajectories of SF?	WP3	D.3.2
		9. What are SF and SFB perspectives for the future?	WP4	To be provided by WP4 leader
		10. What are SF resilience strategies to face social, economic and environmental constraints?	WP3; WP4	D.3.2. and to be provided by WP4 leader
Cross Cutting Issue		6. Which types of SF are identifiable within each region?	WP3	D.3.2

2. Methodology

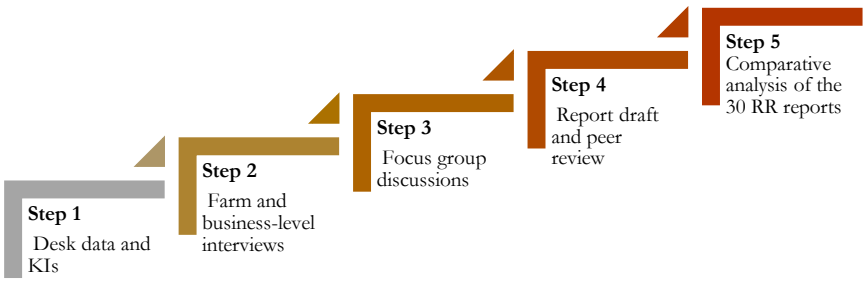
This section is divided into 2 sub-sections: data collection, which summarizes the information already provided in D.3.1.; and data analysis, which provides the detailed procedures used for the comparative analysis.

2.1. Data collection

This deliverable is a comparative summary of the 30 Food System Regional Reports presented in D.3.1. Therefore, the data collection methods are the same and correspond to the same tasks as stated in the GA: 3.1. Inquiries and interviews; 3.2. Stakeholder selection for the FG; 3.2. In-depth assessment.

The methodology involved five major steps, each of which drew from different types of data and sources (see Figure 2). Step 1 involved the selection of key products in each region and provided the first overview of the regional food system for each product selected; it was based on available statistical information and semi-structured interviews to a diverse set of key informants in each region (KIs). Step 2 provided direct information on SF and small food businesses from questionnaires to a diverse sample of small farmers and small food business owners. In step 3 the food system maps were further validated and refined using inputs from focus group discussions, with one focus group organized per key product. In step 4 the draft regional reports were prepared, peer-reviewed, and revised; and finally, in step 5, a comparative analysis of the food systems presented in the regional reports was completed. In the few regions analysed by sub-contracted partners the requirements varied from those analysed by full partners, in terms of the extension of the data collection. Step 1 and 4 were identical for both types of partners. Sub-contracted regions carried out fewer small farmers interviews than in full partner regions, and focus group discussions were optional rather than mandatory.

Figure 2: Methodological steps employed for this deliverable



These five methodological steps, which are described in detail in section 2.1. of deliverable 3.1. were carried out for each region. All teams were provided with identical protocols and reporting templates to ensure the comparability of the data in Step 5. Both protocols and templates were checked, informed and validated by WP3 leads.

The data hereby collected has been combined with data collected and analysed in WP2, which provides production estimates of SF, as an input to the analysis of the role of the SF in the regional food systems, as described in the next section.

2.2. Data analysis

The comparative analysis of the 109 food systems required a systematic approach to reduce the complexity and understand the key patterns underlying the diverse set of food systems. The analysis presented in this D.3.3. is based on data from the following sources of information:

1. **Region-specific data of the food systems**

   This is one of the key outputs of Step 1 shown in section 2.1. above. This data was obtained from each team using national and regional level statistics (desk-based analysis), and consists of basic demographic and economic data at Reference Region (RR) level with focus on land use, agricultural activity and SF' presence.

   The indicators on the reference region (NUTS 3 level) concerning demographics, social and economic features are drawn from Eurostat data base:

   (http://ec.europa.eu/eurostat/web/rural-development/data). However, when data at NUTS 3 level was not available from Eurostat it was retrieved by each partner at national level, or at any other level where the most significant information was available (especially for African regions, where reliable statistical data is sometimes lacking).

2. **Food System maps and narratives including detailed descriptions and estimations of fluxes.**

   Food system maps and narratives were completed per region and per key product selected. Food system maps were created with data collected in Steps 1, 2 and 3. Please refer back to section 2. of deliverable 3.1. for full details on the methodological steps. For the purpose of the comparative analysis, a common template for the food systems maps was provided.

   These maps describe and quantify a simple food system map, where the key elements are mainly the actors and the activities (from production to consumption) of the food system. It is this part of the definition of the food system as understood by Ericksen (2008a) that WP3 focuses on for the analysis of SF' role within the system. Thus, the food system activities grouped into four categories: production, processing, distributing, and consumption and the key actors were recorded for each food system. The first three categories constitute the food supply chain (Ericksen, 2008a).

   Additionally, taking into consideration that the aim is to analyse small farm's role within the food systems they are part of, for the purpose of comparison and to ease the systematic review, in WP3 we chose to map only those actors that are related to SF' activities and their outcomes. For example, cooperatives buy products directly from SF, while wholesales usually receive SF production through distributors, thus cooperatives and distributors are kept in the analysis, while wholesalers are excluded.

3. **WP2 data on small farm's production potential**

   Data from WP2 on SF production or yield potential[2] was also used for the analysis shown in this deliverable. Because this data was not available for all products and regions due

[2] "Yield potential is defined as the yield of a cultivar when grown in environments to which it is adapted, with nutrients and water non-limiting and with pests, diseases, weeds, lodging and other stresses effectively controlled (Evans and Fischer, 1999).

to technical problems of different kinds (see D 2.4. for a detailed explanation), when this data was unavailable, we used the most up to date national and regional level statistics. This decision is endorsed by the evidence deriving from WP2 analysis, that there is a strong convergence between Figures issuing from official statistics and from the WP2 calculations (see Section 3.3. below). This strengthens the validity of the official statistical data. For those few cases when official statistics did not exist either, a panel of experts from each team used an estimation based on data obtained from Steps 1, 2 and 3.

4. Small farm typologies

The SF typologies presented in deliverable 3.2. are also used in this comparative analysis. Acknowledging the different types of SF results in a more accurate analysis, moving away from averages and focusing on the different realities of the SF potentials and limitations. The types of SF obtained with the analysis of the survey data, are here used for comparative purposes and in order to understand how small farm types fit into the different food system groups and how they may affect one another.

With these four sources of information (1-4. above) and following the steps for a systematic analysis and interpretation of the data collected described by Fitz-Gibbon and Morris (1987) and Boaduo (2011), a database was created containing a set of indicators describing each of the **109 food systems analysed in WP3**. Indicators are both numerical and categorical and were divided into 3 main categories in order to get precise measurements of the variables concerned (Yin, 1994):

Category I. Indicators describing the socio-economic and agricultural profile of the region.

Category II. Indicators describing the key products and their production and consumption patterns (balance sheet).

Category III. Indicators describing the intrinsic food system characteristics: key activities and actors.

Once the database was finalized, a systematic analysis of the database could be performed. For this, we used 2 different types of analysis:

1. Descriptive statistical analysis: which we have used to describe the basic features of the food systems in a comparative manner and to clearly visualize the patterns emerging from the different food systems (Hay, 1973).

2. Random forest analysis: In order to evaluate which regional and internal food system characteristics (independent variables) play a key role in shaping those food systems and small farm's role within them, three classification models were created by using Random Forest (RF) algorithm.

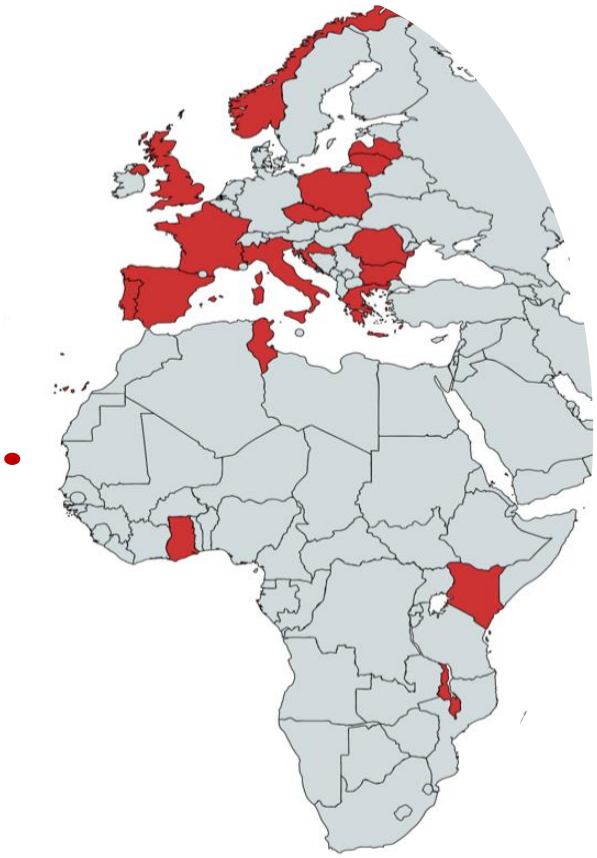
3. Results

The results section is divided into 6 different subsections, each providing a different analysis contributing to answer SALSA's research questions (see table 1): first, a summary of the key socio-economic and agricultural characteristics of the regions analysed is provided; second, the production estimations obtained in WP2 are compared to official statistics; third, an innovative approach to quantifying SF contribution to their regional food and nutrition security (availability dimension) is presented; fourth, a comparative analysis of SF' market linkages is provided and the key patterns discussed; fifth, the key factors shaping food systems are identified; and finally, the small farm typologies obtained in D.3.2. are contrasted against the key characteristics of their particular regional food systems.

3.1. Summary of key characteristics from the regions analysed

This section aims to provide a short regional overview of the reference regions included in the analysis. Reference regions are found across Europe and Africa, and as such, many differences and similarities can be observed (the map shows the countries in which the RRs analysed are found).

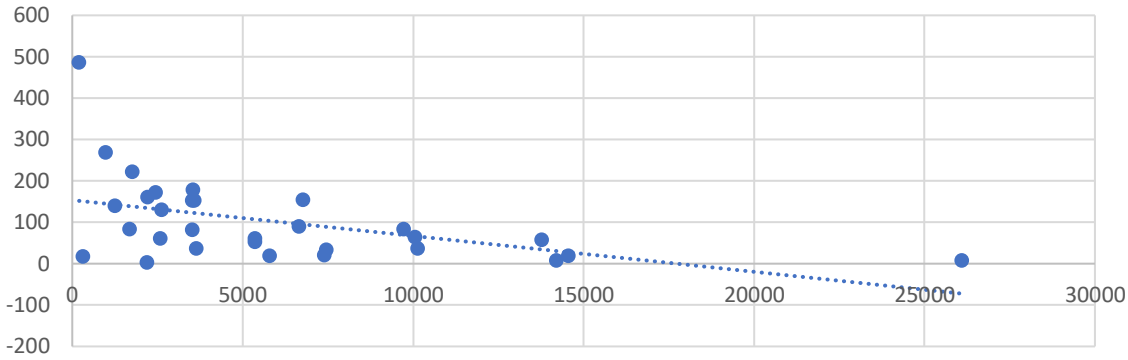
Figure 3. Countries where the RR analysed in SALSA are found



The RRs analysed vary greatly in terms of both land size and population density. The largest RR being Hedmark (NO) and the smallest being Ugunja (KN).

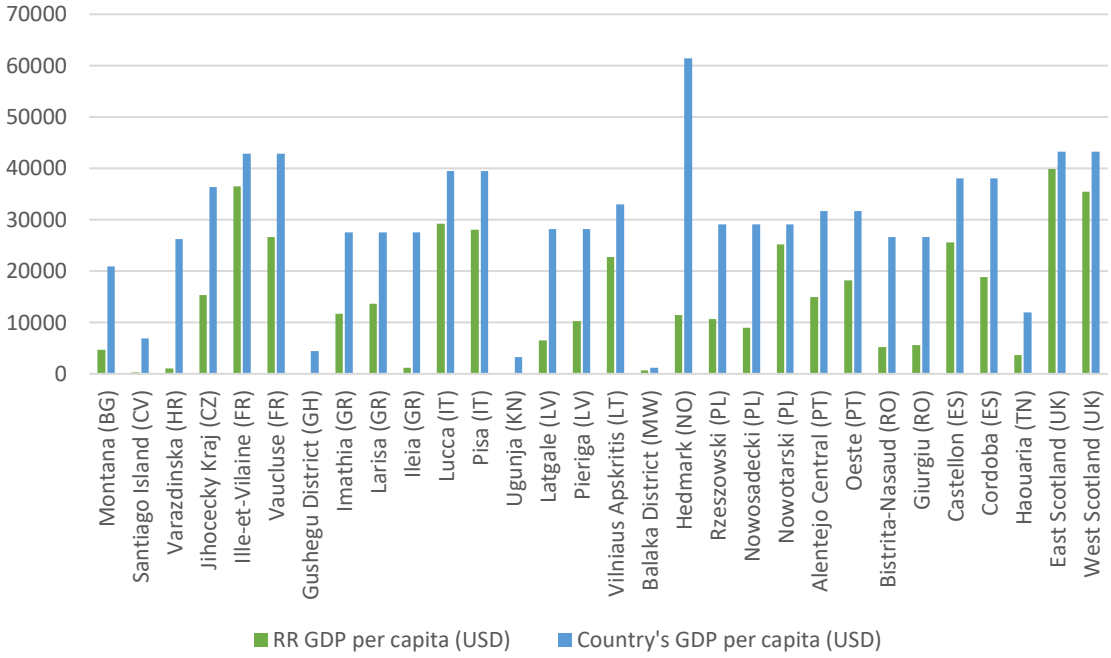
The RR with the highest population density is Ugunja (KN) and the one with the lowest is Hedmark (NO), what reflects an overall tendency in the considered regions: the larger the RR, the less densely populated it is (see Figure below). For Europe, this can be explained by the nature of the regions considered: they are NUTS 3 regions, defined for administrative purposes as thus with the population and economic activities, and as such smaller in area, in regions with higher population density and larger in area, in regions with low population density.

Figure 4. Land Size (sqkm) vs. Population Density (people/sqkm)



In terms of GDP (normalised using Power Purchasing Parity), Figure 5 below shows that all RR have lower regional GDP (most recent data set available in each country's statistics) than the average Country's GDP (year 2017 World Bank data), in some cases much lower GDPs. The selection of the reference regions was performed aiming for the inclusion only of rural regions with no larger urban area included, and therefore the low GDP could have been expected. These results are in line with the OECD (2016) where the economic disparities across territories and even countries are highlighted, and used as a key argument towards using a territorial approach when analysis food systems and FNS.

Figure 5. GDP Per capita in RR and Country of RR

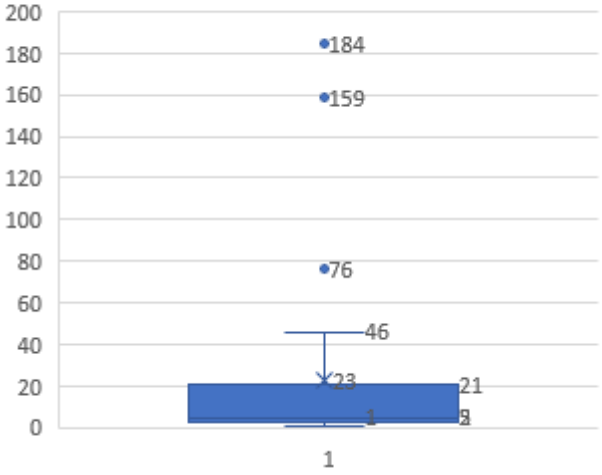


Although for some African RRs there is no regional GDP data available, we can observe that their Country's GDPs are the lowest out of the sample. However, some European RR also have regional GDPs lower than 10000 (USD): Montana (BG), Varazdinska (HR), Ileia (GR), Latgale (LV), Nowosadecki (PL), Bistrita-Nasaud (RO) and Giurgiu (RO). Regions with highest regional GDPs (>25000) are East and West Scotland (UK), Castellón (ES), Nowotarski (PL), Pisa (IT), Lucca (IT), Vaucluse (FR) and Ille-et-Vilaine (FR).

The difference between the country's GDP and the RR's GDP, has a difference in median of 13767 USD. The Gross Domestic Product *per capita* in European Union was last recorded at 36593.03 US dollars in 2017[3]. Therefore, all the RRs within the sample except Ille-et-Vilaine and the two Scottish RRs, have lower regional GDPs that the EU's average.

The average size of farms of all RRs together is 23ha while de median is 5ha, showing that there is a very large majority of SF and then a smaller number of very large farms which pull the average up. See box plot below for more detailed info.

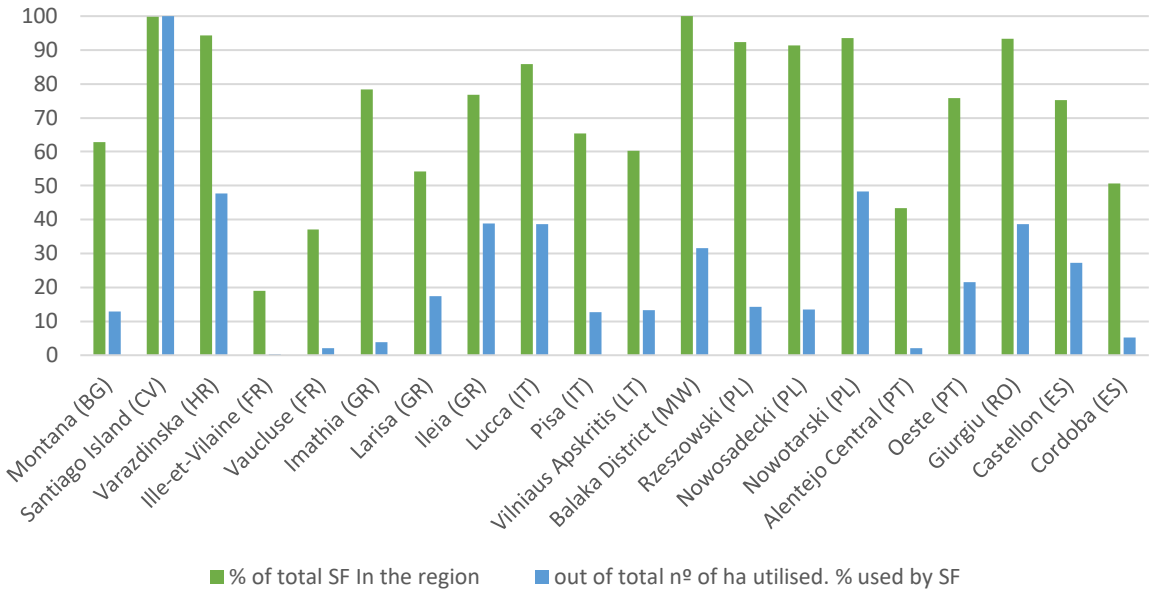
Figure 6. Average farm size (ha)



SF in most RR represent more than 60% of the total nº of farms in all regions analysed. Its numbers range from 11% in Hedmark (NO), to 100 % in Santiago (CV) and Balaka District (MW). It is therefore possible to say that in the RRs analysed, SF are big in numbers, although few official secondary data on area occupied by these SF was available (only 19 out of 30 RRs, 2 out of 5 in Africa remaining). A more detailed statistical description of this data is provided in deliverable 2.1.

[3] https://tradingeconomics.com/european-union/gdp-per-capita

Figure 7. % of SF and % of total UAA utilised by SF (ha)



As expected, there is a strong inverse correlation between the % of SF in the region and the UAA occupied by SF.

3.2. Estimation of SF potential production (WP2)

WP2 produced an estimation of small farm's potential production using the innovative approach of satellite images and remote sensing technology (see D.2.4.). Data on small farm yields and production quantities has been used in WP3 in many parts of the analysis (it was a key variable from Category II variables on SF products and production quantities). Due to methodological choices described in detail in D.2.4., data on production estimates was generated for 25 % of all products analysed. This sample provides some interesting conclusions when comparing WP2 results and national level official statistics (see Figure 8 below).

Figure 8. Crop productions (tons)

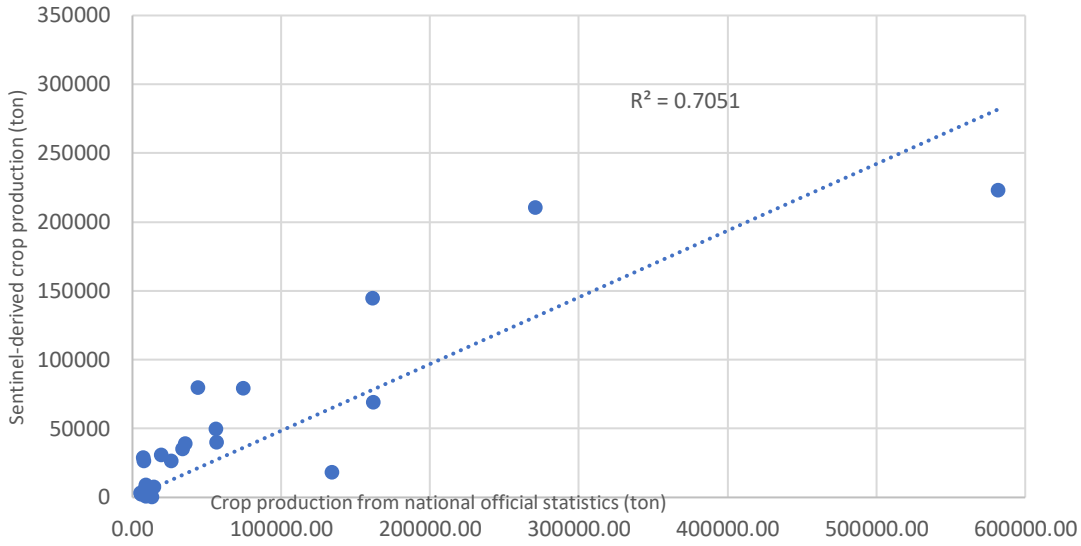


Figure 8, above, shows that when comparing the production data obtained through WP2 methodology and the national official statistics (obtained by each SALSA partner) the values do not diverge much (R^2=0,7). The method set up and tested in WP2 aimed for a high accuracy of data on small plots land cover and related production estimates. With this convergent behaviour of both data sources, we both can validate the accuracy of the statistical data and the relevance of WP2 method to provide reliable data when national official statistics are not available at the level required, in this case, NUTS3. Also, if the level of information required is so micro no official statistics are generated, WP2 methodology allows for this data to be produced. The crops for which we have data from WP2 and the SF potential contribution (%) for the total regional production are presented in Table 2, below.

Table 2 - Estimated share of the total regional potential production by SF, for selected crops in each of the Reference Regions of SALSA

Code	RR	Key crop mapped in WP2	Potential SF production (%)
R1	Montana (BG)	Cereals	4.28
R8	Imathia (GR)	Peaches	70.85
R9	Larisa (GR)	Vegetables	1.12
R10	Ileia (GR)	Vineyards	100.05
R11	Lucca (IT)	Olive grove	68.28
	Lucca (IT)	Vineyards	74.66
R12	Pisa (IT)	Cereals	5.33
R14	Latgale (LV)	Wheat	6.44
R15	Pieriga (LV)	Cereals	2.09
R16	Vilniaus Apskritis (LT)	Vegetables	19.07
R19	Rzeszowski (PL)	Cereals	39.61
	Rzeszowski (PL)	Potatoes	75.28
R20	Nowosadecki (PL)	Cereals	43.80
	Nowosadecki (PL)	Apples	86.36
R21	Nowotarski (PL)	Cereals	65.45
R22	Alentejo Central (PT)	Vineyards	19.00
R23	Oeste (PT)	Pears	20.18
	Oeste (PT)	Vineyards	22.33
R24	Bistrita (RO)	Orchards	16.30
R25	Giurgiu (RO)	Cereals	20.28
	Giurgiu (RO)	Sunflower	18.67
R26	Castellón (ES)	Citrus	108.05[4]
R27	Córdoba (ES)	Cereals	1.84
	Córdoba (ES)	Olive grove	11.90
	Córdoba (ES)	Vineyards	43.00
R28	Haouaria (TN)	Tomato	102.14
	Haouaria (TN)	Pepper	92.60

Potential production values vary a lot across reference regions and product types. From very low for vegetables in Larisa (GR) to really high for vineyards in Ileia (GR), and tomatoes in Houaria (TN).

[4] The reason why some values are higher than 100% is that the area provided by national statistics is smaller than the area obtained with satellite imagery, more details in D.2.4.

3.3. Contribution of SF to their regional food systems and regional FNS (availability)

Section Highlights: In many of the food systems analysed (~ 40%), SF production represents up to 20% of the total regional production.

Food systems are divided into three groups, each representing roughly a third of the total sample: 1) locally oriented; 2) export oriented, and 3) balanced in terms of both locally supplying food and exporting it.

Regarding SF contribution to the availability dimension of FNS:

1. SF in African FS produce a high proportion of the region's production and are mainly locally oriented.
2. SF in Southern European FS produce a high proportion of the region's production and are mainly export oriented.
3. SF in Norther European FS produce a very low proportion of the region's production. Some are export oriented, some are locally oriented.
4. SF in Eastern European FS produce relatively large proportion of the region's production and are mainly locally oriented.

This section aims to **quantify** the importance of SF for the **local food systems** and for the **availability** component of regional food and nutrition security, as defined in the introduction.

To do this, we have used 2 key regional level indicators: 1) % of total regional production produced by SF (%_RP_SF); and 2) minimum amount of product produced by SF that stays within the RR (%_product_locally_sourced).

A. Indicator "%_RP_SF" contains data obtained from:

1) WP2 data for indicator: %_RP_SF

2) When WP2 data was unavailable (see deliverable 2.4. for more details on this), national official statistics were used. When national official statistics were not available, an expert estimation was done using information from SF interviews, key informant interviews and focus groups.

B. Indicator "%_product_locally_sourced" contains data obtained from:

1) KI interviews, SF interviews and FGs. This indicator is an attempt to get an approximation of how much locally sourced food systems are. To calculate this variable, the minimum quantity of product that stays in the RR was used. This is the most objective value that can be extracted from the information obtained from the food system maps. The minimum quantity that stays in RR corresponds to the flow of product that goes directly from SF for self-provisioning or through direct selling to proximity consumers. And even though, in most regions, more quantity of product than what it is actually represented in this analysis is staying within the RR (the more complex the FS the more difficult the estimation is), we consider this analysis as an initial and innovative approximation bringing new knowledge to SF's contribution to the outcome of FNS.

With the data obtained from both these indicators, a matrix was created giving a value to each cell. Table 3. shows the final values of the calculation for each cell, and Table 4, shows

the final rank for each quadrant (1 being those that most contribute to FNS and 15, those that contribute least)[5]. See footnote for an explanation on the calculation of these indexes.

Table 3. Values provided to each quadrant to estimate contribution to FNS

%_RP_SF		%_product_locally_sourced		
		Low	Medium	High
		0-33	34-66	67-100
1	0-20	53	86	120
2	20-40	73	106	140
3	40-60	93	126	160
4	60-80	113	146	180
5	80-100	133	166	200

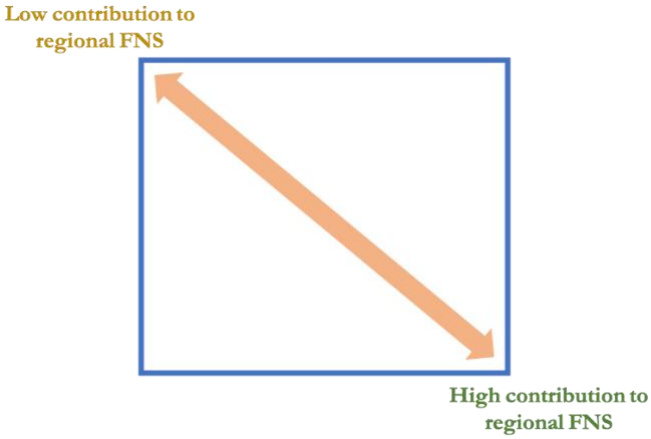
Table 4. Final ranking for quadrants based on calculations from table 3.

%_RP_SF		%_product_locally_sourced		
		Low	Medium	High
		0-33	34-66	67-100
1	0-20	15	13	9
2	20-40	14	11	6
3	40-60	12	8	4
4	60-80	10	5	2
5	80-100	7	3	1

According to the explanation above, the SF that fall in the cell with value 200 contribute the most to their regional availability dimension and those that fall in cell with value 53 contribute least to the availability dimension. It is important to note that we are talking about the availability dimension of **Regional** FNS and not about FNS in general.

Figure 9 shows a summary of the trend shown in both tables above.

Figure 9. Simplified version of tables 3 and 4 showing the general trend in terms of contribution of SF to regional FNS



A general overview of all the products analysed per RR is shown in table 5. Colours represent the macro-regions each RR belongs to.

[5] In table3. The values correspond to the sum of the max % of RP_SF
= (max no. of each of the cells in the groups of indicator %_RP_SF) + (max no. of each of the cells in the groups of indicators Minproduct_staysRR)
For example, for the cells marked in red in table above:
1: 0-20 and Low: 0-33 = 20+33= 53
3: 40-60 and Medium 34-66 = 60 + 66 = 126
5: 80-100 and High: 67-100 = 100+100= 200

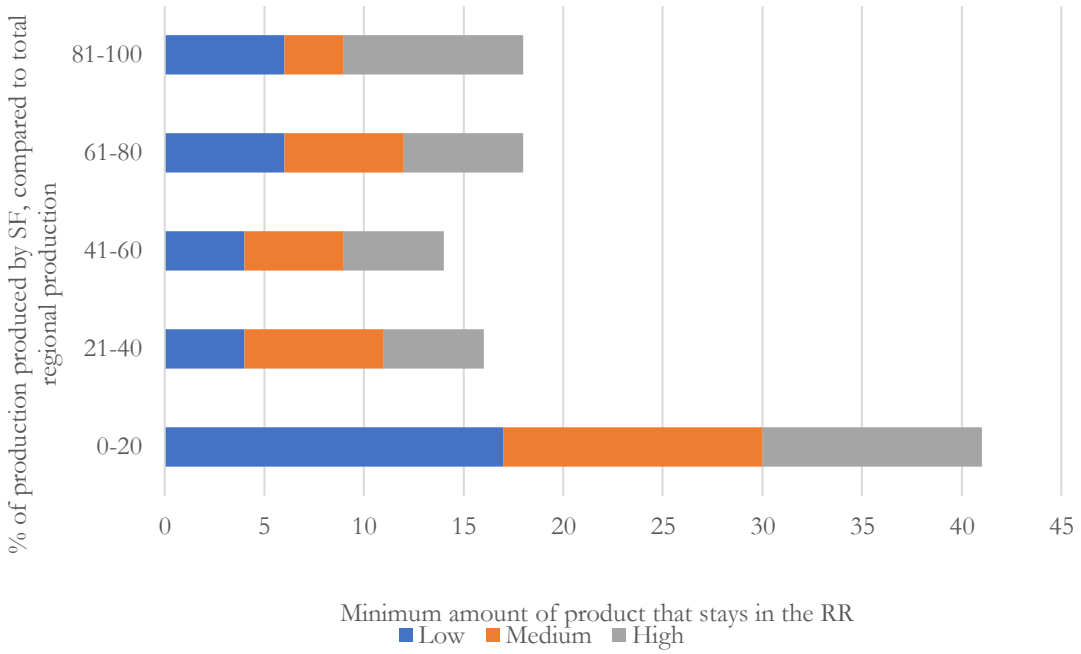
Table 5. SF contribution to regional availability of selected key products as a proportion of overall production

% of total Regional production produced by SF	Minimum amount of product that stays in the RR		
	Low (0-33%)	Medium (34-66%)	High (67-100%)
0-20	MONTANA (BG)- CEREAL VAUCLUSE (FR)- WINE AND FRUIT PISA (IT)- CEREAL HEDMARK (NO)- MEAT, POTATO, DAIRY AND FRUIT ALENTEJO (PT) - MEAT GIURGIU (RO)- OIL PLANTS AND CEREAL CÓRDOB A (ES) - OIL PLANT, CEREAL AND WINE EAST SCOTLAND (UK)- MEAT WEST SCOTLAND (UK)- MEAT AND MEAT	IMATHIA (GR) -MEAT ILEIA (GR) -VEGETABLES PISA (IT) WINE AND MEAT LATGALE (LV)- DAIRY PIERIGA (LV)- DAIRY VILNIAUS (LT)- VEGETABÑES ALENTEJO (PT)- OIL PLANT AND WINE OESTE (PT)- EGGS BISTRITA (RO)- FRUIT EAST SCOTLAND (UK) - MEAT AND POTATOES	SANTIAGO (CV)- MEAT ILLE-ET -VILAINE (FR) MEAT LARISA (GR) -VEGETABLES PISA (IT) - VEGETABLES LATGALE (LV)- POTATOES, CEREAL PIERIGA (LV)- VEGETABLES, CEREAL ALENTEJO (PT) - VEGETABLES EAST SCOTLAND (UK) - VEGETABLES WEST SCOTLAND (UK)- EGGS
20-40	RZEZOWSKI (PL)- MEAT OESTE (PT)- WINE CÓRDOBA (ES)- DAIRY CASTELLÓN (ES)- FRUIT	VARAZDINSKA (HR) POTATOES GUSHEGU DISTRICT (GH)- MEAT LARISA (GR)- FRUIT AND MEAT VILNIAUS (LT)- CEREAL AND DAIRY OESTE (PT)- PEAR	ILE-ET- VILAINE (FR)- FRUIT GUSHEGU DISTRICT (GH) - CEREAL LUCCA (IT)-FRUIT RZEZOWSKI (PL)- CEREAL AND MEAT
40-60	CASTELLON (ES)- FRUIT ILEIA (GR)- FRUIT LUCCA (IT)- WNE NOWOSADEKI (PL)- DAIRY NOWOTARSKI (PL)- DAIRY	IMATHIA (GR)- FRUIT AND WINE LARISA (GR)- FRIOT PIERIGA (LV)- FRUIT OESTE (PT)- POTATOES CASTELLÓN (ES)- OIL PLANTS	JIHOCECKY KRAJ (CZ)- EGGS NOWOSADEKI (PL)- POTATOES AND CEREAL NOWOTARSKI (PL)- POTATOES WEST SCOTLAND (UK)- VEGETABLES
60-80	ILEIA (GR)- OIL PLANTS LUCCA (IT)- OIL PLANTS NOWOTARSKI (PL)- MEAT BISTRITA (PL)- DAIRY CASTELLÓN (ES)- MEAT	VARAZDINSKA (HR)- MEAT GUSHEGU DISTRICT (GH)- OIL PLANT IMATHIA(GR) FRUIT VILNIAUS (LT)- FRUIT BALAKA DISTRICT (MW)-VEGETABLES RZEZOWSKI (PL)- POTATOES	JIHOCECKY KRAJ (CZ)- MEAT GUSHEGU DISTRICT (GH)- CEREAL LUCCA (IT)- VEGETABLES LATGLE (LV)-HONEY BALAKA DISTRICT (MW)- VEGETABLES NOWOTARSKI (PL)- CEREAL
80-100	UGUNJA (KN) - VEGETABLES NOWOSADEKI (PL)- FRIOT GIURGIU (RO) VEGETABLES HAOUARIA (TN)- VEGETABLES AND VEGETABLES (tomatoes and pepers)	ILEIA (GR)- FRUIT BALAKA DISTRICT (MW)-CEREAL BISTRITA (RO) -MEAT	SANTIAGO (CV)- VEGETABLES, FRUIT AND CEREAL UGUNJA (KN)- CEREAL, VEGETABLES AND BEANS BALAKA DISTRICT (MW)- MEAT BISTRITA (RO)- POTATOES GIURGIU (RO)- EGGS

LEGEND	AFR	SE	NE	EE

In Table 5 above and Figure 10 below, it is possible to see that in many food systems analysed (~ 40%), SF contribute from 0 to 20% of total regional production. The other production classes are more similar in terms of total numbers of FS. Also, the minimum amount of product from SF that stays within the region is more balanced. This shows that out of the sample analysed, we can find a diversity of food systems where SF's focus is to export or to locally source the production.

Figure 10. % of food systems falling under each of the categories



When looking at the contribution of SF from a **macro-regional perspective** (see section 3.4.1. below for a detailed explanation on macro-regions), it is possible to observe some interesting patterns. The tables below show the total number of food systems within each quadrant in absolute numbers, in order to more clearly visualise the differences in the number of FS in each of the macro-regions:

AFR: 18; SE: 39; NE:14; EE:38[6]

Some conclusions that can be drawn from these tables are that African SF, in most food systems analysed, highly contribute to the availability of products within the RR and those products in high % stay within the region. Thus, they contribute highly to the availability component of FNS.

Southern European SF are proportionally lower in numbers compared to medium and large farms (see Figure 6). Thus, most of the food systems fall under the top-left categories. Additionally, SF in SE, tend to be more specialised and export oriented than in other macro-regions, with very organised and controlled food chains for each product. Thus, SF in SE have better access to national and international markets, although most probably with reduced profit and control over their own production. SF in Southern Europe therefore contribute in smaller amounts to regional FNS even though they might be producing large

[6] In this analysis both EE and SE lose 1 food system each due to the necessary data to classify them not being available.

volumes of product; most of it leaves the region through mainstream commercialisation pathways. However, one could argue that they do contribute to FNS, although indirectly, through the generation of income in the area (Brunori, 2018).

Table 6. African Food Systems Classification

% of total Regional production produced by SF	Min % of product that is locally sourced		
	Low	Medium	High
	0-33	34-66	67-100
0-20	0	0	1
20-40	0	1	1
40-60	0	0	0
60-80	0	2	2
80-100	3	1	7

Table 7. South European Food Systems Classification

% of total Regional production produced by SF	Min % of product that is locally sourced		
	Low	Medium	High
	0-33	34-66	67-100
0-20	7	7	3
20-40	3	3	1
40-60	2	4	0
60-80	4	1	1
80-100	1	1	0

Table 8. North European Food Systems Classification

% of total Regional production produced by SF	Min % of product that is locally sourced		
	Low	Medium	High
	0-33	34-66	67-100
0-20	7	2	3
20-40	0	0	1
40-60	0	0	1
60-80	0	0	0
80-100	0	0	0

Table 9. Eastern European Food Systems Classification

% of total Regional production produced by SF	Min % of product that is locally sourced		
	Low	Medium	High
	0-33	34-66	67-100
0-20	3	4	4
20-40	1	3	2
40-60	2	1	4
60-80	2	3	3
80-100	2	1	2

Most of the SF in the Northern European food systems analysed, similarly to SE, provide a proportionally lower quantity of product to the total regional production. This is partly due to the fact that SF are generally scarce, although present. However, and in contrast to SE, in NE food systems, product from SF in many cases also stays in large quantities with the RR (this is mainly the case of the crops analysed in Scottish RRs). Small farmers commercialise through alternative networks and not through the mainstream markets, thus ensuring the product stays within the RR. NE food Systems are mainly found close to the top left and right corners of the chart.

In Eastern European food systems there is no clear pattern. Food systems are scattered all around the chart, and cover all the possible quadrants. However, we can say that most of the food systems are found in the right-side of the chart, thus, indicating that SF are more local

oriented than export oriented. Therefore, the contribution of SF to FNS in EE depends a lot on each particular case, as no particular pattern can be observed.

Based on the food systems products analysed, SF in Africa are those that contribute most to regional FNS, followed by SF in EE, then SE and finally NE.

Additionally, when shifting the perspective and looking at differences **between products** in **terms of their contribution to regional availability of FNS** (see section 3.4.1. below for detailed information on product categories), some other interesting patterns can also be observed. Although some products show no significant differences in the ranking of FNS contribution, others are all found ranking high and other are all ranking low in their contributions. The ranking follows the following structure: 1 for those FS where SF contribute most to FNS, to 15, where SF contribute least (see table 5 in annex for more details per product).

Those products that show no significant differences are: cereal, fruit, meat, potatoes and eggs. In the case of cereal, although most are found in lowest ranking position (15), many are also found within the first positions (1-4). These correspond to the African regions that produce cereal, which is kept or sold within the regions. From quadrant 4 to 11 are SF producing cereal in the EE regions of Poland, Latvia and Lithuania. Those in quadrant 15 are cereal producers from Italy, Spain and Bulgaria.

In the case of fruit, most of them are found within in the rankings 5 to 8 and 10 to 13. However, no particular geographical pattern can be observed.

For meat, most cases rank 9 to 15, 15 having the greatest number of cases i.e. Norway, Portugal and both Scottish regions. Other countries in this group are: Poland, Greece, Italy, Ghana and Cape Verde. Ranking higher, we can find Malawi, Romania, Czech Republic and Croatia. Part of this could be explained in relation to different legislative practices in the different countries, where the rules and their enforcement, regarding animal slaughtering may be tougher or weaker, affecting how SF are integrated in the system.

Eggs in Portugal are in rank 13, the lowest in this product group. In Oeste (PT), eggs are produced by most SF but they represent very little in overall regional production quantities. Eggs from SF are mostly kept, sold through direct commercialization and through channels that require product certification, however a part of them is also commercialized in mainstream markets. Next ones, are small farmers that produce eggs in Scotland, ranking 9. They do not produce a large quantity compared to regional production, however, almost all, if not all, the eggs produced stay within the region and are sold through alternative food networks. Eggs in the Czech Republic rank 4 and in Romania rank 1. Here the systems continue to be local, most of the egg production from SF stays within the RR, what changes is what % that production represents for the total regional production.

All other products are more localized closer to the top or the lower quadrants. In the case of dairy products, they are rank from 10 to 15. Those ranking from 11 and 13 (Lithuanian and both Latvian Regions) are more local oriented dairy food systems that the rest. Small farmers do not produce a lot in terms of total regional production, but from 34 to 66 % of the dairy products produced stay within the RR. In all the other cases, from 0 to 33 % of the SF production stays within the RR (Norway, Spain, Poland and Romania).

Vegetables are somewhere in the middle of the ranking towards the top, indicating vegetables in general are part of more locally focused FS, with the remainder export oriented.

3.4. Comparative analysis of small farm's market linkages

SALSA's key objective is to understand the role SF plays in food systems at regional level, and as key output of the food system, on their contribution to regional food and nutrition security (Grando, 2018). To do this, in SALSA, different complementary analyses were performed. For this particular deliverable, we focus on the analysis of the food system functioning, the interactions and activities within the system that generate the outcome of regional availability and availability within FNS (Ericksen, 2008a). Particularly, we analyse the position of SF within value chains, the key relationships between SF and other actors within the system, and the results of such relationships in the different contexts, as explained in section 1.1.

As explained in section 2 above, the food systems of 4 key products per reference region have been analysed (2 for the regions analysed in countries outside the SALSA consortium). In total, SALSA studies a total of 109 food systems.

The analysis of this report is done using 3 **different analytical units**, each providing special insights and perspectives to the analysis. The analytical units are the **key identifiers** of each food system:

1) Product category

2) Macro-regions (geographical location of each reference region)

3) Food System Groups (which separate food systems depending on the degree of SF's contribution to the availability dimension of regional FNS, which depends on production quantities and the orientation of the food systems (locally sourced food systems vs globally sourced food systems. A more detailed explanation is provided in page 31).

From the perspective of each of these analytical units, a comparative analysis on the market linkages of SF is done in order to try to answer 2 of SALSA's research questions:

RQ 1. Which food system actors and activities are involved in the generation of the FNS outcome in the reference region?

RQ 4. What is the position (and importance) of SF in the Regional FS?

The structure of section 3.4. starts with a quick introduction to the key characteristics and determinants of each of the 3 analytical units, followed by the comparative analysis on market linkages.

3.4.1. Introduction to the 3 **analytical units**: key characteristics and distribution patterns

Highlights:

1. More than half of all the products analysed show regional surplus trends, which could imply that those regional food systems are more specialized and geared towards export for those particular products.

2. As expected, SF are in higher numbers in the regional FS, in Africa and Eastern Europe, followed by Southern Europe and finally Northern Europe.

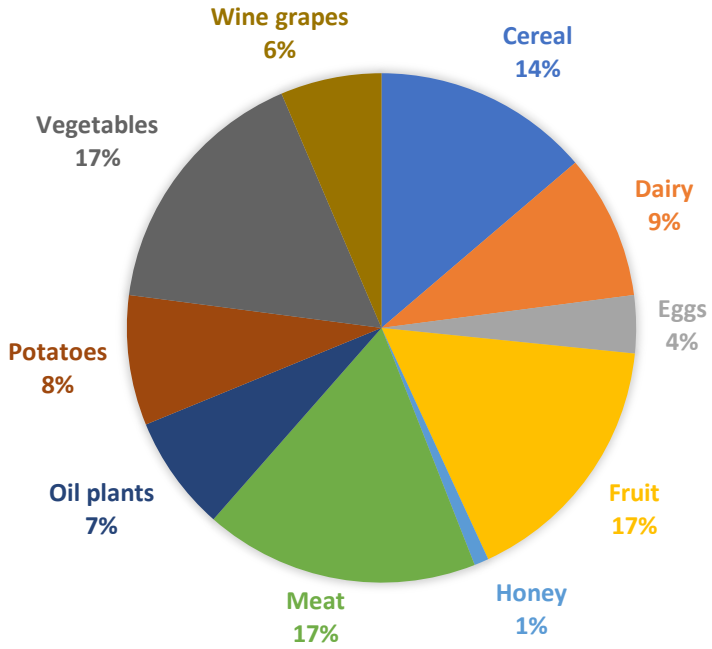
3. FSs characteristics tend to be strongly dependent of the macro-region they are integrated in.

4. SF in group A (where SF contribute most to FNS) are generally part of shorter chains that keep SF production locally. In group B (where SF contribute to a medium extent to FNS) SF are also part of short food chains or alternative food networks, but also some part of their production goes into mainstream commercialisation pathways. SF in group C (where SF contribute least to FNS) are generally export oriented.

Analytical unit 1: Product Category

In SALSA, the products selected for the analysis in each of the RRs have been grouped into larger product categories for analytical purposes. In total, the products have been grouped into 10 different categories[7] (Brunori, 2018). A detailed description of the criteria used for the selection of the products is provided in section 2.2.2. of Deliverable 3.1. The products selected by the regions as key products and that have been analysed are shown in the Figure 11 below.

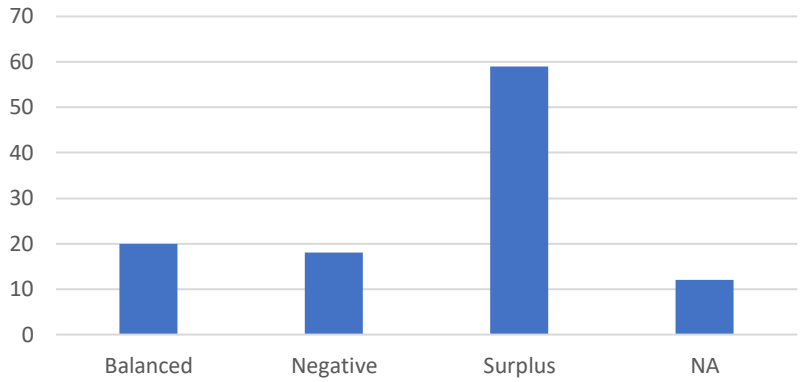
Figure 11. Products analysed in SALSA



[7] See SALSA's Analytical Framework for more information on these categories

The balance sheets of each of these products has also been calculated. As Figure 12 illustrates, most of the products selected show regional surplus trends (53,2%), which means that the quantity of product produced exceeds the quantity consumed in the region. 16,5% show a negative trend and 18,3% are balanced. This provides an idea of whether regions (in general, not just SF) are producing for exporting or for local use and consumption. For more detailed information on each RR's key product balance sheet, please see table 1 in annex I.

Figure 12. Balance Sheet for all products analysed



African regions have selected products that show balanced, negative and surplus patterns, balanced being the most predominant trend among them. Other regions that follow a similar trend within the product selection are Hedmark (NO), Lucca (IT) and Vilniaus Apskritis (LT). In total, 18 food systems show negative trends, the most common among this group are food systems for products: fruit and meat. One of the criteria for the selection of key products was that 1 of them had to be important for consumption in the households, meaning those products do not necessarily need to be produced in large quantities.

Analytical unit 2: Macro-regions

SALSA's Reference Regions can be grouped into 4 geographically based macro-regions (M-R) (see WP6 for an elaborated discussion on the distribution of RRs in their respective macro-regions). The RR analysed are grouped as follows:

Table 10. Distribution of Reference Regions within larger Macro-Regions

Code of M-R	Macro-Region	Regions	Total N° of regions	Total n° of FS
AFR	Africa	Santiago Island (CV); Gushegu District (GH); Ugunja (KN); Balaka District (MW); Haouaria (TN)	5	18
EE	Eastern Europe	Montana (BG); Varazdinska (HR); Jihocecky Kraj (CZ) Latgale (LV); Pieriga (LV); Vilniaus Apskritis (LT); Rzeszowski (PL); Nowosadecki (PL);	11	38

		Nowotarski (PL); Bistrita-Nasaud (RO); Giurgiu (RO);		
NE	Northern Europe	Ille-et-Vilaine (FR); Hedmark (NO); East and West Scotland (UK)	4	14
SE	Southern Europe	Vaucluse (FR); Imathia (GR); Larisa (GR); Ileia (GR); Lucca (IT); Pisa (IT); Alentejo Central (PT); Oeste (PT); Castellon (ES); Cordoba (ES)	10	39

Some Macro-Regions are larger than others, but the selection of the regions for analysis was done following specific criteria based on the distribution and relevance of SF in the region's agriculture structure and territory, described in deliverable 2.1.

Macro-regions are quite diverse in their geographical and socio-political characteristics. And these differences can play an important role regarding how SF are integrated within their respective food systems. This is further elaborated below.

Table 11. Key RR characteristics per macro-region

M-R	Average of Land Size (sqkm)	Average of Population Density (people/sqkm)	Average of GDP *per capita* (USD)
AFR	2075	148	1121
EE	6367	91	11129
NE	14610	36	30028
SE	4778	106	18599

Table 11 shows that the Northern European Macro Region (M-R) has the largest average land size, it is the least populated and richest macro-region, while African regions are smaller, more densely populated and poorer out of all the M-Rs. Southern Europe is the second richest, and second most populous. Eastern Europe is the second with both lowest GDP and population density.

In terms of agricultural characteristics, it is possible to observe the following differences between M-R:

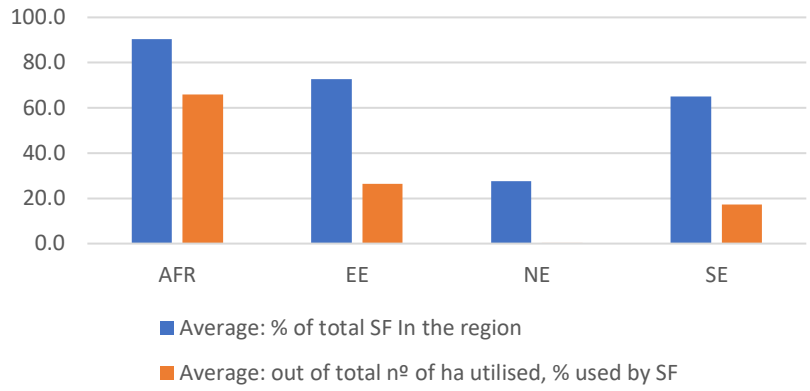
Table 12. Agricultural data per Macro-Region

M-R	Average of Share of Utilised agricultural area in total land area (%)	Average of: % of agricultural area in mountain area	Average of: Out of total nº of ha utilised, % used by SF
AFR	44,5	6,9	65,8
EE	36,1	8,1	26,4
NE	56,4	28,8	0,1
SE	38,8	10,8	17,4

NE has the largest share of utilized Agricultural area in total land area, as well as the largest % of agricultural area in mountain area. However, it has the lowest % of land used by SF,

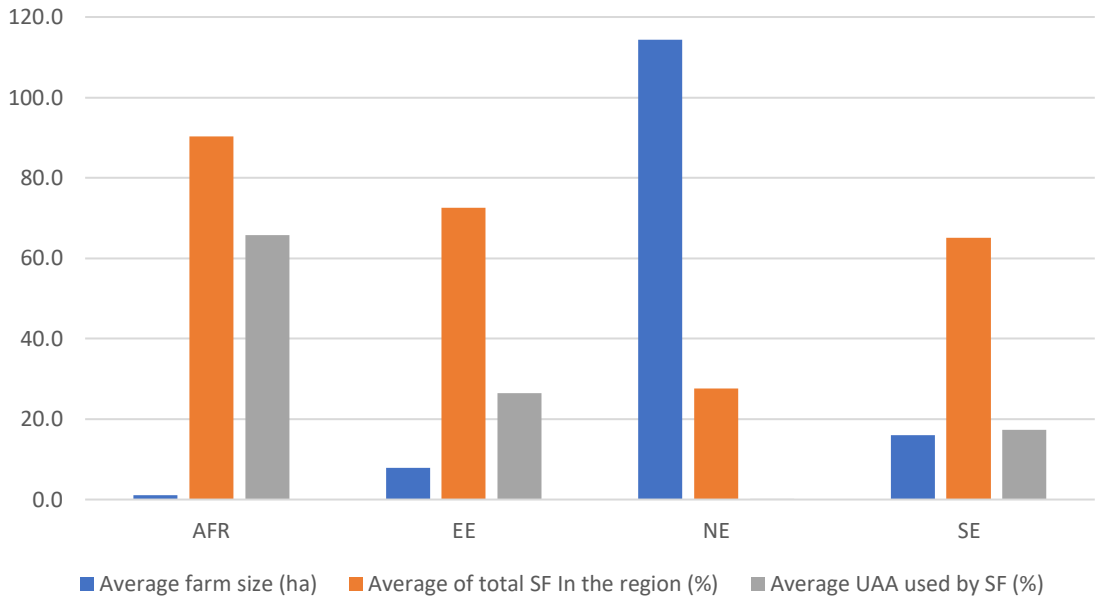
0,1% in average. On the contrary, AFR has the largest % of land being used by SF out of the 4 M-R, 65,8% in average. This is directly related to the number of SF within each of the M-R:

Figure 13. Average % of SF per M-R and % of land utilised by SF



The Figure 14 below clearly illustrates that in AFR, farms are very small (1,1ha in average), representing more than 90% of the total nº of farms, and using 65.8% of the total agricultural area. Thus, SF are very prevalent in terms of number and area occupied. However, in EE, where farms are also small on average (7,9 ha) and large in numbers (72.6 % are SF), the total UAA used by SF is much lower than in Africa (24.4%). In SE, the average size of farms increases compared to EE (16.1 ha) but in NE is significantly much larger (114.3ha). The number of SF in both these M-R is thus also smaller, 65% and 27.6% respectively. In terms of UAA occupied by SF, in SE SF use 17.5% of total UAA, while in NE they only use 0.1% of total UAA. SF in NE are much scarcer than in the other 3 M-R.

Figure 14. Characteristics of SF in each M-R



Analytical unit 3: Food System Groups

Based on the analysis on the contribution of SF to the regional availability and using the ranking described (1-15) (see section 3.3. above), we aggregated the 15 quadrants into three different groups:

Group A: Comprising all FS that ranked from 1 to 5. This is the group where SF contribute most to regional FNS

Group B: Comprising all FS that ranked from 6-10. Here SF have a medium contribution to regional FNS

Group C: Comprising all FS that ranked from 11-15. SF from FS in this group contribute less to FNS.

These groups thus indicate the contribution of SF to the regional availability of specific products. It is important to note we are not assessing regional food security, but only the contribution of SF to some degree of regional food (in)security.

Thus, the 107[8] FS have been classified into a FS group with the following distribution:

Table 13. No of food systems in each FS type

Groups	Total Nº of FS
A	30
B	34
C	43

Looking at macro-regions, we can see that **Group A** is more prevalent in **Africa and Eastern Europe**. **Group B** is more common in **Eastern and Southern European** Food Systems. And **Group C** is most common in **Southern European** FS, and includes also most FS from **Northern Europe**. To see the distribution of FS across the groups from a RR perspective please see annex II (Table 3).

The reasons behind this pattern could be related first, to the nº of SF in each of the macro-regions. SF are more common in Africa and Eastern Europe, followed by Southern Europe and finally Northern Europe, where they are less predominant. Second, the orientation and purpose of small farm production. SF in group A are generally part of shorter chains that keep SF production locally. In group B SF are also part of short food chains or alternative food networks, but also some part of their production goes into mainstream commercialisation pathways, meaning a share of SF production leaves the region. And finally, SF in group C are generally export oriented, and therefore a large share of their production leaves the region.

Table 14. Macro-regional distribution across the 3 food system types (%)

Food System Type	AFR	EE	NE	SE
A	**40,0**	**43,3**	3,3	13,3
B	14,7	**35,3**	11,8	**38,2**
C	2,3	27,9	20,9	**48,8**

[8] 2 FS could not be classified into a FS group as there was no data on SF production: (Montana (BG): Dairy; and Vaucluse (FR): Oil plants

When looking at which product categories fall into each FS group (table 15), it is also possible to observe some interesting patterns for some products.

Table 15. Distribution of products across the 3 food system groups (%)

Product category	A	B	C
Cereal	40	27	33
Dairy	0	11	**89**
Eggs	**50**	25	25
Fruit	28	**44**	28
Honey	**100**	0	0
Meat	21	26	**53**
Oil plants	14	29	**57**
Potatoes	**44**	33	22
Vegetables	39	**50**	11
Wine grapes	0	14	**86**

Most product categories are more or less evenly distributed across the 3 Food System groups. However, those products that usually involve a certain degree of specialization, such as Dairy, Meat, Oil plants and Wine fall clearly under FS group C. This could be due to overall regional specialization on these products: small, medium and large farms produce them, SF thus produce lower % of total RR production. Additionally, all these products require some processing before reaching consumers, meaning food systems to be efficient try to be specialized and thus mainly export oriented. They also require better organization, meaning all types of farmers commercialise their products through the same or similar pathways.

3.4.2. Exploring SF's connection to their regional food systems: a comparative analysis

SF first connection to the food system depends on which other food system actors they are directly connected with, how many are they directly connected to, who they are, and how much product flows through these channels.

3.4.2.1. SF commercialization pathways

Highlights:

1. South European SF have, on average, a lower number of commercialization pathways for their products than the other 3 macro-regions. In SE, the agricultural sector is specialised and organized, thus, easily granting access to SF to mainstream markets. This could imply a lower need for SF to find alternative paths to commercialise their products.

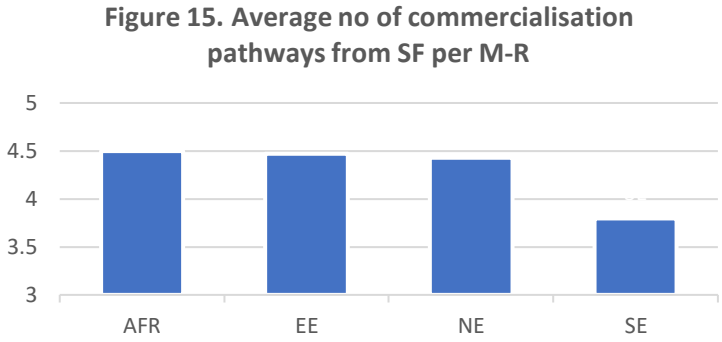
2. SF that produce products that require little or no processing, such as vegetables, potatoes and fruit create a larger number of commercialization pathways than those that produce products that require some kind of processing, such as wine grapes, oil plants, cereal and meat.

The diversity in the number of connections to the food systems could be considered an efficient strategy to reduce the vulnerability of SF. The Third Intergovernmental Panel on Climate Change Assessment Report (McCarthy et al. 2001), advocates for understanding vulnerability as a function of exposure and coping or adaptive capacity. According to Barrett and Carter (2000), coping capacity involves active strategies to manage resources if risk exists. However, adaptive capacity implies longer term changes in livelihood strategies to ensure income for the foreseeable future (Berkes and Jolly 2001). The fact that diversity is a key factor for buffering capacity, as a way to preserve options in cases a crisis arises is well acknowledged in literature (Ericksen, 2008b). Thus, a diversity of direct connections between SF and the food system could be a key strategy for both the coping and adaptive capacity of SF in face of shocks and crisis.

This question has been analysed through the 3 analytical units described above: product type, macro-regions, and food system group.

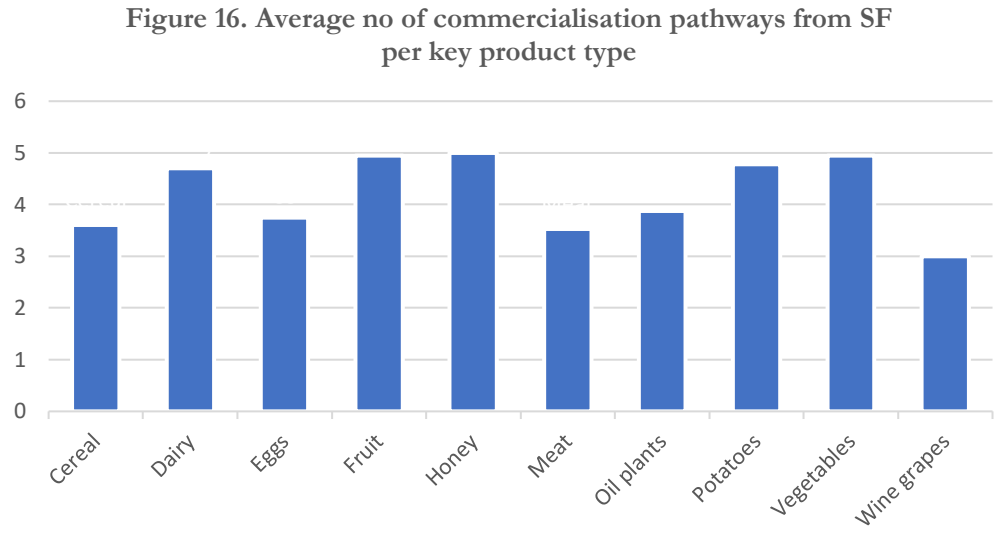
Analytical unit: macro-regions

When looking at the No. of commercialization pathways created by SF from a Macro-regional perspective small differences can be observed (Figure 15). While AFR, EE and NE have higher averages, SE has a lower number of commercialisation paths. In SE, in general, the agricultural sector is specialised and well organised, thus granting access for SF to the mainstream commercialisation pathways, even if the conditions for SF, in terms of revenue are not always good. This may imply that SF have less need to find alternative paths with the risks this entails.



Analytical unit: Product type

When looking at this question from a product type perspective, we can see slightly bigger differences (see Figure 16).



SF that produce product types that require little or no processing, such as vegetables, potatoes and fruit are able to create a larger number of commercialization pathways than those that produce products that require some kind of processing, such as wine grapes, oil plants, cereal and meat. Eggs are an exception, as they do not need processing, but the commercialization is not so high. This may be due to the fact that eggs are an important staple in SF SFS, many SF produce for themselves and are part of very locally oriented food systems, or also to regional food safety regulations. See Figure 16 above.

Analytical unit: Food System Group

In terms of food system group (A, B or C), there is no significant difference, and thus looking at particular RRs the difference is also not noticeable, with the exception of Pieriga (LV), which stands out for having the farmers with most direct connections within their food systems.

3.4.2.2. Key actors within the food systems for SF

Highlights:

1. Processors and cooperatives are the key actors connecting SF to the food system

2. In very few cases small retailers and supermarkets are the main connection between SF and the food system

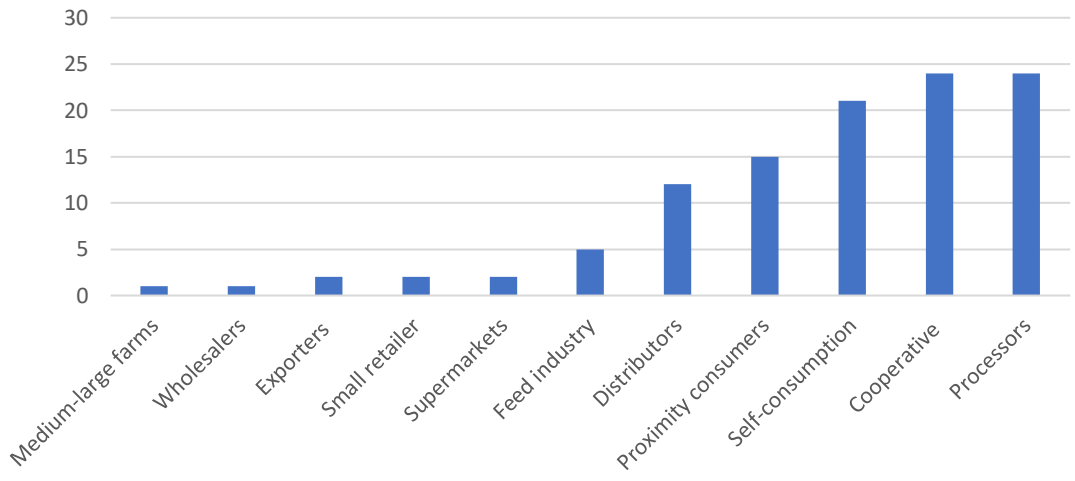
3. Summary table: key actors per analytical unit

Analytical unit	Key actor		
	Cooperatives and Processors	Proximity Consumers	Farm/SFS self-provisioning
Macro-regions	SE	NE	EE and AFR
Food System Group	C	B	A and B

When aiming to understand SF and their role in regional FNS, it is necessary to explore the networks in which SF are embedded. These explorations at the regional level can help to understand the reasons behind the current activities and strategies followed, as well as the opportunities and obstacles for key actors within the regional food systems (Jarosz, 2000). Each actor within the system has a particular role, therefore, SF connecting to one or other actor will result in different flows being activated and to different and diverse outcomes resulting from the action (Clark, 1998; Ericksen, 2008b). The access dimension of FNS is thus also explored in this section.

The following graph shows which are the actors SF sell most of their production to, in other words, who is the main buyer in the supply chain. In a food system, the identity and importance of the main buyer can be informative about the structure of the value chains and the market power of different actors. Figure 17 below shows the main buyer that we identified in each of the 109 food systems.

Figure 17 Main connections to SF and FS



Out of 109 food systems analysed, 24 had processors and cooperatives as their key entry/flow into the food system. 21 and 15 had self-provisioning and proximity consumers as key flows, 12 had distributors and 5 feed industry. In very few cases small retailers and supermarkets were the main connection between SF and the food system, only 4 out of 109 (potatoes in Oeste (PT), meat in Santiago Island (CV), vegetables in Larisa (GR) and wine in Lucca (IT). This shows that intermediaries are important for SF, and that those intermediaries are: processors, cooperatives and distributors. The way the market is organised nowadays makes it easier for supermarkets and retailers to supply through larger organisations where a diversity of products is offered. This fact complicates SFs access to shorter commercialisation chains, where they could earn more money for their products. SF therefore either go for mainstream commercialisation or look for alternative paths that focus on a different type of clientele that looks for products with a different value added (proximity consumers).

Analytical unit: Macro-regions

The importance of the different flows contrasted to Macro-regions provides some really interesting patterns. Cooperatives and processors are the most common points of entry to the system in South Europe. This is related to the types of products that predominate in the macro region (e.g. grapes for wine, olives) (see table 16 below) but it also illustrates the reality of southern European organization around agriculture. In Southern-Europe, self-provisioning does not appear as the main key-flow from small-farms, as a large majority are specialized farms who mainly link to cooperatives or processors (fruit, olive, wine).

Table 16. Weight (%) of the different actors within the 4 Macro-Regions

Macro - Region	Cooperative	Distributors	Exporters	Feed industry	Medium-large farms	Processors	Proximity consumers	Self-provisioning	Small retailer	Supermarkets	Wholesalers
AFR	5,6	**27,8**	0,0	0,0	0,0	16,7	0,0	**44,4**	5,6	0,0	0,0
EE	10,5	2,6	2,6	13,2	2,6	**18,4**	15,8	**34,2**	0,0	0,0	0,0
NE	14,3	**21,4**	7,1	0,0	0,0	**21,4**	**35,7**	0,0	0,0	0,0	0,0
SE	**43,6**	7,7	0,0	0,0	0,0	28,2	10,3	0,0	2,6	5,1	2,6

In Northern Europe we can see that the main flows are proximity consumers[9], followed by both processors and distributors. In Northern Europe we see 2 food system groups: B and C. Northern European food systems under FS type B are those in which proximity consumers represent the main connection with the food system i.e. meat and potatoes in East Scotland (UK), local based and not export oriented, while those under FS type C are those in which distributors and processors are the main buyers, such as all products in Hedmark (NO). FS organized around cooperatives are also present in NE i.e. dairy and meat FS in Hedmark (NO).

In Eastern Europe and Africa, farm households themselves (i.e. self-provisioning) are main recipients of small farm products. In EE, this is followed by processors and proximity consumers. More than half of EE FS fall under FS group A and B. The main first "buyers" for most SF in group A are either the farms themselves or proximity consumers. This is the case of meat and potatoes in Bistrita (RO) and potatoes in Nowosadecki and Nowotarski

[9] Proximity consumers represent the of % of SF production (system-wide, not household based) that flows directly to consumers through alternative commercialisation pathways, such as farmer's markets, online selling, box schemes or purchased directly from the farm

(PL). Cooperatives are also a key link for some food systems in EE, such as potatoes in Varazdinska (HR) dairy in Nowosadecki (PL) and vegetables in Giurgiu (RO).

As it has been highlighted above, in Africa the main flow from SF is also self-provisioning, mainly in food systems types A, such as Meat and vegetables in Balaka District (MW), cereals in Santiago (CV) and vegetables in Ugunja (KN). Followed by distributors, common in most African Food Systems. In Cape Verde, distributors are individuals (called "*Rabidantes*") that go around buying the product from farmers and distributing it to street vendors and local retailers. In African regions, proximity consumers do not appear as a key flow, although present in most food systems, because flows like self-provisioning and distributors receive larger shares of product, thus appearing to diminish their importance in this macro-region.

Analytical unit: Food System Group

In terms of food system groups, it is also possible to observe interesting patterns:

Table 17. Food system groups and key actors involved

Food System Type	Cooperative	Distributors	Exporters	Feed industry	Medium-large farms	Processors	Proximity consumers	Self-provisioning	Small retailer	Supermarkets	Wholesalers
A	6,7	10,0	0,0	6,7	3,3	16,7	**23,3**	**33,3**	0,0	0,0	0,0
B	**20,6**	11,8	2,9	2,9	0,0	11,8	17,6	**23,5**	5,9	2,9	0,0
C	**32,6**	11,6	2,3	4,7	0,0	**34,9**	4,7	4,7	0,0	2,3	2,3

In Food System Group A, the most important actors connecting SF to the different food systems are the farmers themselves (self-provisioning) followed by proximity consumers. SF in these food system group produce larger percentages of the total RR production and much of it stays within the RR, precisely because of the connections established.

In Food System Group B, key connections are more distributed across the different actors, however, **it is still possible to highlight as key, self-provisioning, followed by cooperatives and proximity consumers**. In terms of key actors FS group A and B are quite similar, with the exception of cooperatives. This shows the characteristics of this food system group, which is a local based FS but can also be more specialized and export oriented. Farmers in this FS are also those with most direct connections to different actors within the food system on average. Farmers in this food system more clearly follow diversification strategies than those in other FSs.

Food System Group C, the most specialized and export oriented of the group, shows that SFs' **key connections to the food system are Cooperatives and Processors followed by distributors.** The key connection of FS type C shows that SF in most food systems are part of the conventional regional food system, i.e. all products in Córdoba (ES), meat in East Scotland (UK), citrus and meat in Castellón (ES) and meat, oil plants and wine grapes in Alentejo (PT). However, to a less extent within type C, it also possible to observe totally different cases, where SF produce and sell through alternative pathways, thus having as key connections, self-provisioning and proximity consumers. Examples of this are potatoes in East Scotland (UK) and fruit in Bistrita (RO).

Analytical unit: Product Category

From a Product category perspective, we can observe the following:

Table 18. Product category and key actors

Product Type	Distributors	Exporters livestock	Industry	Processors	Large retailers	Local integrating companies	Cooperative	Medium-large farms	Proximity consumers	self-provisioning	Small local retailer
Cereal			27	27			13			**33**	
Dairy	10			**40**			30			20	
Eggs				25					**50**	25	
Fruit	6			**41**			35		6	12	
Honey									**100**		
Meat	20	10		**25**		5	5	5	15	10	5
Oil plants	13		13				**63**			13	
Potatoes	11						11		22	**44**	11
Vegetables	28			6	6		6		**33**	22	
Wine grapes				29	14		**57**				

The four most common key connections are Cooperatives, Processors, Self-provisioning and Proximity Consumers. In these most common connections, it is possible to observe differences in terms of their importance in different product categories.

Cooperatives are the key flow for wine grapes and oil plants and second most important for cereal, dairy and fruit products. Therefore, out of the 8 types of products, Cooperatives are a key flows in 5 of them. In general, these 5 products require processing (except fruit), and are part of sectors that are generally specialized and organized.

Processors are the key flow for meat, dairy and fruit, and second key flow for cereal and eggs. The explanation for this distribution is similar to the cooperative one.

Self-provisioning is a key flow for products such as cereal, dairy, eggs, potatoes and vegetables. These products have in common that they can all be considered staples in SFS consumption; thus, SF produce them also for themselves.

Proximity consumers are key flows for eggs, potatoes, vegetables and meat. Eggs, potatoes and vegetables are products that do not necessarily require processing necessarily, and thus it is easier for SFs to sell them through different and alternative pathways. Meat products are more dependent on individual country legislations. Some countries require livestock to be solely killed in official slaughter houses, thus, inhibiting the official possibility of SF processing and selling the meat directly to proximity consumers, other countries have no such legislation. In Alentejo (PT), SFs can only officially slaughter their own livestock in the farm for self-provisioning, however, they do also sell through informal channels to proximity consumers, and gift meat to neighbours, family etc. In Poland informal channels also exist when selling meat products, as a result of restricted rules when slaughtering livestock.

3.4.2.3. Quantity of product from SF received by key actors

Highlights:

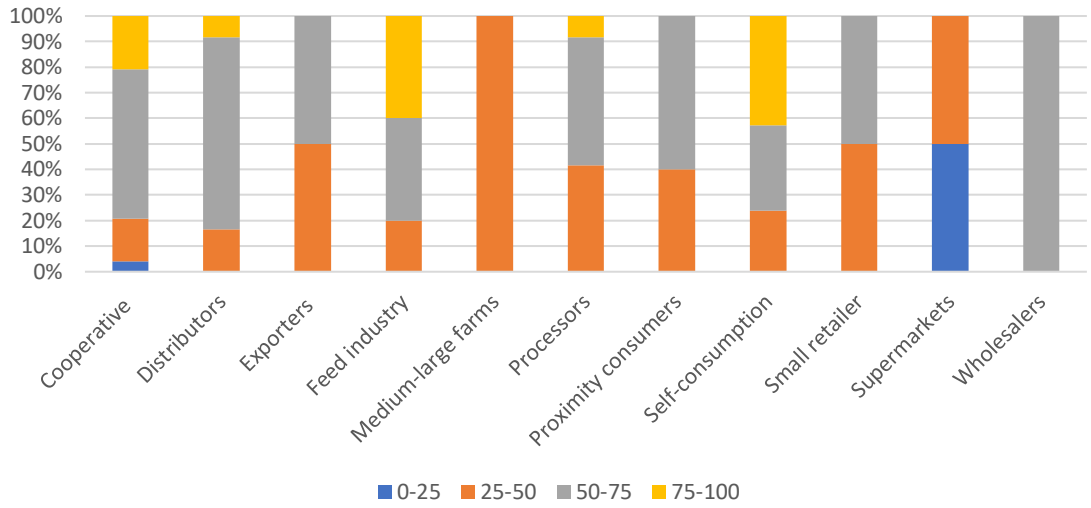
1. Cooperatives and processors and distributors generally receive more than 50% of total SF production

2. In 40% of the cases when self-provisioning is the key flow, SF keep a large majority of their production

3. When proximity consumers are the key flow, the quantity of product reaching them is more balanced than for the rest of key flows.

The importance of the key flow is directly related to the amount of product that those key flows receive from SF. This is because, if a key flow receives most of the product, SF depend much more on that particular flow, than if the amount of product they receive is little, meaning they have a diversity of flows that are also relevant, and makes them less dependent and with a higher coping capacity. Figure 17 below, shows the key connections of SF and how much product they receive from them.

Figure **17. SF key connections to the FS and % of product sold to each connection**



In 60% of the FS, cooperatives receive from 50-75% of the total SF production, and in 20% of the cases from 75-100%. Processors receive in more or less the same nº of cases from 25-50 % and 50-75% of total SF production, indicating greater diversification than cooperatives. In the case of self-provisioning, it ranges from SF keeping 25-50% of the product in approximately 20% of the cases, to 75-50% in around 40% of the cases. This means that in those cases where self-provisioning is a key flow, its importance and dependency on the flow varies greatly from case to case. Proximity consumers, however, is the key flow which allows for a more equilibrated distribution of the other flows. This is because in all cases, the amount of production that goes into this flow ranges from 25-75%. Additionally, this flow includes a variety of direct commercialisation pathways, which increases the diversity of connections.

Macro-regions and food system groups show no significant differences.

3.4.2.4. Diversity of connections and small farm resilience

Highlights:

1. The more connections SFs establish the less the quantity of product that is sold to the main connection and the more equipped SFs are to resist shocks and change.

Literature on resilience argues that diversity is a key factor for buffering capacity (Eriksen, 2018). Maintaining diversity can be key for preserving options in face of a crisis (Fraser 2003, Fraser 2006, Fraser et al. 2005). Thus, we can say that the more diverse are the connections between SF and the food system, the more resilient and less vulnerable SF are. However, the number of connections could also be an indication of SF's pre-existing vulnerability in food supply chains. Farmers might be selling to multiple channels because they actually have very limited market entry opportunities with any single channel, so they have to make ends meet.

Therefore, and in order to understand the real importance of the diversity of connections for the resilience of SF, it is very important to know how many connections exist, but also, how much product goes into those flows, i.e. if SF have a large diversity of connections, but 90% of their product goes to the key flow, the relative importance of the other connections is much lower, thus decreasing farms' resilience. If, however, SF have a large diversity of connections, with an equilibrated distribution of product across them, resilience increases.

As we have seen above, the lower the degree of processing the product needs, the more connections SF are able to make directly with the final consumers. If the total number of connections is contrasted then against the amount of production sold to the key connecting flow, we see a clear tendency (see table below): the more connections SF establish, the less product is sold to the main connection. Thus, really diversifying the flows of their production and increasing their resilience.

Table 19. No. of actors connected to SF vs quantity of product sold to 1st connection according to FS maps

nº of actors connected to SF	0-25	25-50	50-75	75-100
1				**100**
2			**82**	18
3		18	**71**	12
4	6	21	**56**	18
5		**41**	**45**	14
6		**58**	33	8
7		**75**	25	
8		**75**	25	
9				**100**

3.4.2.5. Importance of self-provisioning for SF

Highlights:

1. The self-provisioning flow is present in 92% of the food systems analysed.

2. The relative importance of this connection diminishes from AFR to EE to NE to SE progressively. These macro-regional differences could be partly due to GDP, the poorer the region, the more important the self-provisioning flow is.

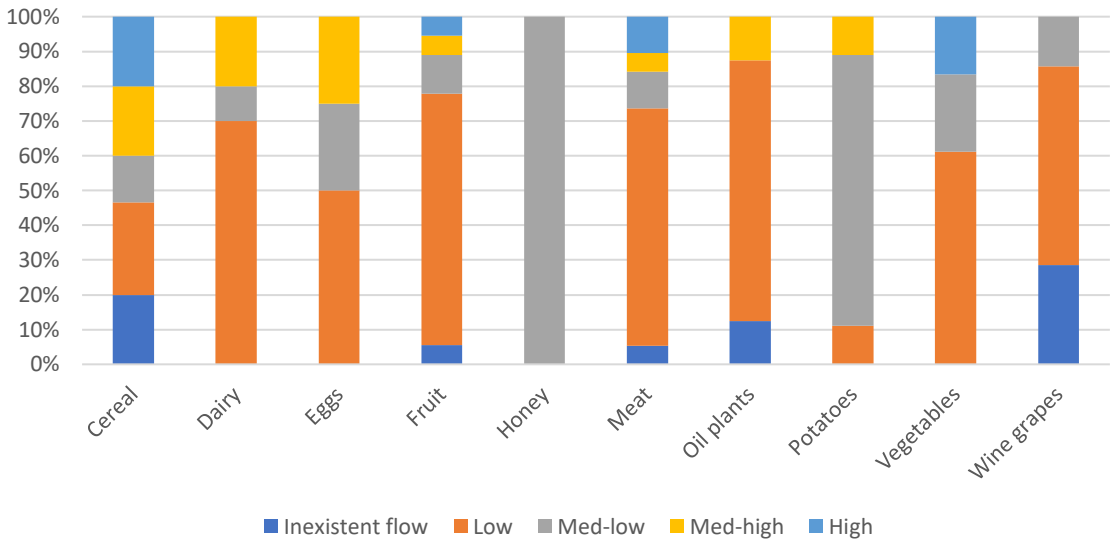
3. The more specialised and export oriented the food system is, the less important is the self-provisioning flow for SFs is.

For the purpose of this analysis, self-provisioning refers specifically to how much of the SF production flows directly back to farms themselves. Thus, the importance of self-provisioning depends mostly on the type of product and its uses within the farm and household. The importance of self-provisioning for SF livelihoods is extensively argued, especially amongst poorer farmers (Davidova, 2012; Davidova and Thompson, 2014). Food self-provisioning has also been described as an important adaptive capacity, by being a source of food independent from global drivers, market fluctuations and crises (Renting, 2012).

Analytical unit: Product Type

Figure 18, shows the importance of this particular flow within the food systems analysed for each particular product category.

Figure 18. Importance of self-provisioning flow per product category



The importance of this particular flow is directly affected by the number of direct connections SF have within the FS. The higher the number of connections, the lower becomes the relative importance of self-provisioning becomes. In order to correctly analyse this flow, it is therefore necessary to look at the Figures in section 3.4.2.2, which together show that:

Cereals and eggs, which are some of the products with less direct connections on average, rank from med-low to high in more than half of the food systems. In the case of cereal, farmers keep part of the production, not only for consumption in the SFS but also for animal

consumption in the farm (i.e. Nowosadecki (PL) and Nowotarski (PL)). Eggs on the other hand, are considered an important staple in most European and African households, it is therefore expected that small farmers are self-sufficient most of the year for this product and sell the excess (i.e. Oeste (PT), Giurgiu (RO), West Scotland (UK) and Jihocecky Kraj (CZ)). In none of these food systems the self-provisioning flow did not exist.

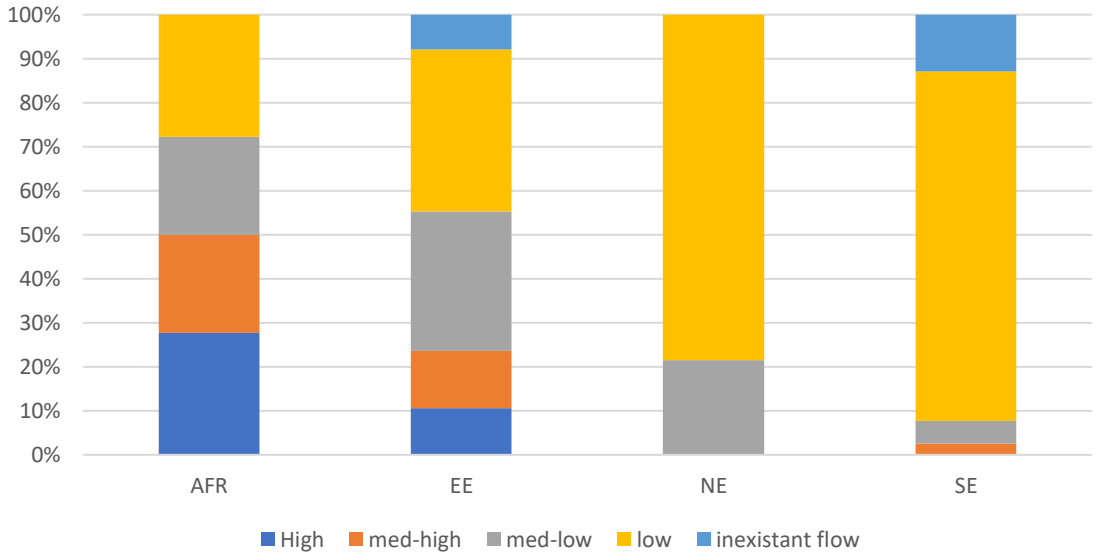
In all product categories, the flow of self-provisioning exists in most food systems. We can assume that SF are self-sufficient at least part of the year, thus self-provisioning can be considered an important flow for small farm production in general, i.e. SF that produce potatoes, if stored correctly, are self-sufficient in potatoes, even if the flow seems low, due to the total amount they produce and the connections they have.

As expected, the products that in some food systems do not have self-provisioning as a flow at all are those that are more specialised and require processing, i.e. wine in Córdoba (ES) and Vaucluse (FR) or Fruit in Castellón (ES). Other reasons for the absence of the self-provisioning flow are that the food system is so complex and specialised that it is not an option, a good example of this is pork meat in Castellón (ES). SF are extremely specialised, they can be small fattening farms, small reproduction farms or small closed cycle farms, and they are often integrated into integrating companies who actually own the animals. Additionally, slaughter houses are often outside the region and the product is brought to them by the integrating companies, not the farmers. It is therefore very difficult for most SF to produce for themselves. In Scotland, remote slaughter houses are also a barrier to self-provisioning. The main function of the activity is achieving household income, not family's food provisioning, thus contributing to the access dimension of FNS.

Analytical unit: Macro-regions

When looking at the importance of the self-provisioning flow per Macro-Region, other interesting trends can be observed (see Figure 19). We can see how the relative importance of this connection diminishes from AFR to EE to NE to SE progressively. These macro-regional differences could be partly due to GDP, the poorer the region, the more important the self-provisioning flow is (see table 19 below).

Figure 19. Importance of self-provisioning per Macro-Region



However, the GDP per capita in NE is considerably higher than in SE, therefore other factors may play a role in explaining these differences.

Analytical unit: Food System Type

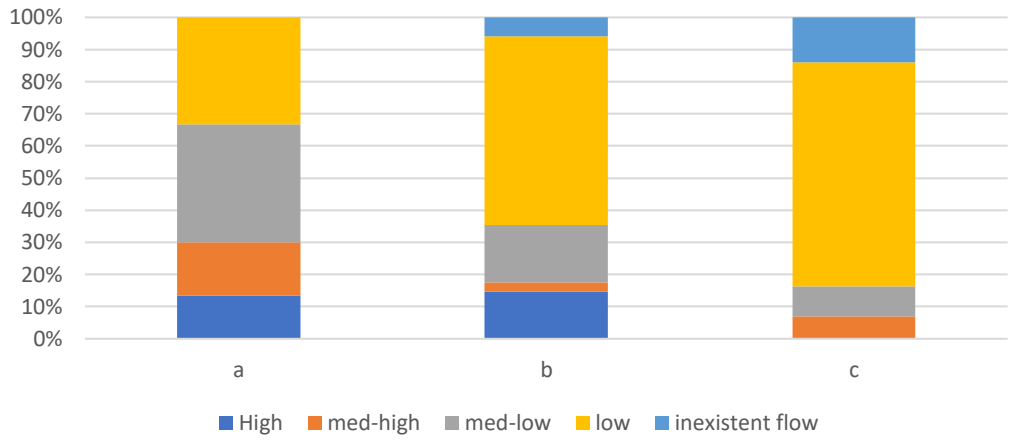
The food system type (local vs export) also shows similar trends to Figure 20.

Table 20. Self-provisioning per Macro-Region

Food System Typology	AFR	EE	NE	SE
A	**40,0**	**43,3**	3,3	13,3
B	14,7	**35,3**	**11,8**	**38,2**
C	2,3	27,9	**20,9**	**48,8**

The more specialised and export oriented the food system is, the less important is the self-provisioning flow for SF. This trend can also be observed in the Figure below.

Figure 20. Importance of self-provisioning per FS Type



3.4.2.6. Importance of proximity consumers for SF

Highlights:

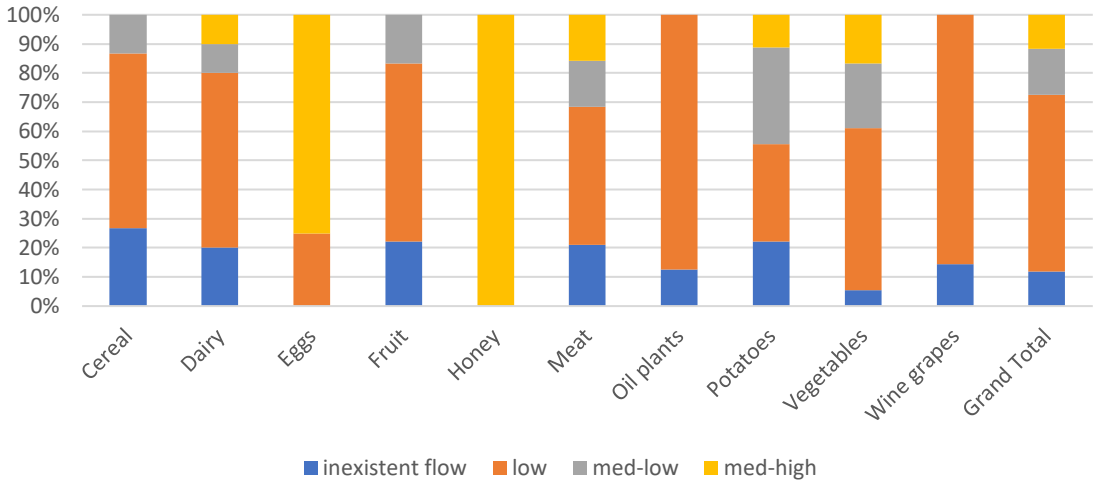
1. The flow to proximity consumers is present in 82% of all food systems analysed
2. In NE food systems is where proximity consumers are most important for SF (mainly Scotland).
3. In Food system group A proximity consumers are present in 94% of the cases. In food system group B proximity consumers are present in 88% of the cases. In food system group C proximity consumers are less relevant.

This flow represents the % of SF production (system-wide, not household based) that flows directly to consumers through alternative commercialisation pathways, such as farmer's markets, online selling, box schemes or purchased directly from the farm etc. This flow, represented in the 109 regional food systems maps is very important, as direct selling by producers offers an alternative in which both producers and consumers can form a symbiotic relationship depending on their individual needs and desires (Gilg and Battershill. 2000). Direct sale is a form of marketing that allow farmers to retain higher share of the final value of the products. Short and direct chains can be seen as strategies to capture new segments of demand interested in local and fresh food, and in direct contact between consumers and suppliers and as strategies to increase the diversification on farms to support and supplement the income necessary to maintain the farm activities (Low & Vogel, 2011; Meet, 2005; Aguglia, 2009).

Analytical unit: product category

In many food systems within the sample, proximity consumers are also an important flow, especially for honey and eggs, followed by vegetables, potatoes, meat and dairy products. However, proximity consumers are present in almost all food systems analysed, independently of the product (see Figure 21).

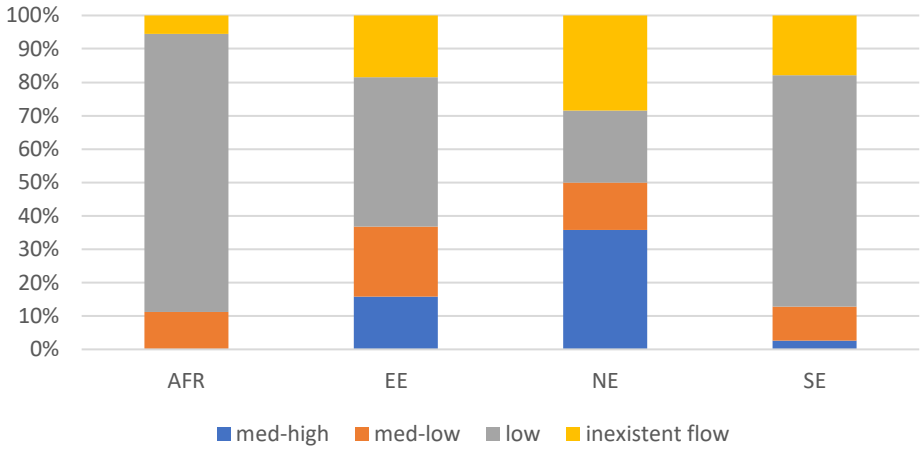
Figure 21. Importance of the Proximity Consumers flow per key product



Analytical unit: Macro-regions

When looking at macro-regions (see Figure 22), it is possible to observe bigger differences. In African Food Systems, proximity consumers are present in almost every case, even though the amount of product that flows directly to them is not so high. This is related to the fact that self-provisioning flow in Africa is quite high, diminishing the importance of proximity consumers. It is in Northern Europe where proximity consumers play a very important role (mainly in Scottish RRs); here SF commercialise their horticultural products largely through alternative food networks, instead of the mainstream market, like SF in Norway do, and the reason why this flow is also inexistent in some food systems within the NE Macro-region. The M-R where proximity consumers overall are less relevant is SE.

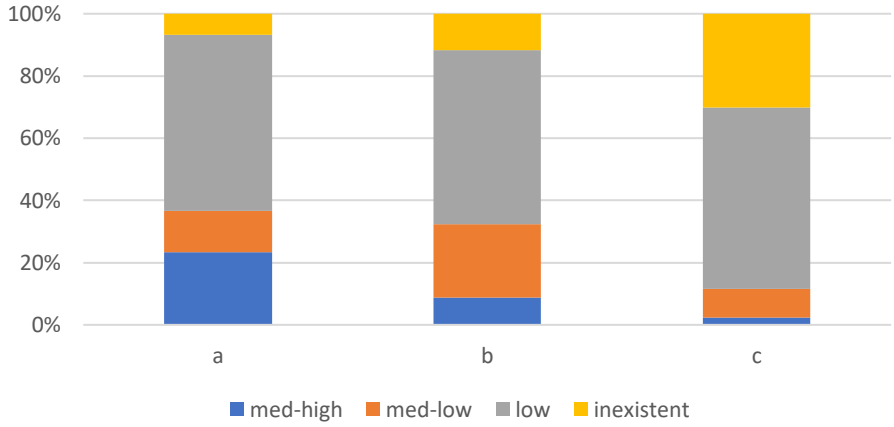
Figure 22. Importance of the Proximity Consumers flow per M-R



Analytical unit: Food system group

However, the most illustrative way of understanding the importance of proximity consumers is through food system groups (Figure 23). Food system group A, where the most locally focused FS are, is where proximity consumers have the most important role and are present in 94% of the cases. In food system group B, the importance diminishes to a small degree compared to A, however proximity consumers are still present in 88% of the cases. Finally, food system group C, the most export-oriented type of the 3, as expected, is where proximity consumers are less relevant. In 30% of the FS proximity consumers are an inexistent flow.

Figure 23. Importance of the Proximity Consumers flow Food System Type



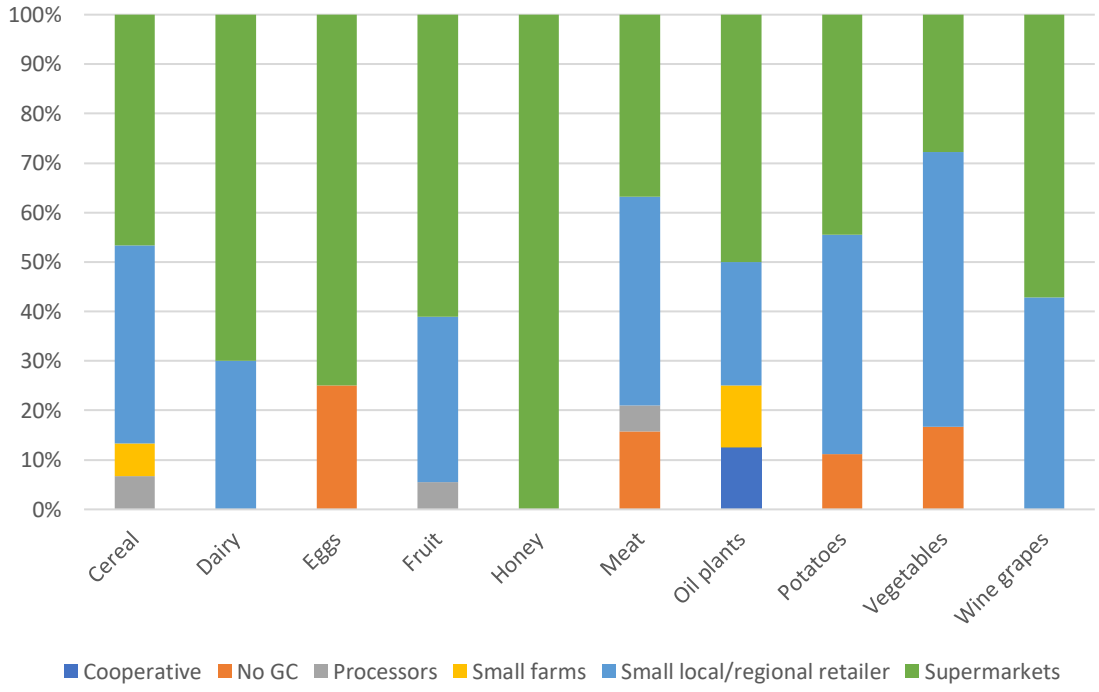
3.4.2.7. Most common points of access to food by general consumers

Highlights:

1. Supermarkets are the main points of access for food in all European regions
2. Supermarkets provide about half of the volume of key products in Eastern and Southern Europe, and small local stores about a third.
3. While most product types are primarily bought in supermarkets, others like meat and vegetables have an important distribution channel in small stores

Supermarkets are the main points of access for food in all European regions, but have only marginal importance in Africa. The importance of supermarkets varies somewhat between European regions, and by food system group. Supermarkets provide about half of the volume of key products in Eastern and Southern Europe, and small local stores about a third. For Northern Europe we don't have good data on general consumers. We also observe some differences depending on the key product (Figure 24). While most product types are primarily bought in supermarkets, others like meat and vegetables have an important distribution channel in small stores, suggesting that consumers may prefer to buy these when fresh or sourced locally.

Figure 24. Main access points for general consumers per product category



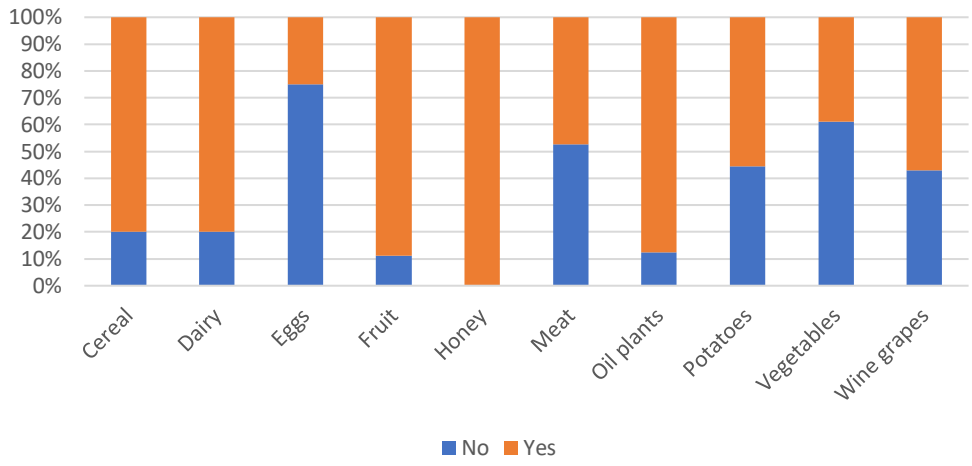
3.4.2.8. Connections between medium-large farms and SF

Highlights:

1. Large farms play an important role for SF's mainly in food systems where the sectors are well organised and specialised. In those cases, changes on, or the absence of medium-large farms could break the sector's organisational structure, causing shocks to SF who would struggle to access the markets they access nowadays through cooperatives, processors and distributors. This also means SF have less control on their production, prices etc. and depend on the governance arrangements created by more influenced farmers.

In 64% of the 109 food systems analysed, SF and M&LF have a direct connection shown in the FS maps, which could mean that M&LF act as supply chain aggregators for products. In terms of product type, the number of times this connection appears varies. As we can see in Figure 25, eggs, meat and vegetables are those where this connection is less frequent (less than 50% of the cases have this shared link). And those where this link is very common are: cereal, dairy, fruit and oil plants, followed by wine grapes and potatoes.

Figure 25. Conection between large and SF



Therefore, this connection is more commonly found for those products where the sector is well organised, and the most common actors acting as link are shown in the following Figure 26.

Figure 26. What is the node connecting SF and medium/large farms?

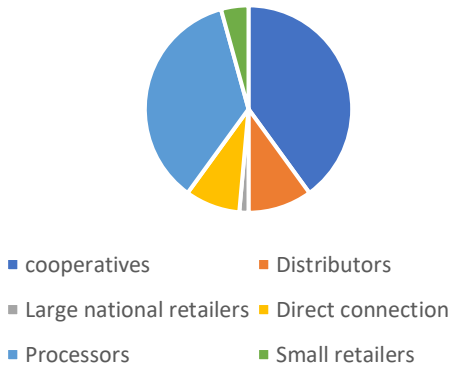
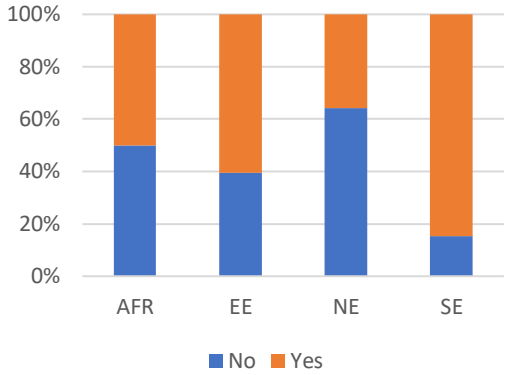


Figure 27. Connections between SF and M&LF



Cooperatives are the actors most commonly acting as link (40% of the times) i.e. oil plants and wine in Alentejo (PT), fruit and oil plants in Castellón (ES), dairy and meat in Hedmark (NO), oil plants in Lucca (IT). Followed closely by processors (36%) i.e. fruit, meat and wine in Imathia (GR), Cereal in Montana (BG), dairy in Pieriga (LV). In 9% of the cases the connection between SF and M&LF is direct i.e. cereal and oil plants in Giurgiu (RO), meat in Ille-et-Vilaine (FR), or potatoes in Nowosadeki (PL).

When we look at the macroregional differences, there are some trends to highlight (Figure 27): SE is the M-R in which most cases show a link between SF and LF, followed by EE and AFR. The M-R where third connection is least common is NE. In NE, i.e. SFs producing horticultural products in Scottish RRs, are usually part of alternative networks and as such, no connection is created between them and M&LF. In NE, small farmers are thus generally more autonomous in their decision making with regards to market arrangements. In SE, for most products analysed, the sectors are well organised and a very common way of organisation and distribution of agricultural products is through cooperatives, in Spain, Portugal and Italy and processors in Greece.

M&LF in most food systems affect the role SF. In some cases, M&LF can even secure SF sales i.e. oil plants and wine in Alentejo (PT) where if cooperatives did not receive the product also from large farms they would not be able to exist. Thus, in some cases LF production is a way of securing and stabilizing some of the key connections for SF. On the other hand, SF are also at the mercy of M&LF strategies, product prices and governance arrangements, thus, being highly influenced by the standards set by M&LF on the market. Any change by M&LF could destabilize SF, causing them to obligatorily change strategy, if they can or are able to.

3.4.2.9. Other roles played by SF within food systems

Highlights:

1. 83% of SF have on farm distribution within their respective food systems
2. Food system type A has the least nº of non-distributor SF, rising in % to food system type C, which has the highest %. The more specialised the sector, the lower the need for SF to distribute their production.
3. 60 % of SF **do not** have on farm processing within their food system
4. Processing depends on type of product, but it can be considered a strategy to create added value which some farmers choose to have and some do not need to.

SF within food systems may play other roles, different than producing. For the purpose of this analysis we look at the roles of distribution and processing. Both these roles may provide additional sources of income for SF, as it is another way of diversifying their businesses.

On farm distribution

In terms of SF having a distribution role or not, in our sample of 109 food systems, 83% of SF do play a distribution role within their respective food systems. This could be related to SF strategies to survive in food systems dominated by large industrial farms. They cannot access mainstream markets with competitive prices that allow for their survival, or because theses distribution channels do not accept small batches of product and so they need to find alternative pathways to use and commercialise their production.

Although most SF distribute, within those that do not, there are some interesting patterns that can be observed (see 3 Figures below):

Figure 28. SF distribution role per product

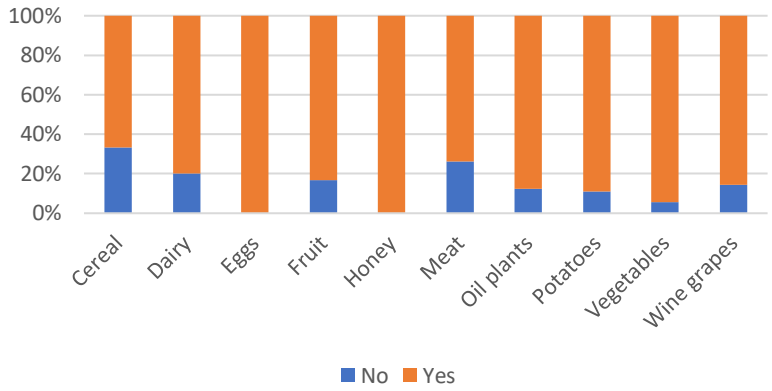


Figure 29. SF distribution role per M-R

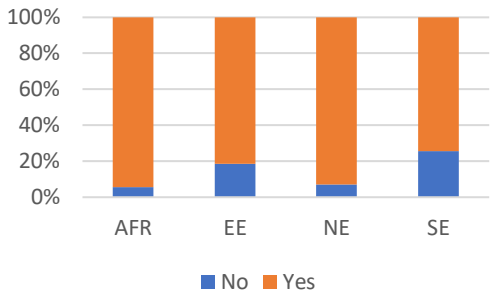
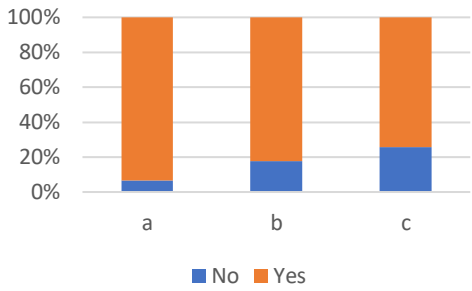


Figure 30. SF distribution role per FS type



Those products that show higher % of SF not having a distribution role within their food system are: cereals, meat and dairy (from 20 to 40% of SF do not have a distribution role), all these 3 products are either highly regulated in some regions, e.g. slaughtering must be done under very specific conditions i.e. Varazdinska (HR), Alentejo (PT) or Castellón (ES), or dairy in Córdoba (ES) and Hedmark (NO), where systems are modernised and very organised. In the case of cereals, the higher % of non-distributors SF is due to the fact that the uses of cereal without processing are more limited. If SF cannot process the cereal, and they do not have livestock, cereal is sold to other actors that process and distribute it (i.e. Latgale and Pieriga (LV), Santiago Island (CV), Rzesxowski (PL) and Montana (BG)).

The macro-regions where more SF do not have a distribution role are SE first, followed by Eastern Europe. Not many conclusions can be drawn from this fact, other than highlighting that SF in SE are generally more specialised and export oriented. Most of them belonging to Food System type C, which also show higher % of non-distributor SF. Food System type does show an increasing interesting trend: food system type A has the least non-distributor SF, rising in food system type C, which has the highest %.

Processing Role

When we look at SF playing a processing role, we see a different trend from above. In this case, 60 % of SF **do not** have a processing role within their food system. This is very much related to the fact that some products do not necessarily require processing, and some do. Products that require processing are: cereals, dairy, meat, oil plants and wine grapes. Whether SF process these products or not depends on individual strategies and the processing capacity of SF, as well as regulations. I.e. Wine in Córdoba (ES) is not processed and sold by SF with their own brand, they may make and keep some for themselves, but it is not a selling strategy. On the other hand, wine in Lucca is processed by SF and sold by them, with particular marketing strategies that give SF higher added value for their product. For cereals, all African regions process their own cereal for self-provisioning in the SFS and for the animals. It is a key staple of their everyday diets, and as such processing is almost a requirement. Cereals in most EE regions, such as Rzeszowski (PL), Pieriga (LV) and Giurgiu (RO) are not processed directly by SF.

For the remaining products, for which processing is not compulsory, and where we do see SF processing, SF are probably looking for diversification and creating by-product is a way of achieving this i.e. vegetables in Balaka District (MW); potatoes in Bistrita (RO), fruit in Pieriga (LV) and Ille et Vilaine (FR) to make cider and eggs in West Scotland (UK).

Figure 31. SF processing role per product

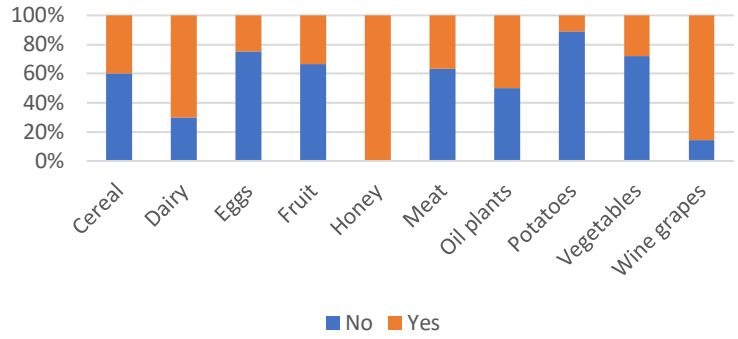


Figure 32. SF processing role per Macro-Region

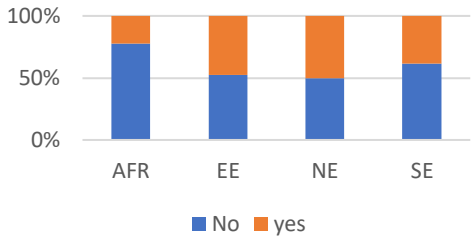
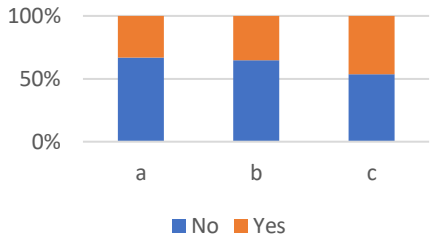


Figure 33. SF processing role per FS Type



Processing role is related to product type, and not so much depends on regional differentiations nor food system types. Although in the food systems type Figure we see a decreasing trend, this is due to the fact that most of the products that require processing are in food system C, and less in Food Systems B and A.

3.5. Key factors shaping food systems

Highlights:

1. The "average farm size" of the reference regions is the key variable shaping food systems in general.

2. The second key variable is the "main first actor connecting SF to the FS", thus showing that how SF are connected to the market highly affects the outcomes of the FS.

3. The most important economic variable shaping food systems is the "Country's GDP per capita".

4. In all models, variables belonging to category 1 (socio-economic and agricultural characteristics) rank first in order of importance.

The key factors or characteristics shaping food systems have been analysed using Random Forest algorithm. For the purpose of this analysis, we talk about shaping food systems in terms of 1) proportion of regional production that comes from SF, 2) proportion of SF production that is consumed within the region and 3) contribution to the availability component of FNS (as explained in section 3.4).

The Random Forest algorithm tool allows to organise, in order of importance, the key characteristics/variables playing a role in shaping food systems. For this, three types of proxy variables of SF importance were assessed: 1) % of total regional production produced by SF (%_RP_SF), 2) quantity of product that is locally sourced (%_product_locally_sourced), and 3) contribution of SF to the availability dimension of regional FNS for the products selected (contribu_FNS) (please refer to section 3.3. for a full explanation on these 2 variables. RF classification was implemented using the R package randomForest, where only two main tuning parameters need to be parametrized. The first, mtry, controls the number of predictor variables randomly sampled to determine each split (Freeman et al., 2015), and with p the number of predictor variables, was used to determine the value of mtry. The second parameter, ntree, is the total number of independent trees to grow, here we use 1000 trees in order to obtain stabilized variable importance estimation (Liaw and Wiemer, 2002). The out-of-bag error (oob) (measure of classification prediction error) and the mean decrease in accuracy (the percentage loss of accuracy when removing a certain variable from the model) were used to assess the model's accuracy and the importance of each predictor (independent variable), respectively. These were all used as independent variables for the analysis.

Three variables were selected for being those that represent most objectively the shape of food systems with regards to the final output of FNS: 1. % of regional production produced by SF); 2. minimum quantity of product produced by SF that is locally sourced); 3) contribution of SF to regional FNS based on the 3 groups created for Analytical Lense. These were each used as a dependent variable in each of the three models created. This type of analysis has been used by other authors in agricultural studies to measure the importance of random forest predictors in explaining different relationships between for example farms and crop portfolios (Weigel, 2018).

Out of the 10 key variables shown per model, in total, 16 different variables stand out, out of which 3 are common across the three models: Cluster Region (D.2.1.) (these are the clusters created by WP2 and presented in D.2.1); country's GDP per capita (USD, PPP); and average farm size. Even though these variables do not always appear in 1st place, they are present in the model, meaning that they always play a key role in shaping food systems.

Figure 34. Model 1: "Contribution of SF to Regional FNS"

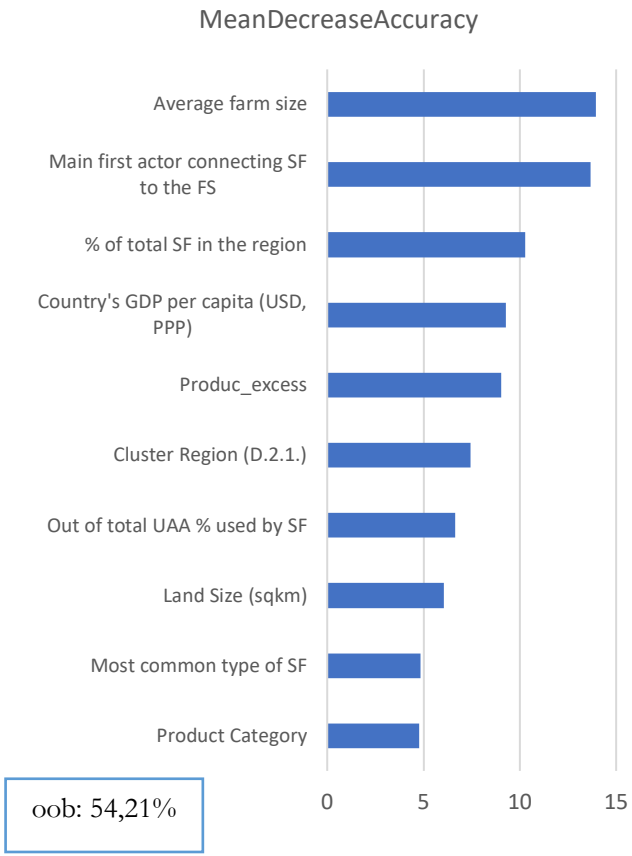


Figure 35. Model 2: "% of total regional production produced by SF"

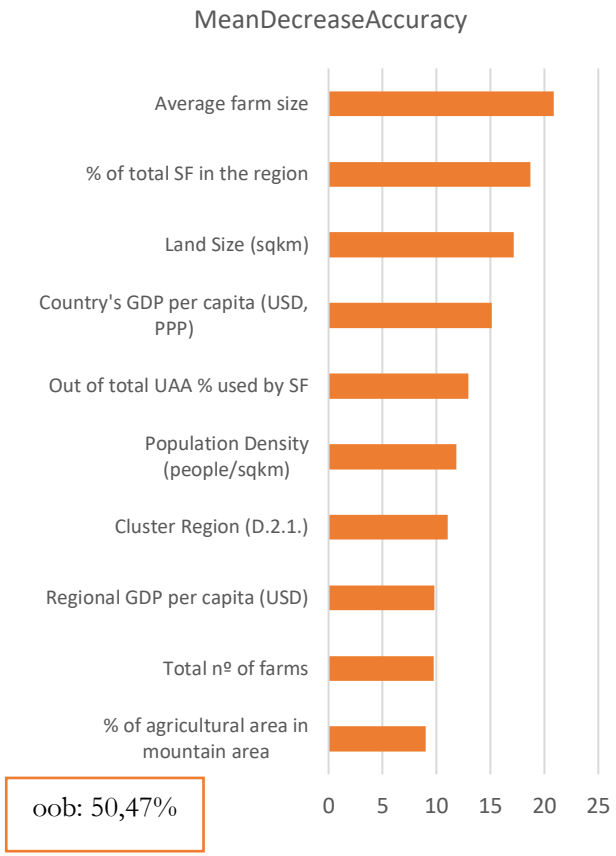
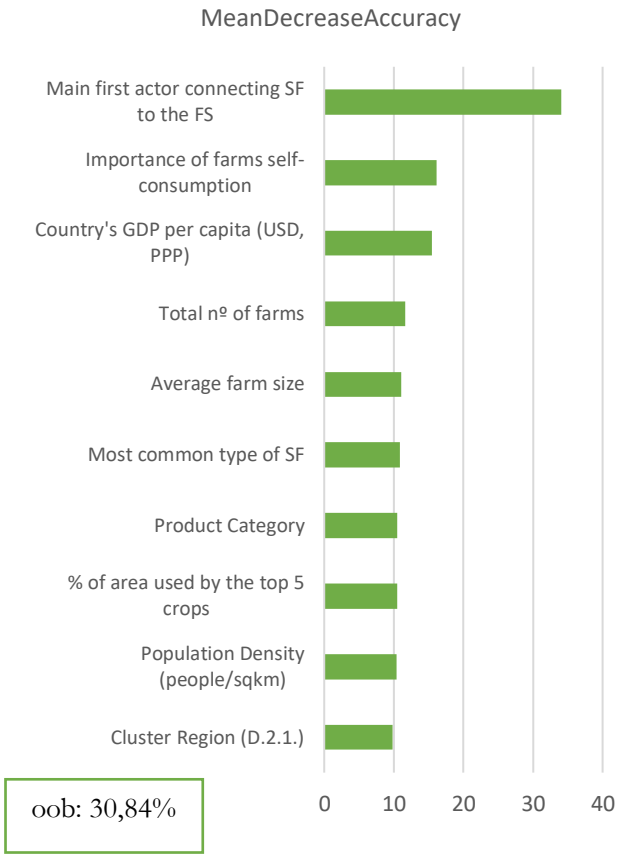


Figure 36. Model 3: "Min quantity of product produced by SF that is locally sourced"



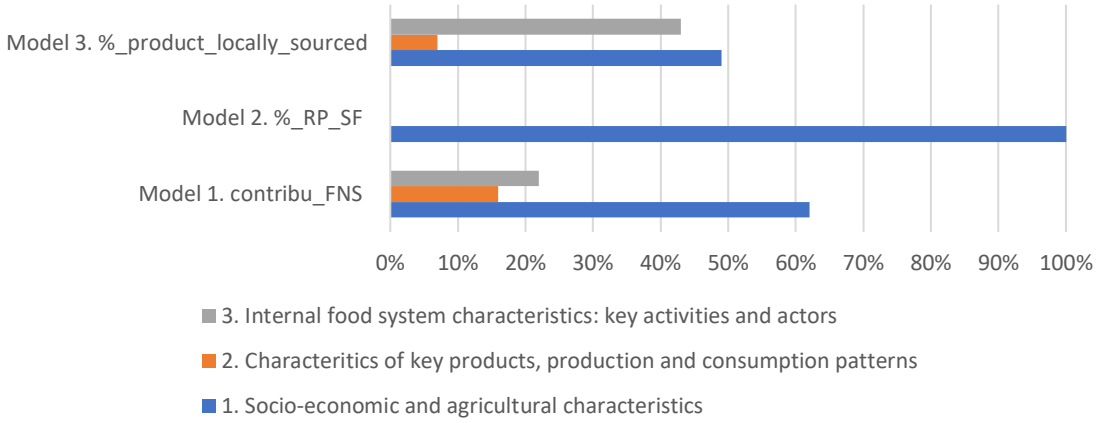
Even though the variables selected can only serve to interpret part of the reality affecting how food systems are shaped[10] (there are other factors contributing to shaping food systems that have not been considered), they are able to represent an important part of the reality and shed light on some of the key variables that need to be considered when making decisions aiming to intervene on food systems.

In general, looking at the figures above, the "average farm size" of the regions is always in the top 5 variables, followed by "the main first actor connection SF to the FS", thus showing that how SF are connected to the market highly affects the outcomes in terms of production quantities that stay or leave the RR, and thus their contribution to regional FNS. "% of total SF in the RR" is the next most common key variable across models. The appearance of this variable makes sense, as how many small farms there actually are must surely affect the shape of the food systems. "Country's GDP *per capita*" is also a key characteristic. It is interesting, as it is the first economic variable in importance, and it seems to play a more important role than Regional GDP *per capita*. Finally, it is important to highlight that a variable intrinsic to the food system appears as 2nd key variable for Model 3 "Min quantity of product that stays within the RR". Thus, depending on SF strategies and their choice of keeping part of their production, this variable will have an important effect on how much product actually stays within the RR.

Regarding each of these specific variables, the next step (for future publication) is to analyse the nature of such correlations to see how they are exactly affecting the dependent variables and to further understand how they work.

An additional interesting analysis is shown in Figure 37 below. Out of the 3 variable categories, it shows which variable type has a higher relative importance considering the top 10 key variables per model.

Figure 37. Importance of the different variable categories in each model



In all models, variables belonging to category 1 (socio-economic and agricultural characteristics) are the most important out of the three, especially for model 2, where all first 10 variables belong to. Therefore, the profile of the region in terms of agriculture and economic and social parameters play a much more important role for the % of regional production coming from SF than type of product related characteristics, or the internal functioning of the food systems.

[10] see oob values (classification error)

It is in model 3 (% of product that is locally sourced), where category 3 variables, referring to internal food system characteristics play a more significant role. Thus, for food systems to show more locally oriented or export oriented tendencies, the activities and roles of the actors within the system play a very important role.

Variables regarding category 2 (key products characteristics) although they would intuitively seem to play an important role in shaping food systems, they are not as strong as the variables in the other 2 categories. However, there is one variable that from this group that appears to play an important role, which is "product category". Thus, the type of product selected does have an effect on the particular shape of the food system.

3.6. Small farm types and their food systems

Highlights:

1. "Conventional strugglers" are the most common type of farms in food systems where SF contribute most to regional FNS, followed by "business specialised".

2. "Conventional entrepreneurs" are the most common type of SFs in food systems where SF contribute least to FNS.

3. "Conventional strugglers" together with "business diversified" SFs are those who establish the largest number of direct connections with the market.

4. There is a clear distribution of SF types according to the macro-regions. The most common type of farms per macro-region as follows:

- AFR: conventional strugglers
- EE: conventional strugglers
- NE: business specialised
- SE: conventional entrepreneurs

According to the analysis performed under WP3 and reported in D.3.2. the sample of SF that were interviewed both in Europe and Africa, can be clustered around 5 different types of SF:

A) Weaker market orientation farms

1. Part-time self-provisioners: Farming appears to be a secondary activity that supplements other sources of income, by generally young farmers, who started farming as a new livelihood option for them; a high proportion of production stays in the household.

2. Conventional strugglers: second poorest cluster, and oldest; farming is rooted in tradition and it accounts for a high proportion of income; high proportion of production stays in household.

B) Stronger market orientation farms

3. Conventional entrepreneurs: relatively wealthy, relatively old and established in farming; rely on family labour; access markets through cooperatives

4. Business specialized: wealthiest group, relatively old and established in farming; extensive use of hired labour; access to markets through cooperatives, invest in certification.

5. Business multifunctional: wealthy, relatively young and new to farming; extensive use of hired labour; diverse portfolio of buyers

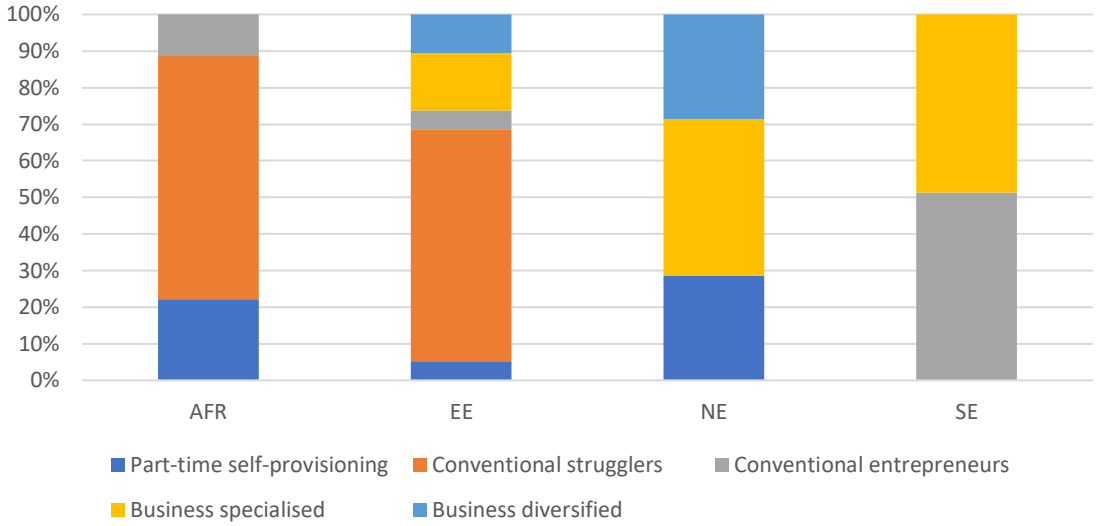
Please refer back to D.3.2. for a detailed description of each type.

We have already presented detailed descriptions of the 109 food systems, and by contrasting them with the most common type of small farm present in each food system, it is possible to observe up to which point and how SF influence food systems.

Macro-regional Distribution of Small Farm Types

Even though most types of farms can be found in most regions, and considering the sample taken in each region was not representative, it aimed to represent the variability in farm types per region, in order to be able to visualize and relate SF and the food system group they belong to, only the most common type of small farm in each region was used in the analysis, showing the following macro-regional distribution (see annex II for a regional distribution):

Figure 38. Most Common Type of SF Macro-Regional Distribution



It is evident that there is a macro-regional distribution of the small farm types, meaning that certain types tend to be much more represented in one or two macro-regions than in others (please bear in mind this is not a representative sample, so the below examples just aim to show general overarching trends). At least for Europe, this seems to indicate there is still a highly differentiated small farm dominant profile, according to the region considered – and thus only a differentiated approach can reveal the diversity of situations to be dealt with, both analytically and from a policy perspective. In Figure 38 above, we can see that in Africa, the most common types of SF (in 88% of the cases) belong to the group "weaker market orientation farmers". Within this group, most are conventional strugglers, the poorer types of farm of the set, which is expected amongst African farmers. We do see however, conventional entrepreneurs in Africa, which is interesting considering they are relatively wealthy and part of well-organized sectors. Part-time self-provisioning farms in Africa are also observed (11%), which is expected, as many farmers in Africa also have other jobs (non-agriculture related) to bring income to the household, complemented by the income and food achieved from their farming activities.

In EE, similarly to Africa, the most common type of SF are the conventional strugglers (63%), followed by business specialized (15%) and business diversified (10%). We can therefore see the old way of doing farming represented in EE, where SF are poor and struggling to survive, but we can also see a new type of small farmer (some old, some young) who opts for specialization and certification, as strategies to increase their income.

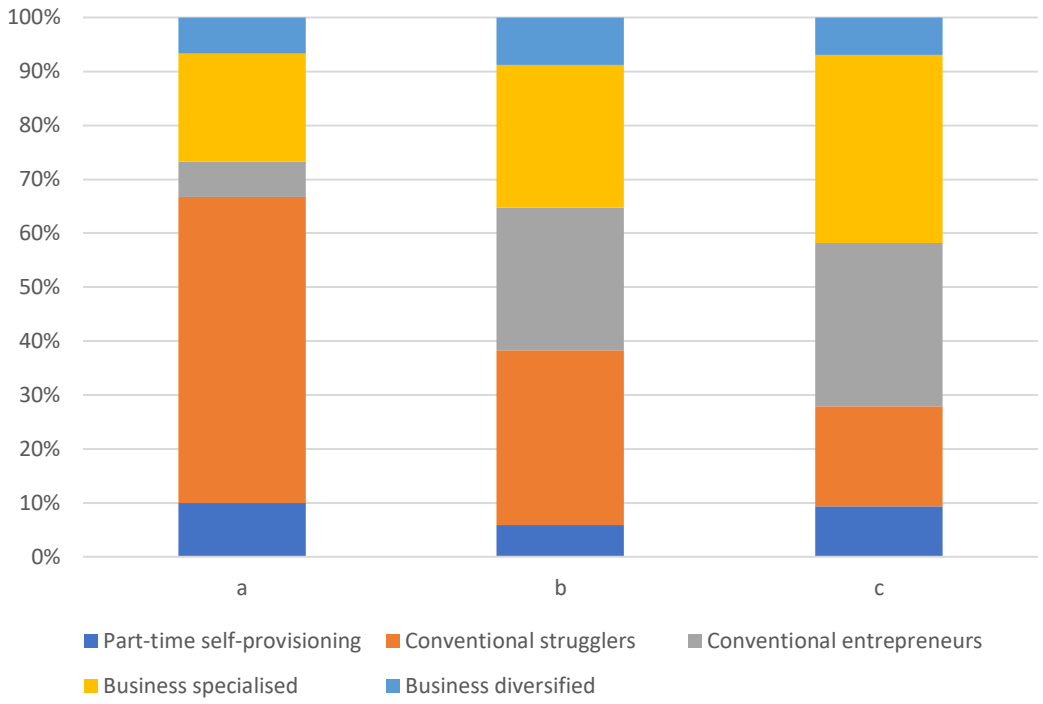
In Northern Europe we see a close balance between part-time (28%), business specialized a bit higher (42%) and business diversified (28%) small farmers. Part-time self-provisioning farmers in NE, are those who choose to farm, but their income does not depend on farming. They farm as a lifestyle choice, keep part of their production and sell the excess. The other 2 types, are specialized and certified, they belong to organized sectors and are able to live of their farming activities with good access to farming subsidies.

In SE, 2 types are the most common: conventional entrepreneurs (51%), a common type of farms found in the Mediterranean areas, who are farmers that sell through cooperatives, typically quite old, who rely on family labour, and do well economically. This is not surprising for SE, where the agricultural sector is specialised and organised, and therefore provides easy access to all types of farmers, but under market conditions. And business diversified (49%), those farmers that try to differentiate themselves from the rest, using different strategies, such as certification to add value to their production.

Small farm types and their contribution to the availability dimension of FNS

As it has been discussed in the sections above, out of the three food systems groups, FS Group A are those where SFs contribute most to FNS; FS group B where they contribute moderately to FNS; and FS group C, where SF contribute less to FNS. Figure 39 shows the distribution of small farm types across food system groups:

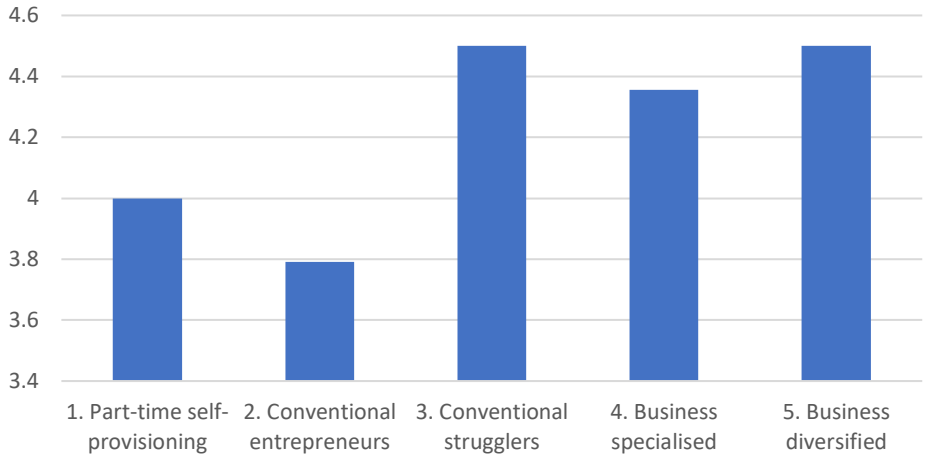
Figure 39. Small farm types and their contribution to availability



The food system group that contributes most to FNS is A, where most SF are conventional strugglers. This is not surprising, considering they keep a large part of their production for their household and as they are weakly market oriented, they most likely source their food very locally, thus most of their production stays within the RR. Conventional strugglers are also present in regions where SF are large in number, therefore a large number of them also increases their potential FNS contribution. Business specialised are the next most common type of farms in food systems A and B, which is interesting, as this group is well off and lives comfortably. A possible reason why this group can be considered the second most important for FNS outcomes is that they are business oriented, looking for added value through different strategies, such as certification etc. opening doors for the production to both stay within the RR (FS group A and B) and be sold through alternative networks, or to be exported through specialised cooperatives (FS group C). Conventional entrepreneurs are also mostly present in group C, thus not contributing much to regional FNS. They commercialise mainly through cooperatives and have no control on where and how their production is sold.

In general, there are many SF, even in Europe, and they are producing large quantities of products. Some of these stays within the RR and some leaves, but in any case, that production exists and contributes to FNS. The stability and resilience (related to product diversification, commercialisation channels diversification, their roles within the FS) of the different types of SF may give us the clue as to what extent their production would be important and necessary in times of crisis (see Figure 40).

Figure 40. Average of total No. of connections with the market per SF type



According to this Figure, those SFs with a smaller number of different connections to the market are the "conventional entrepreneurs", very common in areas where the sectors are well organised through farmer's organisations and cooperatives, therefore, a smaller number of connections are needed by SF to access markets. The next from the bottom are "part-time self-provisioning SFs". Their connection to the markets is weaker, they have other sources of income, and thus, this connection might not be a priority for them. Those with most connections are "conventional strugglers" and "business diversified" followed by "business specialised". This is very interesting, as the number of connections derive from completely different needs. It also challenges what the literature has described so far, as non-market orientation which is generally viewed as having a low number of connections. Our evidence shows that, in the case of "conventional strugglers", they establish different connections because they need it to survive, and none of the connections is strong enough to completely support their income on its own, so they diversify. The "business diversified" farmers also look for alternative markets and commercialisation pathways to access a different type of consumer, where their product can get a higher added value and thus, their income increases. In both cases, the more connections they have, the more stable their income.

4. Conclusions- What new have we learnt?

For the purpose of this analysis, the use of a territorial approach to explore small farm's contribution to the local food system and the availability dimension of FNS, has allowed us to explore the specific contexts in which SF operate, as argued by Cistulli (2014) and OECD (2016) and the outcomes of the particular contexts in terms of the activities carried out by SF and the different flows activated. Of course, the outcomes are also very much related to SF's specific attributes (backgrounds, motivations, education etc.) and agency counted. "Structure" and "agency", in Gidden's terms (Danermark, Ekstrom and Jakobsen, 2005), are in more interactive and mutually shaping relationships.

The type of region, meaning largely its location in different macro-regional settings for Europe, or in Africa, has been shown to be highly determinant for many of the characteristics of the food system, confirming that territorial conditions are a fundamental determinant for the functioning of the food system and the role of small farms and respective role of small food businesses.

This deliverable aimed to generate further knowledge related to 2 of SALSA's research questions. Conclusions are therefore organised around them as follows: RQ1. Which food system actors and activities are involved in the generation of the FNS outcome in the reference region; and RQ4. What is the position (and importance) of SF in the Regional FS.

4.1. Research Question 1. Which food system actors and activities are involved in the generation of the FNS outcome in the reference region?

4.1.1. SF contribution to regional food availability

When looking in general at SF's contribution to regional availability (production and food system orientation) of certain products, we have seen that African SF contribute most, followed by Eastern European, Southern European and finally Northern European. However, this is strongly affected, not only by the connections established between SF and their food systems, that will be discussed below, but also by the total number of SF in the regions. In Northern European regions, SF are relatively few in relation to the overall farm structure, compared to Africa where most farms are small.

The nature of the connections to the market established by SF also affect the outcome. First, the total number of connections, and second, who are SF are most importantly connected to. In Southern Europe the number of direct connections between SF and the market is the lowest, but these regions are also recognized by having highly structured sectors, thus reducing the need for connections. The choice of products, may also be determining the total number of connections. We have seen that the less the need for processing a product has, the higher the number of connections SF make. The number of connections can also be related to the coping and adaptive capacity of SF in the face of a crisis (Barret and Carter, 2000; Berkes and Jolly 2001), thus, SF with more diverse connections may be more able to withstand crises than those with less. However, for some SFs, this is directly related to their own vulnerability, whereby they are unable to access stable larger markets and thus have to opt for a larger number and more diverse means of putting their products into the market.

When looking at the actors exerting the main link between SF and the market, we can see that when SF are more integrated into mainstream markets, such as most in SE and some

NE and EE regions, cooperatives and processors are the main links. When SF are less market integrated, such as in African RR and EE RRs, or integrated into alternative food networks, such as EE regions and some NE, the main actors are proximity consumers and the farm households themselves.

Self-provisioning in SF is very common across all regions and food systems. This flow exists in 92% of the food systems analysed. And even though the relative importance of this flow diminishes the more export oriented the food system is, the fact that it exists in most food systems should be highlighted.

4.1.2. Key factors shaping food systems

According to our data, the key factors shaping food systems are related to the economic and structural characteristics of the region, such as the average farm size and the country's GDP. However, a new interesting finding is that the main actor linking SF to market also determines and shapes the outcome of the food system. Although further, and more in-depth specific analysis will need to be made in this direction, we can already prove that how SF connect to the market, has important effects on the availability dimension of regional FNS.

4.2. Research question 4. What is the position (and importance) of SF in the Regional Food Systems

4.2.1. Destination of SF' foods

Even though in most of the food systems analysed, small farm production represents up to 20% of the total regional production, the strategies and connections of the SF with the food system determined how much they actually contribute to the availability dimension of regional FNS, as it defines how much product is locally sourced. In this regard, there are some interesting macroregional differences to be drawn. While in Africa, SF supply most, if not all, of their production locally, in southern European regions, most product from SF is exported. In northern and eastern European regions, we see both types of food systems. This could probably imply that for the products where the agricultural sector is well organized and specialized, SF are better able to access mainstream markets, reducing their need to look for alternative commercialization pathways. However, this could also mean that SF lose control of their production and prices, while in northern European regions SF are able to obtain much higher added values through direct sale channels. In fact, it is in regions with specialized sectors that large farms have more influence on SF's work and production (see section 3.4.2.8). As we have seen, changes on, or the sudden absence of medium-large farms could break the sector's organisational structure, causing shocks to SF who would struggle to access the markets they access nowadays. This also means SF depend on the market arrangements more beneficial for the more powerful larger farmers. Thus, we could say that M&LF, as well as cooperatives, or any other processor or intermediary serves ultimately as a gate keeper for SF, holding them in the least powerful place in the food chain, where they are arguably price takers. Even in cases of no cooperation between SF & M&LF, the latter influences the former through indirect competition on quantities and price-setting.

4.2.2. Food systems and small farm types

Most SALSA's identified types of SF are present in every region; however, from our sample, in each region, some are more common than others. When contrasting food system groups with the most common types of SF present in the region, the key conclusions that can be drawn are that "conventional struggler" SF are the most common type of farms in food systems where SF contribute most to regional availability, and "conventional entrepreneurs" are the most common type of SF in food systems where SF contribute least to regional availability. Both these groups are also the most numerous types in our sample. Ideally, for SF to contribute to the regional availability of food products, small farmers should not need to be poor and struggle to get by. Thus, other strategies need to be found, that allow them to contribute to the availability of regional FNS but at the same time being able to provide good livelihoods for their families, such as improving SF's socio-economic conditions and situations. The types of SF that meet both these criteria would be the "business specialised" and "business diversified". Both these types are common across all regions, but especially relevant in Northern European regions, where small farmers, as defined in SALSA, are very scarce. These types may have resulted from an adaptation to an increasing industrialised agriculture, whereby they needed to survive either by growing or by looking for new market niches.

4.3. Contribution to current debate on SF and FNS

Current debate around SF is related to the importance of self-provisioning and its relevance for SF's livelihoods. Davidova et al. (2012) and Davidova and Thompson (2014) argue that self-provisioning is very important for SF's livelihoods in Eastern European countries and particularly among poorer farmers. Studies in African regions also highlight the importance of self-provisioning for SFs' livelihoods and specially for women farmers (Drèze and Sen, 1991; Jiggings (1989); Lupian (1997); and Nagayets (2005). Our evidence shows that these statements are true, but it is also true amongst SF in all other European countries analysed, where SF in all regions keep part of their own production for themselves. The more specialised the SF are, the less product is kept for themselves, thus conventional entrepreneurs and business specialised keep relatively less. Nevertheless, almost always, there is a share of the production which is kept in the household, and this is highly interesting, meaning there is almost always part of the SF production that never reaches the market. This same statement can be made about the findings on food systems, the more specialised the sector is, the less product that is locally sourced by SF within their food systems. Self-provisioning is and should remain an important function of SF (and probably farms in general). However, in terms of SF contribution to FNS, there is still much potential in SF still unused, especially considering the important number of poor and struggling SF, which might produce more. And some of the key inhibitors of such potential is the high and insurmountable costs of entering markets (production and product standards, costs of permissions, regulations of distribution etc).

We can conclude that our results bring new insights to the current debate around SF and their contribution to FNS, which argues that SF are still a key element of global FNS. The HLPE (2013) states that about 500 million SF in developing countries support about 2 billion people and up to 80 % of the food supply in Asia and sub-Saharan Africa. Our results are in line with these findings regarding Africa, and furthermore, bring additional light into European SF, evidencing that there are still large numbers of SF in Europe and that more than 60% of them are contributing to regional availability through locally sourcing half if not

most of their production (mainly in EE and NE). In the other 40% of cases, the production potential of SF is high, and thus exporting outside the RR and the country is their major focus, but their contribution to the regional food system, in terms of food quantities is still significant (mainly in SE).

Further explorations on SF's role to FNS and the other dimensions are presented in D3.2., which analyses the contribution from a farm/household perspective. Other Deliverables from WP4, on the foresight analysis, as well as the governance mechanisms behind SF's action and activities from WP5, and the relevance of policies from WP6, complement this analysis. In order to see the full picture of SF contribution to regional food systems and all dimensions of FNS all these results need to come together and be analysed in conjunction.

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ANNEX I. Overall Description of the type of data collected

Figure 1. Land Size (sqkm)

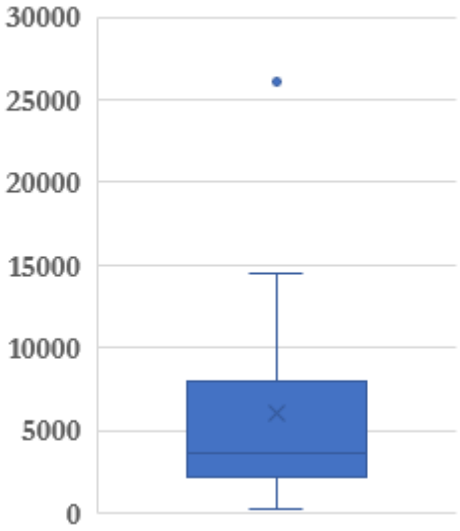

Figure 2. Population Density (people/sqkm)

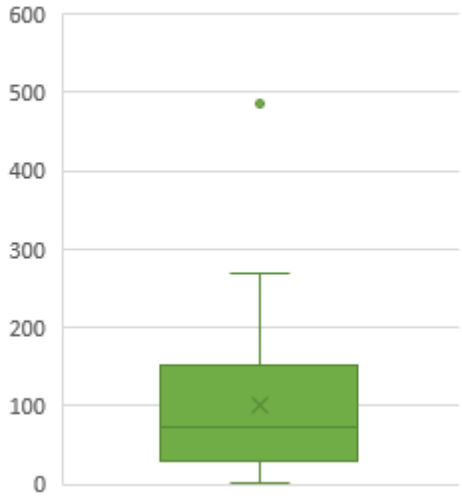

Figure 3. RR GDP per capita vs Country's GDP per capita

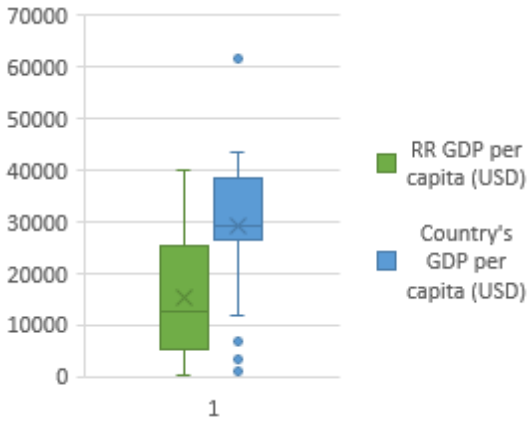

Figure 4. % of SF in the RR

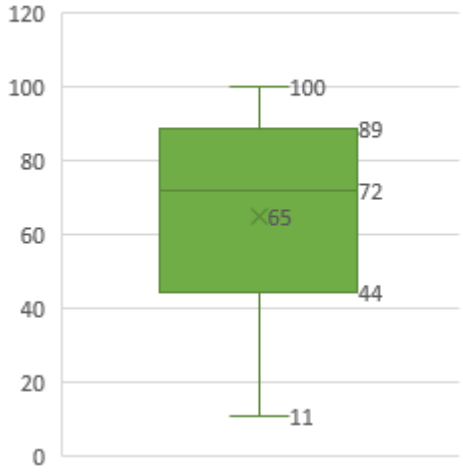

Figure 5. % of SF vs % of total UAA used by SF

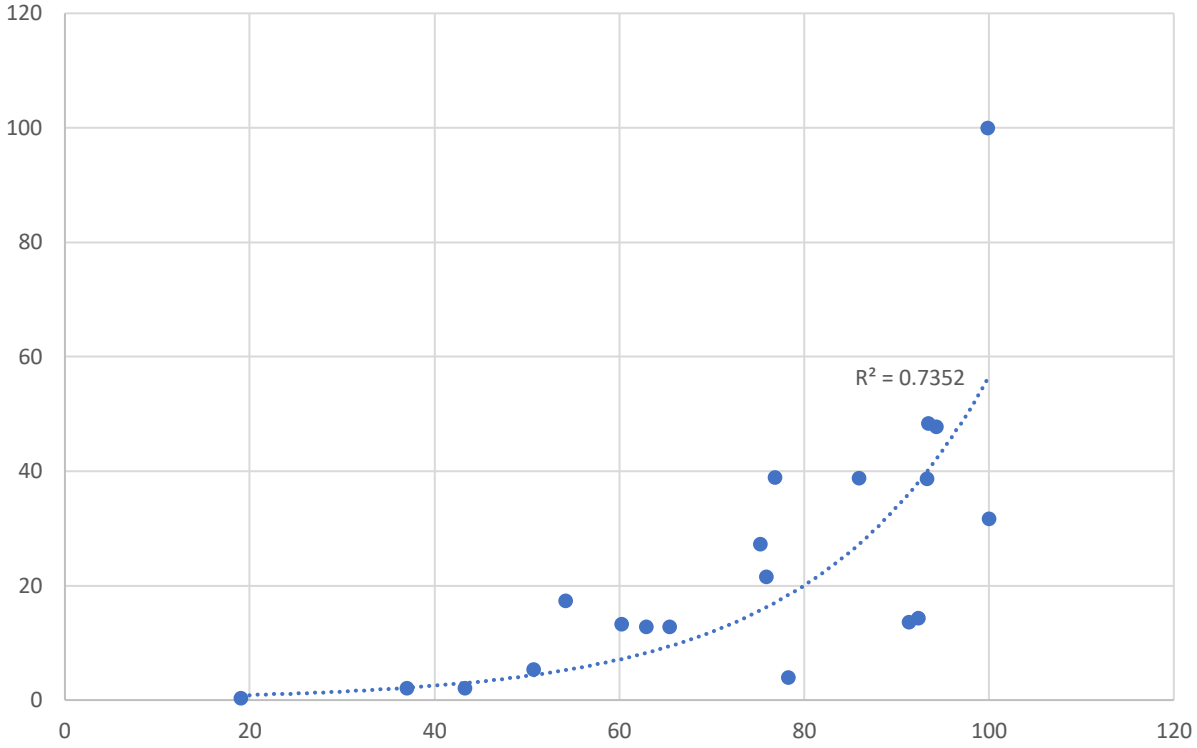

Table 1. Key Products' balance sheet

Code of RR	RR	Key products	Product category	Surplus/deficit/balance Category -50 to +50 balanced
R1	Montana (BG)	Wheat	Cereal	NA
R1	Montana (BG)	Milk and cheese	Dairy	NA
R2	Santiago Island (CV)	Tomato	Vegetables	Balanced
R2	Santiago Island (CV)	Banana	Fruit	Balanced
R2	Santiago Island (CV)	Chicken	Meat	Negative
R2	Santiago Island (CV)	Maize	Cereal	Negative
R3	Varazdinska (HR)	Potatoes	Potatoes	Surplus
R3	Varazdinska (HR)	Pork meat	Meat	Balanced
R4	Jihocecky Kraj (CZ)	Eggs	Eggs	Balanced
R4	Jihocecky Kraj (CZ)	Goat cheese	Meat	Balanced
R5	Ille-et-Vilaine (FR)	Pork	Meat	Surplus
R5	Ille-et-Vilaine (FR)	Apples	Fruit	Negative
R6	Vaucluse (FR)	Wine	Wine grapes	Surplus
R6	Vaucluse (FR)	Cherry	Fruit	Balanced
R6	Vaucluse (FR)	Olive oil	Oil plants	Negative
R7	Gushegu District (GH)	Soy beans	Oil plants	Surplus
R7	Gushegu District (GH)	Sheep	Meat	Surplus
R7	Gushegu District (GH)	Rice	Cereal	Surplus
R7	Gushegu District (GH)	Maize	Cereal	Surplus
R8	Imathia (GR)	Peaches	Fruit	Surplus
R8	Imathia (GR)	Cherries	Fruit	Surplus
R8	Imathia (GR)	Wine grapes	Wine grapes	Surplus
R8	Imathia (GR)	Beef	Meat	Negative
R9	Larisa (GR)	Almond	Fruit	Surplus
R9	Larisa (GR)	Sheep and goat milk	Dairy	Surplus
R9	Larisa (GR)	Apples	Fruit	Surplus

R9	Larisa (GR)	Pulses	Vegetables	Surplus
R10	Ileia (GR)	Corinthian currants	Fruit	Surplus
R10	Ileia (GR)	Oranges	Fruit	Surplus
R10	Ileia (GR)	Olive oil	Oil plants	Surplus
R10	Ileia (GR)	Pickled vegetables	Vegetables	Surplus
R11	Lucca (IT)	Vegetables	Vegetables	Balanced
R11	Lucca (IT)	Wine	Wine grapes	Negative
R11	Lucca (IT)	Olive oil	Oil plants	Negative
R11	Lucca (IT)	Fruit	Fruit	Negative
R12	Pisa (IT)	Wine	Wine grapes	Surplus
R12	Pisa (IT)	Vegetables	Vegetables	Surplus
R12	Pisa (IT)	Wheat	Cereal	Surplus
R12	Pisa (IT)	Bovine meet	Meat	Negative
R13	Ugunja (KN)	Maize	Cereal	Balanced
R13	Ugunja (KN)	Groundnuts	Vegetables	Balanced
R13	Ugunja (KN)	Cowpeas	Vegetables	Balanced
R13	Ugunja (KN)	Beans	Vegetables	NA
R14	Latgale (LV)	Potatoes	Potatoes	Surplus
R14	Latgale (LV)	Wheat	Cereal	Surplus
R14	Latgale (LV)	Honey	Honey	Surplus
R14	Latgale (LV)	Milk	Dairy	Surplus
R15	Pieriga (LV)	Vegetables	Vegetables	Surplus
R15	Pieriga (LV)	Milk	Dairy	Surplus
R15	Pieriga (LV)	Wheat	Cereal	Balanced
R15	Pieriga (LV)	Apples	Fruit	Negative
R16	Vilniaus Apskritis (LT)	Cereals	Cereal	Surplus
R16	Vilniaus Apskritis (LT)	Vegetables	Vegetables	Negative
R16	Vilniaus Apskritis (LT)	Milk and derivatives	Dairy	Negative
R16	Vilniaus Apskritis (LT)	Fruit	Fruit	Negative
R17	Balaka District (MW)	Groundnuts	Vegetables	Surplus
R17	Balaka District (MW)	Goat meat	Meat	Balanced
R17	Balaka District (MW)	Cabbage	Vegetables	Balanced
R17	Balaka District (MW)	Maize	Cereal	Balanced
R18	Hedmark (NO)	Lamb	Meat	NA
R18	Hedmark (NO)	Potatoes	Potatoes	Surplus
R18	Hedmark (NO)	Milk	Dairy	Balanced
R18	Hedmark (NO)	Berries	Fruit	Negative
R19	Rzeszowski (PL)	Potatoes	Potatoes	Surplus
R19	Rzeszowski (PL)	Cereals	Cereal	Surplus
R19	Rzeszowski (PL)	Poultry	Meat	Negative
R19	Rzeszowski (PL)	Pork	Meat	Negative
R20	Nowosadecki (PL)	Apples	Fruit	Surplus
R20	Nowosadecki (PL)	Potatoes	Potatoes	Surplus
R20	Nowosadecki (PL)	Cereals	Cereal	Balanced
R20	Nowosadecki (PL)	Milk	Dairy	Balanced
R21	Nowotarski (PL)	Lamb	Meat	Surplus
R21	Nowotarski (PL)	Potatoes	Potatoes	Surplus
R21	Nowotarski (PL)	Mik	Dairy	Negative
R21	Nowotarski (PL)	Cereals	Cereal	Negative
R22	Alentejo Central (PT)	Tomatoes	Vegetables	Surplus
R22	Alentejo Central (PT)	Sheep	Meat	Surplus
R22	Alentejo Central (PT)	Olive oil	Oil plants	Surplus
R22	Alentejo Central (PT)	Wine	Wine grapes	Surplus
R23	Oeste (PT)	Wine	Wine grapes	Surplus
R23	Oeste (PT)	Pears	Fruit	Surplus
R23	Oeste (PT)	Eggs	Eggs	Surplus
R23	Oeste (PT)	Potatoes	Potatoes	Balanced
R24	Bistrita-Nasaud (RO)	Apples	Fruit	Surplus
R24	Bistrita-Nasaud (RO)	Potatoes	Potatoes	Surplus

R24	Bistrita-Nasaud (RO)	Cow and buffalo milk and cheese	Dairy	Surplus
R24	Bistrita-Nasaud (RO)	Pork	Meat	Balanced
R25	Giurgiu (RO)	Sunflower oil	Oil plants	Surplus
R25	Giurgiu (RO)	Wheat	Cereal	Surplus
R25	Giurgiu (RO)	Eggs	Eggs	Surplus
R25	Giurgiu (RO)	Tomatoes	Vegetables	Surplus
R26	Castellon (ES)	Citrus	Fruit	Surplus
R26	Castellon (ES)	Almond	Fruit	Surplus
R26	Castellon (ES)	Pork	Meat	Surplus
R26	Castellon (ES)	Olive oil	Oil plants	Balanced
R27	Cordoba (ES)	Olive oil	Oil plants	Surplus
R27	Cordoba (ES)	Wheat	Cereal	Surplus
R27	Cordoba (ES)	Wine	Wine grapes	Surplus
R27	Cordoba (ES)	Milk	Dairy	Surplus
R28	Haouaria (TN)	Tomato	Vegetables	Surplus
R28	Haouaria (TN)	Pepper	Vegetables	Surplus
R29	East Scotland (UK)	Beef	Meat	NA
R29	East Scotland (UK)	Lamb	Meat	NA
R29	East Scotland (UK)	Mixed horticulture	Vegetables	NA
R29	East Scotland (UK)	Potatoes	Potatoes	NA
R30	West Scotland (UK)	Salad leaves	Vegetables	NA
R30	West Scotland (UK)	Eggs	Eggs	NA
R30	West Scotland (UK)	Lamb	Meat	NA
R30	West Scotland (UK)	Beef	Meat	NA

Table 2. Key regional data per RR

RR	RR Name	Land Size (sqkm)	Population Density (people /sqkm)	RR GDP per capita (USD)	Country 's GDP per capita (USD)	Share of Utilised agricultu rl area in total land area (%)	% of agricultu ral area in mountai n area	Averag e farm size	Total nº of farms 0<5ha	Total nº of farms 5<20h a	Total nº of farm s 20<5 0ha	Tot al nº of far ms >=5 0	Total nº of farms	% of total SF In the region	Nº of releva nt crops produ ced in the RR	out of total nº of ha utilise d. % used by SF	AWU in SF <5ha in relation to total labour force in agricult ure (%)
1	Montana (BG)	3634	37	4643	20948	32	7	15	1730	590	110	319	2749	63	5	13	ND
2	Santiago Island (CV)	991	269	283	6898	21	2	1	2478	1	1	0	2480	100	ND	100	ND
3	Varazdinska (HR)	1262	140	1080	26288	42	0	2	31528	1843	44	9	33424	94	7	48	ND
4	Jihocecky Kraj (CZ)	10058	64	15300	36327	41	10	2	600	1000	500	800	2900	21	7		ND
5	Ille-et-Vilaine (FR)	6775	155	36535	42850	66	0	46	1836	1449	2350	3995	9630	19	5	0	10
6	Vaucluse (FR)	3575	152	26600	42850	32	0	21	2169	2026	1180	480	5855	37	4	2	7
7	Gushegu District (GH)	5796	19		4492	7	0	1	29866	5583	1098	736	37283	80	ND	ND	ND
8	Imathia (GR)	1686	84	11716	27602	33	11	4	10339	2481	293	84	13197	78	20	4	7495
9	Larisa (GR)	5369	53	13600	27602	38	6	8	13552	8839	2299	309	24999	54	17	17	5563
10	Ileia (GR)	2583	61	1241	27602	35	13	5	20434	4757	1221	161	26573	77	14	39	9163
11	Lucca (IT)	1773	222	29200	39427	14	6	1	5623	758	117	45	6543	86	6	39	10017
12	Pisa (IT)	2445	172	28100	39427	39	5	4	4527	1365	574	446	6912	65	5	13	
13	Ugunja (KN)	201	487		3285	65	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND
14	Latgale (LV)	14550	19	6462	28199	31	0	17	10422	6932	8536	1189	27079	38	9	ND	25
15	Pieriga (LV)	10135	36	10334	28199	24	0	21	6172	1865	3283	685	12005	51	11	ND	15

16	Vilniaus Apskritis (LT)	9731	83	22763	32998	28	0	13	12037	5819	1160	962	19978	60	7	13	ND
17	Balaka District (MW)	2193	2	720	1202	80	11	1	111992	0	0	2	111994	100	7	32	ND
18	Hedmark (NO)	26100	7	11500	61414	4	1	34	348	1125	1142	628	3243	11	ND	ND	ND
19	Rzeszowski (PL)	3552	178	10666	29122	52	0	3	66953	5204	302	0	72459	92	6	14	84
20	Nowosadecki (PL)	3524	152	8997	29122	35	24	2	52944	4848	174	0	57966	91	4	14	84
21	Nowotarski (PL)	2632	130	25136	29122	42	0	3	42448	2976	0	0	45424	93	10	48	85
22	Alentejo Central (PT)	7393	21	14910	31673	78	0	76	3212	1887	670	1643	7412	43	8	2	1
23	Oeste (PT)	2220	161	18150	31673	29	0	5	9342	2427	418	117	12304	76	6	22	13
24	Bistrita-Nasaud (RO)	5355	62	5272	26657		44	4	57690	14040	190	120	72040	80	8	ND	ND
25	Giurgiu (RO)	3526	81	5583	26657		0	3	78080	5340	0	250	83670	93	16	39	ND
26	Castellon (ES)	6662	89	25612	37998	28	55	10	19503	5038	800	566	25907	75	14	27	53
27	Cordoba (ES)	13771	58	18862	37998	61		28	18537	10393	3793	3834	36557	51	13	5	21
28	Haouaria (TN)	312	17	3600	11911	56	32	3	3004	1050	90	36	4180	72	6	ND	ND
29	East Scotland (UK)	7450	33	39922	43269	72	49	159	1201	685	492	1477	3855	31	9	ND	6
30	West Scotland (UK)	14196,2	7	35410	43269	88,9	51,34	184	2481	1298	568	1132	5479	45	7	ND	2

Table 3. Distribution of RR per Food System Type

RR	A	B	C	Total FS
Montana (BG)	**1**	0	0	1
Santiago Island (CV)	**3**	1	0	4
Varazdinska (HR)	**1**	**1**	0	2
Jihocecky Kraj (CZ)	**2**	0	0	2
Ille-et-Vilaine (FR)	0	**2**	0	2
Vaucluse (FR)	0	0	**2**	2
Gushegu District (GH)	**2**	1	1	4
Imathia (GR)	1	**2**	1	4
Larisa (GR)	0	**2**	2	4
Ileia (GR)	1	1	**2**	4
Lucca (IT)	1	**2**	1	4
Pisa (IT)	0	1	**3**	4
Ugunja (KN)	**3**	1	0	4
Latgale (LV)	1	**2**	1	4
Pieriga (LV)	0	**3**	1	4
Vilniaus Apskritis (LT)	1	0	**3**	4
Balaka District (MW)	**4**	0	0	4
Hedmark (NO)	0	0	**4**	4
Rzeszowski (PL)	1	**2**	1	4
Nowosadecki (PL)	**2**	1	1	4
Nowotarski (PL)	**2**	1	1	4
Alentejo Central (PT)	0	1	**3**	4
Oeste (PT)	1	1	**2**	4
Bistrita-Nasaud (RO)	**2**	1	1	4
Giurgiu (RO)	1	1	**2**	4
Castellon (ES)	0	1	**3**	4
Cordoba (ES)	0	0	**4**	4
Haouaria (TN)	0	**2**	0	2
East Scotland (UK)	0	1	**3**	4
West Scotland (UK)	1	1	**2**	4

ANNEX II. Comparative Analysis

Table 4. Product Analysed in each Reference Region

Product category per Reference Region											
Refernce Region	Cereal	Dairy	Eggs	Fruit	Honey	Meat	Oil plants	Potatoes	Vegetables	Wine grapes	Total
Alentejo Central						1	1		1	1	4
Balaka District	1					1			2		4
Bistrita-Nasaud		1		1		1		1			4
Castellon				2		1	1				4
Cordoba	1	1					1			1	4
East Scotland						2		1	1		4
Giurgiu	1		1				1		1		4
Gushegu District	2					1	1				4
Haouaria									2		2
Hedmark		1		1		1		1			4
Ileia				2			1		1		4
Ille-et-Vilaine				1		1					2
Imathia				2		1				1	4
Jihocecky Kraj			1			1					2
Larisa		1		2					1		4
Latgale	1	1			1			1			4
Lucca				1			1		1	1	4
Montana	1	1									2
Nowosadecki	1	1		1				1			4
Nowotarski	1	1				1		1			4
Oeste			1	1				1		1	4
Pieriga	1	1		1					1		4
Pisa	1					1			1	1	4
Rzeszowski	1					2		1			4
Santiago Island	1			1		1			1		4
Ugunja	1								3		4
Varazdinska						1		1			2
Vaucluse				1			1			1	3
Vilniaus Apskritis	1	1		1					1		4
West Scotland			1			2			1		4
Grand Total	**15**	**10**	**4**	**18**	**1**	**19**	**8**	**9**	**18**	**7**	**109**

Figure 6. Product vs Main buyer

Figure 7. SF and M&LF connections per FS type

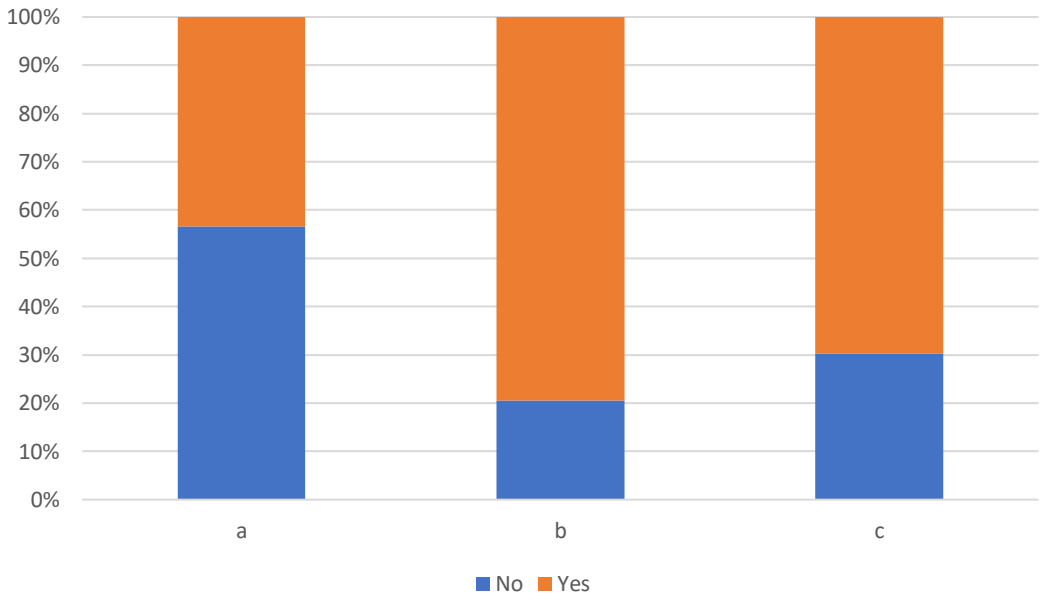

Table 5. % of each product category that falls into each quadrant

Quadrant No.	Cereal	Dairy	Vegetables	Fruit	Meat	Potatoes	Eggs	Wine grapes	Oil plants	Honey
1	13		17	6	5	11	25			
2	13		11		5					100
3	7			6	5					
4	7		6			22	25			
5			6	11	5	11			14	
6	13			11	5					
7			22	11						
8				17		11		14		
9	13		28		10	11	25			
10		13		6	10				29	
11	7	13		11	10	11				
12		25		6				14		
13		25	11	6	15	11	25	29	14	
14		13			5			14	14	
15	27	13		11	25	11		29	29	

Table 6. Most common type of farm per RR

Reference Region	Most common type of farm
Alentejo Central (PT)	Conventional entrepreneurs
Balaka District (MW)	Conventional strugglers
Bistrita-Nasaud (RO)	Conventional strugglers
Castellon (ES)	Conventional entrepreneurs
Cordoba (ES)	Conventional entrepreneurs
East Scotland (UK)	Part-time
Giurgiu (RO)	Conventional strugglers
Gushegu District (GH)	Conventional strugglers
Haouaria (TN)	Conventional entrepreneurs
Hedmark (NO)	Business specialised
Ileia (GR)	Conventional entrepreneurs
Ille-et-Vilaine (FR)	Business specialised
Imathia (GR)	Business specialised
Jihocecky Kraj (CZ)	Business specialised
Larisa (GR)	Business specialised

Reference Region	Most common type of farm
Latgale (LV)	Business multifunctional
Lucca (IT)	Business specialised
Montana (BG)	Part-time
Nowosadecki (PL)	Conventional strugglers
Nowotarski (PL)	Conventional strugglers
Oeste (PT)	Business specialised
Pieriga (LV)	Conventional strugglers
Pisa (IT)	Conventional entrepreneurs
Rzeszowski (PL)	Conventional strugglers
Santiago Island (CV)	Conventional strugglers
Ugunja (KN)	Part-time
Varazdinska (HR)	Conventional entrepreneurs
Vaucluse (FR)	Business specialised
Vilniaus Apskritis (LT)	Business specialised
West Scotland (UK)	Business multifunctional