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D3.1 Report on current farm demographics and trends

Work Performed by P3 (OCILVO), in cooperation with P12 (IAMO)

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1 INTRODUCTION

Farming systems in Europe face a vast range of environmental, economic, social and institutional challenges. Farming systems maintaining their essential functions in the face of these increasingly complex and volatile challenges, are defined as resilient farming systems (Meuwissen et al. 2018. Systems are thus resilient if they have the capacity to adapt to changing circumstances and challenges while maintaining their core functions, including the delivery of vital goods and services. By using existing concepts of resilience thinking, SURE-Farm has developed a comprehensive framework to identify conditions that enable farming systems to become and remain resilient to a broad range of current and imminent stressors (Meuwissen et al., 2018). SURE-FARM will use this comprehensive framework to study resilience of farming systems in 11 case-studies, reflecting a variety of settings and a diversity of farm types. Hence, in SURE-FARM, a case-study is defined as a particular farming system in a certain region. To investigate the ability of farming systems to cope with changing environments, we need a clear understanding of these farming systems, including the type of challenges a system is facing and how farming systems respond to these challenges. Characterization of the system is therefore a first step in the framework developed in the project. This characterization will be achieved at four different levels; at the level of agricultural production, at the level of governance; at the level of farm demographics and at the level of risk management strategies. This deliverable focusses on farm demographics.

Farm demographics concerns dynamics within the farmers' population and the provision of labour to farming systems, capturing both labour directly employed by the farmers' population and hired labour force. This work uses both quantitative and qualitative data to provide an overview of trends in demographic processes of European farming systems over the last decades. Development pathways and trends in agriculture differ from region to region depending on varying agro-ecological and socio-economic contexts. Regarding the selection of a representative set of farming systems across Europe, this overview builds on the farm typology as developed in WP1 of the project. The farm typology addresses the heterogeneity of EU agriculture, considering both traditional issues of farm demographics, just as the particularities of large corporate farms in member states with a socialist history and of Mediterranean and mountainous regions. This work is complementary to a profound analysis of local interviews to reveal insights in the influence and relative importance of various driving forces on the trends described in this work (Deliverable 3.2). This deliverable will feed into a following scenario approach to provide qualitative and quantitative projections of future farm demographics of farms and farm labour and the interdependence with the regional specificities. The ultimate goal is to identify and evaluate

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measures which improve the resilience of farm demographics and facilitate entry into the sector, for both farms and labour.

1.1 Resilience of European farming systems

In SURE-FARM, the resilience framework builds on the concept of adaptive cycles (Holling et al., 2002). Adaptive cycles (Figure 1) represent different stages (growth, equilibrium, collapse, reorientation) through which systems pass in response to changing environments and internal dynamics (Fath et al., 2015). The sequence, direction and speed with which farming systems proceed through these adaptive cycles are empirical questions. While a system might remain in one stage for a long time, and the sequence of stages is not fixed, transition from one stage to another is always a possibility if circumstances change. Reorientation is generally preceded by so-called 'tipping points' which illustrate thresholds beyond which systems may collapse or change drastically (Ge et al., 2016). Understanding adaptive cycles improves understanding of resilience (Carpenter et al., 2001). For instance, while many agricultural sectors seem persistent, drastic system changes (regime shifts) within one generation (Cumming and Peterson, 2017) may be the result of a tipping point.

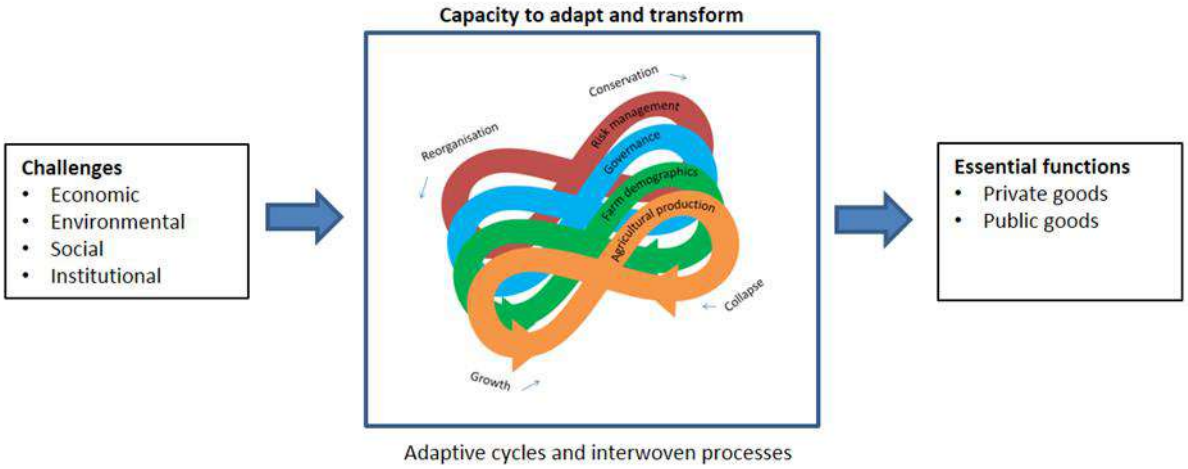

Figure 1: The resilience concept for farming systems

In SURE-Farm, four main adaptive cycle processes are emphasized to be essential for EU farming systems: governance, farm demographics, agricultural production and risk management (Meuwissen et al. 2018). Agricultural production includes all agricultural and multifunctional activities undertaken by farms leading to the provision of private and public goods. Farm demographics concern the provision of labour to farming systems, capturing both farm

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populations and hired labour force. Governance embraces elements of the Common Agricultural Policy (CAP) and its national transpositions, public and private regulations affecting agricultural production chains. Finally, risk management is defined as on-farm risk management, as well as risk sharing within a farming system; and thus comprises both public and private risk management strategies.

Each of these processes can collapse unless there is timely and smart adaptation to economic, environmental, institutional and/or social challenges and uncertainties. Following Folke et al. (2010), the dynamics of these adaptive cycle stages are studied along a scale of the following resilience types: robustness, adaptive capacity (adaptability) and capacity to transform (transformability). Robustness is the ability to maintain desired levels of outputs despite the occurrence of perturbations (Urruty et al., 2016). Adaptability is the capacity to adjust responses to changing external drivers and internal processes and thereby allow for development along the current trajectory while continuing important functionalities (stability domain) (Folke et al. 2010). Transformability is the capacity to create a fundamentally new system when environmental, economic, or social structures make the existing system untenable in order to provide important functionalities (Walker et al. 2004).

1.2 Farm demographics and farm structural change

Demography can be defined as the analysis of the dynamics of populations, and how these dynamics change over time and space. Demography encompasses the study of the size, structure and distribution of a population, and spatial and temporal changes in them in response to birth, migration, aging and death. Demographics are quantifiable characteristics of a given population. Farm demographics as such can be defined as quantifiable characteristics of a farmers' population. From our perspective, this farmers' population contains all people engaging in on farm activities, and includes the owner or manager of the farm, just as farm workers employed on non-regular basis. Farm demographics is thereby defined along two dimensions: from an institutional perspective it represents the structure of the population of farms, e.g., regarding legal forms and organization; from a human resource perspective it represents the structure of the agricultural labour force considering characteristics like age, qualification, gender, origin.

In literature, dynamics of farmers' populations are mostly approached by analysis of farm structural dimensions such as orientation (the share of output from non-agricultural activities), size, intensity and specialization (Chavas 2001; Buchenrieder 2007; Hansson and Ferguson 2011). These insights derived by previous work, are however, very complementary to analysis of farm demographics, as farm structural change and farm demographics are very interwoven processes. Farm exit/entry choices will be reflected in farm structural changes. For example, increased part-time employment of farmers outside the farm, might stimulate technologies that best fit a part-

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time farming structure, including more specialized production (Boehlje, 1992). Farmers who do not have the managerial skills to introduce cost effectively advanced technologies, might eventually leave the sector, resulting in fewer and larger firms. The close link between farm structural change and farm demographics is further illustrated by Happe et al., 2009 (Figure 2). Human specific characteristics as age, education and managerial ability just as the share of family labour force and hired labour force are described as farm-internal determinants of farm structural change.

Regarding structural change EU-wide, the agricultural sector went through significant structural changes over the last decades. The most evident structural developments in EU agriculture are reflected in the declining number of farms, farm size growth and production specialisation over time. As farm size grows, farms tend to re-specialize into cereal cropping and grazing livestock, away from permanent crops, granivores and mixed farming (EU, 2012). In many developed regions, the total number of farms is decreasing while the age of the farm population increases. Analysis of Eurostat data by Zagata and Sutherland (2015) confirmed that the proportion of older farmers is growing while the numbers of younger farmers and the UAA they farm is decreasing EU-wide. Finding successors has become difficult (Fennell, 1981; Mishra et al., 2004; Wheeler et al., 2012), although familial intergenerational transfer remains the main entry route into farming (Lobley and Baker, 2012). The European union support for generational renewal is rooted in the position that young farmers are more productive, that there is knowledge inherent to the sector which needs to be retained (through succession) and that younger farmers have a different attitude to risk and are more open to change, be it technological or technical (EU, 2012).

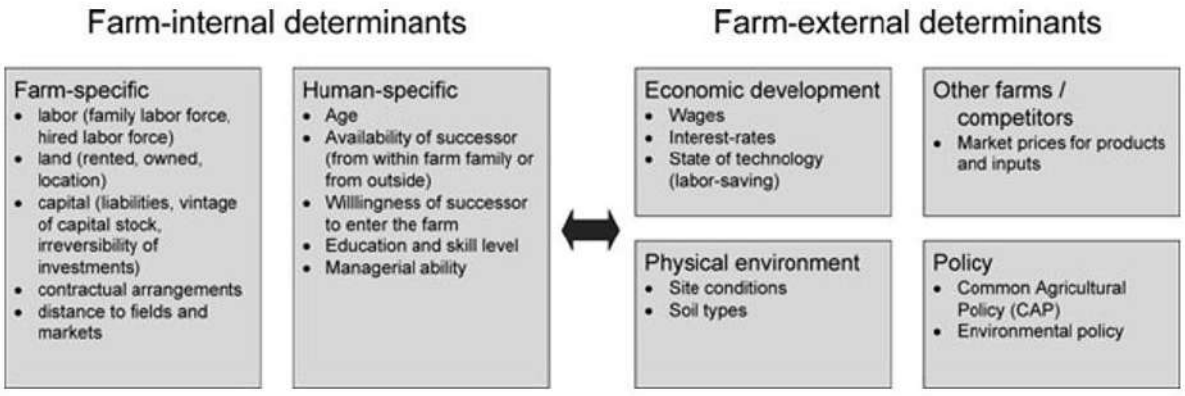

Figure 2: Determinants of farm structural change (adopted from Happe et al., 2009)

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1.3 Farm demographics and resilience

Changes in the dynamics of farmers populations, are the result of growth, equilibrium, collapse and reorientation stages of adaptive cycles as a response of the farming population to changing environments and internal dynamics. Farm demographics are affected by several overlapping cycles at various scales. On family farms, there is the cycle of generational renewal by succession, which has been widely studied, as well as a variety of factors that influence this continuity process (see f.e. Conway et al. 2017 , Lobley et al. 2010, Darnhofer et al. 2016; Joosse and Grubbström 2017). Management and the employed labour force on corporate farms are also affected by similar processes of generational renewal. In every new generation of a family or turnover of employees (especially managers) of a corporate farm, decisions are necessary on whether to continue and how to adapt the organisation of the farm to changing needs and abilities, especially as farming is often perceived as bound to limiting conditions (or push factors of farm exit), such as low income, long working hours, remote locations and often high personal financial risks. For instance, many EU farms are particularly vulnerable at the point of intergenerational hand-over due to a decrease in the attractiveness of farming when compared to other employment sources, which can lead to lack of interested successors or new entrants (Happe et al., 2009; Fischer and Burton, 2014; Chiswell and Lobley, 2015; Van Vliet et al., 2015). This is not only affecting the farm, and hence entrepreneurial and employment opportunities in the agricultural sector, but also the landscape. Cultural and environmental implications of farming practices have significant implications for the attractiveness and demographic stability of rural areas (Copus et al., 2006).

Farm demographics are also affected by the adaptive cycles of agricultural production and governance, both within the sector and outside. Cochrane's (1958) model of the technology treadmill describes how farmers have either to adopt a new technology (growth) or suffer from decreasing incomes that might finally lead to market exit that occurs in extreme cases through bankruptcy (collapse) while in others through involuntary or consciously planned professional reorientation (push factor). A conscious reorientation is more likely when wages outside agriculture are attractive (a pull factor) and farm employees have convertible skills. At the farming system level, technological progress not only reduces total labour input, but also results in an increasing capital to labour ratio, which in turn requires beyond necessary financial resources and more efficient use of labour, specialised operator skills and improved farm management capacities. Such a development can enable growth of production and per capita income. However, accumulation of push and pull factors in combination with demands for highly specialised skills may result in a structural deficit of farm successors and skilled farm labour, which could trigger reorientation or even collapse of regional farming systems. Such a reorientation can include seasonal and permanent migration of farm labour and farmers, such as the establishment of new farms in East Germany and other former socialist countries after 1990 by farmers

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migrating from other EU regions and countries, such as West Germany, the Netherlands and Denmark. Correspondingly, the seasonality of agricultural production links with farm demographic processes, especially peak labour requirements driving the (seasonal) movements of the labour force.

Besides agricultural production processes, also governance processes affect demography of farm populations, not only by agricultural policies, such as early retirement or new entrant schemes, but also indirectly by regulations on international labour migration and differing national taxation rules for the capital transfer involved in intergenerational hand-over.

Finally, with regard to risk management, strategies at EU level mainly pertain to the management of price and production risks. For risks that can be addressed at farm level, risk management historically focussed on farm diversification with farms having both crop and livestock activities (conservation). With post-war increasing levels of farm specialisation, risk-sharing strategies became increasingly important (growth), including contracts, financial leverage, commercial insurance and exchange of farmland (Meuwissen et al., 2001). From the 1980s onwards, vulnerability of specialised farms was among the reasons for certain farms to 'reinvest' in farm diversification (reorganisation), initially focussing on complementary activities, such as agri-tourism and nature conservation (Van der Ploeg and Roep, 2003), and currently further stimulated through price spikes and subsidies towards the production of energy and processing of waste (DG Agri, 2017). With regard to resilience of farm demographics, policy can still further expand the range of risk management instruments, f.e. by bringing the entangled relation of household and farming level risks into focus (de Mey et al. 2013)

Resilience of farm demographics appears to be a complicated concept that needs further exploration. Although it might seem evident to link resilience characteristics to the population of farmers, the underlying processes that shape farm demographics depend on a wide variety of (interactions between) endo- and exogeneous factors. Previous discussions in the literature show that there is need for a deeper understanding of what enhances the resilience of farm demographic processes. For example, although the predominant focus of past research lies on the importance of attracting the next generation farmers and facilitating succession processes (Suess-Reyes and Fuetsch 2016; Chiswell and Lobley 2018; Leonard et al. 2017; Duesberg et al. 2017; Leonard et al. 2017)), it is however still not clear whether or not Europe is dealing with an acute succession crisis or not (Burton and Fischer 2015; Fischer and Burton 2014; Chiswell and Lobley 2015; Zagata and Sutherland 2015; Sutherland 2015; van der Ploeg 2017).

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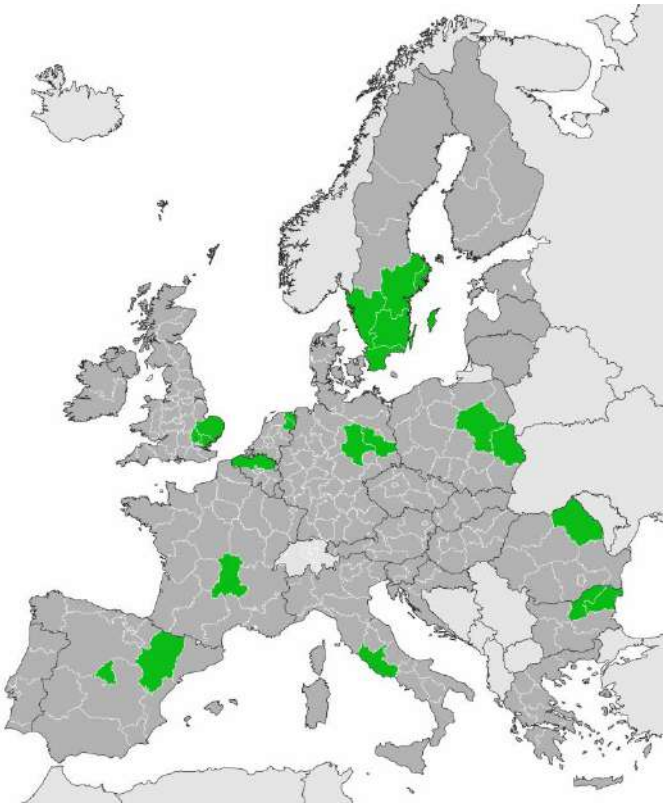
2 CASE-STUDY REGIONS



The map above provides an overview of the case study regions in SURE-Farm. SURE-Farm is organized along multiple case study regions, representing a range of different contexts. The case study regions, together with the specific code of the territorial unit of which they are part of, are shown in table 1. These territorial units are based on the NUTS classification and are used in the quantitative step of our analysis based on Eurostat data. The NUTS classification subdivides the economic territory of the Member States into territorial units NUTS. It ascribes to each territorial unit a specific code and name. The NUTS classification is hierarchical. It subdivides each Member State into NUTS level 1 territorial units, each of which is subdivided into NUTS level 2 territorial units, these in turn each being subdivided into NUTS level 3 territorial units. However, a particular territorial unit may be classified at several NUTS levels. At the same NUTS level, two different territorial units in the same Member State may not be identified by the same name. If two territorial units in different Member States have the same name, the country identifier is added to the territorial units' names.

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Table 1: ***Case study regions***

Country	*Case study region*	*NUTS2 regions*
Belgium	**NUTS 1** region : **BE2** (Vlaams Gewest)	**BE21** (Prov Antwerpen), **BE22** (Prov Limburg), **BE23** (Prov Oost-Vlaanderen), **BE24** (Prov Vlaams-Brabant), **BE25** (Prov West-Vlaanderen)
Bulgaria	**NUTS 2** regions: **BG32** (North Central / Severen centralen) and **BG 33** (North East / Severoiztochen)	**BG32** (Severen tsentralen), **BG33** (Severoiztochen)
France	French case study region (Bourbonnais region) corresponds to a **NUTS3** region (it corresponds roughly to the current area of the Allier department). The NUTS code is **FRK11.**	**FR72** (2013) - **FRK1** (Auvergne)
Germany	NUTS3-Regions "DEE04", "DEE0D", "DEE06" and "DE40E"	**DE40** (Brandenburg), **DEE0** (Sachsen-Anhalt)
Italy	Part of NUTS 3 region : **ITI41** (Province of Viterbo). It excludes the coastal area that is very different from the internal part of the province because of several reasons. Viterbo is part of the **NUTS 2** region Lazio (Code **ITI4**).	**ITI4** (Lazio)
Netherlands	NUTS3 level : parts of **NL111** (Oost-Groningen), **NL112** (Delfzijl en omgeving), **NL131** (Noord-Drenthe) and **NL132** (Zuidoost-Drenthe). The largest part of the CS is situated in **NL111** (Oost-Groningen).	**NL11** (Groningen), **NL13** (Drenthe)
Poland	**NUTS2** regions: **PL92 (**Mazowieckie) and **PL81 (**Lubelskie)	**PL92** (Mazowieckie), **PL81** (Lubelskie)
Romania	Romanian case study region is part of the **NUTS 2** region "Nord-Est" (**RO21**).	**RO21** (Nord-Est)
Spain	NUTS2 (Aragón) **ES24** and Sierra de Guadarrama part of **ES30**	**ES24** (Aragon), **ES30** (Comunidad de Madrid)
Sweden	**NUTS 2 regions: SE11, SE12, SE21, SE22, SE23**	**SE11**(Stockholm), **SE12**(Östra Mellansverige), **SE21**(Småland med öarna), **SE22** (Sydsverige), **SE23** (Västsverige)
UK	**NUTS 1** region called “East of england”, code **UKH**	**UKH1** (East Anglia), **UKH2** (Bedfordshire and Hertfordshire), **UKH3** (Essex)

3 DATA COLLECTION

A combination of quantitative and qualitative data sources was used to describe demographics of the farmers’ populations in the case-study regions.

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3.1 Quantitative data

In order to understand trends on dynamics of the farmers' population in the case-study regions, the Eurostat datasets are used as primary data source for quantitative analysis. Eurostat is part of DG-ESTAT (European Commission) and its main role is to process and publish comparable statistical information at European level. Data collection is organized by the Member States by their statistical authorities. They verify and analyse national data and send them to Eurostat. Eurostat's role is to consolidate the data and ensure they are comparable, using a harmonized methodology. Eurostat database provides time series from 1990 to 2016 on agricultural statistics. However, not all data is available for all years and its availability is varying across regions. Some data are available only at national level, other data available at NUTS2 or NUTS3 level. The data availability at NUTS3-level proved to be very limited. Quantitative data (obtained from Eurostat datasets)in this report is shown at the level of NUTS2 regions. This should be taken into account for interpretation of data of some of the case study regions, which are sometimes only a small part of the particular NUTS2 region. Most data are available for the agricultural sector as a whole. For data specified in function of horizontal specialisation, availability is often limited to a shorter time span or less detail.

Eurostat datasets from 1990-2016 (Eurostat, 2009) were combined to describe the evolution of:

- Total number of farm holdings within a region
- Size of the farm holdings (both expressed in ha and SO or ESU)
- Horizontal specialization
- Legal form of the farm holdings: depending on whether the holder is a “natural” or a “legal” person the holdings are classified under following groups: Holdings where the holder is:
    - a natural person and the sole holder of an independent holding,
    - a group of natural persons being a group of partners on a group holding
    - a legal person.
- Holder of the agricultural holding is the natural person, group of natural persons or legal person on whose account and in whose name the holding is operated and who is legally and economically responsible for the holding, i.e. who takes the economic risks of the holding.
- Total agricultural area (ha) in the region
- Total labour force expressed as annual working units (AWU). Annual working units correspond to the work performed by one person who is occupied on an agricultural holding on a full-time basis. Full-time means the minimum hours required by the relevant national provisions governing contracts of employment.
- Age of the farm manager

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3.2 Qualitative data

The quantitative data collection in this work is supported by qualitative data collected by the methodology as described by Unay-Gailhard et al., 2017. This report describes the development of a farm typology which has been applied in every case study region by doing in-depth interviews with regional experts.

In SURE-Farm, a farm typology has been developed to classify EU farms in groups that are homogeneous, characteristic and representative regarding their challenges to cope with requirements of resilience and farming systems (Unay-Gailhard et al., 2017). This farm typology approach aims to respond to research questions where statistics on average farm characteristics are not representative for the majority of the farms in the case study regions. The SURE-Farm project farm typology applied an integrated framework that covers farm level dimensions with (i) farm structural characteristics, and extends the typology within farming system level dimensions with (ii) socio-economic characteristics; (iii) agro-ecological zoning, (iv) institutional and cultural embedding, and (v) value chain integration dimensions.

In each of the case study regions, local expert knowledge was used to apply the farm typology based on the dimensions of the farm typology as developed in SURE-Farm. In a first step, farms in the case study region were classified in groups that are homogeneous and representative regarding to farm size, managerial ownership, and specialization. These groups defined by expert knowledge are entitled “typical farm types”. In the following step, the importance of regional characteristics on resilience of these typical farm types was assessed together with the experts. These characteristics include socio-economic and agro-ecological zoning characteristics, institutional and cultural aspects and value chain integration dimensions of farms. Detailed information on these characteristics and typology approach can be found in D1.3 (Unay-Gailhard et al., 2017). In what follows, we provide an overview of the different farm types based on the farm size, the horizontal specialization and managerial ownership dimension.

The farm size dimension can be scaled from very small to very large based on the standard output (SO) of the farm. The SO of an agricultural product (crop or livestock) is defined as the average monetary value of the agricultural output at farm-gate price, in Euro per hectare or per head of livestock (Eurostat, 2017). There is a regional SO coefficient for each product, as an average value over a reference period (5 years). The sum of all the SO per hectare of crop and per head of livestock on a farm is a measure of its overall economic size, expressed in Euro. In the SURE-Farm typology, five farm types are identified based on their SO.

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Table 2: Farm size dimension based on the total standard output (SO) of the holding expressed in Euro.

Farm Size Dimensions	Limits in Euros
Very small	less than 8 000 euro
Small	from 8 000 to less than 40 000 euro
Medium	from 40 000 to less than 200 000 euro
Large	from 200 000 to less than 1000 000 euro
Very large	equal to or greater than 1000 000 euro

In deliverable 1.3, farm size is measured by economic size in European Size Unit (ESU). Regarding the Community typology, until 2007, the FADN and FSS used Standard Gross Margin (SGM) to classify agricultural holdings by economic size. From 2010, this classification introduced the standard output (SO) to classify agricultural holdings by economic size.

Table 3: Farm size dimension based on the total standard output (SO) of the holding expressed in Euro.

Farm Size Dimensions	Limits in Euros
Very small	less than 8 000 euro
Small	from 8 000 to less than 40 000 euro
Medium	from 40 000 to less than 200 000 euro
Large	from 200 000 to less than 1000 000 euro
Very large	equal to or greater than 1000 000 euro

The horizontal specialization dimension can be scaled as a relative share of the most important specialization in terms of returns or costs. In the SURE-Farm typology, we followed the specialisation variable that has been the basis of the well-established Community typology of farms used in FADN, as well as for FSS. The farm specialisation and land use dimensions have been combined into 8 specialisation types.

Table 4: SURE-Farm typology: horizontal specialisation dimension with 8 main farm type specialisation types.

	Farm specialisation types
1	Field crops
2	Horticulture
3	Wine
4	Other permanent crops
5	Milk
6	Other grazing livestock
7	Granivores
8	Mixed

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The managerial ownership dimension can be scaled from "low ownership of labour, land and capital" to "full ownership of labour, land and capital". Managerial ownership in deliverable 1.3 is expressed as family farms, corporate farms and partnership farms.

Table 5: SURE-Farm typology: managerial ownership dimension with 3 farm types

Managerial ownership dimensions	Classification
Family farms	Farm where the profits cover unpaid labour and own capital of the holder and the holder's family
Partnership farms	Farms where the profits cover the production factors brought into the holding by a number of partners
Corporate farms	Farms without unpaid labour or which are not included in the other two groups (e.g., legal persons, corporate farms, and producer cooperatives).

For each case study region, one interview (around 2-3 hours) was held with one or more experts who has/have knowledge on farm types and the farming systems in the study region. The results of these interviews are integrated in this report. In the following part of this deliverable, for each of the case study regions, an overview is given of the typical farm types in the region, farm demographic trends and regional characteristics influencing resilience of typical farm types. The typical farm types within the case study region were identified by experts. The description of the farm demographic trends in the case study region is based on the expert interviews, unless otherwise stated. The graphs illustrating these trends are based on Eurostat data from the NUTS 2 regions that cover all or part of the case study region (Table 1). The regional characteristics (socio-economic, agro-ecological zoning, institutional and cultural embedding, embedding in the value chain) that have an impact on the resilience of the typical farm types are based on expert knowledge.

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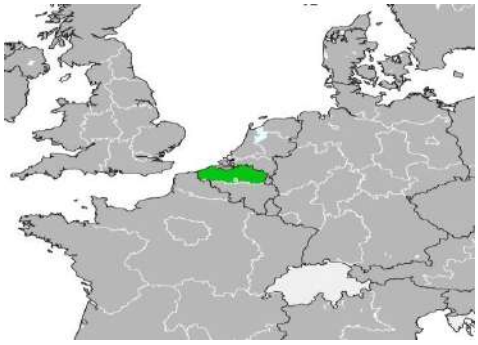
4 Flanders, Belgium

Flanders is the northern part of Belgium, excluding the Brussels Capital Region.



4.1 Typical farm types in Flanders

7 typical farm types in Flanders are identified by expert knowledge:

- Large - specialised dairy family farms (>100 dairy cows, >500 000l milk production)
- Specialised pig production – family farms – (> 250 à 300 sows; 2000 à 3000 meat pigs); almost no agricultural area
- Specialist horticulture outdoor (vegetables) – family farms – 10à15 ha
- Specialist poultry production – family farms – (100 000 broilers; 40 000 layers); almost no agricultural area
- General field cropping – family farms - 40à50 ha (large)
- Mixed farms (field crops- grazing livestock combined) – family farms
- Specialised horticulture indoor (vegetables) – family farms

4.2 Farm demographic trends in Flanders

In Flanders, the average farm size (expressed as number of animals and agricultural area) increased over the last 20-30 years, while the number of farms is decreasing. Farms are evolving from medium sized to large and very large farms. This tendency is still continuing and is seen for all agricultural sectors. The overall number of agricultural holdings has substantially decreased from 56 560 farms in 1990 decreased to 23 980 farms in 2016. A similar decreasing tendency applies for total labour force expressed in annual working units (AWU). Ageing of the farmers' population has been clear for many years. In Flanders, the average age of farm managers increased from 48 years in 2004 to 52 years in 2013. A significant portion of them has no successor. The number of farms in Belgium where the farmer is older than 50 years and has no successor, increased with 7.5 percent between 2013 and 2016. In addition, more and more family labour force is part-time employment: between 2013 and 2016, there was an increase of 49 percent.

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More and more farmers have an additional job outside the company, with an increase from 109% between 2013 and 2016. There is a decrease in number of assisting spouses on farms, from 45% in 2013 to 37% in 2016 (Vilt, 2018). Despite a strong decline in the number of agricultural holdings and AWU, the total utilized agricultural area has slightly increased from 598 970 ha in 1990 to 613 190 ha in 2013. This suggests a structural change towards bigger farms over the last decades. Whereas the number of holdings up to 30ha has been declining, the number of holdings cultivating more than 30ha was higher in 2007 compared to 1990. Especially holdings with more than 100 ha, show a continuing rising trend over that time span. Sector organisations, research institutes and governance are all supporting this tendency in scale enlargement and intensification. About 3 to 4% of the farms is disappearing each year, with an estimation of about 10 000 farms left by 2040.

Ownership has been relatively stable in the last 20 to 30 years, almost all farms are family farms. Ongoing mechanization and automation of agricultural production, allows scale enlargement and intensification while the main labour force on farms is family labour. However, farmers do invest more in paid labour force over the years. Whereas a total of 63940 AWU was recorded in 1990, only 40240 AWU were employed on farms in 2013. About 92% of total labour force in 1990 is family labour, this steadily declined to 76% by 2007. Both subsidies and financial support from financial institutions allow farmers to invest in new machinery and scale enlargement of the farms. Farms are becoming more specialized, more focussed on either animal or crop production, although mixed farms still exist. Agricultural production has been intensified over the last decades. Total agricultural production in Flanders is still increasing and is mainly the result of intensification in all agricultural sectors. Agriculture in Flanders is also capital intensive. In 2007, 42% of total agricultural labour force was directly employed (AWU) on farms above 100 ESU. In 1990, only 8% of labour force is employed on farms bigger than 100ESU. In 1990, only 1% of the farm labour force is directly employed on holdings with legal entity. The remaining 99% is employed on sole holders' holdings. In 2007, labour force employed on holdings with legal entity raised to 15%. On larger farms (>100ESU), this raised to 24%.

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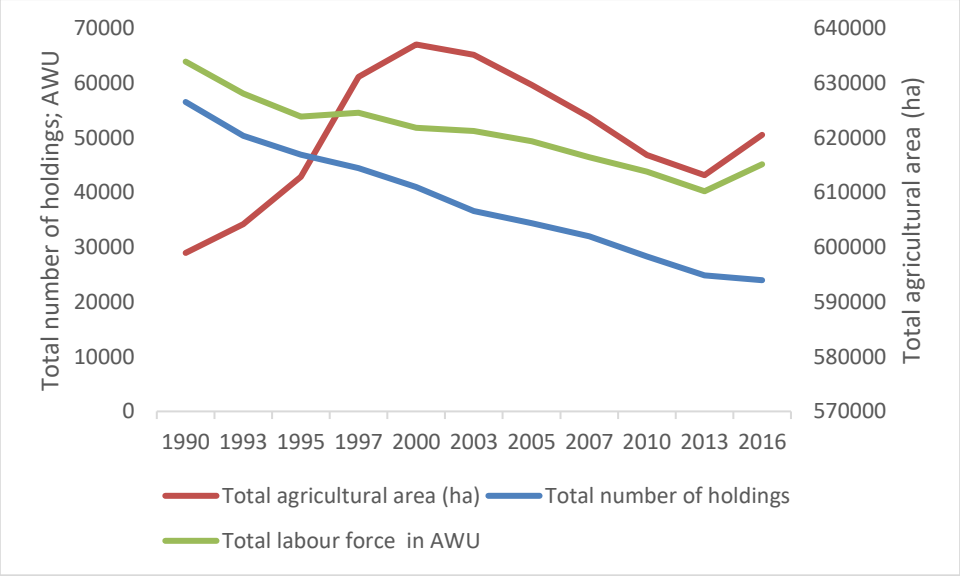

Figure *3*: Evolution (1990-2016) in number of farm holdings, total agricultural area (ha) and total labour force (AWU) in Flanders (NUTS 2 units: BE21, BE22, BE23, BE24, BE25) (Source EUROSTAT)

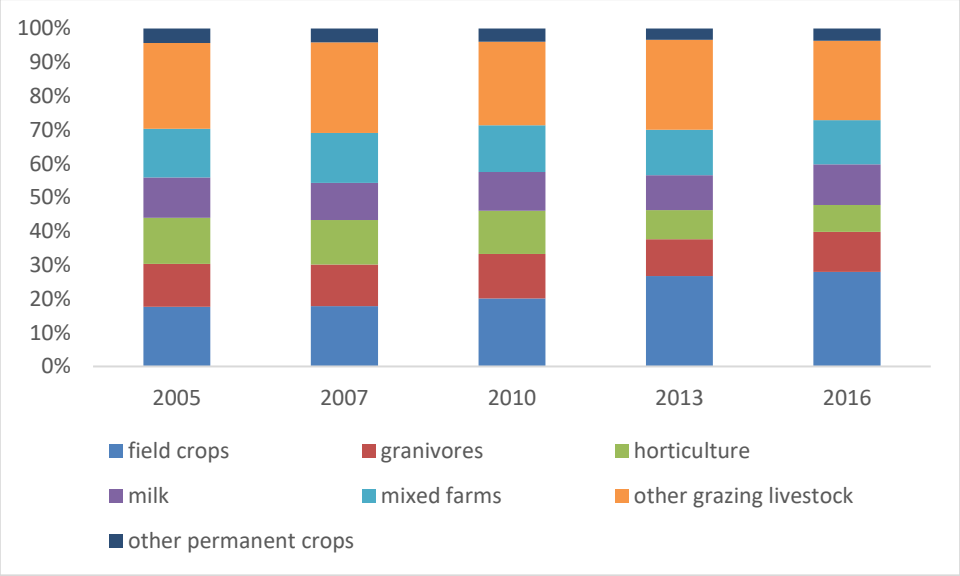

Figure *4*: Structural change in horizontal specialisation in Flanders (NUTS 2 units: BE21, BE22, BE23, BE24, BE25) (Source EUROSTAT) (2005-2016)

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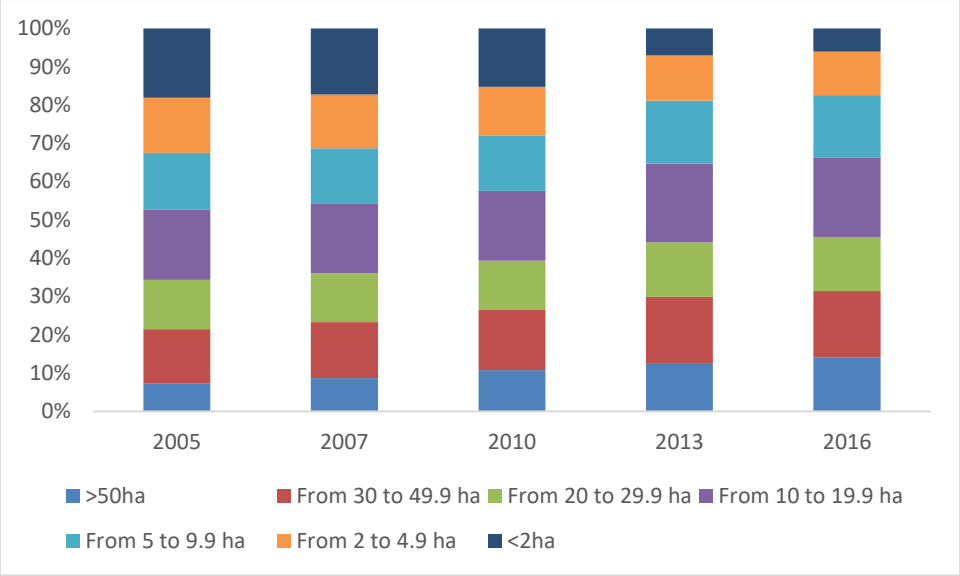

Figure *5*: Structural change (number of holdings) (2005-2016) in farm size (ha) in Flanders (NUTS 2 units: BE21, BE22, BE23, BE24, BE25) (Source EUROSTAT)

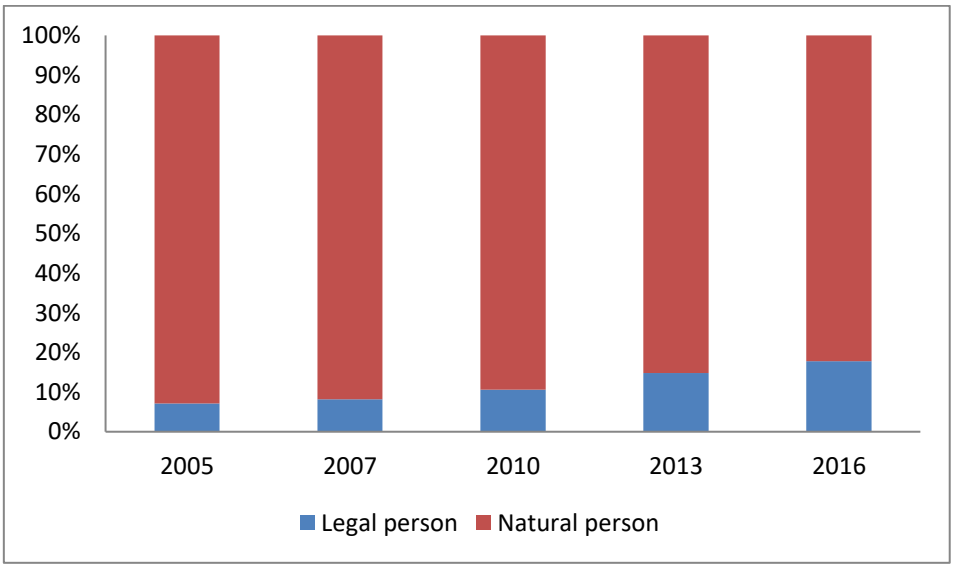

Figure *6*: Structural change (2005-2016) in legal structure of the farm holdings in Flanders (NUTS 2 units: BE21, BE22, BE23, BE24, BE25) (Source EUROSTAT)

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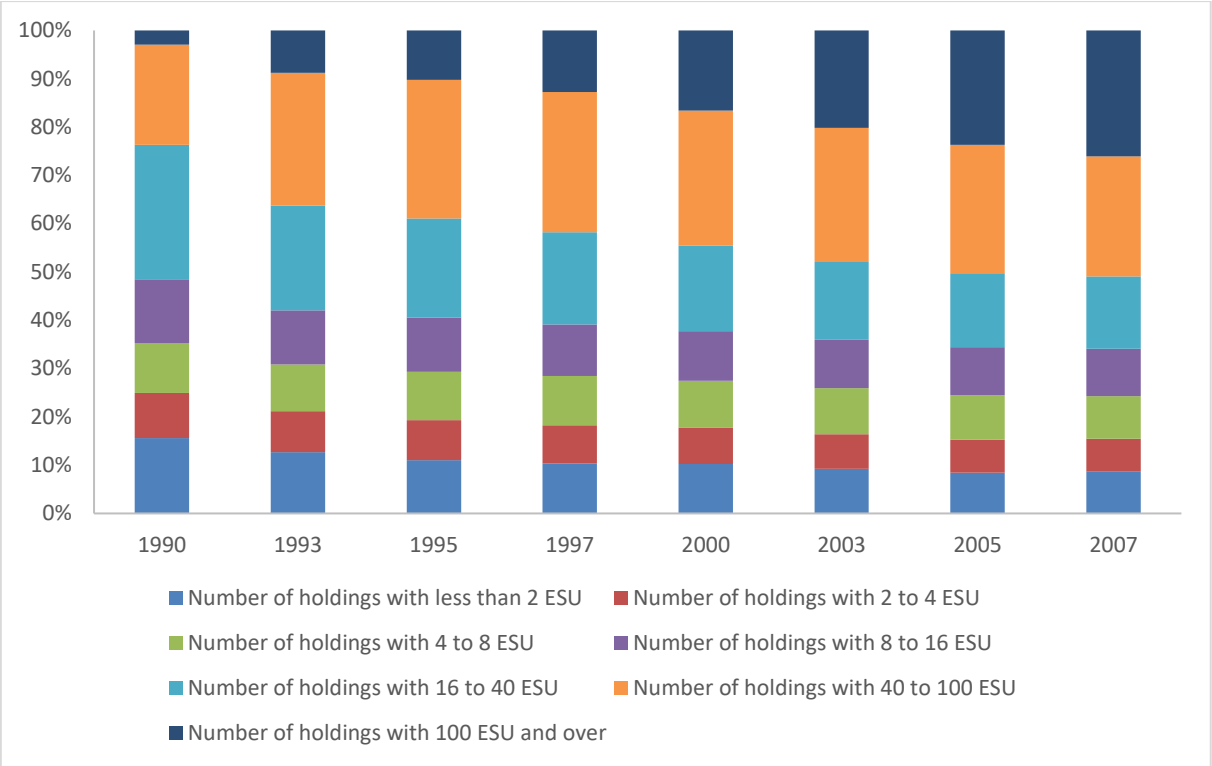

Figure 7: Structural change (number of holdings) (1990-2007) in farm size (SO in euros) in Flanders (NUTS 2 units: BE21, BE22, BE23, BE24, BE25) (Source EUROSTAT)

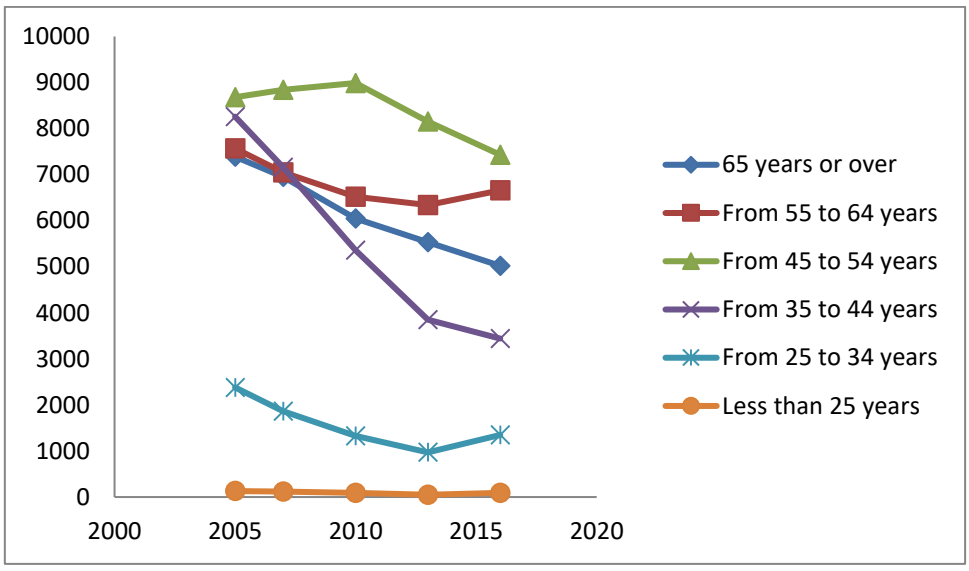

Figure 8: Evolution (2005-2016) of number of farm holdings in function of the age of the farm holder in Flanders (NUTS 2 units: BE21, BE22, BE23, BE24, BE25) (Source EUROSTAT)

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4.3 Regional characteristics influencing resilience of typical farm types in Flanders

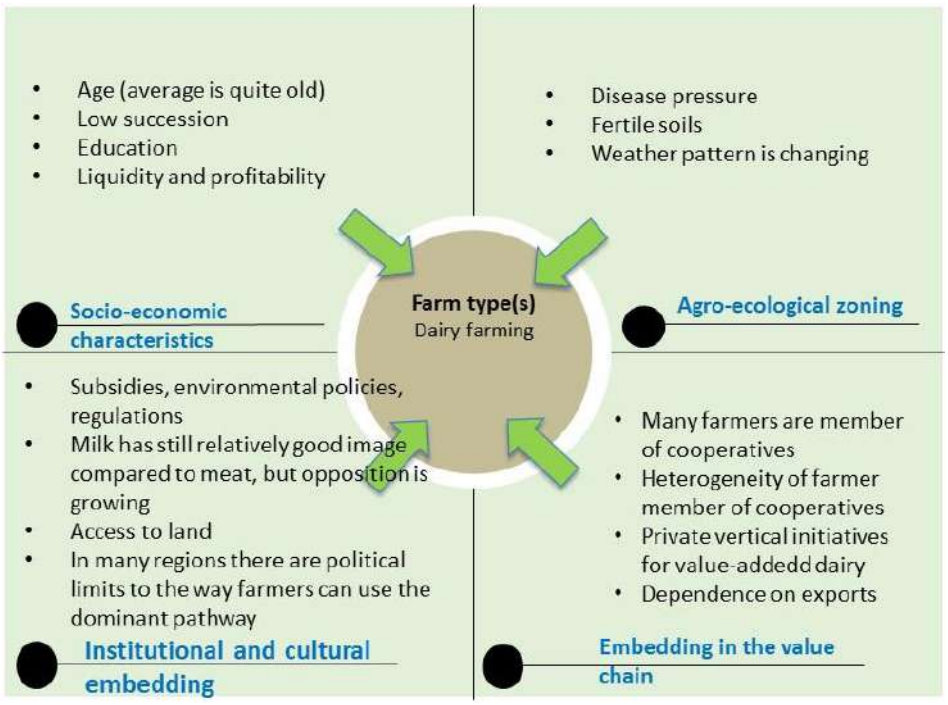

Figure 9: Overview of regional characteristics influencing resilience of typical farm types in Flanders

Agriculture in Flanders is strongly dependent on export. Especially dairy and pig production exceed largely the degree of self-sufficiency. As a consequence, these sectors are strongly influenced by foreign stressors and susceptible to changes on the global market. Pig production and dairy production strong dependent on export position. This position might change due to unexpected circumstances (ban from Russia) with large economic impact on these farms. Farms have difficulties to respond well to price fluctuations and changing demand, resulting in multiple crises. Volatility of product prices (in horticulture, pig production, dairy production) will have more impact on resilience as governmental interventions are limited (and this limitation will increase).

Despite efforts and regulations to reduce mineral and organic fertilization, water quality (due to nitrate leaching) is still suboptimal. Regulations might become more strict, which might have an impact on production practices and maybe on crop yields. But in general, before new regulation is introduced, the economic impact of these regulations has been intensively discussed and analysed. If this impact is perceived as too negative (e.g. prohibition of specific pesticides), these regulations will rather not be imposed or introduced gradually. There are also problems with soil

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erosion and climate change might introduce new crop diseases and pests. Easy-to-implement measures to deal with environmental challenges have been widely adopted. However, still big environmental challenges remain (GHG emissions, water quality, soil erosion). Farmers will have to adopt more far-reaching measures, that might interfere with production capacity (restructure livestock herd in Flanders). But this will depend on priorities in demand of society and how policy will respond on this demand.

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5 North-East and North-Central Bulgaria, Bulgaria

North-East Bulgaria is characterized by a varied relief with semi-mountainous areas, river valleys and lowlands; climate, with well-defined four seasons, is of a Continental type; well-developed agricultural region favoured by nature in the country; agriculture is a priority economic sector; soils are among the most fertile in the country, suitable for growing of cereals, sunflower, industrial crops, fruits, vegetables; on an average the agricultural land amounts to 70% (in North-East planning region it is 82,7%) of the total land in the country.

5.1 Typical farm types in North-East and North-Central Bulgaria

Seven typical farm types have been identified by expert knowledge:

- TFT1: > 1000 ha + Corporate farms + Arable land (Field crop farms) + Milk farms (> 80 < 400 cows)
- TFT2: > 2000 ha + Corporate farms + Arable land (Field crop farms)
- TFT3: > 200 ha < 2000 ha + Cooperatives + Arable land (Field crop farms)
- TFT4: > 30 < 100 ha + Corporate/Family farms + Arable land (Field crop farms) + Horticulture (> 3 ha) and Animal breeding (< 50 cows or < 300 sheep)
- TFT5: > 200 beehives + Family farms + Horticulture (< 1 ha)
- TFT6: Horticulture (< 1 ha) + Family farms
- TFT7: Animal breeding (< 5 cows or < 100 sheep or < 50 beehives) + Family farms

5.2 Farm demographic trends in North-East and North-Central Bulgaria

Complicated land property rights restitution resulted in highly fragmented agricultural land and domination of small scale farms. Gradually, land consolidation has started and currently there are

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representatives of big, medium and small farm holdings. In animal breeding the existing herds in each village (milk and meat cattle-breeding, fine-fleeced sheep-breeding) have been restructured and currently disappeared. Large farms are both cooperative farm holdings (size varying between 200 up to 2000 ha), which number is slightly decreasing last 10 years and farms managed by the tenant farmers (with an average size of 2000 ha and several exceptions with over 6000 ha). The number of medium and small farms is decreasing and this decrease is relatively higher for the medium sized farms. The number of mid-sized farms is approx. doubled to the number of big structures. The small size farms represent 80% of the registered farms in the area.

Farm size is often associated with farm specialisation. There is an increased number of small farms (1-2 ha) specialized in perennials (walnuts, hazelnuts, stone fruits) as a result of RDP measures implementation, some of which are still not yielded. The number of small farms specialized in milk production decreased rapidly after 2006 (farms with less than 10 dairy cows/100 sheep for which was not possible to invest a lot in equipment). A few of big private farms (less than 1% of the total number of farms) are milk farms or cultivate vegetables and perennials.

Farms specialized in crop production (mostly big structures) are business oriented and some of them are result from the investments made by the businesses outside of the agriculture. They operate as corporate structures and are registered according to the Trade law in Bulgaria. Mid- and small-sized farms are mainly registered as physical persons (VAT registration is not required). Most of them can be classified as family farms despite some of the big crop producers (cultivating 1000-1500 ha field crops) are also using only family labour.

Cooperative farms operate under the Law of agricultural cooperatives and are kind of partnership organizations. They cultivate mainly crops (wheat, barley, corn) and oleaginous (sunflower and after 2007 rape). A limited numbers of cooperatives (approx. 10%) are specialised in breeding dairy cows. Leaseholder farms are specialised in field crop production. Last 2-3 years slight processes of crop diversification have been started due to the greening requirements, including protein and leguminous crops cultivation (lucerne, peas, soybean) or let lie fallow

The diversity in production specialisation is higher in mid- and small-sized farms. Mid-sized cultivate between 30-100 ha field crops or up to 1-3 ha vegetables (incl. grown under glass)/perennials or are bee-keepers (the preliminary part of the farms is organically certified) with an average number of 200 hives. Small-sized farms are also specialised in fruit and vegetables (incl. grown under glass) growing and animal breeding (incl. bee-keeping). Horticultural farms are specialized in fruit production, berries (raspberries) and stone fruits; less in vegetable production.

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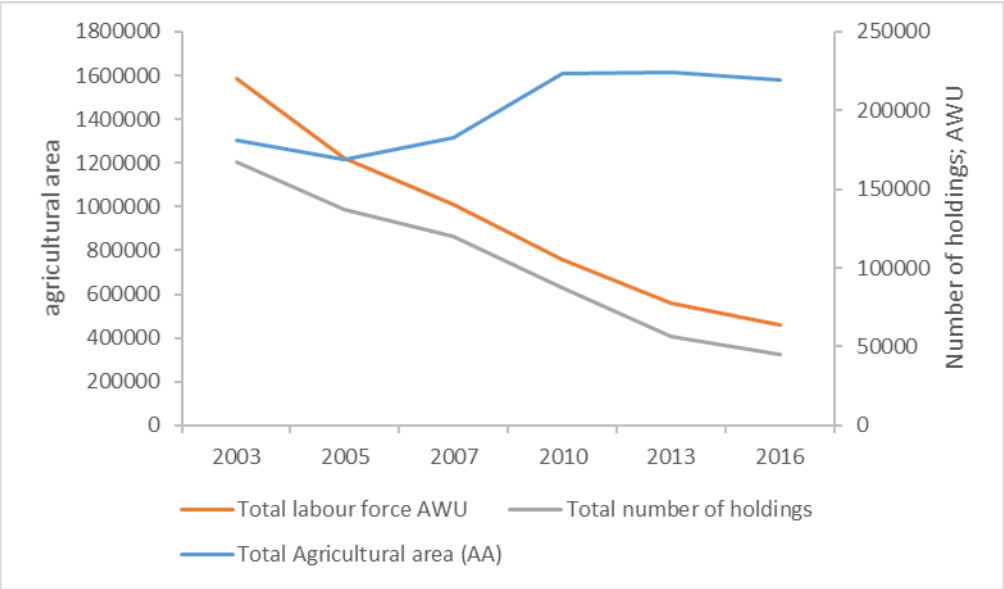

Figure 10: Evolution (2003-2016) in number of farm holdings, total agricultural area (ha) and total labour force (AWU) in Severen tsentralen and Severoiztochen (NUTS 2 units: BG32, BG33) (Source EUROSTAT)

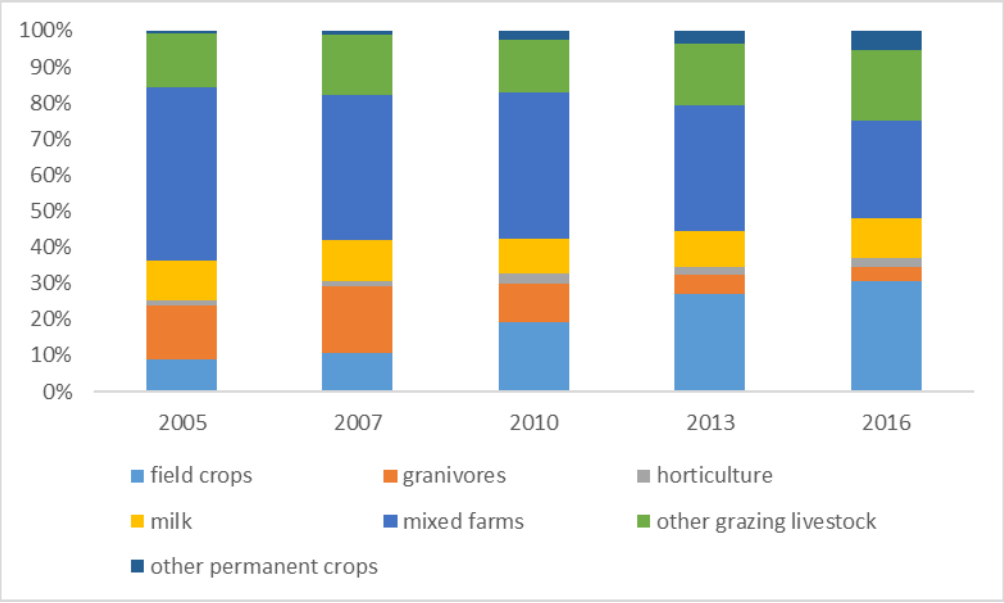

Figure 11: Structural change in horizontal specialisation in Severen tsentralen and Severoiztochen (2005-2016) (NUTS 2 units: BG32, BG33) (Source EUROSTAT)

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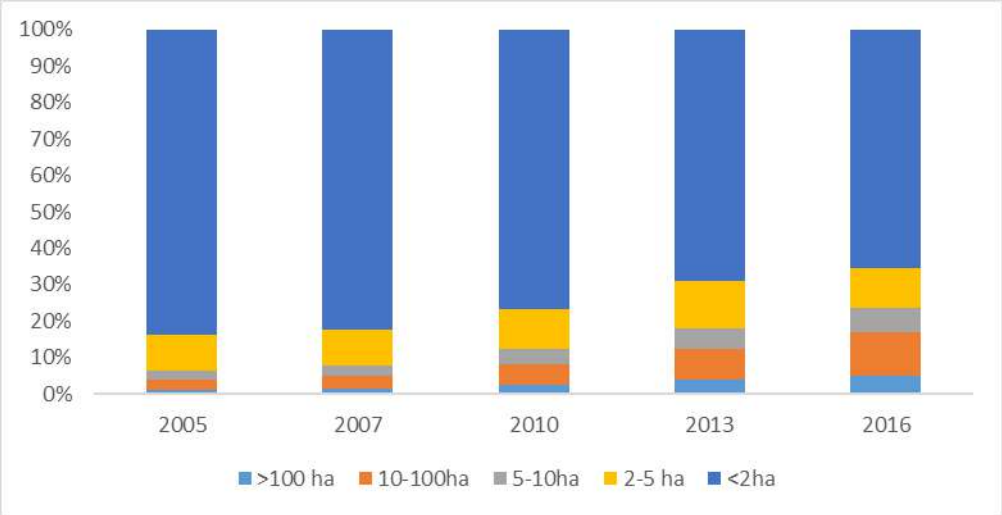

Figure 12: Structural change (number of holdings) (2005-2016) in farm size (ha) in Severen tsentralen and Severoiztochen (NUTS 2 units: BG32, BG33) (Source EUROSTAT)

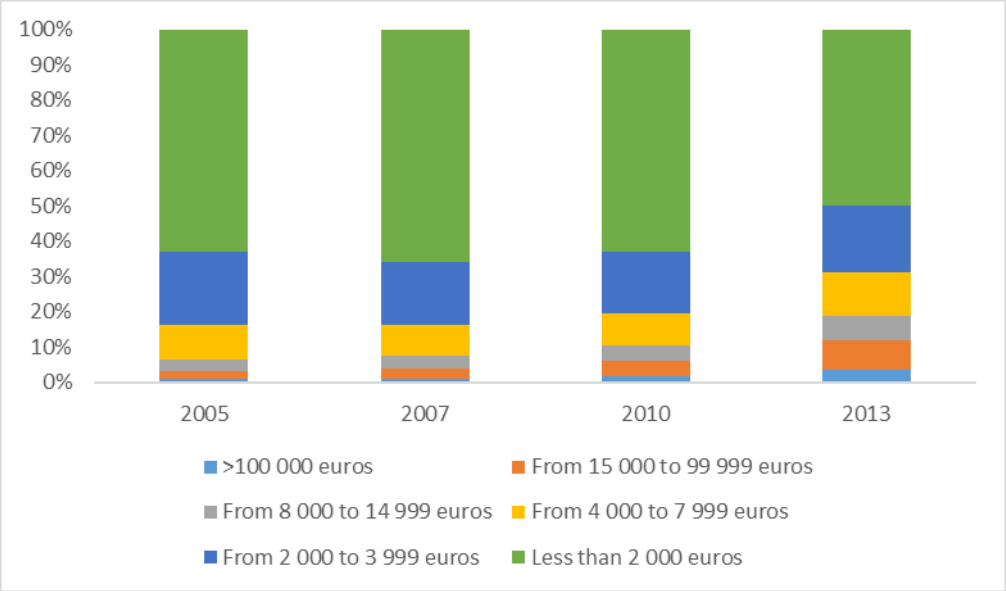

Figure 13: Structural change (number of holdings) (2005-2013) in farm size (SO in euros) in Severen tsentralen and Severoiztochen (NUTS 2 units: BG32, BG33) (Source EUROSTAT)

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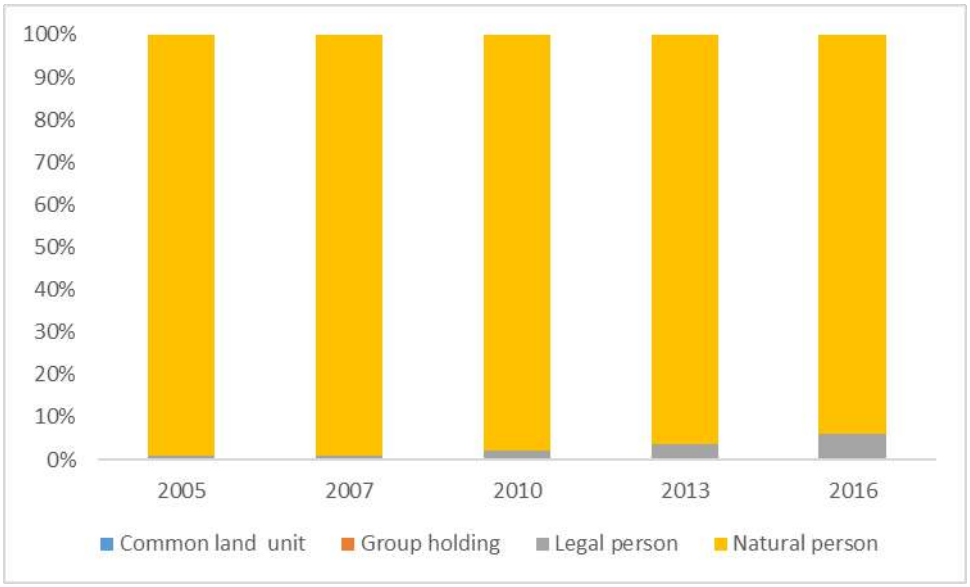

Figure 14: Structural change (2005-2016) in legal structure of the farm holdings in Severen tsentralen and Severoiztochen (NUTS 2 units: BG32, BG33) (Source EUROSTAT)

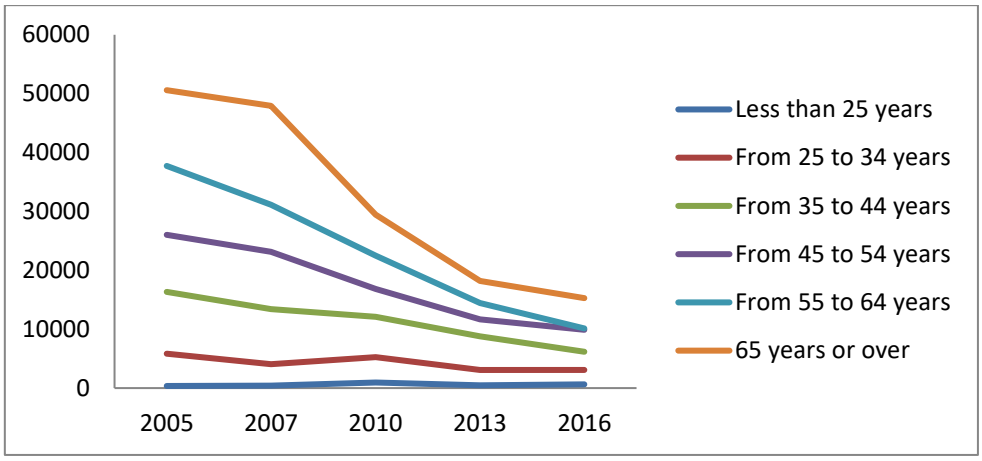

Figure 15: Evolution (2005-2016) of number of farm holdings in function of the age of the farm holder in Severen tsentralen and Severoiztochen (NUTS 2 units: BG32, BG33) (Source EUROSTAT)

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5.3 Regional characteristics influencing resilience of typical farm types in North-East and North-Central Bulgaria

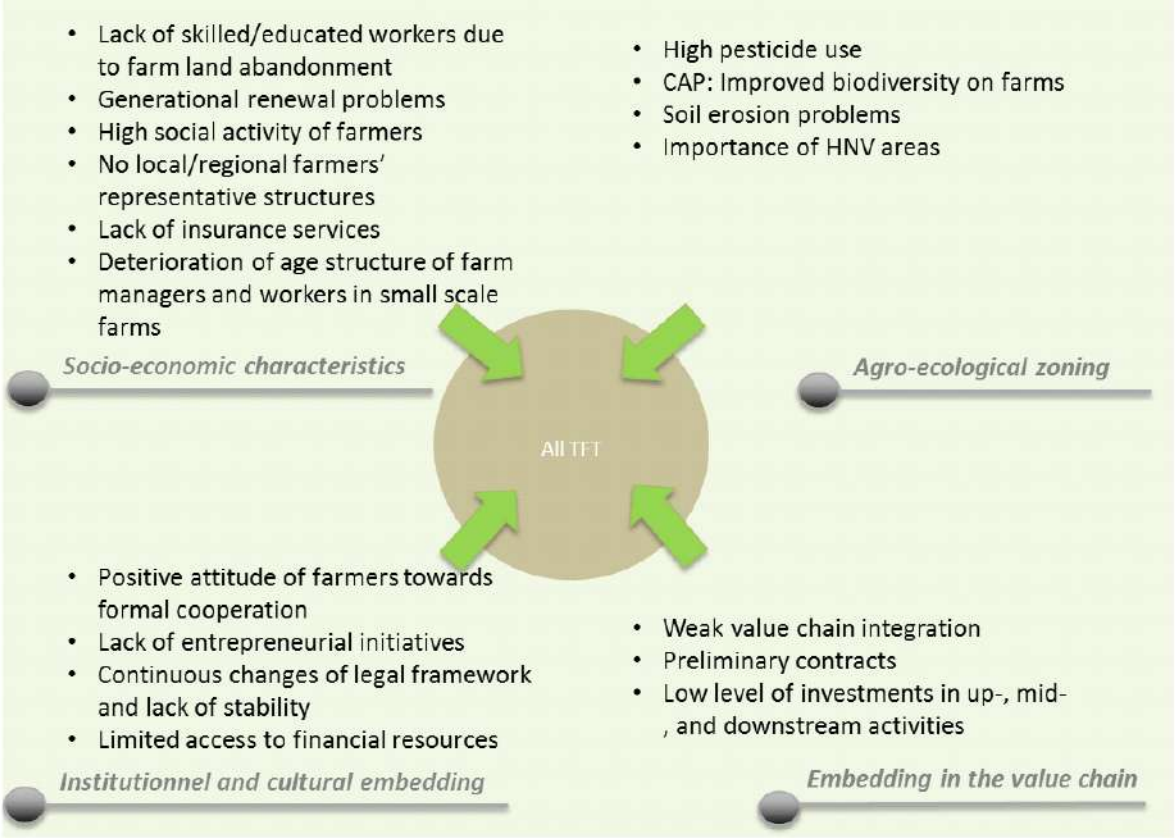

Figure 16: Overview of regional characteristics influencing resilience of typical farm types in North-East and North-Central Bulgaria

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6 Bourbonnais, France

Bourbonnais region (more or less the department of Allier), located in Central part of France, traditionally dominated by beef production.

6.1 Typical farm types in Bourbonnais

Three typical farm types were identified by expert knowledge:

- TFT1: 116 ha + Family farms + Grassland with or without arable land (**beef farms**)
- TFT2: 81 ha + Family farms + Arable land (**Field crop farms**)
- TFT3: 30 ha + Family farms + Arable and grassland (**sheep and goat farms**)

Farming intensity remains low in Allier compared to other French regions: LU / ha MFA in beef cattle farms ranges from 1.1 to 1.35 LU / ha MFA. Input cost / ha UAA = 250€ / ha UAA in beef cattle farms and 350€ / ha UAA in arable farms.

6.2 Farm demographic trends in Bourbonnais

In Allier, the overall number of farms decreased to 5523 farms in 2010, compared to 13680 farms in 1980. In that time span, the average farm size increased by 130%, reaching 88 ha in 2010. This is larger than the average farm size in France, which is on average 55 ha. This increased average farm size is the result of an increasing number of medium and especially large farms and a simultaneous decrease in the number of small farms. The average number of livestock units on the farms increased by 210% to an average of 82 livestock units/farm. About 72% of these farms are run as family farms, compared to 82% in 2000. This decrease is accompanied by a small increase in partnership farms (GAEC) (11% of farms versus 9% in 2000) and an increase in the number of corporate farms (EARL) (13% of farms in 2010 versus 6% in 2000). Specialist cattle-rearing and fattening represent 42% of farms and 55% of UAA (38% of farms and 53% of UAA in

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2000). Specialist cereals, oilseeds and protein crops represent 16% of farms and 15% of UAA (11% of farms and 12% of UAA in 2000). Sheep, goats and other grazing represent 20% of farms and 7% of UAA (24% of farms and 10% of UAA in 2000). There is a growing interest in commercializing the origin of the products or using quality labels. Demographic trends in the figures below are based on statistics of NUTS-2 region, Auvergne.

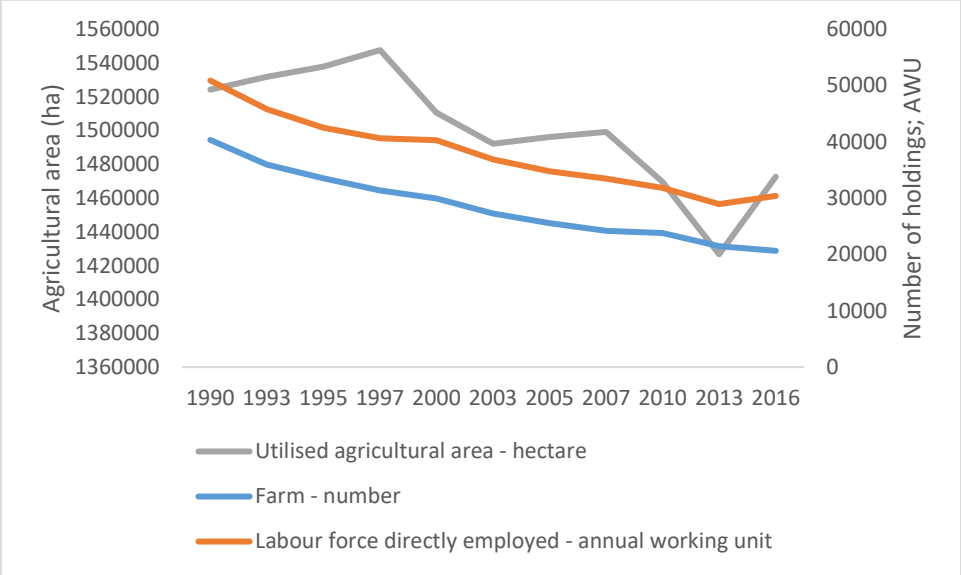

Figure 17: Evolution (1990-2016) in number of farm holdings, total agricultural area (ha) and total labour force (AWU) in Auvergne (NUTS 2 unit: FRK1) (Source EUROSTAT)

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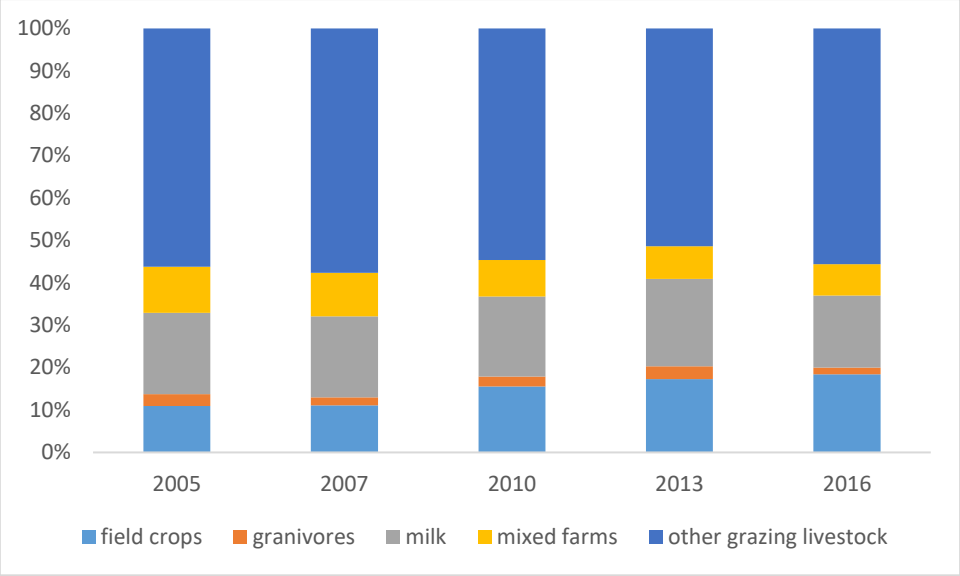

Figure *18*: Structural change (number of farm holdings) in horizontal specialisation in Auvergne (NUTS 2 unit: FRK1) (Source EUROSTAT) (2005-2016)

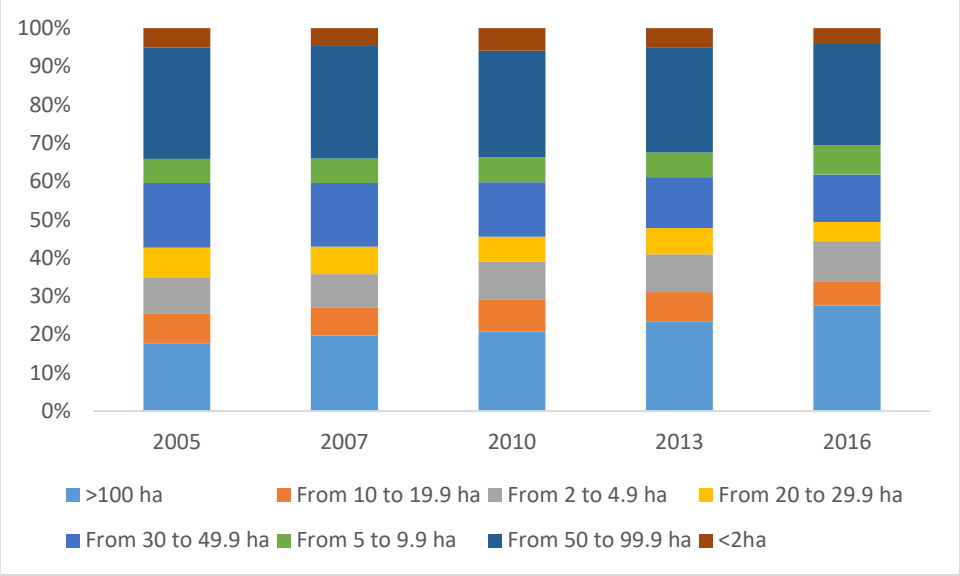

Figure *19*: Structural change (number of holdings) (2005-2016) in farm size (ha) in Auvergne (NUTS 2 unit: FRK1) (Source EUROSTAT)

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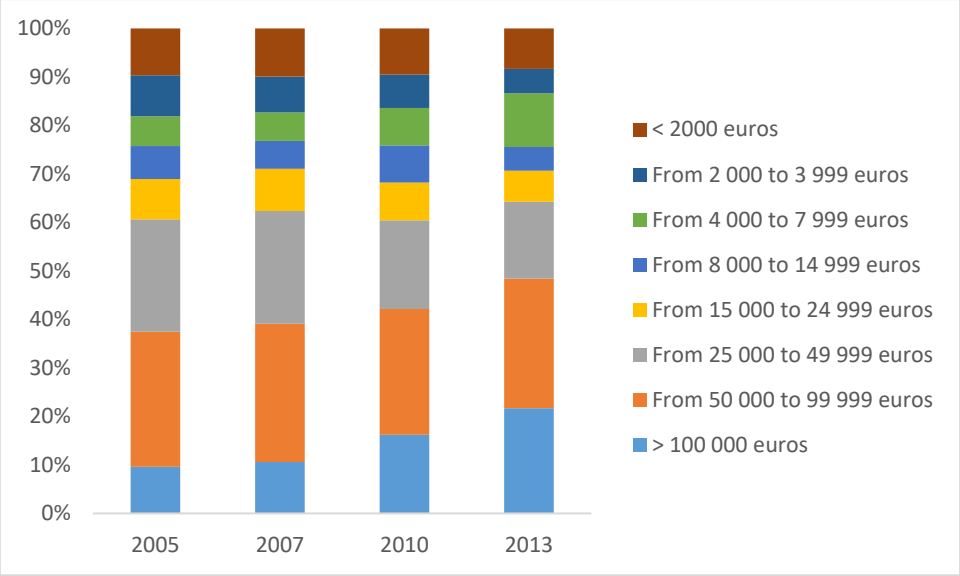

Figure *20*: Structural change (number of holdings) (2005-2013) in farm size (SO in euros) in Auvergne (NUTS 2 unit: FRK1) (Source EUROSTAT)

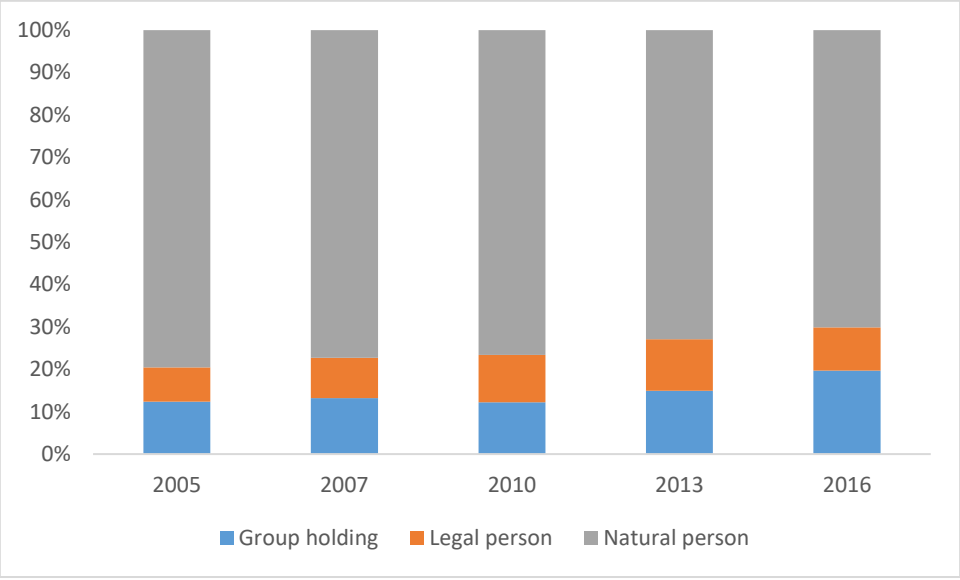

Figure *21*: Structural change (2005-2016) in legal structure of the farm holdings in Auvergne (NUTS 2 unit: FRK1) (Source EUROSTAT)

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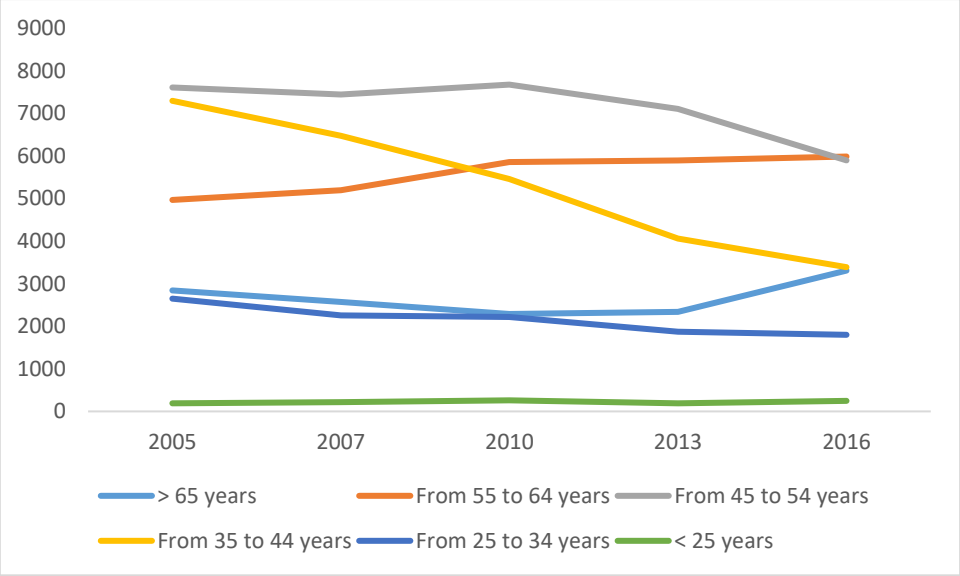

Figure *22*: Evolution (2005-2016) of number of farm holdings in function of the age of the farm holder in Auvergne (NUTS 2 unit: FRK1) (Source EUROSTAT)

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6.3 Regional characteristics influencing resilience of typical farm types in Bourbonnais

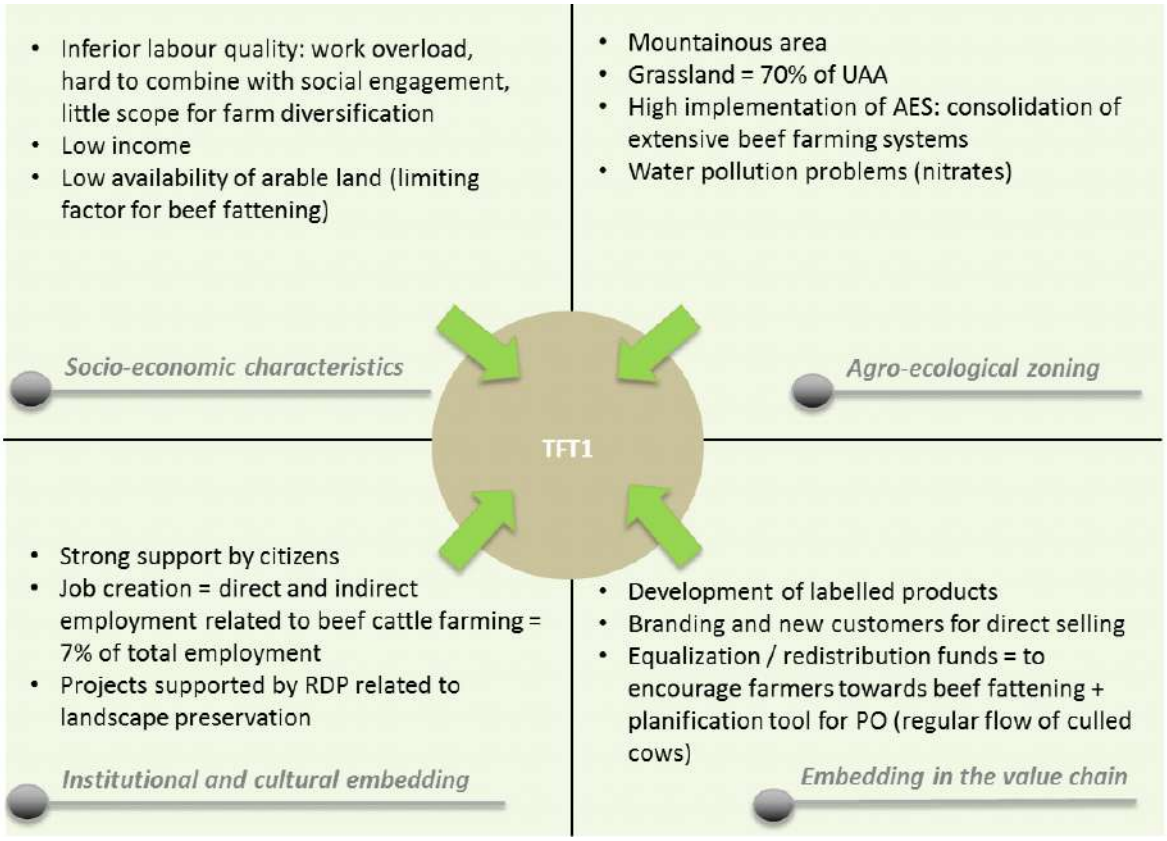

Figure *23*: Overview of regional characteristics influencing resilience of typical farm types in Bourbonnais

Direct and indirect employment related to beef cattle farming in Allier represent 7% of total employment in the region. It includes 3374 direct jobs in farms, 5449 indirect jobs in meat processors, input & machinery manufacturers, research & development etc.. However, labour quality is not optimal to many farmers in Allier due to a combination of low wages, not being-up-to-date in daily working activities and work overload. This might create unhappiness in the farmers' population. Labour organization is an important focal point as farmers are already working at full capacity and they have difficulties in free up time for social engagement, capacity building or for income diversification. This work quality and organization is very much influenced by the status of farm managers and workers and to what extent they depend on other family members in daily work activities. In farms where one member of the couple is working outside there may be some discrepancies between family and professional life (wage gap and calving constraints). Farms where both members derive their income from the farm result in less discrepancies between family and professional life because there is a unique reference for family & professional life. A farming couple will accept to earn 1.5 salary instead of 2. The sector invests in upstream economic activities such as beef genetic selection, and in midstream economic

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activities such as the development of labelled products (label rouge and organic label) for high value purposes, such as the valorization of grassland based beef in Massif central and branding and branding and new targeted customers for direct selling (increased added value at farm level).

Allier is a grassland dominated region (70% of UAA) and arable land is scarce and concentrated in the Val Allier. Low availability of arable land in the UAA is a limiting factor for beef fattening. Especially in mountains where arable land is not available (15% of the region), beef fattening is precluded. Beef cattle farms are heavily dependent on grasslands ; they are thus extremely challenged by climate change which occurs through repeated extreme weather events (droughts) impacting feeding strategies. However, this region dominated by grassland results in high protection of biodiversity and abundance of key farmland plant and animal species. Grassland fields are intertwined with dense hedgerow network. The landscape supports and delivers public goods such as biodiversity recreational ecosystem services, carbon sequestration, pollination etc. Specific projects are raised by Rural Development Programme focusing on removing all agricultural wastes that create eyesores for the public and damage landscape beauty (e.g. agricultural plastic waste such as silage film or pesticide packaging). As a consequence, the beef cattle sector is highly supported by local population.

Since the 90's, numerous agro-environmental schemes (AES) have been implemented and contributed to consolidate extensive beef farms. Current AES target the preservation of water resources (priority catchment area, vulnerable area…), biodiversity (Natura 2000 sites), areas for carbon sequestration (risk for grassland destruction), wet grassland preservation. AES include decrease or eliminate nitrogen fertilizers; reduce stocking rate; maintenance of floristic diversity; wet grassland management; targeted maintenance of existing natural hedgerows. Water pollution (nitrates) is a problem in the region and partially resulting from increased levels of farm intensity on arable and beef farm types.

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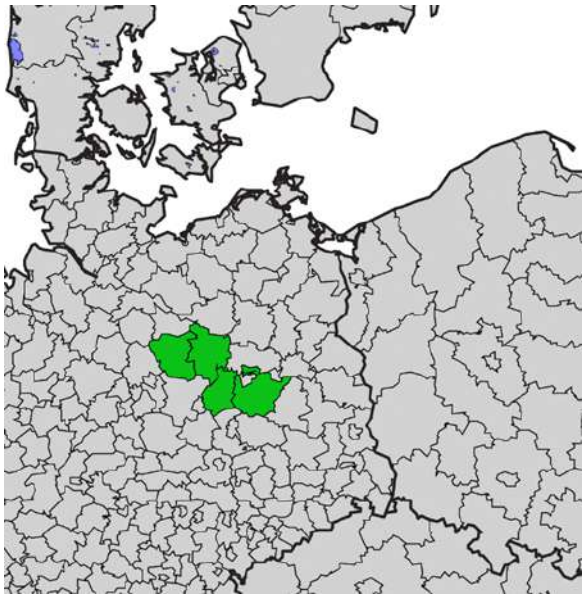
7 Altmark, Germany

The Altmark is located in the German Federal State of Saxony-Anhalt (districts “Stendal” and “Altmarkkreis Salzwedel”), and captures important features of the large-scale agricultural structures of East German agriculture. The Altmark is located in the German Federal State of Saxony-Anhalt, and captures important features of the large-scale agricultural structures of East German agriculture. The Altmark has a comparatively high proportion of grassland at nearly 27%. The soil quality is rather poor, and the yield levels in arable farming are rather low. By far the most of the land is cultivated by farms with more than 200 ha. Farm sizes are heterogeneous.



7.1 Typical farm types in Altmark

5 typical farm types have been identified by expert knowledge:

- TFT1: 300-350 ha + Family farms + Arable land (Field crop farms)
- TFT2: > 1000 ha + Corporate farms + Arable land (Field crop farms)
- TFT3: < 800 ha + Corporate farms + Arable land (Field crop farms)
- TFT4: 200-400 ha + Family partnership (GbR) + Milk farms (around or less than 300 cows) and Arable land (Field crop farms)
- TFT5: > 1000 ha + Corporate farms + Milk farms (>1000 cows) and Arable land (Field crop farms) (mainly these farms are establishing biogas plants)

7.2 Farm demographic trends in Altmark

Agriculture in Altmark is confronted with an increasing number of medium and large farms (especially medium farms) and a slightly increasing number of large and very large farms. The

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number of small farms is decreasing. Especially during periods with low milk prices, the number of small dairy farms is decreasing rapidly. Some small dairy farms exited the market and transformed their farms into crop production. Additionally, generational renewal problems of farms played a role in decreasing the number of small dairy farms (not only the owners but also their children recognised that the dairy business is very risky). This doesn´t mean that large dairy farms were very resilient during the milk crisis but they had some advantages dealing with fluctuating milk prices. Around 60% of dairy family farms did not exit the market. Their success relied on specialisation in one of two productions: milk and crop production.

Increasing farm sizes can partially be explained by specific land market behaviour of new investors. Investors prefer to buy several farms simultaneously to establish a farm association (or holding). After unification of the country, a lot of profit-based investors (with limited agricultural knowledge) started to invest in farm businesses with a decrease in the share of family farms. However, this trend disappeared over the years. But during milk crises, the number of family dairy farms dropped. Currently, there is a growth of milk family farms (about 400 cows): these farms are professional and stable. Farm intensity levels have increased both in the field crop and milk farms after unification. For the agricultural sector in general, and especially for the larger farms, cooperative farms seem to make way for legal persons like GmbH's. The main specialization, field crop production and dairying, remain stable over the years. However, due to the establishment of biogas plants (mainly by large milk farms), the share of maize on land for field crop production is growing rapidly. There is also a growing interest in organic food, with an increasing number of organic egg production by new investors. The figures below are based on data at the level of two combined NUTS-2 regions Brandenburg and Sachsen-Anhalt.

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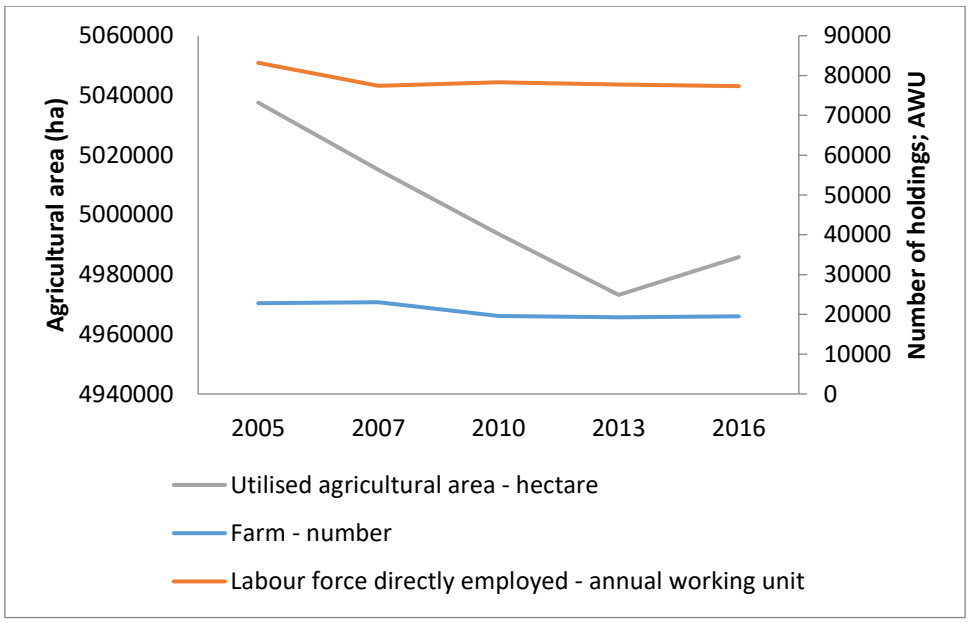

Figure *24*: Evolution (2005-2016) in number of farm holdings, total agricultural area (ha) and total labour force (AWU) in Brandenburg and Sachsen-Anhalt (NUTS 2 unit: DE40 and DEE0) (Source EUROSTAT)

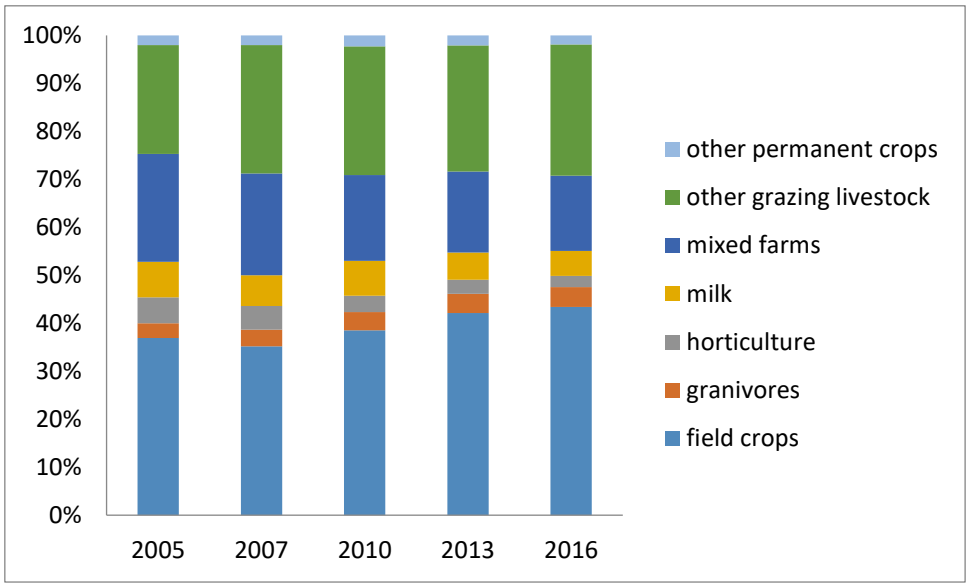

Figure *25*: Structural change (number of holdings) in horizontal specialisation in Brandenburg and Sachsen-Anhalt (NUTS 2 unit: DE40 and DEE0) (Source EUROSTAT) (2005-2016)

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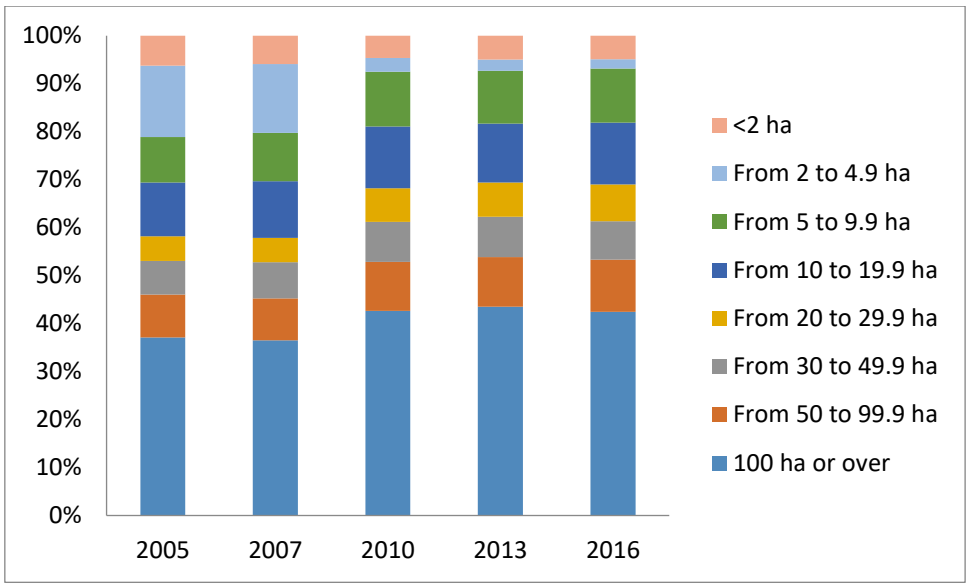

Figure *26*: Structural change (number of holdings) (2005-2016) in farm size (ha) in Brandenburg and Sachsen-Anhalt (NUTS 2 unit: DE40 and DEE0) (Source EUROSTAT)

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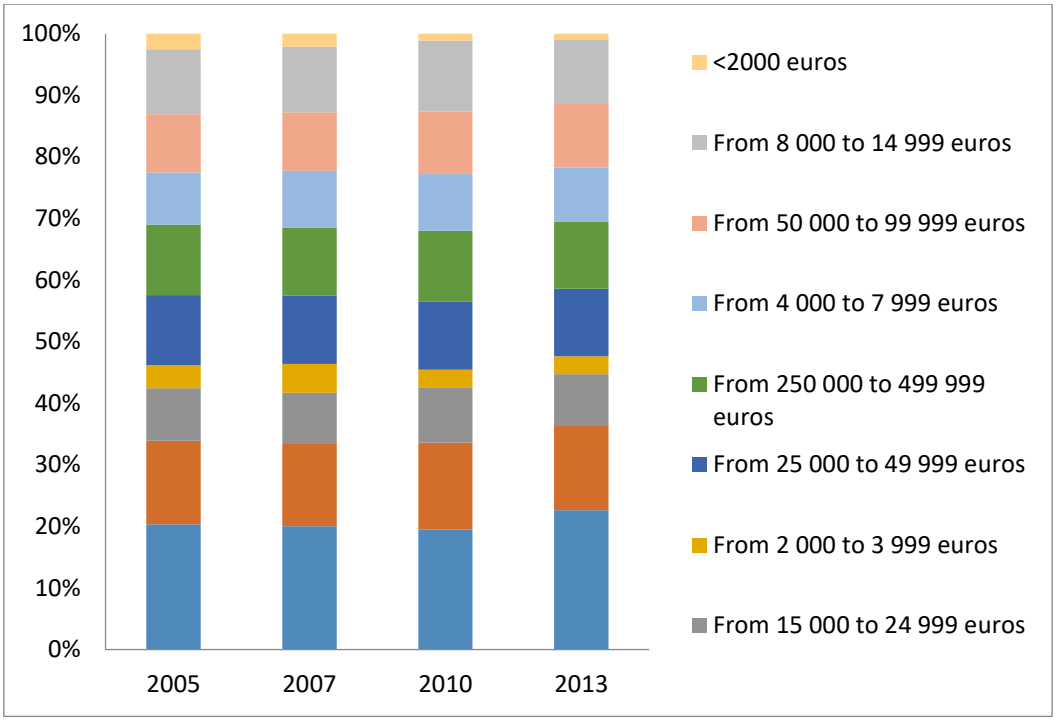

Figure *27*: Structural change (number of holdings) (2005-2013) in farm size (SO in euros) in Brandenburg and Sachsen-Anhalt (NUTS 2 unit: DE40 and DEE0) (Source EUROSTAT)

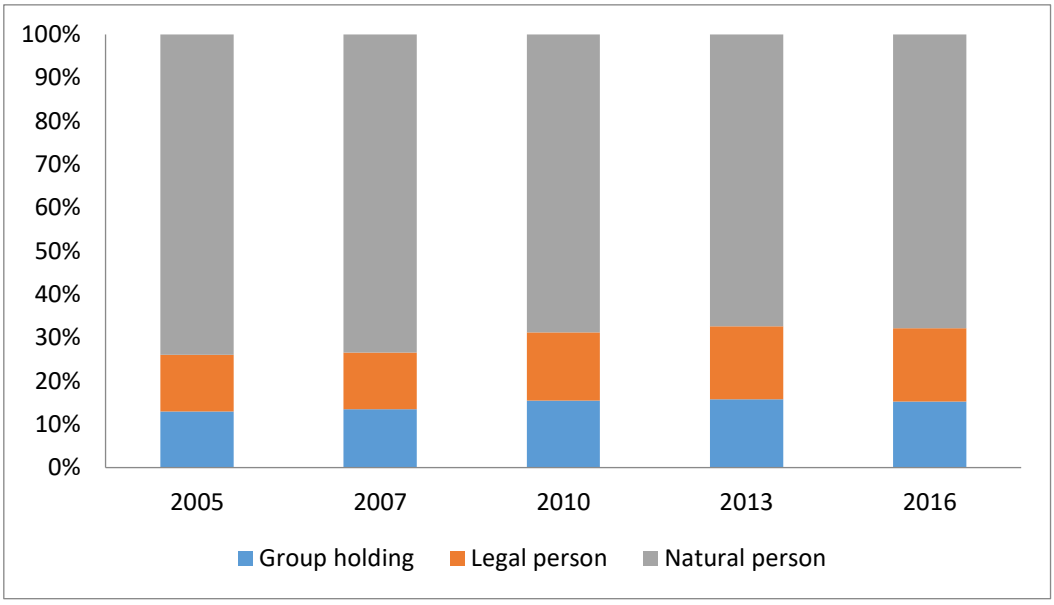

Figure *28*: Structural change (2005-2016) in legal structure of the farm holdings in Brandenburg and Sachsen-Anhalt (NUTS 2 unit: DE40 and DEE0) (Source EUROSTAT)

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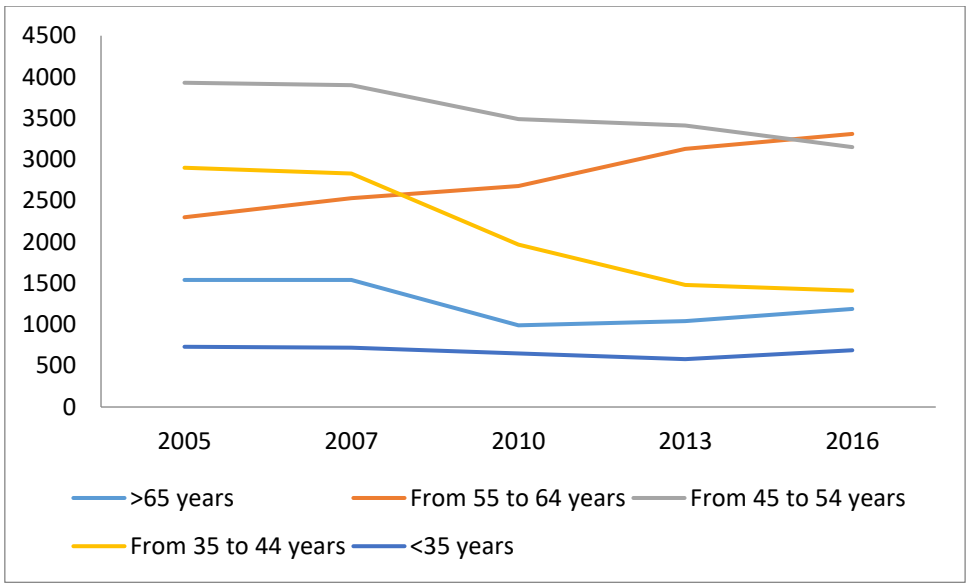

Figure *29*: Evolution (2005-2016) of number of farm holdings in function of the age of the farm holder in Brandenburg and Sachsen-Anhalt (NUTS 2 unit: DE40 and DEE0) (Source EUROSTAT)

7.3 Regional characteristics influencing resilience of typical farm types in Altmark

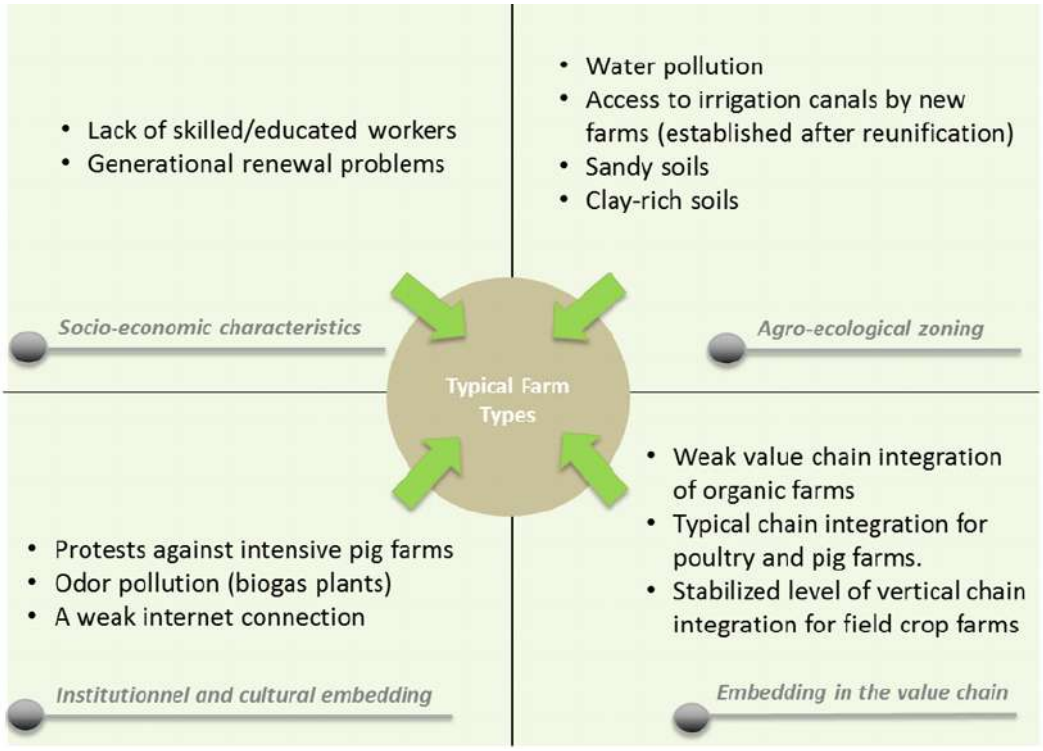

Figure *30*: Overview of regional characteristics influencing resilience of typical farm types in Altmark

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In Altmark, there is a generational renewal problem which is particularly the case at cooperative farms with 800 to 1000 ha, having problems to find replacement for retiring managers. This generational renewal problem may increase the involvement of external investors to the region in the future. Cooperative farms could transform into a holding structure.

Field crop farms, both family and corporate farms, perceive low availability of skilled and well-educated workers. However, some family farms and a few cooperative farms have more access to local labour, relative to corporate farms, due to a strong social network in the region. Corporate dairy farms compensate the lack of skilled workers by more automation of practices (milking and feeding) which is facilitated by financial support for acquiring technical equipment. However, high automation without educated workers may create a challenge in terms of keeping up a stable amount of milk production. There is a low level of salary payments to workers at large corporate dairy farms (TFT2 and 5). These farms can attract more skilled workers if they increase the salary level.

Due to an increase in farm intensity at all typical farm types mentioned above, the region has to deal with a water pollution problem. Not only water quality but also the quantity of water is a problem for some farms. Many water canals are from pre-unification time, and owned by corporate farms, resulting in unequally distributed water canals limiting access to clean water on some farms. This kind of ownership structure increases the difficulty for farms which are dependent on artificial irrigation. An interesting question is whether the region (flat and characterized by drainage, trench system) is capable of establishing centralised water reservoirs. This might be important to face unexpected droughts. Farms are flexible for such a transformation. However, government payments should compensate farms that are willing to invest in such technologies.

Another challenge are the more strict regulations on the use of fertilizers and pesticides. Successful adaptation of farms depends on the acquisition of new technologies (e.g., georeferenced fertilizer spreading machines). These regulations could be a big challenge for farms that are producing very high quality wheat.

In Altmark, intensive pig farms (mainly for Straathof holding owned farms) is meeting with increasing resistance of society. This has negatively influenced the investment plans in the region, and many pig farms exit the market. A similar resistance is seen for biogas plants, which is mainly caused by odor pollution. Therefore, more and more biogas plants are currently being established outside of the villages. The image of the dairy sector is much better as they are very well

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integrated in the rural population through good communication, and large scale successfully implemented projects.

Farms in the Altmark mainly produce bulk products. The majority of dairy farms sell their milk to large dairy processing companies. Only very small group of farms are collaborating and try to avoid selling to these large dairy factories. This established trend influences milk prices in a negative way. Farms do not have a potential to specialize in label products: transformation to organic milk production is more realistic (only small farms have converted to organic farming until now). However, fluctuation in milk prices (around 10-15%) is not a big problem, neither for family farms nor for other farms. However, an increase in the number of huge regressions (which the region experienced two times in the last years) is a big threat. Large farms (both family and corporate) with biogas plants could compensate for low milk prices.

There is a typical chain integration for poultry and pig farms. Organic farms have difficulties in organizing strong value chains, except for organic potatoes producing farms who succeeded in establishing a much more stable level in vertical chain integration.

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8 Viterbo, Italy

VITERBO, north of Lazio region, central-Italy, is part of NUTS 3 region: IT141 (Province of Viterbo). It excludes the coastal area that is very different from the internal part of the province because of several reasons. Viterbo is part of the NUTS 2 region Lazio (Code IT14). Italy is the world's second largest producer of hazelnuts, right after Turkey. Around ⅓ of its production comes from the Lazio region, where it generates 73 million euros. Viterbo produces 94% of said hazelnuts with its 6000 farms.

8.1 Typical farm types in Viterbo

Six typical farm types have been identified by expert knowledge:

- TFT1: Family Farms + Field crop farms (Arable and limited permanent crops)
- TFT2: Family Farms + Extensive Livestock (Sheep, Goats, and Mixed Livestock)
- TFT3: Small Family Farms (<10 ha) + Specialized Hazelnut
- TFT4: Medium-Large Family Farms (≥10ha) + Specialized Hazelnut
- TFT5: Family Farms + Other Permanent Crops (Vineyards and Olive groves)
- TFT6: Family Farms + Intensive Livestock (Specialized Bovine, Pig, and Poultry)

8.2 Farm demographic trends in Viterbo

During the last 30 years, the farm population remained stable in terms of units, whereas the UAA decreased by aprox. 25%. National agricultural statistics points to a large drop in units of farm in 2010, but this is the direct consequence of Regulation (EC) No. 1166/2008, by which only those farms with more than one hectare of UAA have to be included (agricultural holdings with UAA<1 are included only if accruing for a certain sales' share). Large Farms (>30ha) increased their UAA' shares on total. The most common ownership remained the family ownership with family work, accounting for almost the whole population of farms and gathering 2/3 of total agricultural area.

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The family ownership with external workers represents about 5% of the total units and 20% of the total agricultural area. Mixed Farms (i.e., Policultural farms, Mixed livestock, Mixed crops and livestock farms) decreased by aprox. 15% on the total (i.e., 10% of the total). On the opposite, specialized farms (i.e., Field crops farms, Horticulture and Floriculture farms, Permanent crops farms, Granivores farms, Herbivores farms) increased in terms of units (aprox. 25% more on the total farm population, reaching 90% of the total). There is a significant increase towards permanent crop specialization in terms of units (+ 15%) but not in terms of acreage, pointing to fragmentation for this sub-category. There is a significant increase in terms of UAA of specialized field crop farms (i.e., accruing nowadays aprox. 40% of total UAA in the region). Especially, the hazelnut sector proves to be highly profitable in the last years, attracting new investment that increased the amount of land devoted to this perennial crop, especially in the last five-years period. Indeed, the total hazelnut surface of Lazio region increased by 26% in between 2006-2018 (ISTAT, 2019. The farm size within the hazelnut sector increased in the last decade, due to the growing mechanization of cropping practices. Both mechanization and profitability (hazelnut generates 73 Million Euro of added value in the Lazio Region, according to last data available for the year 2015 (CREA, 2017)), supported the retention of young people in the farming activity.

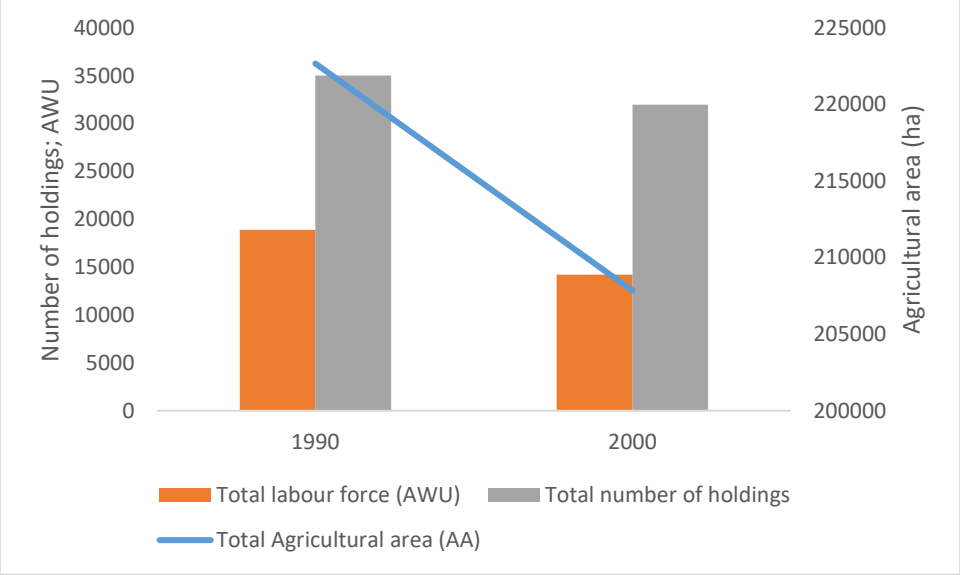

Figure *31*: Evolution (1990-2000) in number of farm holdings, total agricultural area (ha) and total labour force (AWU) in the Province of Viterbo (NUTS 3 unit: ITI41) (Source EUROSTAT)

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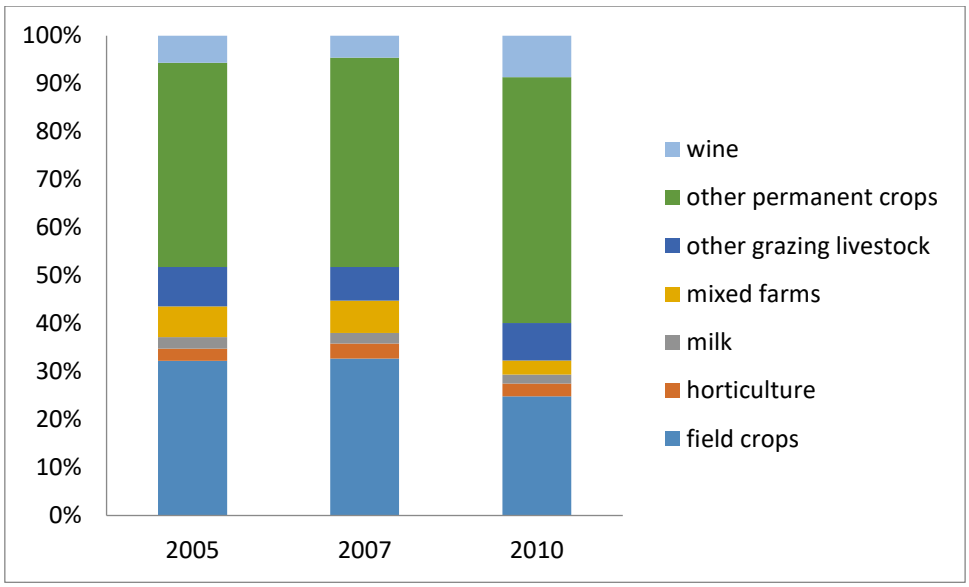

Figure *32*: Structural change (number of farm holdings) in horizontal specialisation in Lazio (NUTS 2 unit: ITI4) (Source EUROSTAT) (2005-2010)

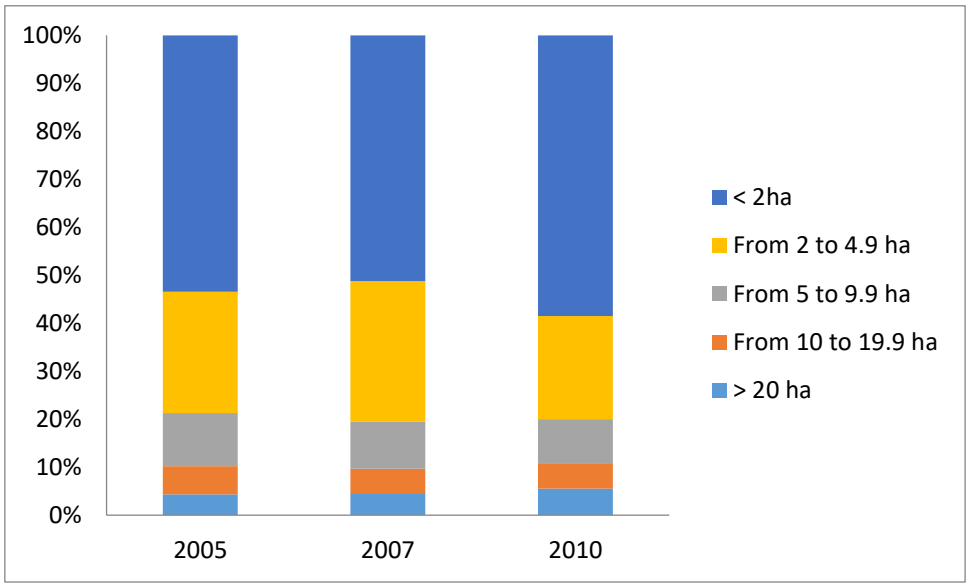

Figure *33*: Structural change (number of holdings) (2005-2010) in farm size (ha) in Lazio (NUTS 2 unit: ITI4) (Source EUROSTAT)

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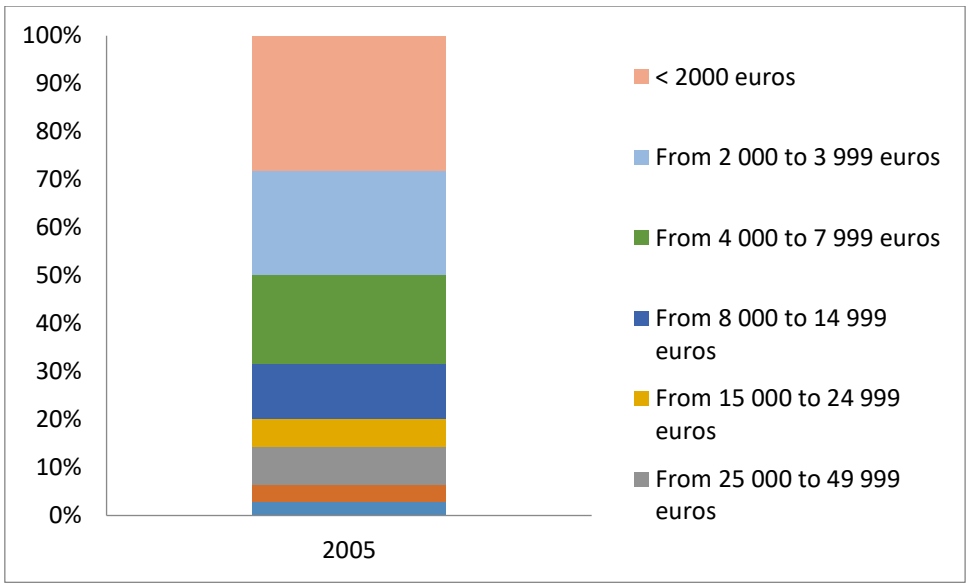

Figure *34*: Farm size (SO in euros) of agricultural holdings in Lazio (NUTS 2 unit: ITI4) (Source EUROSTAT)

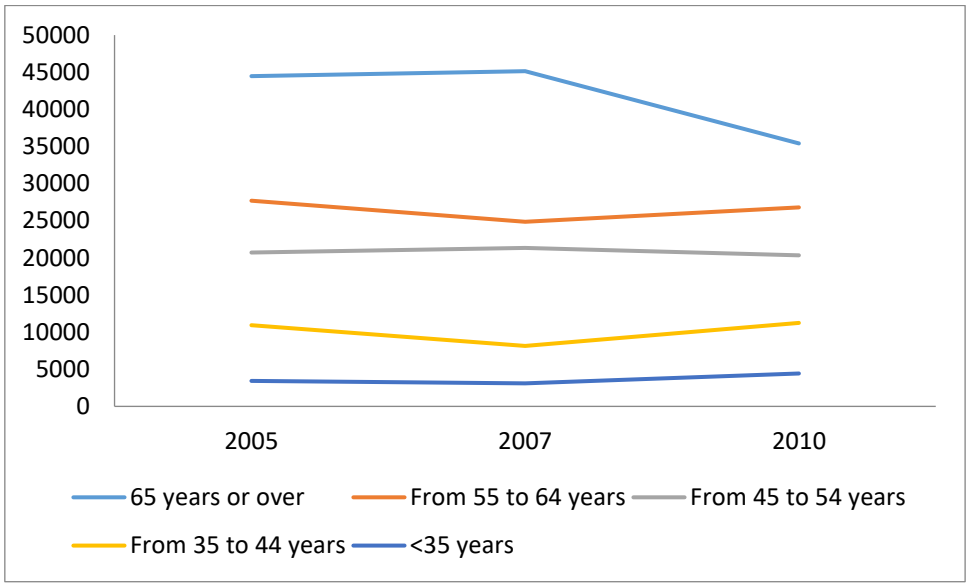

Figure *35*: Evolution (2005-2010) of number of farm holdings in function of the age of the farm holder in Lazio (NUTS 2 unit: ITI4) (Source EUROSTAT)

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8.3 Regional characteristics influencing resilience of typical farm types in Viterbo

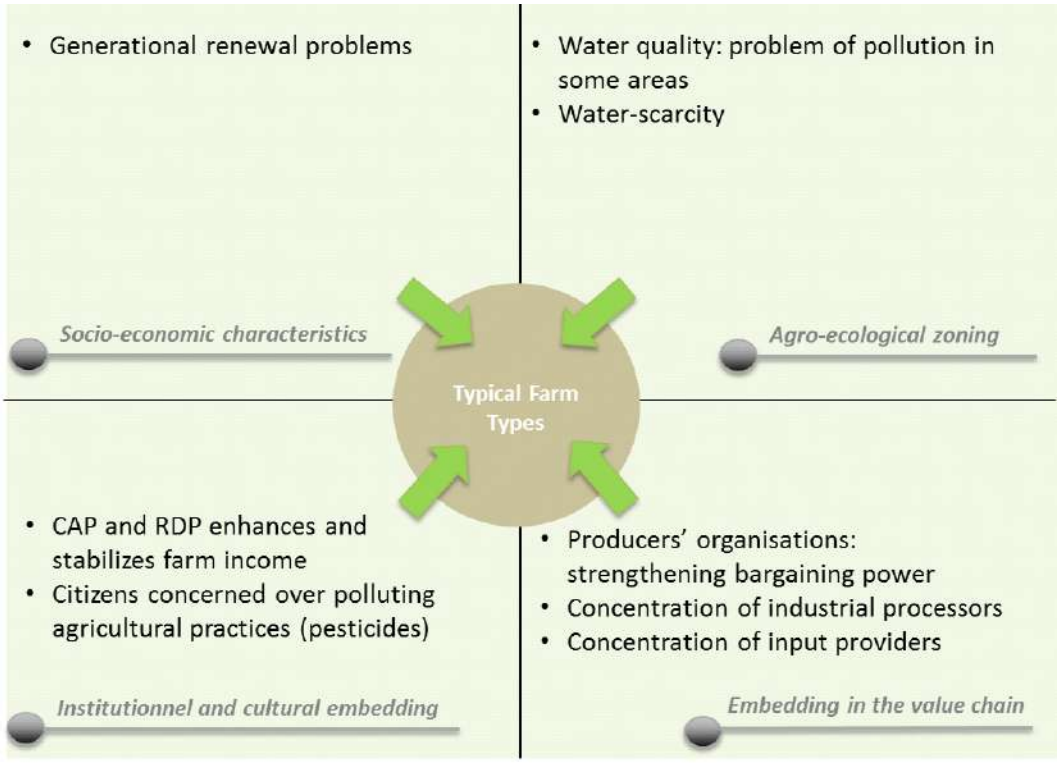

Figure *36*: Overview of regional characteristics influencing resilience of typical farm types in Viterbo

One of the biggest challenges to Viterbo's hazelnut sector is Turkey, who still dominates globally. Turkey has the power to influence the world's hazelnuts prices through its policies, resulting in price uncertainty and potentially threatening Italian farm economic sustainability. Two years ago, the production level in Lazio was at a record low, causing hazelnut prices to increase and requiring Turkey to lend support to Italian producers. That temporary dependence on Turkey created an incentive for Italian farmers to increase production and stimulate new hazelnut installations. But producing of hazelnuts is a slow process – their fruition taking up to 10 years after plantation. Other challenges to Virterbo's production include the low amount of hazelnut cultivars.

Ageing and low educational level are two characteristics of the farmers population in Viterbo. Farm managers are often elderly people with primary education, and workers are not highly skilled (as skilled labor force flows to other better-paying sectors). There is also a generational renewal problem. Skilled workers and managers would help in understanding and, hence, coping with and sometimes anticipating to socio-economic and environmental challenges. Improving social engagement of farmers by participating in organizations might improve financial and

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decision making, adoption of technological innovation and understanding changing market conditions. Farms are additional dealing with low availability on seasonal workers.

The current CAP and RDP subsidies are important in providing a stable and viable income for the farmers. Increasing interest rates and reduced access to bank loans are perceived as important future challenges.

In some areas of Viterbo there is a water pollution problem, although periods of water scarcity are a challenge for the whole region. This is a crucial input for all typical farm types, and has a primary impact on farm economics of the farm, as irrigation from other sources implies higher production costs.

There is an increasing societal concern over the use of pesticides and other polluting agricultural practices near public areas. This has resulted in prohibition of some practices and prohibition or reduction of the use of some chemicals.

Value chains in the region are characterized by a concentration of input providers and processing industry. However, the higher quality of the Viterbo hazelnut, recognized by the PDO “Nocciola Romana”, could be prompted in the near future for promoting and differentiating the local products on both domestic and foreign markets. Local producers are aware of such opportunity.

Producers’ organizations are important for information pass-through over market, environmental, and technological changes. Potentially, it strengthens the bargaining power of farms in both political lobbying and marketing activities with processors and retailers.

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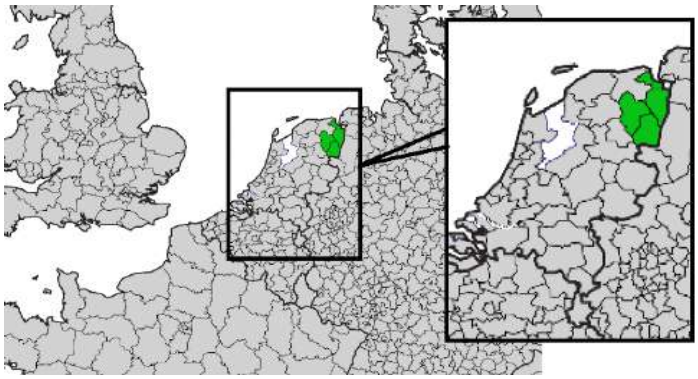
9 Veenkolonieën and Old-Ambt, the Netherlands

Veenkoloniën and Oldambt - NUTS3 level : parts of NL111 (Oost-Groningen), NL112 (Delfzijl en omgeving), NL131 (Noord-Drenthe) and NL132 (Zuidoost-Drenthe). The largest part of the CS is situated in NL111 (Oost-Groningen).



9.1 Typical farm types in Veenkoloniën and Old-Ambt

5 typical farm types in Veenkoloniën and Oldambt are:

- Specialised livestock (dairy) + family farm + medium size (100-150 cows)
- Arable farming (field crop; in Oldambt: primarily wheat) + family farm + medium size (60-120 ha, with a relatively large spread in farm size)
- Arable farming (field crop; in Veenkoloniën: starch potato, sugar beet, wheat)+ family farm + medium size (70-90 ha)
- Arable farming mixed with livestock (primarily arable) + family farm + medium size (70-90 ha)
- Arable farming mixed with bulb growing (primarily arable) + family farm + medium size (70-90 ha)

Arable farmers in the Veenkoloniën and Oldambt are larger than the average Dutch arable farm.

9.2 Farm demographic trends in Veenkolonieën and Old-Ambt

Veenkoloniën and Oldambt are two areas with different farm characteristics. In Oldambt, the average farm size increased over the last 20-30 years. Most farms in Oldambt are medium sized, while the number of farms is decreasing. In the Veenkoloniën most farms are medium sized as well. Most farms are family farms, both in Oldambt and Veenkoloniën. Ownership has been relatively stable in the last 20 to 30 years, most of the farms are family farms for a relatively long period of time. Most farms in Oldambt are either dairy or arable (field crop) farmers. Arable farming specialises primarily in wheat production. Initiatives for collaboration between dairy and

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arable farmers are stimulated. In Veenkoloniën, arable farming traditionally consisted of a combination of starch potato, sugar beets and wheat. Over the last couple of years, some specialised arable diversified to mixed farms (arable and (intensive) livestock or arable and bulb growing). Next to arable farming, dairy farmers are present as well in Veenkoloniën. Developments in the Veenkoloniën and Oldambt show an increase in farm intensity, possibly driven by low prices. The Netherlands has a highly intensive arable farming sector compared to other European countries. For Dutch standards, the intensity is relatively low, as starch potatoes and especially winter wheat have rather low ESUs.

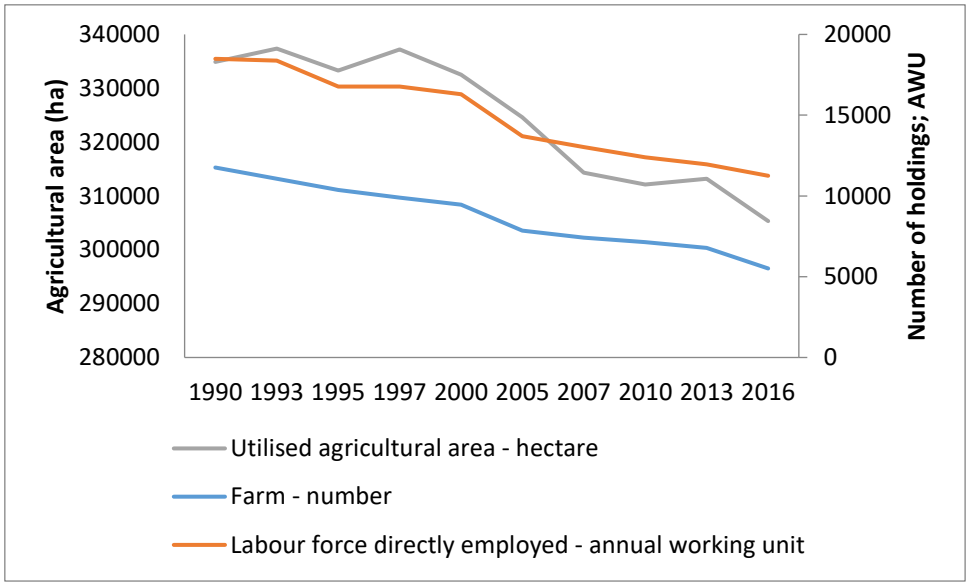

Figure *37*: Evolution (1990-2016) in number of farm holdings, total agricultural area (ha) and total labour force (AWU) in Groningen and Drenthe (NUTS 2 units: NL11 and NL13) (Source EUROSTAT)

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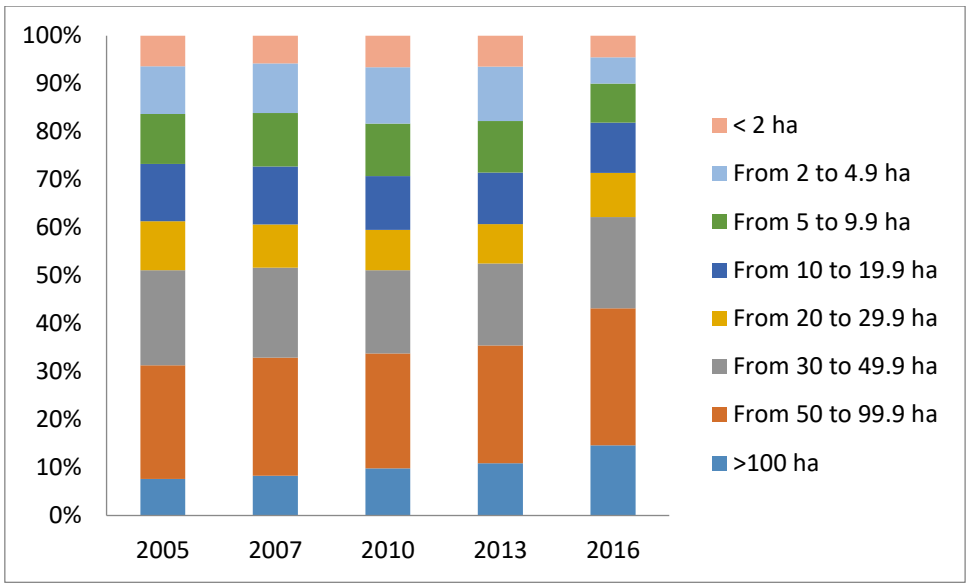

Figure *38*: Structural change (number of holdings) (2005-2016) in farm size (ha) in Groningen and Drenthe (NUTS 2 units: NL11 and NL13) (Source EUROSTAT)

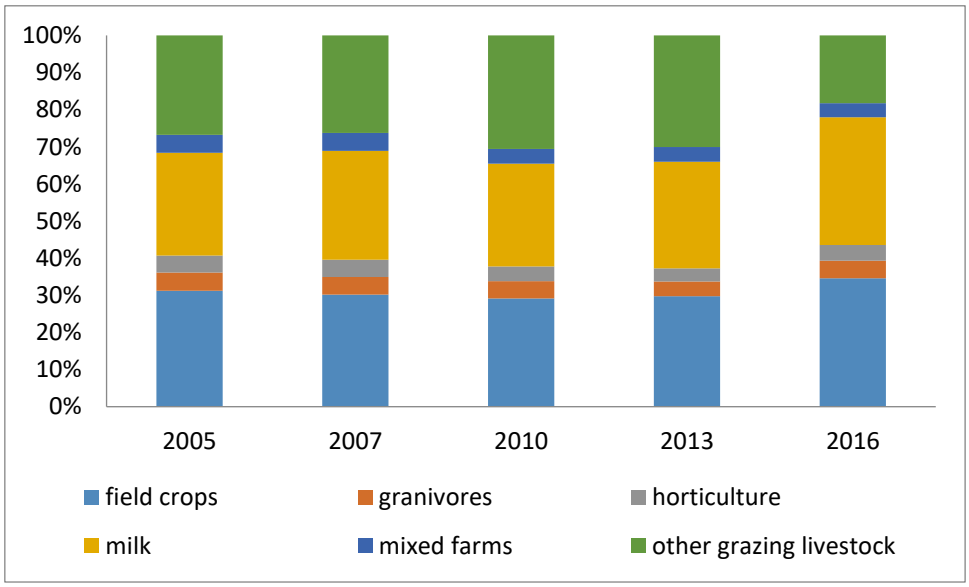

Figure *39*: Structural change (number of farm holdings) in horizontal specialisation in Groningen and Drenthe (NUTS 2 units: NL11 and NL13) (Source EUROSTAT) (2005-2016)

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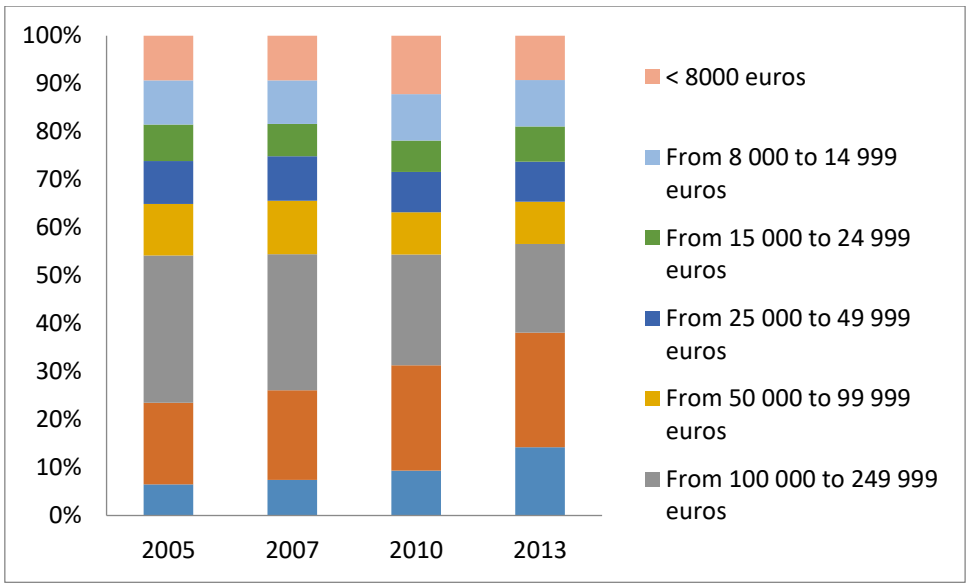

Figure *40*: Structural change (number of holdings) (2005-2013) in farm size (SO in euros) in Groningen and Drenthe (NUTS 2 units: NL11 and NL13) (Source EUROSTAT)

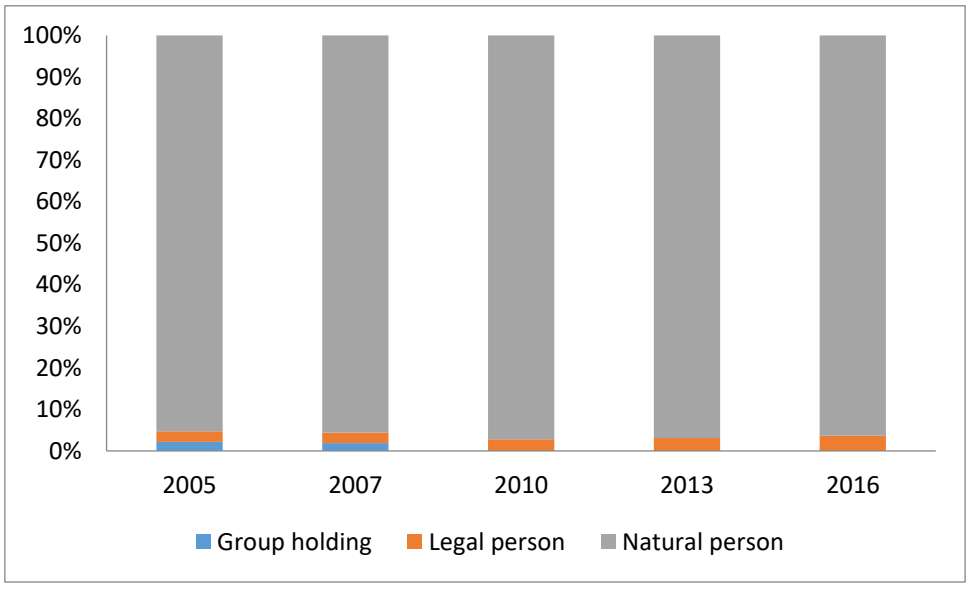

Figure *41*: Structural change (2005-2016) in legal structure of the farm holdings in Groningen and Drenthe (NUTS 2 units: NL11 and NL13) (Source EUROSTAT)

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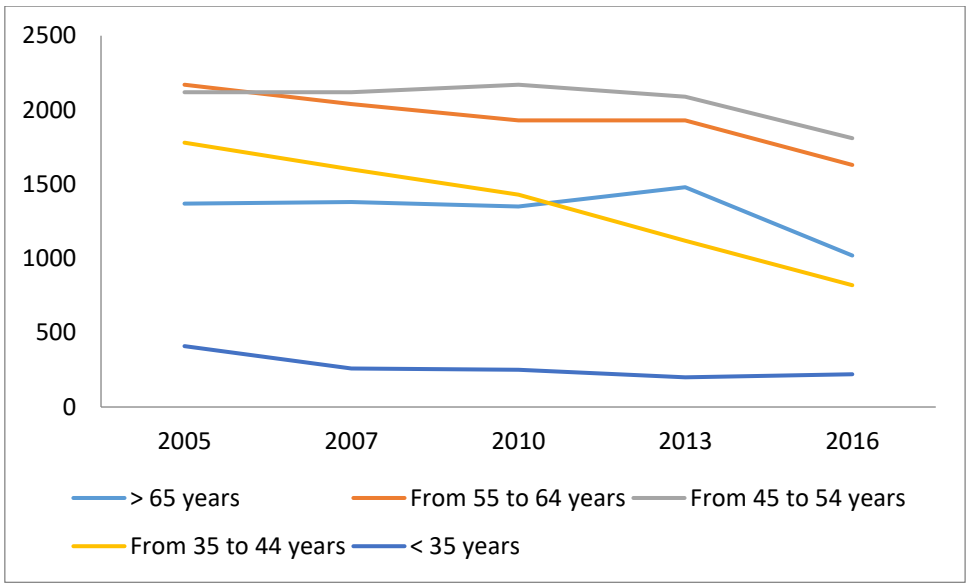

Figure *42*: Evolution (2005-2016) of number of farm holdings in function of the age of the farm holder in Groningen and Drenthe (NUTS 2 units: NL11 and NL13) (Source EUROSTAT)

9.3 Regional characteristics influencing resilience of typical farm types in Veenkolonieën and Old-Ambt

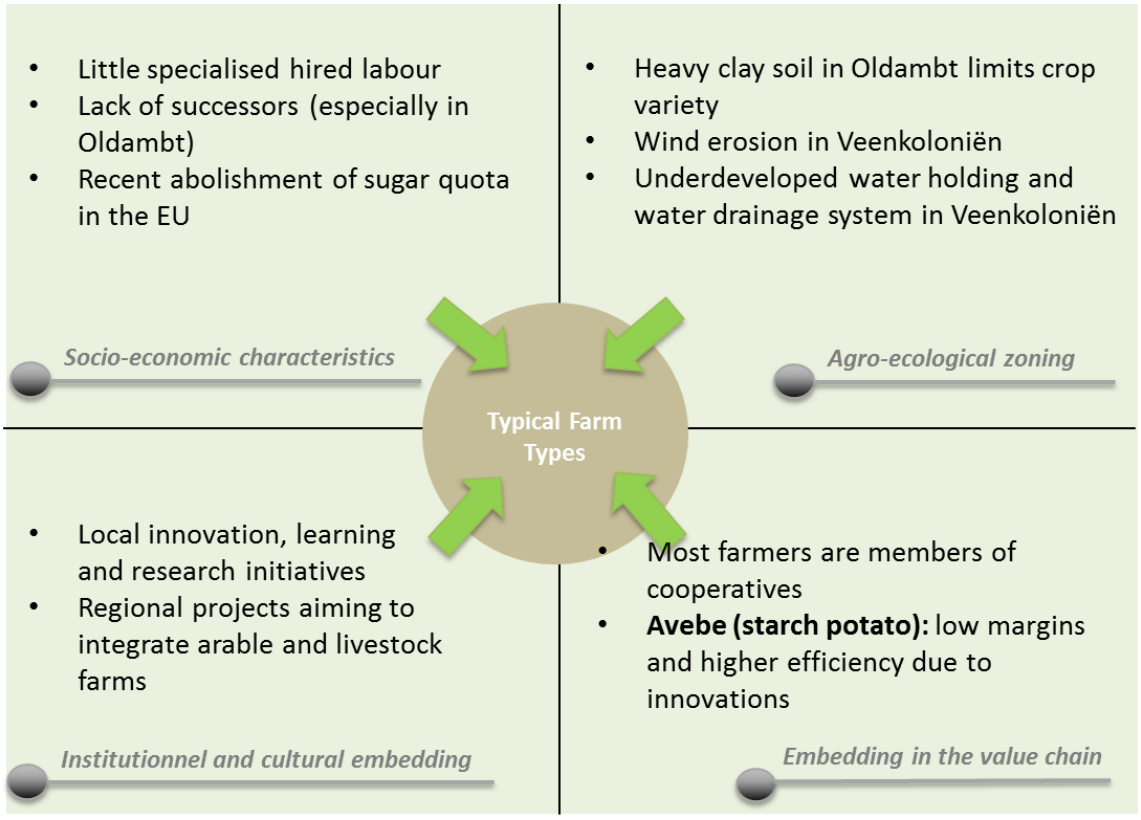

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Figure *43*: Overview of regional characteristics influencing resilience of typical farm types in Veenkoloniën and Old-Ambt

Heavy clay soil in Oldambt limits the variety of crops that can be cultivated on the land. Due to the heavy clay soil, primarily wheat has been cultivated in Oldambt. Traditionally starch potato, sugar beets and wheat are grown on peat soil in Veenkoloniën. The introduction of new crops is a future challenge for arable farmers. In Veenkoloniën, the availability of a fourth viable crop – next to starch potatoes, sugar beets, and wheat – would improve the situation of arable farmers. The high frequency of cultivating starch potatoes to often increases the risk of nematodes. Crop rotation is needed to prevent crop diseases. Previously it was assumed that onions did not grow well on the peat soil, but currently some farmers are experimenting with onions as a fourth crop. The introduction of a new crop could be seen as adaptability. Next to this, diversification from arable to mixed farms occurs. Examples of these mixed farms are bulb growing and arable farming or (either intensive or extensive) livestock and arable farming. The shift from specialised arable farming to mixed farming is an example of transformation.

Besides differences in crop production between these regions, there are also cultural differences between farmers in both regions. Generally speaking, farmers in Veenkoloniën are more open for collaboration with other farmers and open to discuss problems. For example, in Veenkoloniën, there are some initiatives on local farmer communities, research, and learning about agricultural practices. An example of this is “Innovatie Veenkoloniën”, which focusses on innovation, research and information meetings for arable farmers. Meetings on precision farming and green manure are examples of relevant subjects where innovation, research and information provision to farmers are combined. Farmers from Oldambt are more on their own and do not share worries easily with other farmers, cooperatives or other institutions.

In both regions, most of the farms are family farms, so there is a lot of family labour and less (specialised) hired labour. The amount of family labour per farm is relatively stable and could partly enhance robustness. For instance by working harder in bad times. Some older farmers do not have a successor yet. As most of the farms are family farms, the prioritized successor is a family member. This is especially for the arable farmers in Oldambt an issue and may partly explain the decreasing number of farms and the increasing average farm size.

Soil and wind erosion is and has been a problem in the Veenkoloniën, due to the peat and sandy soil. In the beginnings of the 2000s, there have been some governmental programs aiming to prevent or decrease soil erosion. One of the target areas of these programs was the Veenkoloniën. These governmental programs either aimed to enhance robustness, by decreasing soil erosion, or adaptability, aiming to prevent or minimise soil erosion. Another environmental characteristic and future challenge are phosphate and nitrate regulations for dairy farmers in the Netherlands. The

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relatively intensive Dutch dairy sector has a derogation which allows Dutch dairy farmers to have higher nitrate levels than the EU nitrate regulations allow. After the abolishment of the dairy quota, the average herd size of Dutch dairy farmers increased and nitrate and phosphate levels came more under pressure. The EU threatened to withdraw the Dutch derogation. To meet the phosphate and nitrate regulations, farmers had to reduce herd size and successfully met the EU demands. This challenge relates to the adaptive capacity of dairy farmers. Also developing regulations, both on national and European level, might affect agricultural production. An example of recent developments in these regulations are the negotiations of glyphosate (an often used herbicides) allowance. On EU level there was a debate on whether glyphosate should be banned or not. Eventually, the EU allowed the usage glyphosate for the next 5 years. For arable farmers, the allowance of glyphosate in the next 5 years enabled farmers to adapt step by step to a situation of using less glyphosate.

To stimulate sustainability, primarily in dairy farming, the "Groninger Verdienmodel" has been designed. This is a set of regulations that a dairy farmer has to meet before the farmer can expand his farm with 2-4 ha. If the regulations are not properly met, the dairy farmer is only allowed to expand his farm up to 2 ha. Better adapted farms found it easier to meet these regulations than less adapted farms.

Farmers in both regions are often associated to (National) cooperatives. Examples of important cooperatives in the Veenkoloniën and Oldambt are Avebe (starch potato), Cosun (sugar beets), Royal FrieslandCampina (dairy). Challenges for Avebe are the margins on starch potatoes relative to other crops and how innovation could improve efficiency. A combination of relatively low yield growth and stable prices could stagnate the starch potato market. For Cosun, the recent abolishment of the sugar quota liberalised the sugar market are relevant challenges. In general, future developments in productivity, revenues and profit margins are therefore important challenges for farmers in these regions. These developments in price and yield challenge robustness in the short run, but in a longer period of time they may affect adaptability or transformability. Since the introduction of the direct payments per hectare of the CAP, the CAP payments for arable farmers decreased. Arable farmers adapted successfully to the lower CAP-payments. It is expected that the upcoming CAP reform does not have effects as large as the shift to direct payments per hectare for arable farmers.

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10 Mazovian, Poland

Mazovian region (org. EUFADN "Mazowsze i Podlasie") located in Central-East part of Poland - NUTS2 regions: PL92 (Mazowieckie) and PL81 (Lubelskie) - traditionally dominated by horticulture which determines its diversified landscape.

10.1 Typical farm types in Mazovian

Five typical farm types have been identified by expert knowledge:

- TFT1: small farms (<10 ha) + Family farms + Arable land (Field crop farms).
- TFT2: medium farms (10-30 ha) + Family farms + Arable land.
- TFT3: medium farms (10-30 ha) + Family farms + Milk farms.
- TFT4: small farms (<10 ha) + Family farms + fruits or (and) vegetables.
- TFT5: small farms (<5 ha) + Family farms + poultry farm (farming based on purchased fodder inputs).

10.2 Farm demographic trends in the Mazovian region

Between 1990 and 2010, the number of small and medium-sized farms decreased (the largest decrease occurred among farms up to 5 ha) and the number of large farms (over 30 ha) increased. About 1,300 thousand farms (up to 30 ha) are using 55% of agricultural land and the remaining part (45% of UAA) are shared between ca. 70,000 farms over 30 ha. The concentration of land is progressing. The number of livestock decreased significantly during 1990-2010, mainly sheep (tenfold), horses (four times), cattle and pigs (twice), the main reason being the lower profitability of small-scale livestock production. Agriculture in the region is characterized by a decrease of public sector's share due to ownership transformations (from over 20% to ca. 3%). The land was

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generally transferred to private owners on a paid basis. The dominant form according to the criterion of managerial ownership in the studied region is family farms (over 99.9% of the total quantity). They use over 95% of agricultural land. Livestock production is mainly carried out on specialized farms with dairy cattle. Horticultural production is mainly carried out farms with less than 10 ha. There is a growing interest in the creation of producer groups (e.g. joint investments in storage facilities) among fruit and vegetable farms. Poultry production (eggs, meat) is becoming more specialized and new crops, such as the production of mushroom (mostly champignon mushrooms) are introduced in the region. There is a significant increase in sown-area of rapeseed (more than triple) and maize for grain (tenfold). The increased interest in rapeseed is explained by an increased demand of the biofuel industry, and the increased interest in maize is due to the higher yield compared to traditional cereals. Both in crop and animal and crop production, there is an on-going increase in the intensity of largest and specialized farms. The TFTs 1, 2 and 3 are dominated by farms with own labour inputs (SE015), while vegetable and fruit farms as well as farming systems (SE020) require the employment of labour from the outside. Significant intensification of employment of workers from Ukraine is present.

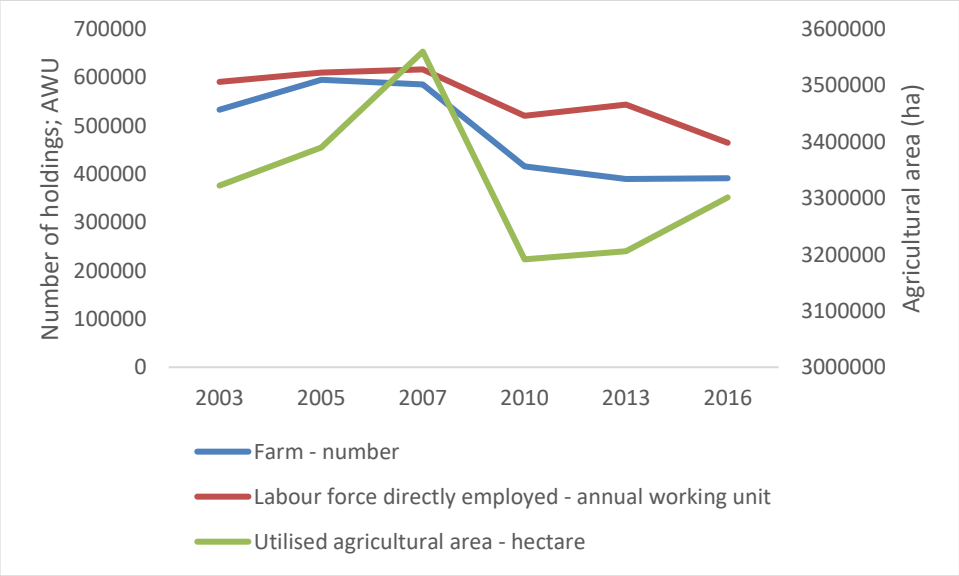

Figure *44*: Evolution (2003-2016) in number of farm holdings, total agricultural area (ha) and total labour force (AWU) in Mazowieckie and Lubelskie (NUTS 2 units: PL92 and PL81) (Source EUROSTAT)

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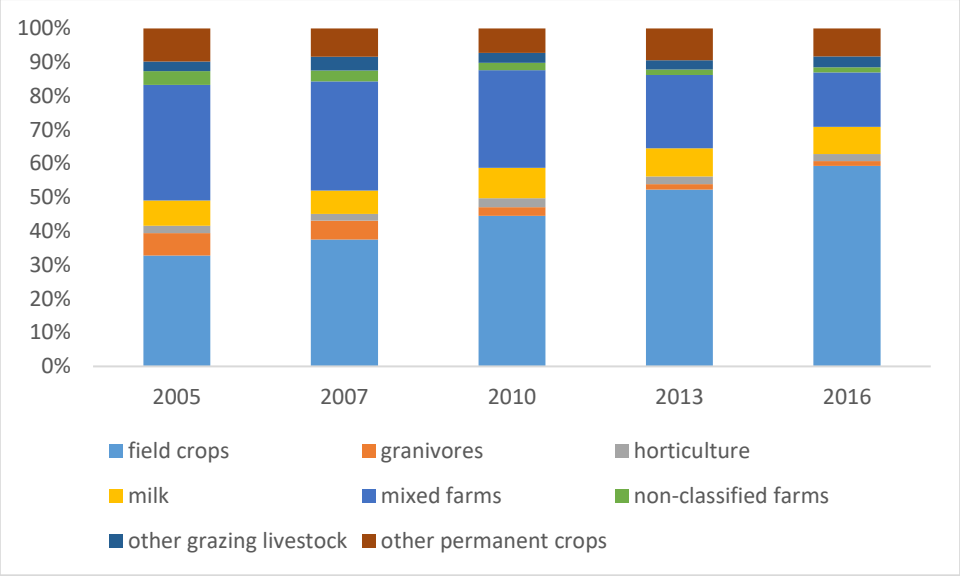

Figure *45*: Structural change in horizontal specialisation (number of farm holdings) in Mazowieckie and Lubelskie (NUTS 2 units: PL92 and PL81) (Source EUROSTAT) (2005-2016)

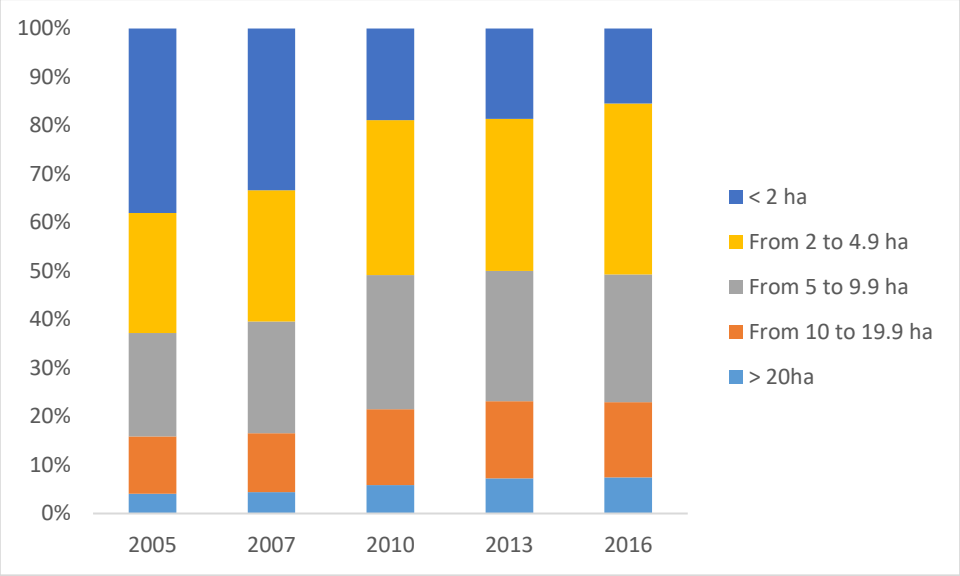

Figure *46*: Structural change (number of holdings) (2005-2016) in farm size (ha) in Mazowieckie and Lubelskie(NUTS 2 units: PL92 and PL81) (Source EUROSTAT)

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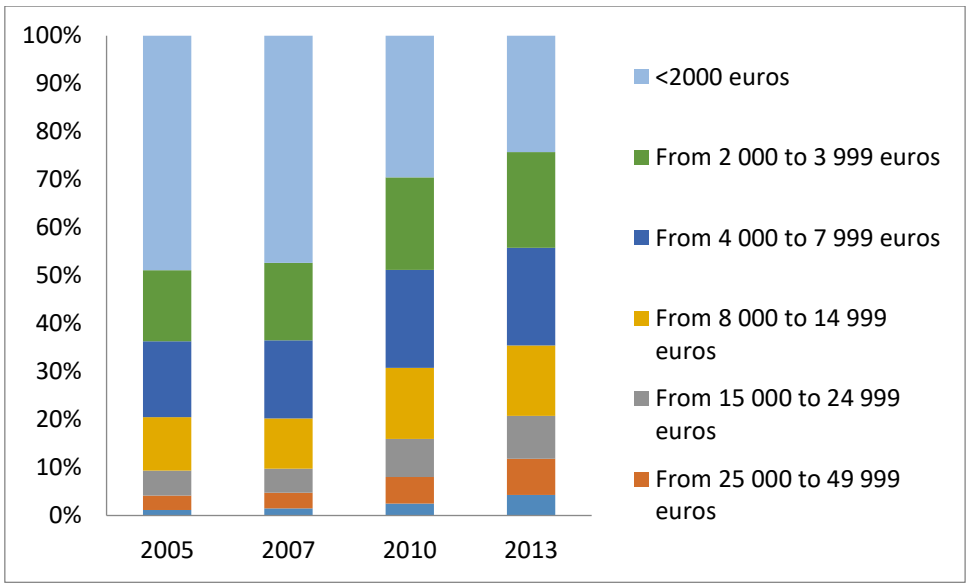

Figure *47*: Structural change (number of holdings) (2005-2013) in farm size (SO in euros) in Mazowieckie and Lubelskie (NUTS 2 units: PL92 and PL81) (Source EUROSTAT)

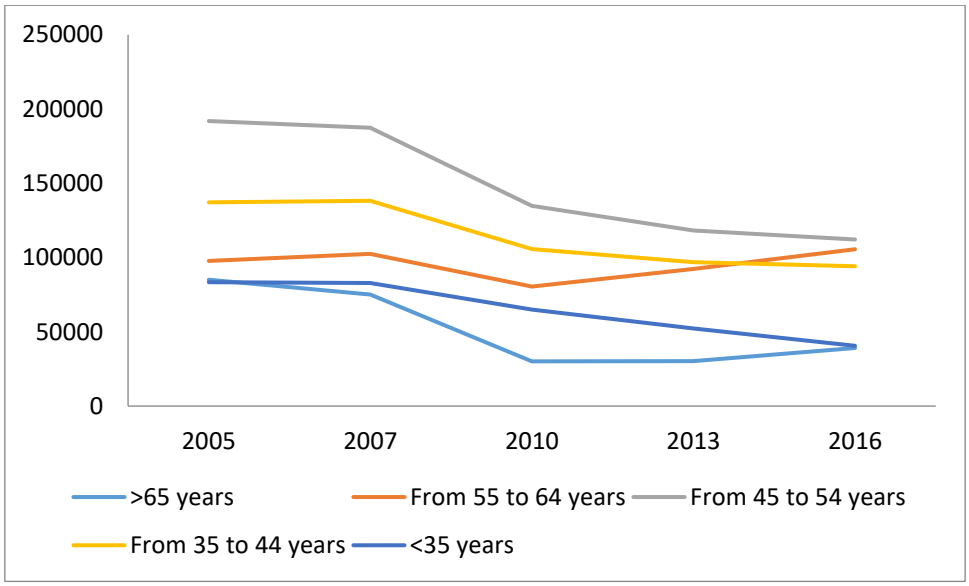

Figure *48*: Evolution (2005-2016) of number of farm holdings in function of the age of the farm holder in Mazowieckie and Lubelskie (NUTS 2 units: PL92 and PL81) (Source EUROSTAT)

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10.3 Regional characteristics influencing resilience of typical farm types in the Mazovian Region

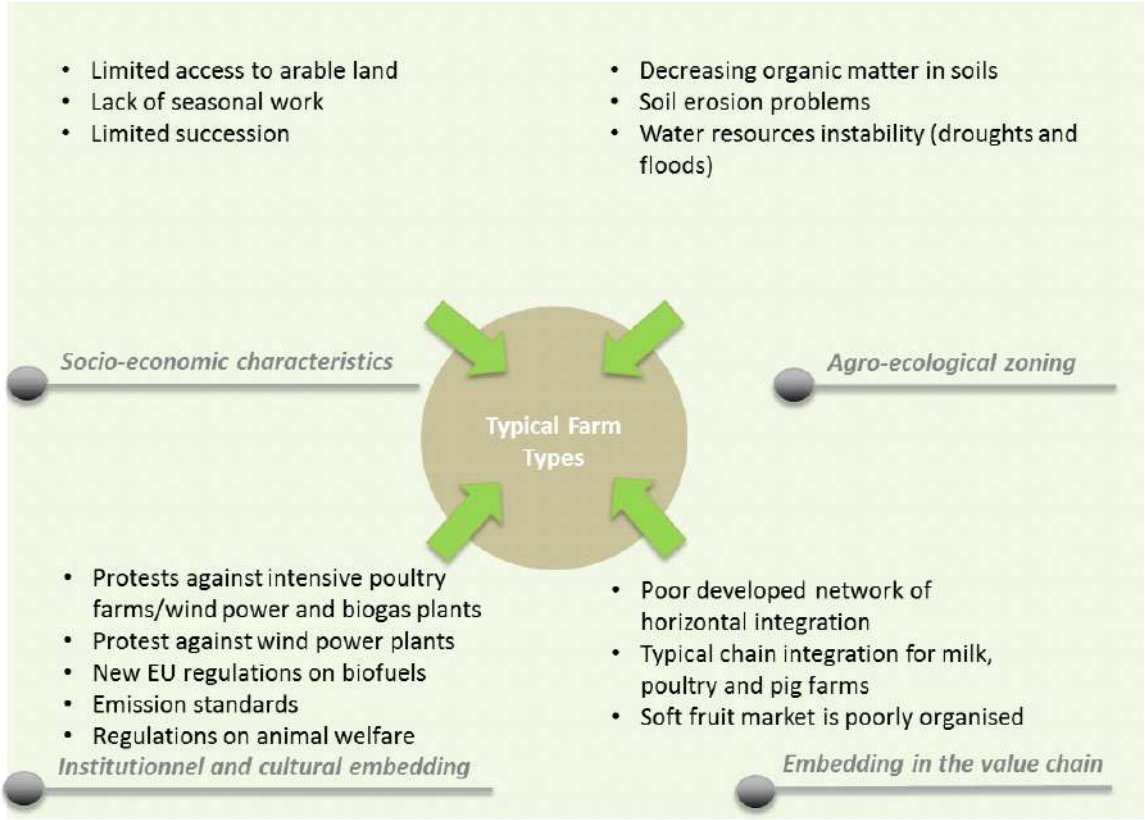

Figure *49*: Overview of regional characteristics influencing resilience of typical farm types in the Mazovian Region

The share of farms with more than 30ha is growing in Poland. However, this growing process has been very slow, especially in recent years. The main barrier to faster progress is the lack of supply of arable land coming from farms liquidating or reducing their agricultural production, as well as from privatization of state-owned agricultural land (especially in the last few years). A key solution to improve access to land would be by improving regulation on land rent, mainly by strengthening the rights of tenants by guaranteeing long-term rent.

Farms are also confronted with a lack of seasonal workers. Fruit and vegetable production as well as growing of industrial plants (tobacco, hops, herbs, sugar beets) requires high labour inputs, yet in recent years the demand for seasonal workers significantly exceeds supply, which influences the development of production. This lack of seasonal workers can be solved, either by procedural facilitation improving hiring employees from remote (foreign) areas, or by further mechanization of some processes (e.g. harvesting). Many farms hire Ukrainian workers, this tendency will

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probably continue as the Polish government creates favourable conditions for such solution of the problem.

Besides this lack of seasonal workers, the region is also dealing with a generation renewal problem. Even on economically viable farms, the lack of successors is evident, and the lack of managerial staff with appropriate qualifications is also significant. However, lack of succession might improve the availability of land to growing farms as some owners may decide to sell or lease land.

The Mazovian region is also dealing with some environmental characteristics and challenges. Due to the significant reduction in livestock population and thus the production of organic fertilizers, the soil's humus content has decreased. This issue was deepened by changes in the structure of crops, in which soil degrading plants play a decisive role (farther reducing the amount of organic matter). The share of these plants (cereals and oilseeds) in the structure of sown-areas for many years exceeds 80%. Part of the region is subjected to soil erosion, depending on the terrain and soil type. Due to periodic shortages and excesses of water, management of water resources needs to addressed. Especially as this phenomena will be deepened as a result of climate change, small retention reservoirs and irrigation systems need further development. Besides these reservoirs, reducing the outflow by implementing measures to increase soil water retention. This should be achieved by increasing organic matter content of soils and reducing evaporation from the exposed soil through the use of stubble crops and after-crops and leaving mulch on the soil surface. The region also has some legally protected areas with restrictions on the intensification of agricultural production. There are no compensations for this or they are very low. Converion to organic production and the development of rural tourism, including agritourism, might be a solution for farmers in these legally protected areas. Finally, many rural areas are characterized by poor quality of technical infrastructure (road, water and sewage, access to the Internet). This is slowly changing due to financial resources being allocated in the state budget as well as numerous EU projects, but the process is long and never-ending.

The region has been confronted with societal resistance against large poultry farm and biogas plants due to air pollution (odour). This has negatively influenced the investment plans in the region. Many poultry farms exit the market, and the agricultural biogas plants sector is developing very slowly. Introduction of new regulations on biofuels will result in a significant reduction in demand mainly for oilseed crops. Similar resistance has been raised against wind power plants, although these plants could bring significant benefits to those farmers, who would lease their land for such power plants.

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The network of horizontal integration connections in agriculture is in general poorly developed, with the exception of some fruits production (e.g. apples). In the dairy sector, vertical integration has been fairly well-organized. The integrator's role is most often played by dairy cooperatives. This system also exists in the sugar, tobacco and meat processing (primary poultry). The soft fruit market is poorly organized, due to the lack of vertical integration links. There are very frequent distortions in this market, manifested by drops in purchase prices.

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11 North-East of Romania, Romania

The case study region involves the North-East of Romania - part of the NUTS 2 region "Nord-Est" (RO21) - traditionally dominated by mixed farms depending on the landscape (plains and hills) and soil fertility (targeted counties: Suceava, Iasi, Vaslui).

11.1 Typical farm types in North-East of Romania

Five typical farm types have been identified by expert knowledge:

- TFT1: Very small, semi-subsistence (1-2 ha) + Family Farms + Various mixed crops and livestock
- TFT2: Small size (2-5 ha) + Family Farms + Field crops combined with livestock
- TFT3: Medium size + Family Farms (5-20 ha) + Field crops combined with livestock
- TFT4: Medium size + corporative farms ($\geq$ 20ha) + Field crops
- TFT5: Large size + corporative farms (> 500 ha) + Field crops

11.2 Farm demographic trends in North-East of Romania

After the collapse of the communism (end 1989), the former collective farms were divided in a huge number of very small units: 880,000 farms of 2.39 ha UAA average size. The former state farms were dismantled a decade later (year 2000), it resulted in the emergence of large farms (>100 ha) and agricultural companies. In the last 15 years, land concentration occurred, resulting in a diminution of the farm number by 18%, while the average UAA per farm increased to 2.65 ha.

A polarization phenomenon occurred. A small number (0.2%) of large farms (>100 ha) are cultivating 39% of the total UAA of the region, while a large number (43%) of small farms (1-10 ha) are cultivating 40% of the total UAA of the region. Currently, very large farms (>700 ha) are operating 15-20% of the total UAA in the region. The small farms are generally family farms, most commonly the farmer is the owner. Medium-size farms are mostly family farms, where the farmer owns most of the land, but part of the land is rented. These small and medium-sized farms are mainly mixed farms (field crops + livestock). There are some non-typical medium farms:

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specialized dairying, specialized vineyards and specialized fruit. The large farms are mostly corporate, with a large share of leased land. The large farms are specialized in cereals and oilseeds (machinery-intensive and low-labor intensive, due to the lack of temporary workers). There is no visible shift towards innovative productions (organic, high quality products, biofuel, etc.) In the very small farms, farm intensity levels are almost unchanged as in the communist times (very low), while in the small and medium-size farms, farm intensity almost doubled as compared to the communist times. In the large farms, farm intensity increased significantly, comparable to levels in the OMS (Old Member States).

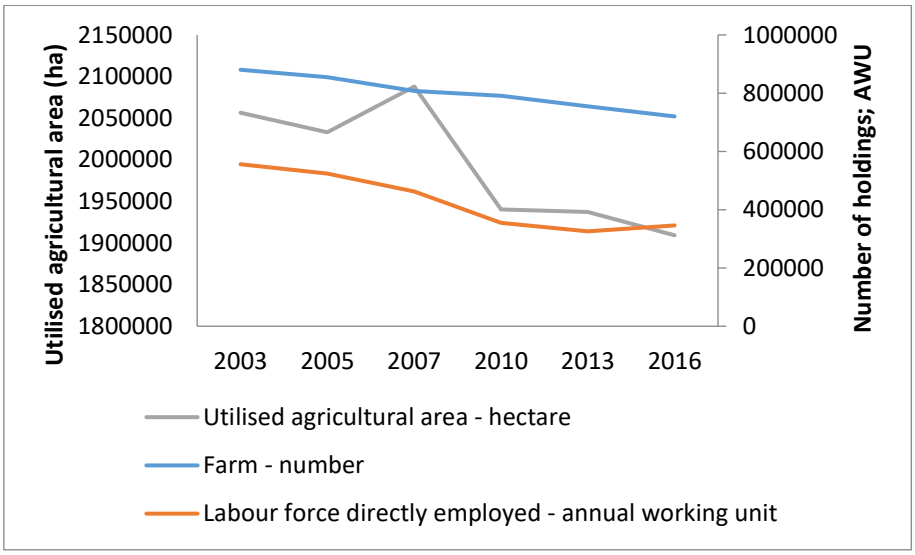

Figure *50*: Evolution (2003-2016) of number of farm holdings, total agricultural area (ha) and labour force (AWU) in Nord-Est (NUTS 2 unit: RO21) (Source EUROSTAT)

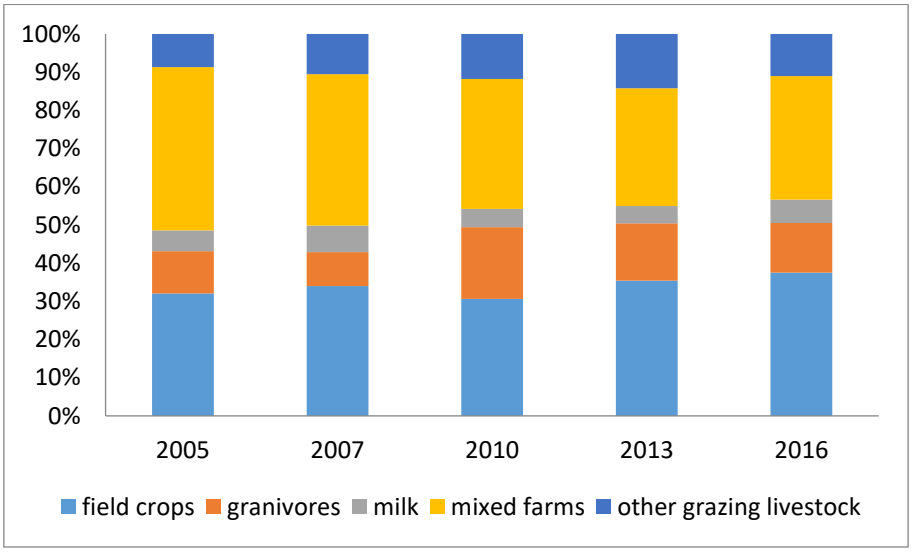

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Figure *51*: Structural change in horizontal specialisation in Nord-Est (NUTS 2 unit: RO21) (Source EUROSTAT (2005-2016)

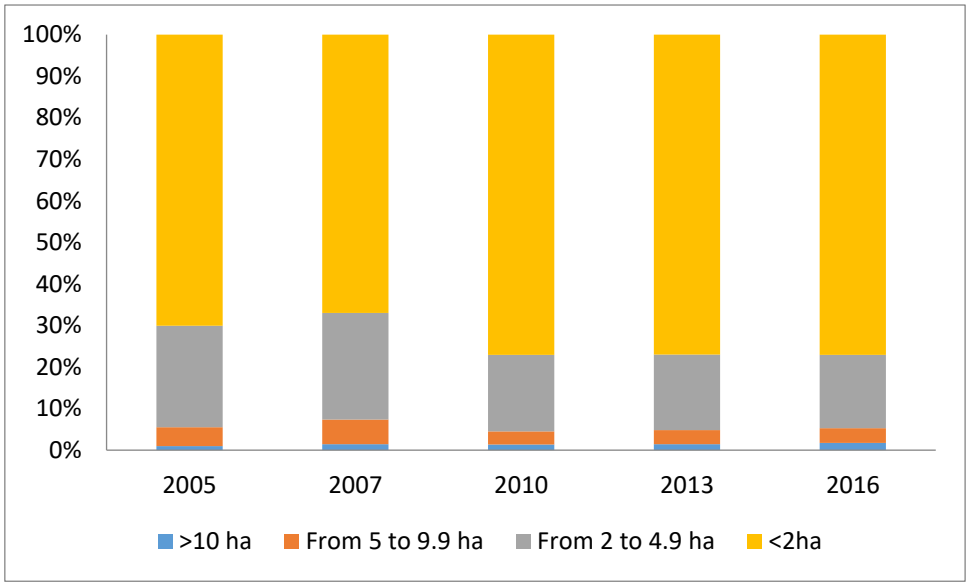

Figure *52*: Structural change (number of holdings) (2005-2016) in farm size (ha) in Nord-Est (NUTS 2 unit: RO21) (Source EUROSTAT)

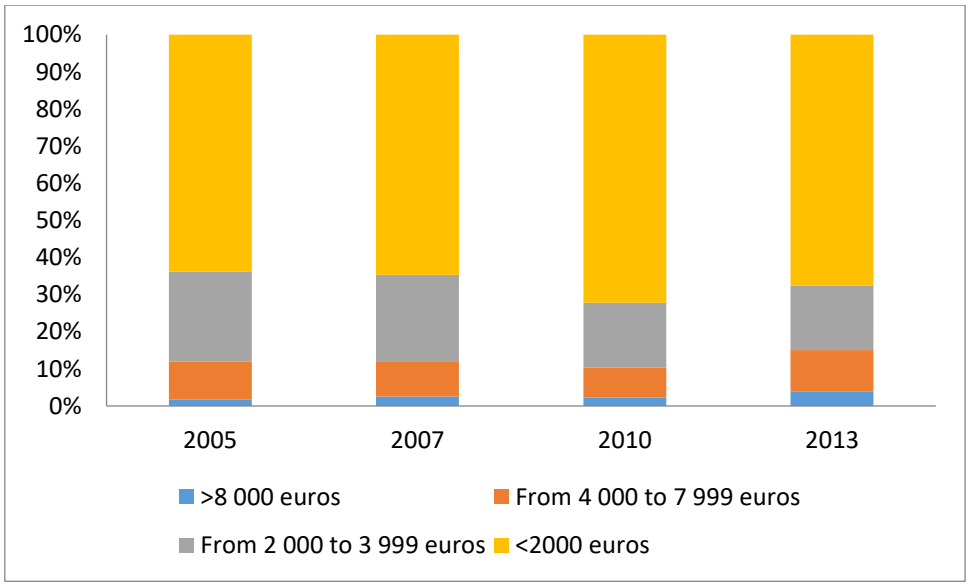

Figure 53: Structural change (number of holdings) (2005-2013) in farm size (SO in euros) in Nord-Est (NUTS 2 unit: RO21) (Source EUROSTAT)

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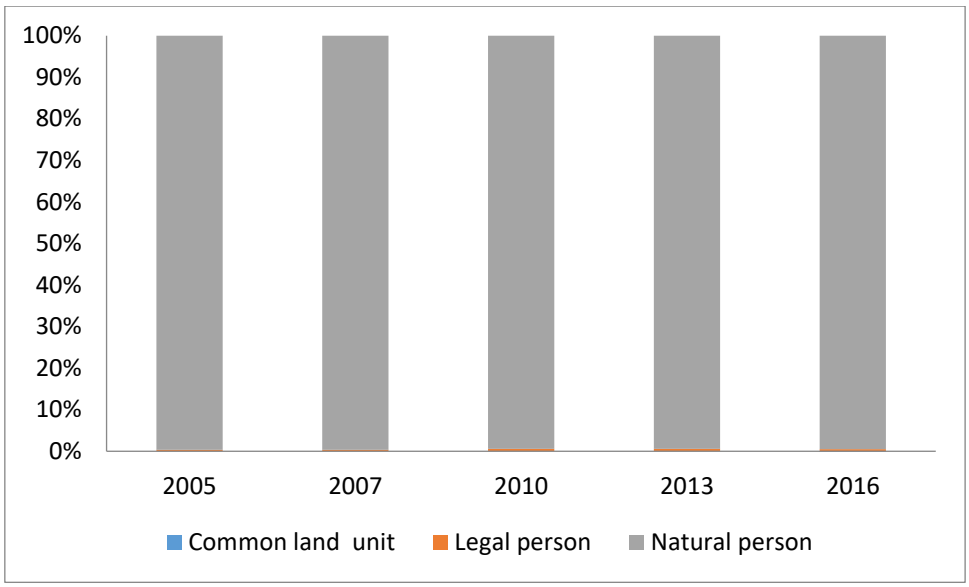

Figure 54: Structural change (2005-2016) in legal structure of the farm holdings in Nord-Est (NUTS 2 unit: RO21) (Source EUROSTAT)

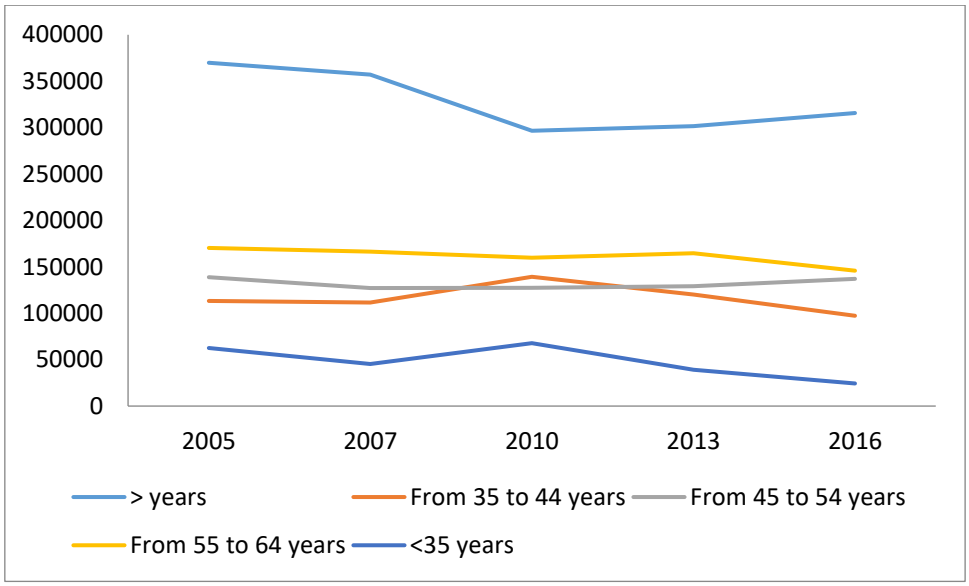

Figure 55: Evolution (2005-2016) of number of farm holdings in function of the age of the farm holder in Nord-Est (NUTS 2 unit: RO21) (Source EUROSTAT)

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11.3 Regional characteristics influencing resilience of typical farm types in North-East of Romania

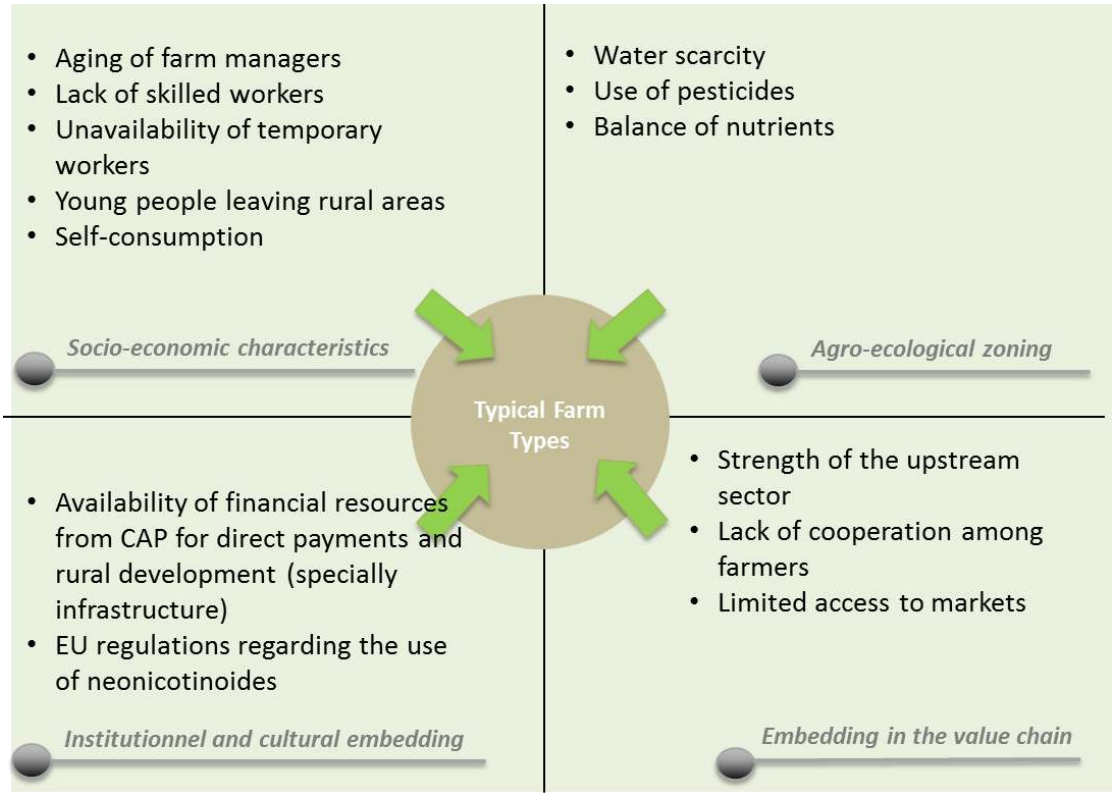

Figure 56: Overview of regional characteristics influencing resilience of typical farm types in North-East of Romania

A major characteristic of the farms in the North-East of Romania is the high level of on-farm consumption of agricultural production. On very small and small size farms (TFT 1: very small – semi-subsistence farms), on-farm production covers most of the food consumption of the family. Small farms (TFT 2) are based as well on self (on-farm) consumption, but they also sell the surplus on local markets. TFT 3, 4 and 5 are commercially oriented, they sell their products on the market. Experts expect this self (on-farm) consumption to continue for some time, since it is very traditional. Nevertheless, small farms are potential future development nuclei in the process of transformation into more commercially oriented farms which might supply the domestic local markets, while medium and large farms might supply the urban markets and exports. Another potential direction for development of small farms is into higher value products (organic, very intensive production such as indoor horticulture, mushrooms, medicinal and spice plants etc.).

The region is also characterized by an ageing low-educated farmers' population. When the former collective farms were dismantled, the land was returned to the old owners (or to their heirs). Thus, the resulting small-size farms went mostly to elderly people with primary education or to persons living in urban areas, with little or no agricultural knowledge or managerial skills. About

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65% of the local population is in the 45-60 years old age group. Most of the small size farms (TFT 1 and 2) managers are elderly people. In TFT 4 (medium corporative farms), managers are more educated and specialized, while in the large corporative farms (TFT 5), there is a professional farm management (highly educated and skilled). Ageing of farm owners in TFT 1 and 2 will result in further diminishing of the very small and small farms number (sales, leasing). In many cases, the successors are long-time urban inhabitants that are not interested in moving to rural areas and taking over the farm – they are likely to lease or sell it. This generational renewal problem of these very small farms might however create opportunities for new entrants (young new farmers), or for TFT 3 and 4 to buy or lease land (the number of farms with UAA<2 ha in the region diminished by 14% between 2002 and 2016).

In general, young people tend to leave rural areas and migrate to urban areas or emigrate to other old member states (Spain, Italy, Greece, Germany, UK). Emigration is the highest for the active population (<35 years), irrespectively of their education level. The remaining workers are not highly skilled, since the skilled labor flows to other better paying sectors. In addition, there is also a lack of temporary (seasonal) workers. This lack of seasonal workers resulted in a diminishment of mixed types of agricultural production and a reorientation of medium and large commercial farms to field crops (mostly cereal and oilseeds) specialization, which require low labor input and high machinery use. It is an important obstacle in activity diversification for small and medium farms, to start activities which are more labor-consuming, such as animal husbandry (milk and meat production), fruit or vegetables production. It is a real barrier to development of specialized farms in animal and horticultural production (milk, meat, fruit and vegetables).

Besides these socio-economic characteristics, this region is also dealing with several environmental challenges. Romania is located at the extreme eastern part of the EU, and its climate is temperate to dry. Frequent droughts affect the production and income levels, more severely for small and medium size farms located in areas with no irrigation systems. Investments in access to irrigation sources are prohibitive, except for large farms. A national programme for irrigation development (funded through CAP and national budget) would enable increasing crop yields. Extreme weather events, other than drought, affect to a greater extent the small and medium size farms due to limited access to insurance instruments due to prohibitive prices or unfavorable contract terms for farmers.

The increase of farm intensity level in TFT 3, 4 and 5 is creating a water pollution problem. There is an imbalance of nutrients, which is due to high prices of P and K fertilizers in TFT1 and TFT2. The specific pest Tanymecus, which is present in the South-Eastern part of Europe (covering the whole Romania), but absent in the Western Member States, needs the use of neonicotinoides,

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especially for maize and sunflower crops. Romania obtained until now (2018 included) an exception from the ban on the use of neonicotinoides.

Financial support from direct payments (CAP) are essential for small and medium sized farms, since it may cover up to 30% of production costs. The financial support from NRDP (National Rural Development Programme) (CAP) contributes significantly to improved life quality (water supply and sewerage networks) and better economic opportunities (modernizing roads). The financial support for economic development represents an essential, stable, viable, available and trustworthy funding source (since commercial credit is prohibitive) for improving technologies, developing and diversifying productive activities and for agritourism development. Farmers are also confronted with an instable taxation system resulting in unexpected financial problems to medium and large farms. Access to operational and investment credits is difficult as commercial banks are reluctant to work with small and medium farmers, and the contractual terms are unfavorable for farmers.

Horizontal organization of farmers into producers' organisations is weak as these organisations are in an early stage of development, and for the moment are representing mainly the interests of medium and large size farmers and not those of small farmers. Lack of cooperation among small farmers is resulting in lack of sales organization, poor negotiating power with buyers and limited access to markets if they are located at prohibitive distances. Input providers and industrial processors are very much concentrated, which is negatively influencing the prices offered to milk and meat producers. Romania produces 7 products included in the European and national high-quality schemes, one of them, "Cașcaval de Săveni" – PGI, is produced in the North-East of Romania. There is an important potential for more such products, but the bureaucratic procedures (at national level) are rather discouraging for producers.

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12 Sistema Central mountain range, Spain

Sistema Central mountain range in Spain – it belongs to Aragon (ES24) and Sierra de Guadarrama part of ES30. In what follows, we only focus on the region Sierra de Guadarrama.

12.1 Typical farm types in Sierra de Guadarrama

Five typical farm types were identified by expert knowledge:

- TFT1: 15-50 animals + Family Farms + other grazing livestock (suckler-cow farms)
- TFT2: 50-100 animals + Family Farms + Other grazing livestock (suckler-cow farms)
- TFT3: >100 animals + Corporate Farms + Other grazing livestock (suckler-cow farms)
- TFT4: 30-50 animals + Family Farms + Other grazing livestock (sheep farms)
- TFT5: >500 animals + Family Farms + Other grazing livestock (sheep farms)

12.2 Farm demographic trends in Sierra de Guadarrama

This region is dominated by extensive farms, run by family labour (one or 2 persons working on a farm). Many farms are kept by retired or part-time non-professional people as they own the land, and, with the help of the CAP, the farms continue to be profitable. It facilitates the combination of livestock activity with other complementary activities and this explains why the professionalization of the sector is slow. This additionally explains the transformation from dairy farms to suckler-cow farms. The latter implicates less effort and time. Other alternatives are the breeder-cow farms, very similar to the suckler-cow farms in terms of effort and time dedicated. An important aspect that farmers take into consideration before the transformation is the consumers' demand. Currently, the demand is greater than local and national supply

This transformation is shown by a major decrease in the number of dairy farms. During the last two decades, the number of dairy farms decreased from 120 to only 3 farms. The remaining farms

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have more than 120 livestock animals. The number of ovine farms also declined during that time span and the remaining meat sheep farms have a medium (>500 animals) to large farm size (>1200). The ovine sector is however, a relatively important sector in the region, and shows a tendency of contracting and concentrating.
Smaller ovine holdings (30 to 50 animals) are run by holders' with a main economic activity outside the farm (bus drivers, plumbers) and part of their production is consumed by the household. Remaining dairy sheep farms are medium sized (>150 animals) and the milk is processed into dairy products on the farm.

The number of beef farms has been stable over the last 20 years, with an overall of 300 active farms. Half of these farms are small, with an average of 20 animals, and are run by older farmers. CAP subsidies prevent the exit of these farms. As they already have the land (the scarcest resource) and the suckler-cows, they have chosen to continue the business, many times alongside other economic activities, since this type of breeding doesn't require full time care. The remaining half of the beef farms has increased (from 60 to 300 animals for suckler-cow farms and 50 for breeder-cow farms).

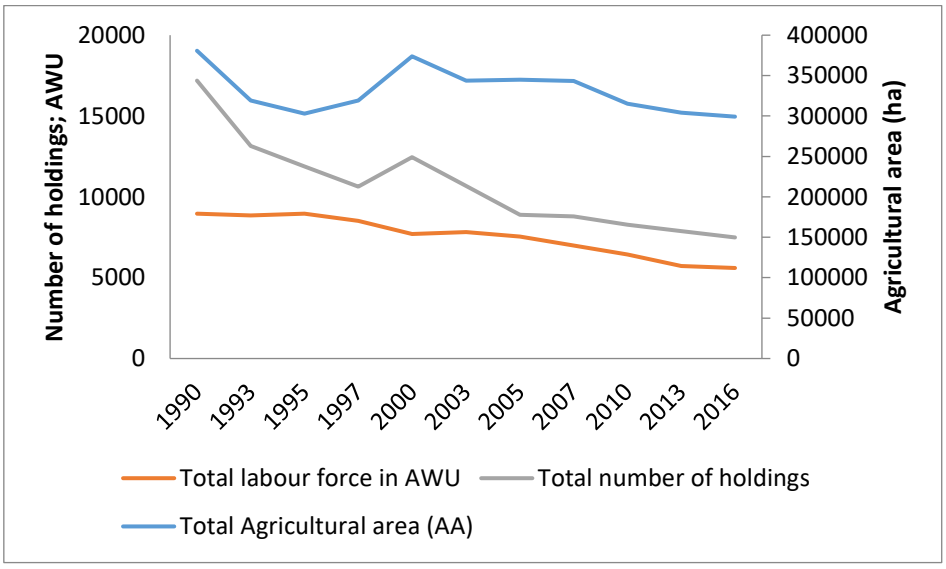

Figure 57: Evolution (1990-2016) in number of farm holdings, total agricultural area (ha) and total labour force (AWU) in comunidad de Madrid (NUTS 2 unit: ES30) (Source EUROSTAT)

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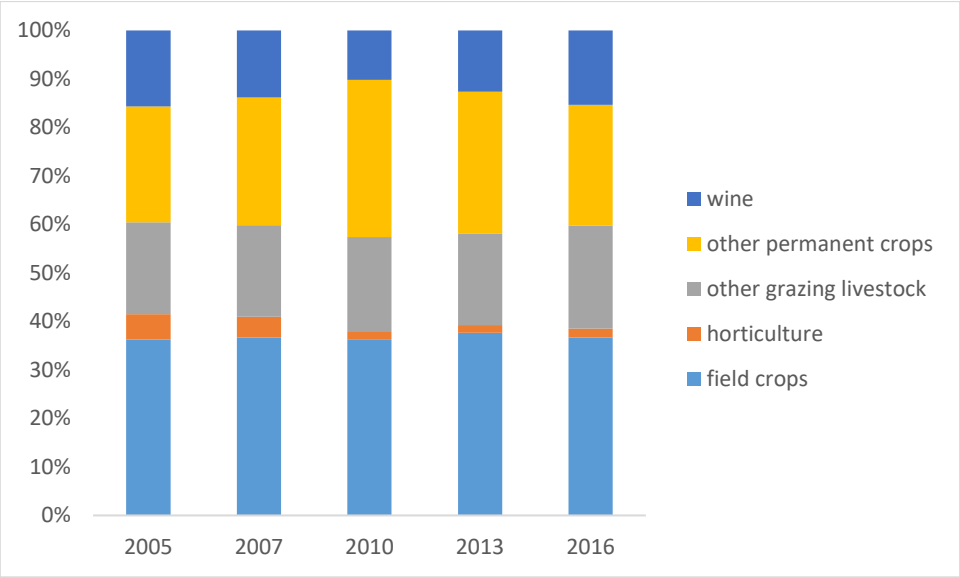

Figure 58: Structural change (number of holdings) in horizontal specialisation in Comunidad de Madrid (NUTS 2 unit: ES30) (Source EUROSTAT) (2005-2016)

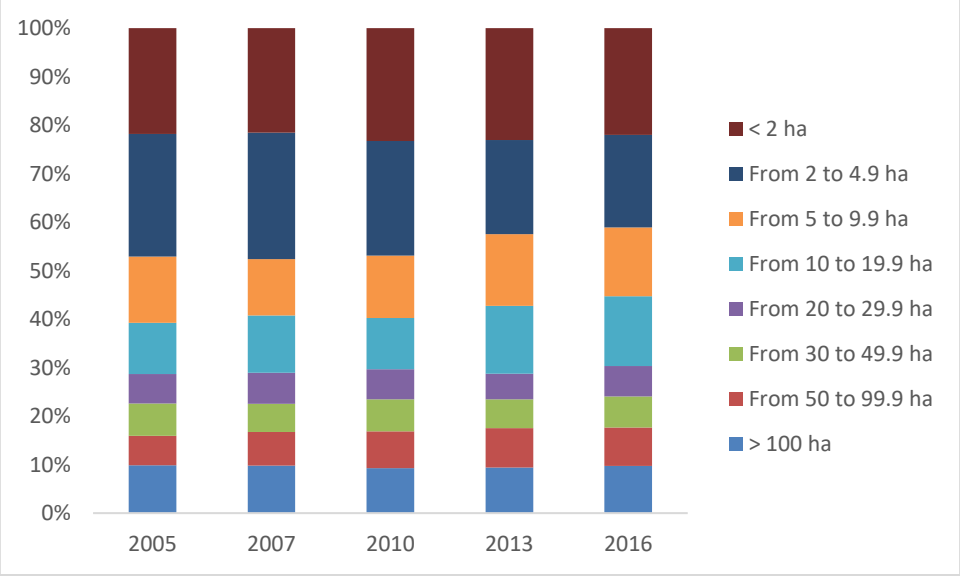

Figure 59: Structural change (number of holdings) (2005-2016) in farm size (ha) in Comunidad de Madrid (NUTS 2 unit: ES30) (Source EUROSTAT)

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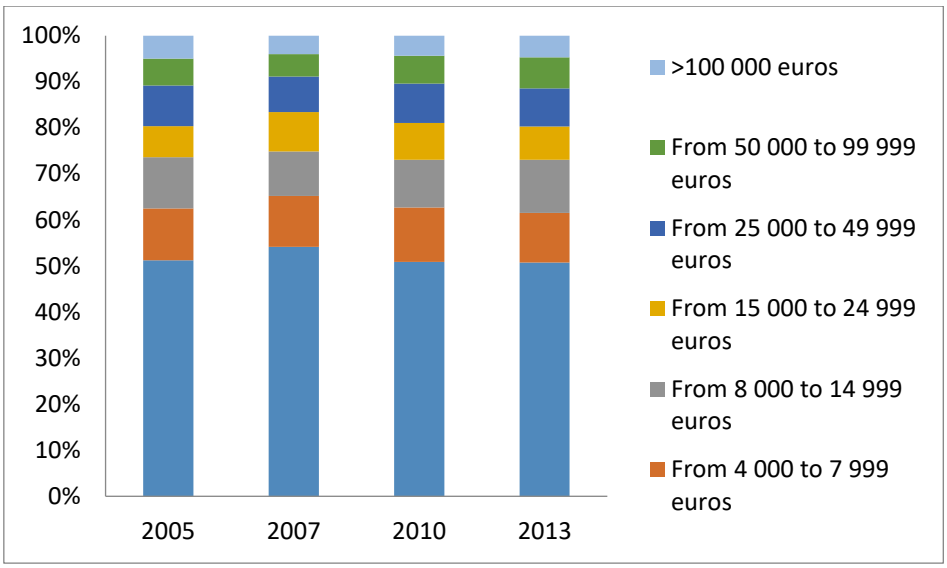

Figure 60: Structural change (number of holdings) (2005-2013) in farm size (SO in euros) in Comunidad de Madrid(NUTS 2 unit: ES30) (Source EUROSTAT)

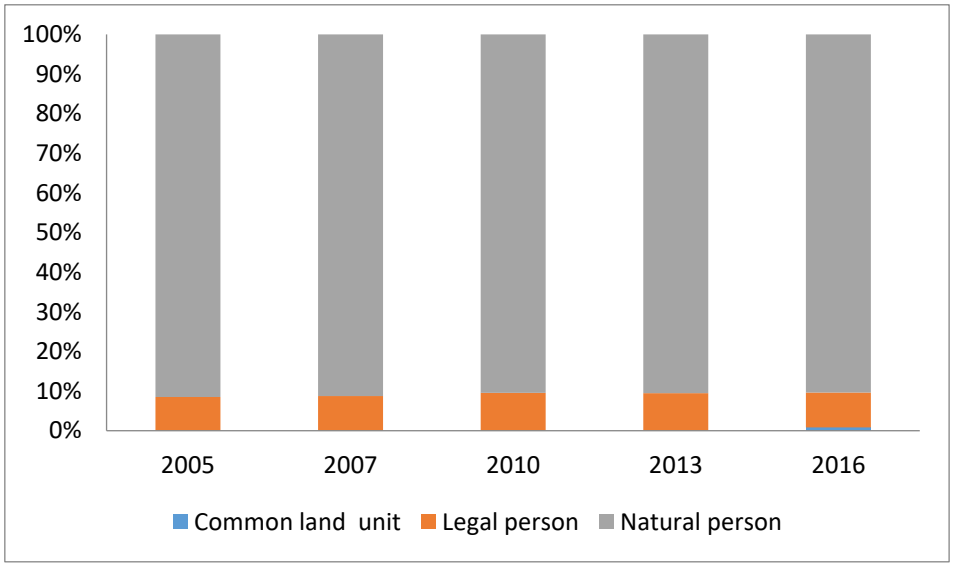

Figure 61: Structural change (2005-2016) in legal structure of the farm holdings in Comunidad de Madrid (NUTS 2 unit: ES30) (Source EUROSTAT)

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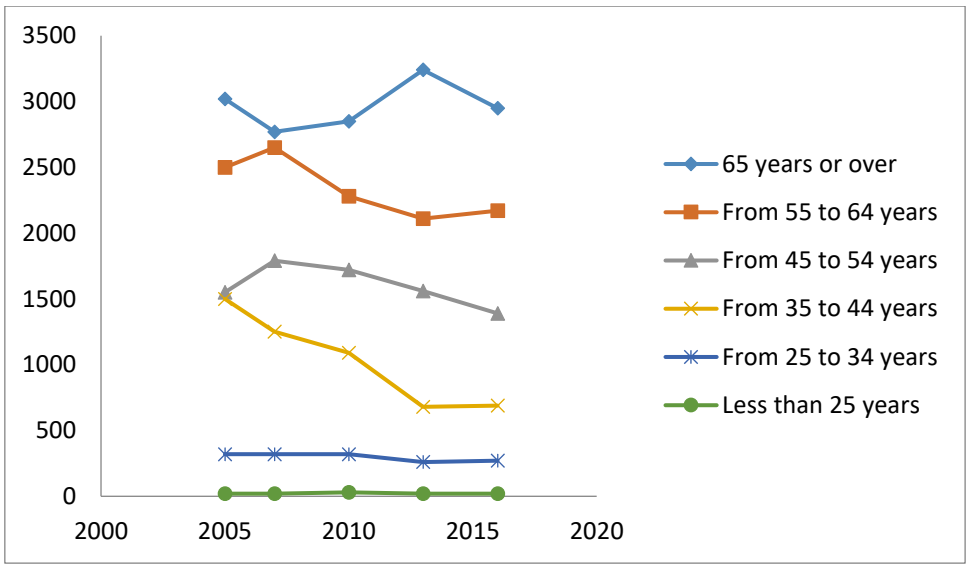

Figure 62: Evolution (2005-2016) of number of farm holdings in function of the age of the farm holder in Comunidad de Madrid (NUTS 2 unit: ES30) (Source EUROSTAT)

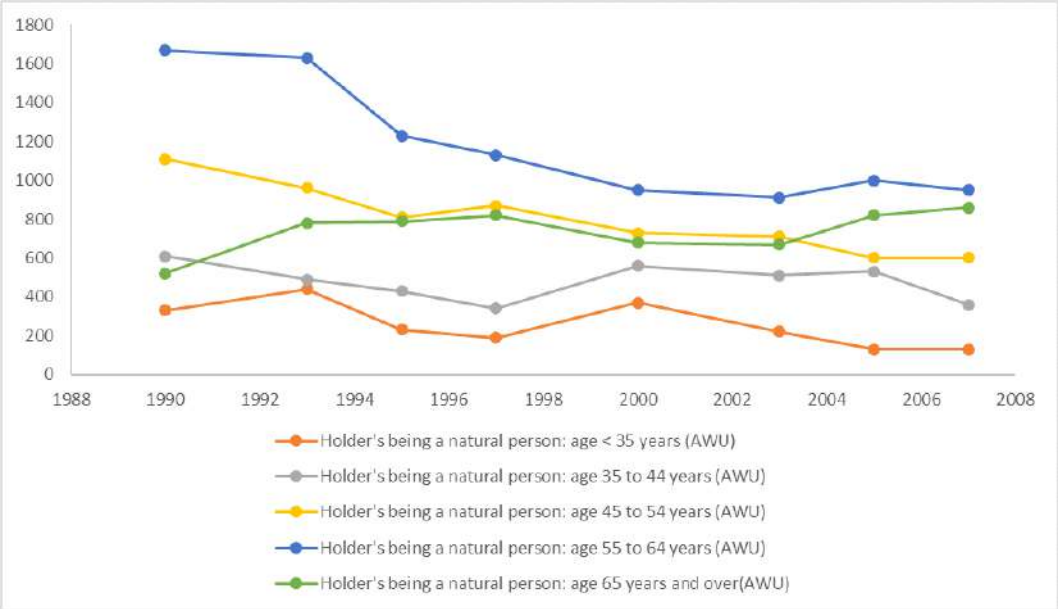

Figure 63: Evolution of number of holdings (1990-2007) in function of the age of the farm holder in Communidad de Madrid (NUTS 2 unit: ES30) (Source EUROSTAT)

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12.3 Regional characteristics influencing resilience of typical farm types in Sierra de Guadarrama

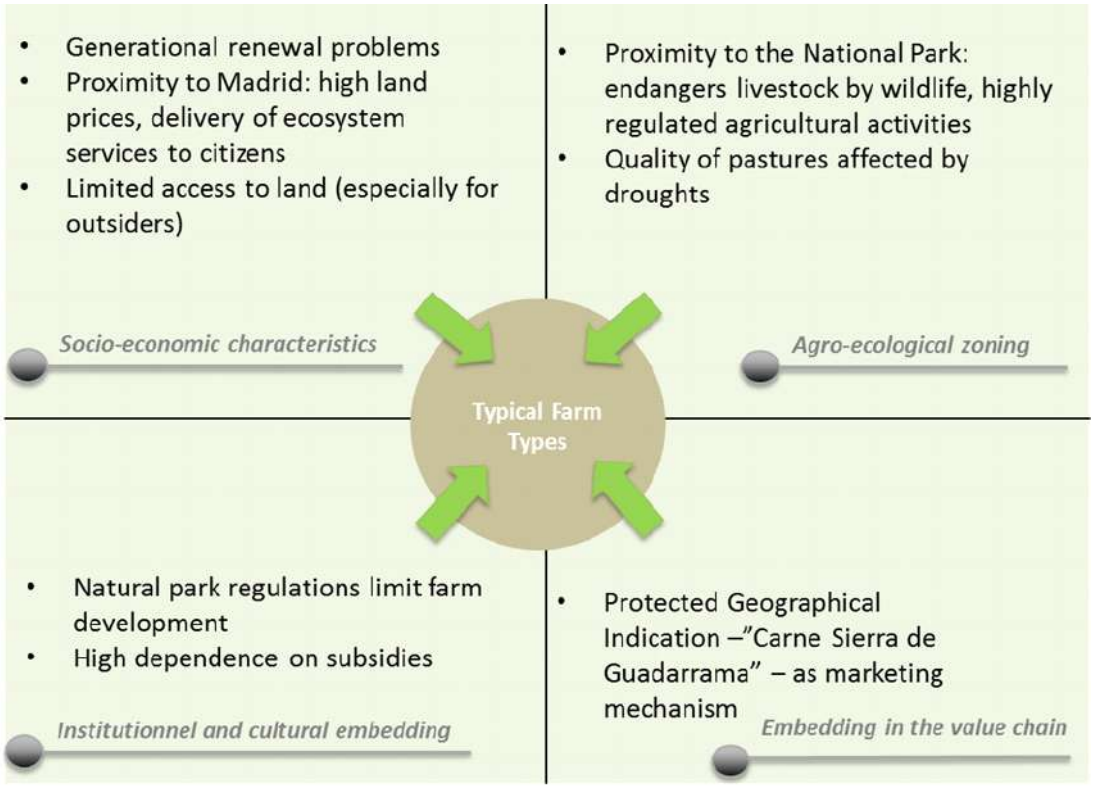

Figure 64: Overview of regional characteristics influencing resilience of typical farm types in Sierra de Guadarrama

As this region is very close to Madrid, there is a great urban pressure, making land in the region attractive for sale. As a consequence, the opportunity cost of land is very high for farmers, mainly managing extensive cattle farms. Ownership of the farms is 50% owned and 50% rented. Priority access to land (inheritance or rent) is given to those who are from the area, which is an entry barrier for outside farmers. Some young farmers, always relatives or neighbors in the area, have a vision of achieving a quality of life comparable to any other type of work in the city with their livestock farm. Citizens on the other hand, are finding their ways to the rural area to take part in outdoor activities and sports. Communal pastures or even privately-owned livestock farms are used for these purposes, resulting in reduced quality of the pastures. This generates conflicts between citizens and farmers.

The proximity to the city makes this zone more attractive for the sustainability of livestock activity since farms provide all public services. On the other hand, there is no possibility of expansion of the area devoted to agriculture. The geographical proximity of the Sierra de Guadarrama National Park, which is a protected and highly regulated area, implies the compulsory coexistence of wildlife with livestock. There have been many cases of wild dogs and wolves attacking sheep and

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of vultures attacking calves. Likewise, rabbits disrupt the pastures intended for livestock feeding. Additionally, wild boars can spread tuberculosis to cattle. However, all these damages are subject to compensation, covered by local and national public institutions. Strict regulations in the National park limit new constructions and are very restrictive regarding the treatment of waste, which mainly affects feedlots. The increasing regulation on feedlots waste is reducing the number of feedlots in the region. It limits the capacity of the farmers to sell the calves to be fed in the region. Possible future infrastructure developments, and activities are duly regulated under national law and must be submitted to a bureaucratic and rigorous evaluation process before being accepted.

With increasing frequency, the quality of the pastures is affected by drought, forcing farmers to buy feed and straw at a much higher price due to increase in demand and decrease in supply in order to cover their needs. On the other hand, there is the possibility of having access to and communal pastures in the area and pastoral resources (700ha) through public contests during 5 years, to which generally only the largest professionalized farms have access to.

The main funding comes from CAP's advance payment. This financing is obtained through the ICO (Official Credit Institute), a public entity that discounts, or from private financial entities. There is also another source of funding from suppliers: the feed cooperative, since it allows the postponement of payments until the farmers receive CAP aid. The aid represents 30% of their income.

There is little partnership between farmers. The sole purpose of the existing associations is to receive specific assistance, such as with the management of direct CAP payments. The presence of the IGP Carne Sierra de Guadarrama is a very important marketing mechanism that guarantees the traceability and quality of the meat and unites the farmers, feedlots, slaughterhouses, and butchers. There are also breeding associations for purebred breeding cattle, as programs of selection, improvement, and genetic evaluation are made through them.

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13 Southern Sweden, Sweden

The selected case study region in Sweden concerns Southern Sweden (NUTS-2 regions to be covered: SE11, SE12, SE21, SE22, SE23), in plain districts with dominating cereal production.

13.1 Typical farm types in Southern Sweden

Three typical farm types were identified by local experts:

- TFT1: Medium size farms 50 - 100 ha + Family farms + Arable land (Field crop farms, cereals)
- TFT2: Medium size farms 50 - 100 ha + Family farms + Cattle farms (meat and other grazing, around 100-150 animals)
- TFT3: Medium size farms 50 - 100 ha + Family farms + Cattle farms (milk farms, around 100 -150 cows)

13.2 Farm demographic trends in Southern Sweden

Large decrease of very small farms, especially for farms specialised in milk and pig production. The number of medium farms increases the most. Private persons/family farms are most common, owning/managing about 90% respective 85% of the total agricultural land. Corporate farms own/manage only about 5% of the total agricultural land. There is a growing interest in organic production, especially in areas occupied with protein crops and green fodder (20-25%). Farm intensity increases at all farm specialisations, especially on field crop and dairy farms.

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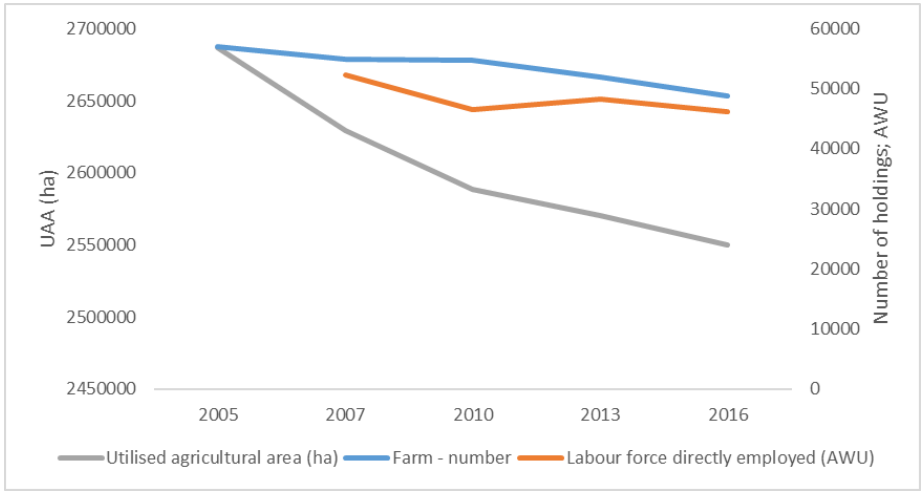

Figure 65: Evolution (2005-2016) in number of farm holdings, total agricultural area (ha) and total labour force (AWU) in Southern Sweden (NUTS 2 units: SE11, SE12, SE21, SE22, SE23) (Source EUROSTAT)

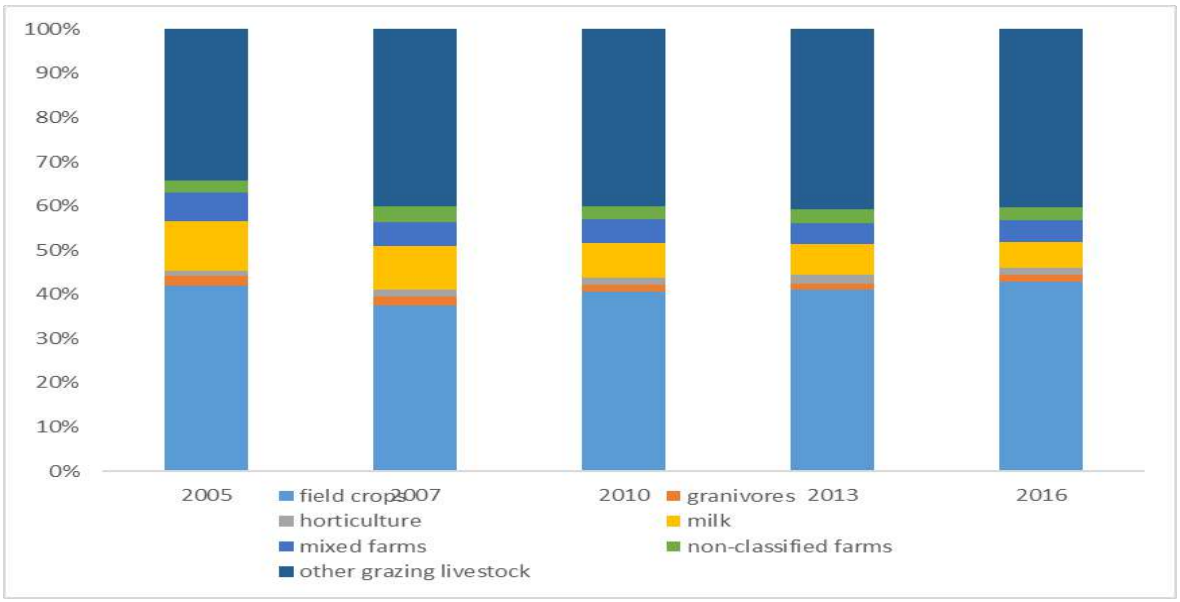

Figure 66: Structural change (number of farm holdings) (2005-2016) in horizontal specialisation in Southern Sweden (NUTS 2 units: SE11, SE12, SE21, SE22, SE23) (Source EUROSTAT)

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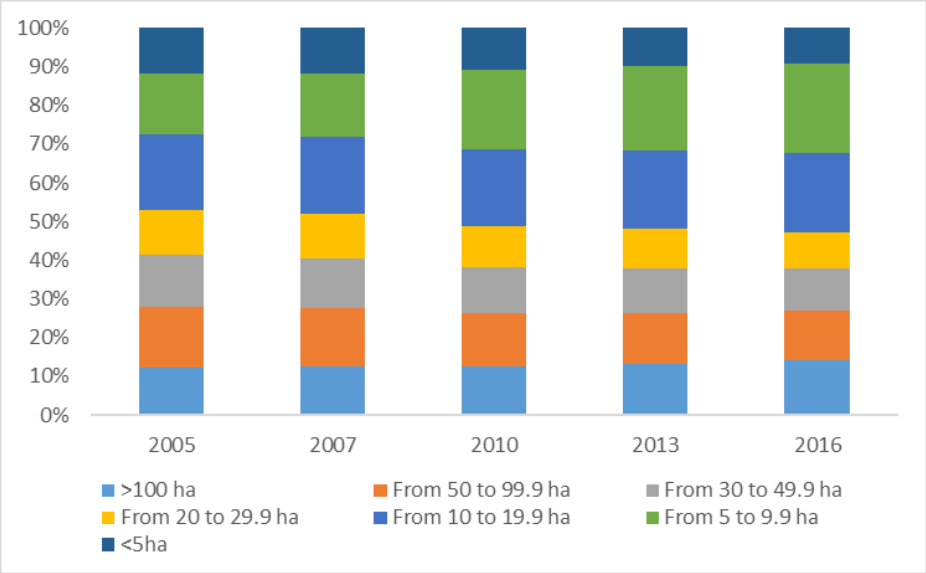

Figure 67: Structural change (number of holdings) (2005-2016) in farm size (ha) in Southern Sweden (NUTS 2 units: SE11, SE12, SE21, SE22, SE23) (Source EUROSTAT)

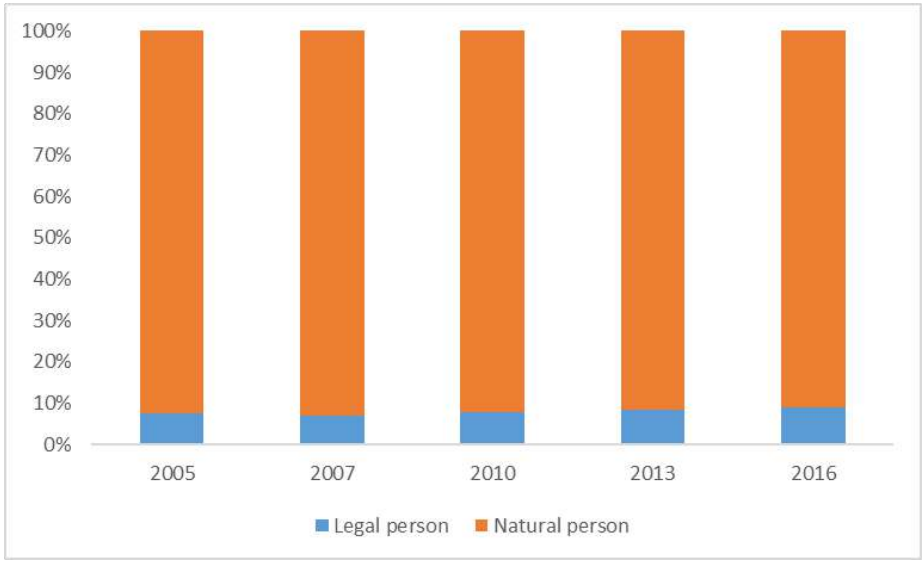

Figure 68: Structural change (2005-2016) in legal structure of the farm holdings in Southern Sweden (NUTS 2 units: SE11, SE12, SE21, SE22, SE23) (Source EUROSTAT)

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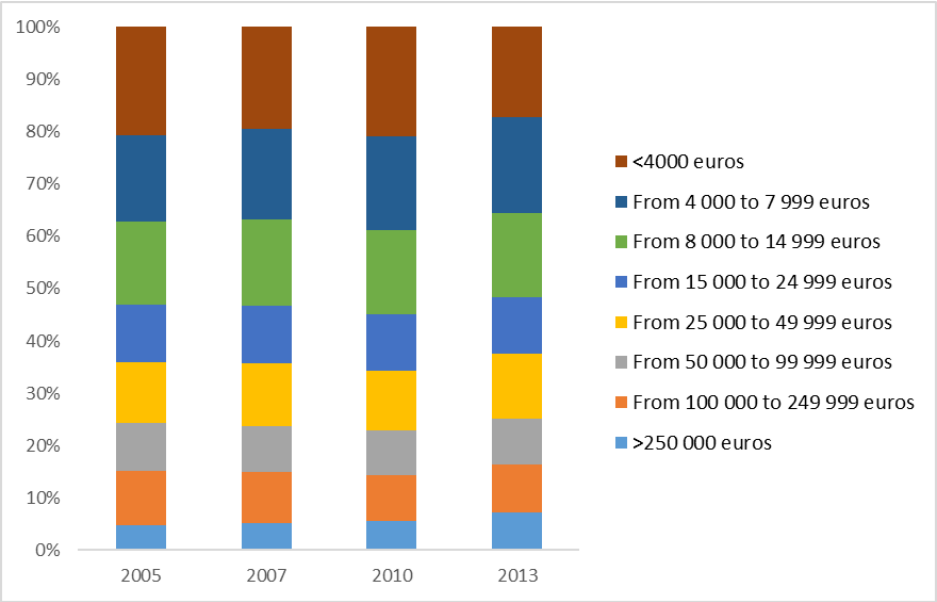

Figure 69: Structural change (2005-2013) (number of farm holdings) in farm size (SO in euros) in Southern Sweden (NUTS 2 units: SE11, SE12, SE21, SE22, SE23) (Source EUROSTAT)

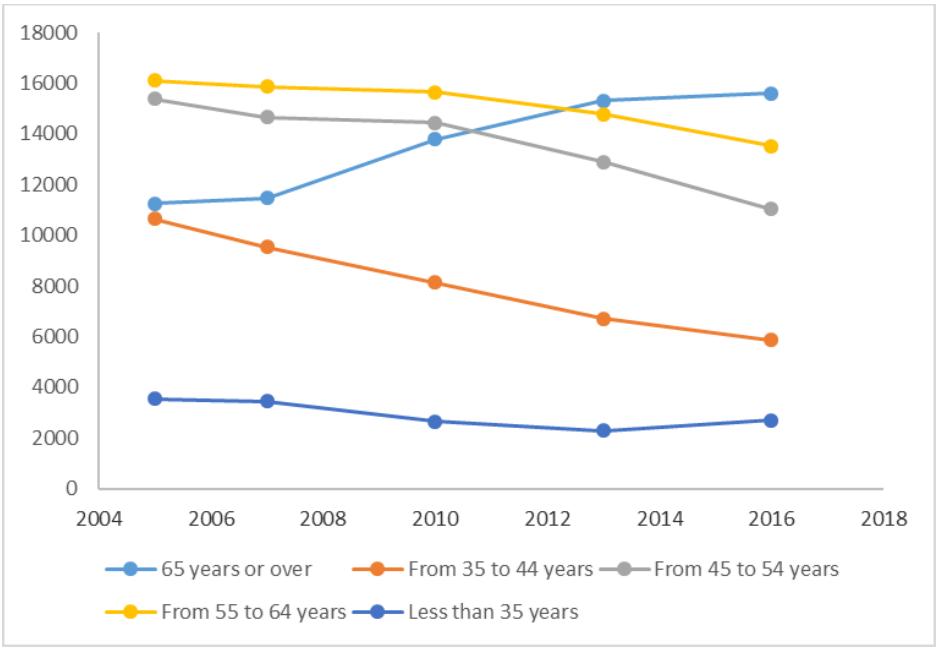

Figure 70: Evolution (2005-2016) of farm numbers in function of age of the farm holders in Southern Sweden (NUTS 2 units: SE11, SE12, SE21, SE22, SE23) (Source EUROSTAT)

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13.3 Regional characteristics influencing resilience of typical farm types in Southern Sweden

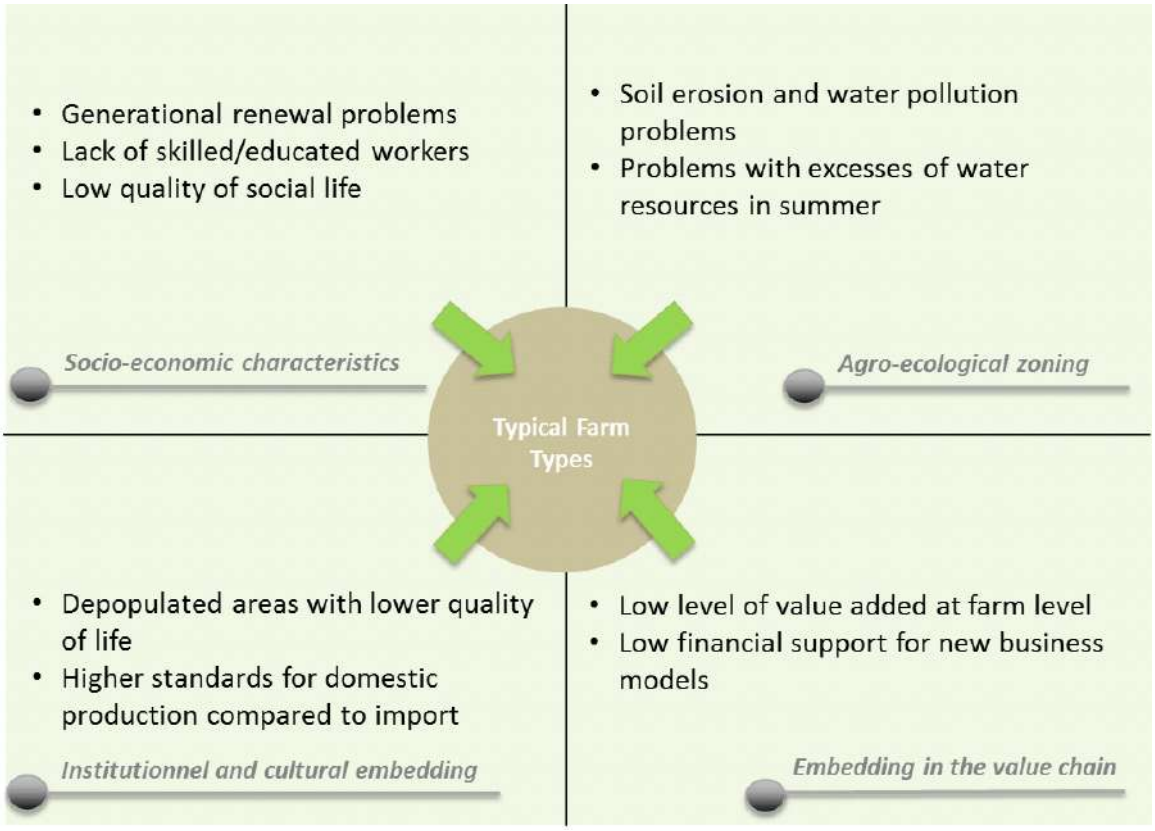

Figure 71: Overview of regional characteristics influencing resilience of typical farm types in Southern Sweden

In Sweden, most of the farms are family farms, and generational renewal is a problem. The younger generation is either not willing or able to take over the farm. The gender balance is another problem, since it's very uncommon for daughters to take over and run the farm. Female farm manages are also uncommon, although wives are included in the farming/managerial activities. Due to the low attractiveness of the sector (low salaries, low profitability), the availability of skilled and well-educated work force is limited, which is reflected in low interest for attaining agricultural education.

Life quality of farmers is worsened by depopulation of rural areas. Depopulated areas have low incomes from taxes and municipalities are forced to maintain the shortage by increasing the taxes, and cutting down services/infrastructural investments and by that worsening the life quality.

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With respect to agricultural production, farmers have to follow strict regulations on the use of fertilisers, both for the use of mineral fertilisers and manure application. This is both a challenge for for field crop farms that need to purchase manure, and for livestock farms that follow strict rules for storage. Due to erosion on agricultural land, especially on silt and clay soils, excesses of phosphorus are causing water pollution. The P value and thus the problem is highest at livestock intensive farms/areas, whereas at field-crop farms/areas there is often a deficit. Moreover, as farms need to comply with high environmental standards, domestic production becomes more expensive compared to imported products that are produced with less strict standards. Due to climate change, excess of precipitation water interfere with agricultural production, especially during the harvesting (summer) period. The drainage system which was build 60-100 years ago is not adjusted with the current climate change. A well-designed system is a prerequisite for securing the food/fodder production and minimizing the nutrition's (nitrogen, phosphorus) leakage.

Low level of value-added at farm level makes producers to be dependent on processors. Large farms have more negotiation power. It could be of interest for milk farms to process and sell the milk on the farm, or to process it to cheese. Development of high value-added product by innovation initiatives is difficult as financial institutions do not take risks to support such production.

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14 East of England, UK

East of England (also known as East Anglia) located in Central-East part of England. It is a NUTS 1 region called "East of England", code UKH, characterized by extensive rural areas with flat and fertile arable land.

14.1 Typical farm types in East of England

Three typical farm types have been identified by expert knowledge:

- TFT1: **Cereals** – tend to be larger farm size (in terms of area) than horticulture. Increasingly arable farms also may have other small-scale specializations in sheep or cows to provide manure (or they will collaborate with a neighbouring livestock/dairy farm to supply feed in return for manure). Intensive in work load through July-November and will bring in labour during this period. Diversification is likely, often in the form of renting out building for other business use and increasingly green energy.
- TFT2: **General cropping** (largely root crops, sugar beet) – tend to be larger farm size (in terms of area) than horticulture but slightly smaller than cereals. Often growing a wide range of crops and employing more labour throughout the year than cereals. Diversification is likely, often in the form of farm shops, although income from diversification likely to be lower than cereals in terms of their economic outputs.
- TFT3: **Horticulture** – less land area than cereals or general cropping but high economic output per hectare. Often owner-occupiers, but also tenanted. Could be smaller family farms, or larger corporate businesses. Highly specialized even within horticulture (e.g. may specialize in growing apples for cider; or glasshouse soft fruits), and unlikely to have other farming activities present. Diversification activities likely, such as a farm shop.

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Within each of these farm types, there will be wide range of farm sizes in terms of land area, ownership type and tenure. For example, this may range from part-time farms which are supported by off-farm income or diversified income on the farm; through to very large businesses employing lots of people producing economic outputs.

14.2 Farm demographic trends in East of England

The East of England has been dominated by arable farming for a long time, as the soil and climate is particularly suited to this form of agriculture. Although arable farms still dominate the landscape, farm size in terms of land area has increased over the years, particularly for the production of cereals. The increase in mechanization over this period and an increase in renting and contracting in more land has resulted in cereal and general cropping farms to grow in size. Larger land areas are required to justify the investment of large machinery. Over this period land owners have been reluctant to sell their land. This is partly due to policy, as retaining land even when they no longer wish to farm themselves allows land owners to continue receiving land-based subsidies. Further, land owners are unlikely to sell their land in a rising market – land prices have steadily risen over this period. The result of this has been an increase in tenanted farms and contract farming. Farms have generally become more specialized in order to survive. Resilient farms tend to be those that have specialized and become very good at what they do. Farm intensity levels in terms of yield have increased particularly for general cropping farms due to advances in technological innovation and agronomic practices (e.g. sugar beet due to very effective research pipeline). However, farm intensity levels are dominated by policy – when production was linked to subsidies, farms were more intensive. When farm payments were

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decoupled from production and related to land area and requirements for environmental services (e.g. set aside), overall farm intensity could be considered as lower.

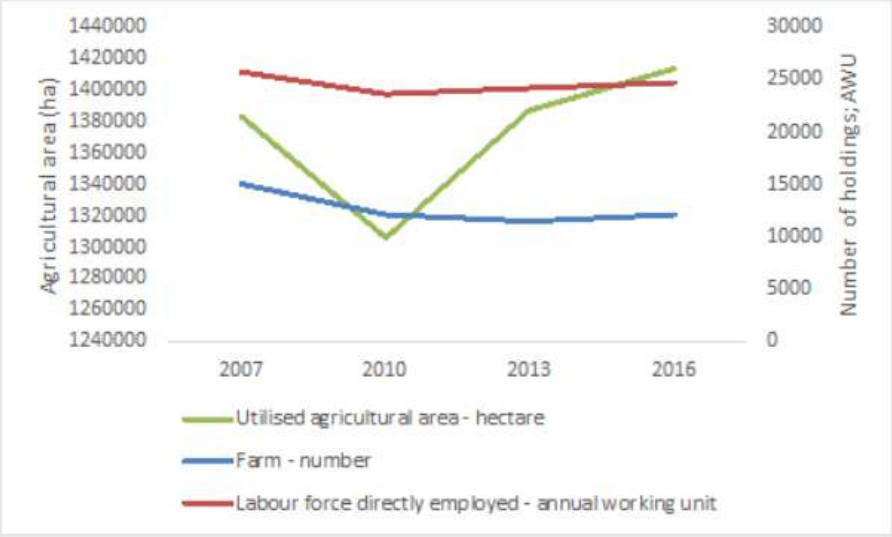

Figure 72: Evolution of labour force (AWU), total UAA and number of farm holdings in East of England (2007-2016) (NUTS 2 units: UKH1, UKH2, UKH3) (Source EUROSTAT)

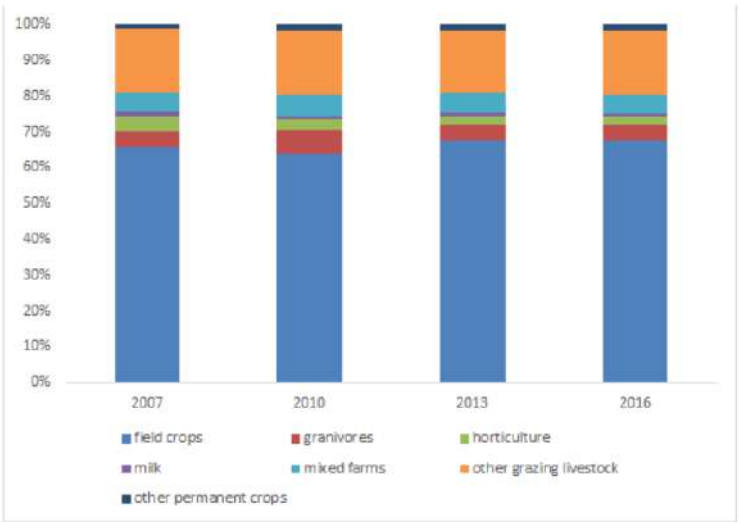

Figure 73: Structural change in horizontal specialisation in East of England (2007-2016) (NUTS 2 units: UKH1, UKH2, UKH3) (Source EUROSTAT)

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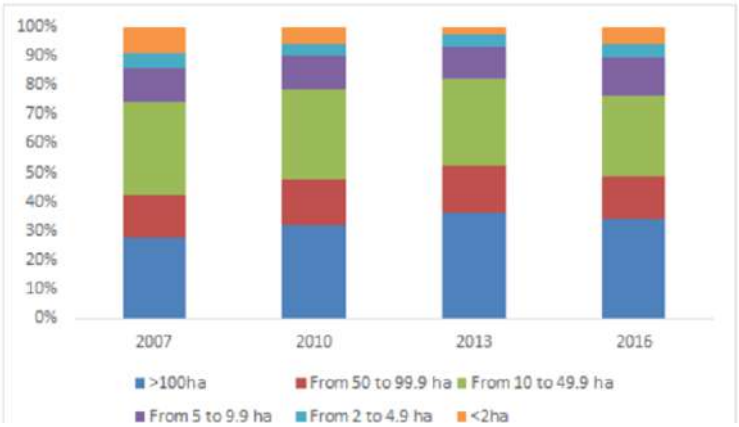

Figure 74: Structural change (number of holdings) (2007-2016) in farm size (ha) in East of England (NUTS 2 units: UKH1, UKH2, UKH3) (Source EUROSTAT)

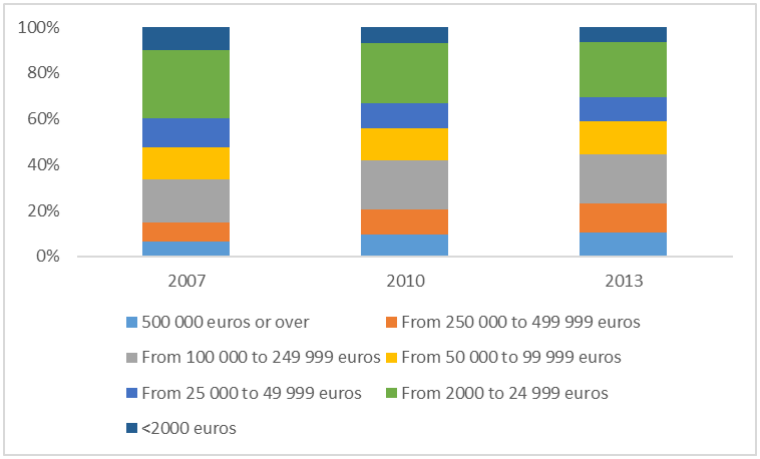

Figure 75: Structural change (number of holdings) (2007-2013) in farm size (SO in euros) in East of England (NUTS 2 units: UKH1, UKH2, UKH3) (Source EUROSTAT)

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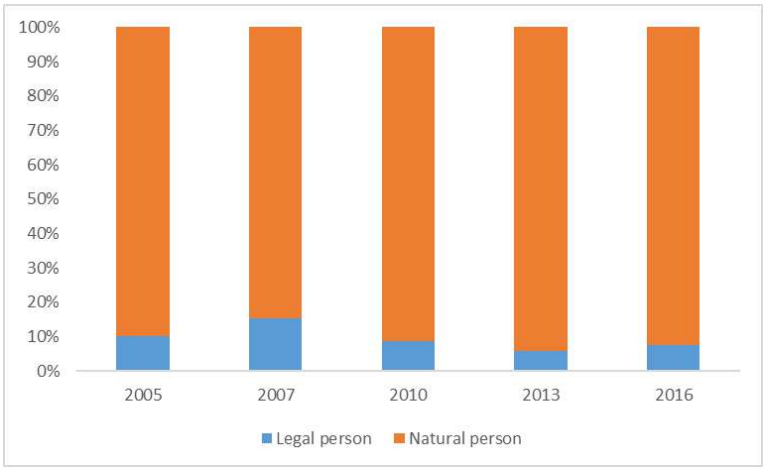

Figure 76: Structural change (2005-2016) in legal structure of the farm holdings in East of England (NUTS 2 units: UKH1, UKH2, UKH3) (Source EUROSTAT)

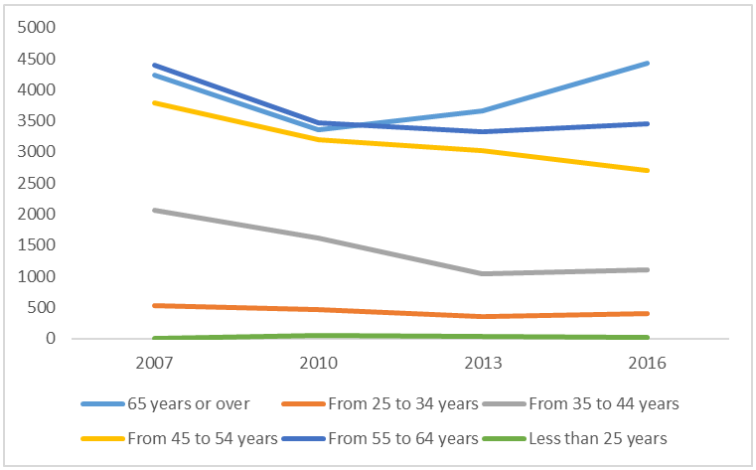

Figure 77: Evolution (2007-2016) of number of farm holdings in function of the age of the farm holder in East of England (NUTS 2 units: UKH1, UKH2, UKH3) (Source EUROSTAT)

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14.3 Regional characteristics influencing resilience of typical farm types in East of England

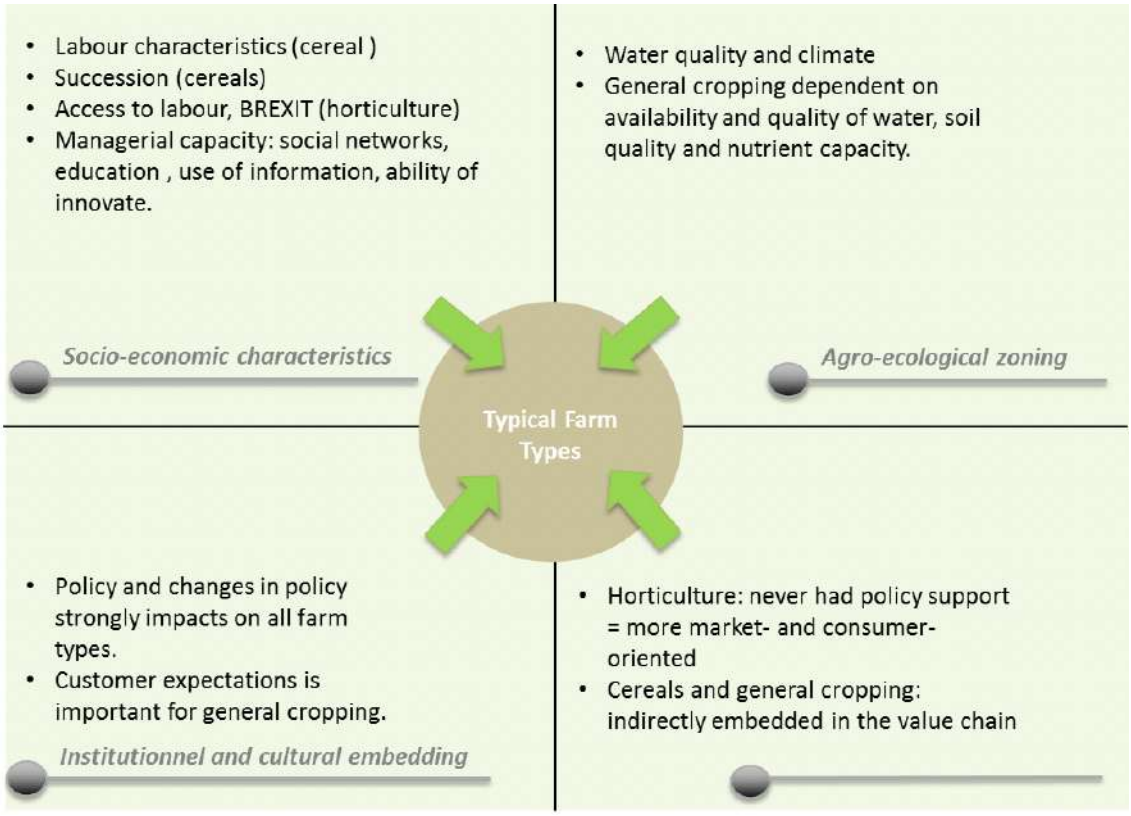

Figure 78: Overview of regional characteristics influencing resilience of typical farm types in East of England

The Brexit is perceived as a challenge to the resilience of farms in East of England. The current uncertainty in the trade deals post-Brexit could potentially have an economic impact on farmers. For horticulture farms, labour force from Europe dominates the unskilled labour force on these farms. The Brexit might induce uncertainties about access to labour from Europe.

On cereal farms, not the access to labour but rather a lack of educated workers may create a challenge for these farms. For cereal and general cropping farms, labour is becoming more skilled and technological in order to operate large, highly technical machinery. Besides technological skills, also the managerial capacity of farmers is important and their ability of focus on the right things financially in order for their business to be resilient. This is driven by their social networks, education and use of information, ability of innovate. Business-oriented farmers, including tenanted or mixed, could be very efficient and productive, but may not be resilient to market or weather fluctuations because they are over-exposed. Thus, the managerial capacity of farmers is crucial to the ability to adapt and transform. This lack of educated workers might hamper succession on these cereal farms, and thus the future of the farm business.

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Agro-ecological characteristics as water quality and climate are very important as general cropping is very much dependent on the environment. Currently, there is a major problem with black rust on cereals. Access to plant protection products that can deal with this disease or other diseases has an impact on robustness or adaptability of the farms. Access to weedkiller such as glyphosate is important for conservation, minimal tillage, cover crop activities. Policy change that requires less cultivation and inputs must provide the technology to enable this (e.g. use of glyphosate for no till cultivation methods or novel plant breeding techniques).

Reform of agricultural policy in the UK is the biggest challenge/opportunity in the sector and will require adaptation and transformation. Potential policy change that focuses on public goods will require farms to adapt. Policy uncertainty and change will have a significant economic impacts on cereal and general cropping farms should the basic farm payment based on land area be removed. This will particularly impact large-scale cereal farms. Horticulture has never been supported from a policy perspective and so is more market-driven and market-focused, and so has had to look at consumer demands more so than cereals and general cropping. Cereals and general cropping are more directly embedded in the value chain, whereas horticulture is more direct.

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