STUDY

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European Parliament

The Future of the European Farming Model

Socio-economic and territorial implications of the decline in the number of farms and farmers in the EU

Agriculture and Rural Development

Policy Department for Structural and Cohesion Policies
Directorate-General for Internal Policies
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RESEARCH FOR AGRI COMMITTEE

The Future of the European Farming Model

Socio-economic and territorial implications of the decline in the number of farms and farmers in the EU

Abstract

This study provides an overview of the effect of the decline in the number of farms across the EU on the European farming model (EFM), which is built around the notion of multifunctionality and provision of public goods by agriculture. It concludes that in order to foster sustainability and resilience, the EFM and policy tools must embrace the emerging diversity of farmer profiles and stimulate socially desirable adaptive strategies that preserve the multifunctionality of farming.

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LIST OF ABBREVIATIONS

AECM	Agri-environment-climate measures
AGRI	Agriculture and Rural Development Committee
AIC	Akaike information criterion
ANC	Areas facing natural constraints
ARIMA	Auto-regressive integrated moving average
AWU	Annual work units
BIC	Bayesian information criterion
CAP	Common Agricultural Policy
CEEC	Central and Eastern European Countries
CLLD	Community-led local development
CMO	Common market organisation
CO_2-eq	Carbon dioxide equivalent
DP	Direct Payment
EC	European Commission
ECA	European Court of Audits
EIP	European Innovation Partnership
ENRD	European Network for Rural Development
EU	European Union
EUROSTAT	Statistical Office of the European Union
FADN	Farm Accountancy Data Network
FAO	Food and Agriculture Organization of the United Nations
FSS	Farm Structure Survey
GDP	Gross domestic product
GHG	Greenhouse gas
GMO	Genetically modified organism
GVA	Gross value added
IPCC	Intergovernmental Panel on Climate Change
JRC	Joint Research Centre
LAG	Local action group
LEADER	Liaison entre actions de développement de l'économie rurale
LFA	Less favoured areas
MCI	Multiplicative Competitive Interaction
MS	Member States

NUTS	Nomenclature des unités territoriales statistiques
PG	Producer Group
PO	Producer Organisation
RDP	Rural Development Programme
SO	Standard Output
UAA	Utilised Agricultural area
WFD	Water Framework Directive

Country abbreviations, EU27

AT	Austria
BE	Belgium
BG	Bulgaria
CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
EE	Estonia
EL	Greece
ES	Spain
FI	Finland
FR	France
HR	Croatia
HU	Hungary
IE	Ireland
IT	Italy
LT	Lithuania
LU	Luxemburg
LV	Latvia
MT	Malta
NL	Netherlands
PL	Poland
PT	Portugal
RO	Romania
SE	Sweden
SI	Slovenia
SK	Slovak Republic

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EXECUTIVE SUMMARY

KEY FINDINGS

- The European Farming Model (EFM) is built on the recognition of the multifunctionality and diversity of European agricultural systems, and the notion that EU farming is a crucial provider of public goods.
- Almost all EU regions are undergoing long-term structural change in farming – a steady increase in average farm sizes and a concentration of production on fewer and larger farms, with major temporal and regional variation; the decline is stronger in new Member States.
- The number of farms in EU-27 declined between 2003 and 2016 from about 15 to 10 million (-32%), with the decline strongest among small farms (<5 ha; -38%), and moderate among medium sized farms (5-19 ha, 20-49 ha; 17% and 12%, respectively), while the number of large farms (>50 ha) has increased by 7%. A very large majority of EU NUTS-2 regions is projected to be under moderate risk of declining numbers, while 16% are under high (8%) or very high (8%) risk (Projection from 2016 to 2040).
- By 2040, the EU might lose an additional 6.4 million farms, resulting in a remaining number of approx. 3.9 million farms across the EU, an impressive 62% decrease as compared to 2016 figures.
- Despite the presence of some policy measures addressing structural change, the Common agricultural policy has a limited and indirect effect on structures. Its distribution of funds and measures focuses on economic issues and consequently favours large, intensive farms, compounding the shift towards concentration dictated by market forces. The existing structural measures (Less Favoured Areas/Areas facing Natural Constraints, payment for small farms and young farmers) do not compensate for this effect due to poor targeting or insufficient funds, but clearly demonstrate that direct goals and targeted funding could achieve structural objectives.
- To address these changes and foster sustainability and resilience, the EFM must adapt to include diverse emerging farmer profiles; despite its relatively weak impact on structures, this must be endorsed by a policy, which should include clear, explicit objectives and targeted measures to adapt to a greater diversity in current and emerging farmer's profiles and stimulate socially desirable adaptive strategies. A balanced consideration of potential policy impacts on structural change could prove instrumental in better aligning with the Sustainable Development Goals. A prioritisation of structural change and farm types, categorisation of beneficiaries, and adjustment of policy tools to directly target each group is important to improve targeting.
- To increase the resilience of farms, measures should support adding value to products, education and advisory services, removing barriers to entry, risk management and collective action to a greater degree, necessitating a general overhaul of agricultural policy and a greater shift towards rural development measures.

The European Farming Model (EFM)

Since the 1980s, EU agricultural policy has taken a broader view of agricultural objectives, including the environmental and spatial implications of land management. Seeing agriculture as rooted in cultural notions of land use, the relevant concerns were captured by the concept of multifunctionality. This perspective led the European Council in 1997 to advocate a "European model of agriculture", whereby it argued that the agricultural sector "must … be versatile, sustainable, competitive and spread throughout European territory, including regions with specific problems". Thus, from the outset, the EFM was framed as subsuming the diversity of European regions, traditions and agricultural systems reflected in the wide variety of farm structures, types of land cultivation and range of products.

However, while the specific *impact of small-scale farming* on various aspects of multifunctionality and on maintaining traditional European agricultural landscapes, has been recognized, a **literature review of the function and role of the EFM** and ongoing structural adjustment also underlines the *long-term process of structural change*. In contrast to the assumptions of a standard prototype of farm management, it dispels the notion of a unique farming model and underlines the need for land management systems that enhance multifunctionality and public goods provision as a core task of European farming systems, highlighting the *dynamic character of the evolution of land management in the EU*. Similarly, the report "Farmers of the Future" stresses the "emergence of more diverse and experimental models of farming to face the environmental challenges and to address the diverse consumption models". This shift of the general framework towards an increasing diversity of farming models has strong implications for governance, but should also allow for place-sensitive adaptation of agricultural systems across European regions. In the future, the EFM will be shaped by adaptation strategies adopted at farm-level and along value chains to respond to emerging sector-specific and external challenges.

Dynamics of the European Farming Model

The analysis of the **quantitative trends of structural adjustment** confirms a *drastic decline in the number of farms*, especially small farms, across the EU. This decline is more pronounced in New Member States due to their recent accession, the associated transition process and rigid social agricultural structures. Conversely, large farms are growing in number. This has significant implications for the multifunctional role and resilience of European agriculture, particularly in terms of sustaining economic activity and employment in rural areas, enhancing the value of rural areas, maintaining environmental quality, safeguarding biodiversity, and preserving the landscape and its beauty.

Projections into the future show a *substantial decline in the number of farms* in almost all NUTS 2 regions of the EU-27 and a prevalence of adaptation strategies that entail a substantial increase in the size and/or intensity of remaining farms and/or a greater EU dependence on agricultural imports. This trend toward farm concentration is particularly evident in southern and eastern regions. Mountainous areas are also at high risk of abandonment. Results of the **scenario analysis** predict increased polarisation of the farming structure, with continued abandonment and specialisation under all scenarios.

The **drivers** of farm decline are primarily *structural, economic and social, and to a lesser extent environmental*. Drivers such as agricultural subsidies, agricultural prices, macroeconomic and demographic variables play a greater role in the New Member States and affect the various types of farms differently. Previous studies of **drivers of farm structural change** in the EU-27 suggest that *the main determinant of farm structure is past farm structure*. The strong dependence of structural trends on local conditions was underscored by **case study** results, which demonstrate that the main structural driver of farm decline is a *market structure that favours intensive production and large-scale farms*, related to tightening

margins and low bargaining power. Furthermore, barriers to entry compound the issues of demographic change (aging populations) and rural exodus. While there are concerns with the EU subsidy system, the consensus remains that subsidies are indispensable, but should be further tailored to reverse negative effects.

Policy responses

Since the late 1980s, EU food security has been taken for granted, which may explain why public concern and policy discourse have shifted to focus on environmental implications of farming and product quality, in addition to the decline in farms and the reduction of farm employment. Agricultural policy support was assumed to contribute to the competitiveness of the sector and farming incomes, suggesting that increased support would slow the decline in the agricultural labour force. While some measures (in particular rural development and structural measures) are intended to guide structural adaptation, others (in particular market measures and income support) may yield *unintended structural consequences*.

The CAP and other relevant EU policies can only partly and indirectly address external challenges affecting the farming sector, while the scope of policies is greater for sector-specific challenges. Our assessment shows that the CAP *cannot adequately address new societal challenges and its capacity to reconcile the constraints of agricultural markets with the EFM and emerging societal demands is limited*. The policy framework pursues the three elements of sustainable development (economic, ecological, social), but hardly lessens the effects of global market mechanisms on structural adjustment and resilience of food systems.

While farm structures seem to be taken as a given and are *not addressed as such in the CAP objectives*, CAP measures need to integrate more clearly and specifically the implications for structural adjustment and the preservation of the diversity of farming practices. Many measures address the multiple drivers of structural change, while *only a few address specific structural challenges* (generational change/young farmers, organic farming). Targeted measures could achieve more specific goals in terms of resultant structures and sustainability.

As the CAP's *policy focus is primarily on addressing economic issues* (farm income, competitiveness, market pressures), a disproportionate share of spending is allocated to large farms, implicitly accelerating their growth and concentration processes. To support the pursuit of the Sustainable Development Goals, *a greater shift in policy focus is needed*, with increased attention to diverse transition strategies. Agricultural policies need to be thoroughly revised, including structural goals, to create an environment that supports multifunctional and resilient strategies through openness to new forms and types of land management, farming practices, and market relationships.

1. INTRODUCTION

There are around 608 million farmers worldwide, 90% of which are family farms. They produce about 80% of the world's food (Lowder et al., 2021). Family farms play an essential role in Europe: In 2016, there were 10.5 million farmers in the EU, of which the majority (92%) were family farms (EC, 2021). Even though these numbers seem high, a massive structural change is taking place in agriculture. Between 2005 and 2016 alone, Europe lost 4.5 million farmers – a trend that seems unreversible (EC, 2016).

In 1997 the European Council advocated a "European model of agriculture" which should be "versatile, sustainable competitive and spread throughout European territory, including regions with specific problems" (EC, 1997, para. 40). This notion of European agriculture was largely based on "greater internal and external competitiveness" and aimed at achieving an optimal organisation of the diverse European regional farming contexts towards balanced markets. Since then, it has become clear that socioeconomic challenges are changing substantially, and the general public is increasingly interested in ecological, social and territorial aspects as well.

A variety of different management types for agricultural activities will be required in the future to meet the multitude of socioeconomic and environmental challenges. The notion of twelve "archetypes" of future farmers in 2040 (Bock et al., 2020) illustrates the wide range of drivers and aspects to be considered in agricultural management and food value chains.

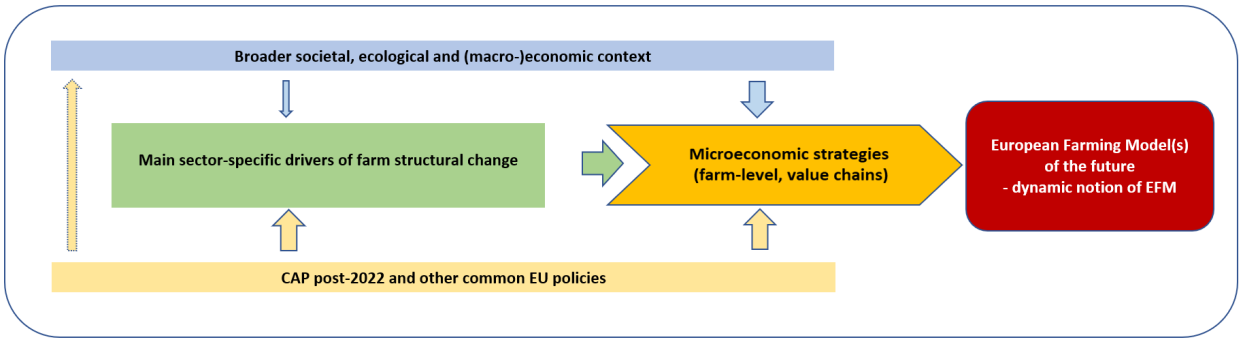
Future agricultural models should therefore not only be limited to competitive agricultural management systems, but must create the conditions for agricultural practices that also deliver environmentally and socially beneficial outcomes in line with societal expectations.

1.1. European Farming Model in a dynamic setting of drivers, policies and microeconomic strategies

The European Farming model in the future will be largely shaped by adaptation strategies, ones that decision-makers will need to adopt at farm-level, as well as along related value chains, in order to respond to the sector-specific, and external challenges, emerging. In pursuit of the long-term strategic objectives attached to the European farming model, the policy responses, most notably the Common Agricultural Policy (CAP), will need to address these challenges. While the CAP and other relevant EU policies can only partly and indirectly address external challenges affecting the farming sector, the scope of policies is greater and more direct in the case of sector-specific challenges. Policy instruments also indirectly affect microeconomic strategies at the farm level, as well as further along value chains. While some of these measures (in particular rural development and structural measures) are intended to encourage and guide structural adaptation of the farming sector in a socially desirable manner, and in line with the EU strategic objectives, some changes in CAP mechanisms (in particular market measures and income support) may yield unintended structural consequences.

Our understanding of the main concepts linked with the European farming model, present in a dynamic setting of interacting factors and policies affecting farm structural change is visualised in Figure 1.

Figure 1: European farming model in a dynamic setting of drivers, policies and microeconomic strategies affecting farm structural change



Source: Consortium, 2021.

The first set of factors explored relate to the general socio-economic context, which are external to agriculture, but have proven to have a strong impact on structural change in agriculture and its related value chains. This group of factors includes demography (such as population growth, urbanisation and aging), economic cycles and international trades, resource use and competition, conflicts and crisis, etc. Apart from general socio-economic factors, also ecological factors, such as climate change (including extreme weather events) are considered.

The second set of factors deals with sector-specific drivers that trigger farms to adapt their practices. These factors include technological advances in agriculture, input and output prices, market and production risk, frictions along the agri-food chain or internal frictions at farm level, market valorisation of sustainable farming practices and ecosystem services, access to resources (particularly agricultural land) and land market regulation.

The third set of factors relates to public interventions that have been strongly affecting the decision-making process at the farm level. In this theoretical frame, the main emphasis is put on CAP instruments and other common EU policies instruments.

As can be seen from the factors outlined, farm households' decisions are not exclusively shaped by, or focused on, agricultural and other land management activities, but are placed within a multitude of socio-economic, environmental, and political factors. Relevant strategies at the microeconomic level are needed to adapt, or react, to the challenges posed by changes in (i) general socio-economic context, (ii) sector-specific drivers of structural change, or (iii) agricultural and other relevant economic policies.

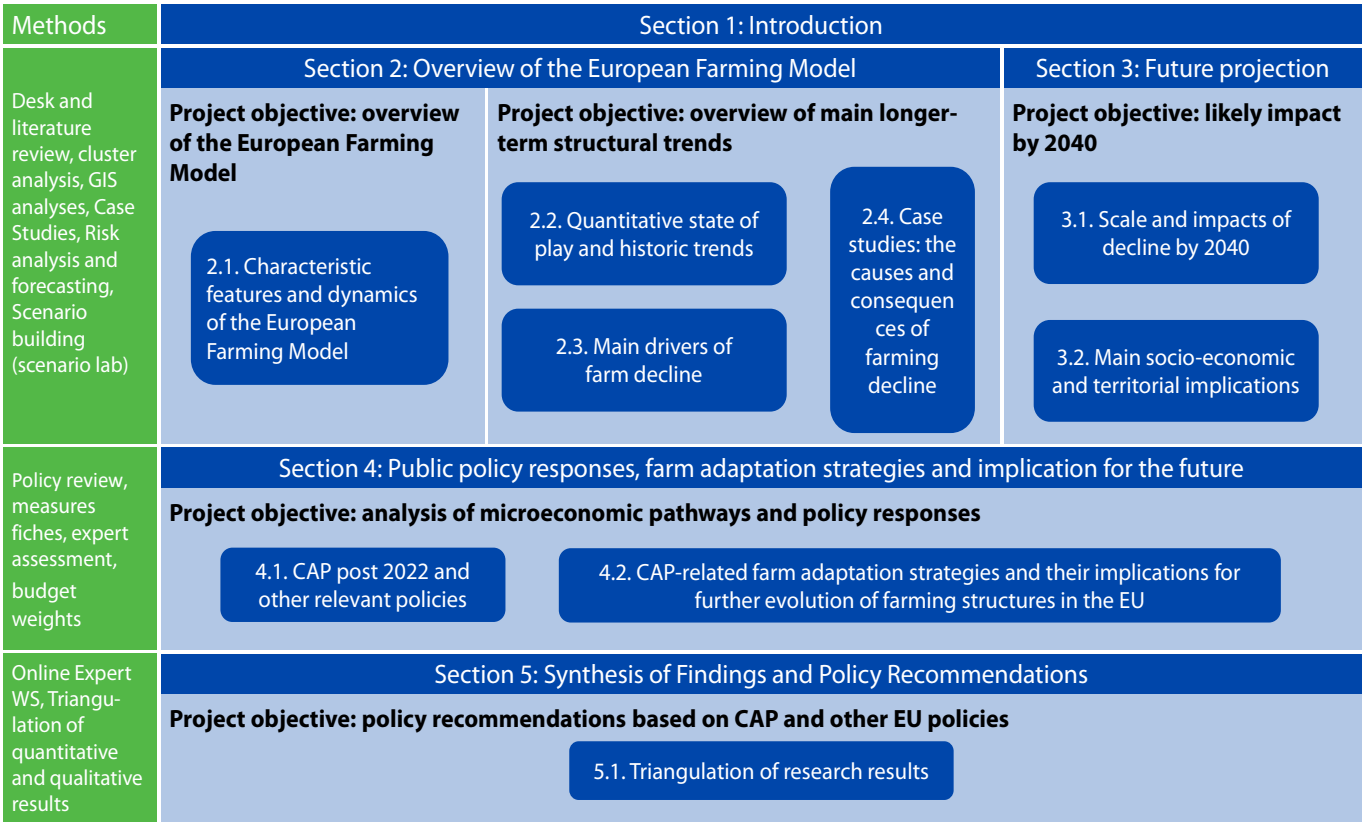
1.2. Study objectives, data sources and methods

The project aims at depicting *"the future of the European farming model"* and analysing *"the socio-economic and territorial implications of the decline in the number of farms and farmers in the EU"*. The project will provide a deeper and up-to-date understanding of the multifunctional European family farming model based on available data and information gathered, including influencing drivers, development, scenarios, implications, public policy responses and microeconomic pathways applied by farmers. The resulting study aims to assist the AGRI Committee members and serves as an informative and authoritative reference for decision making on similar and related matters. It complements existing evidence with specific research on structural development and presents conclusions relevant to the ongoing CAP policy discourse.

The study has four specific objectives according to which the report structure has been designed. As presented in the figure below, sections 2 and 3 address the first two objectives of the study: to provide

an overview of the European Farming Model, as well as the main longer-term structural trends and likely impacts by 2040. Furthermore, section 2 and 3 consist of six sub-sections which investigate different aspects of farming structural trends and future projections, in line with these objectives. Numerous research methods are applied in these sections – ranging from desk and literature review to cluster analysis and mapping, case studies, forecasting and a scenario lab. Section 4 focuses on public policy responses and microeconomic path-ways implemented by farmers. For this analysis, measures fiches were developed. Finally, section 5 summarizes the opinions and feedback from external experts, triangulates all quantitative and qualitative results and presents recommendations of the study. Results from the expert workshop can be found in Annex A.8.

Figure 2: Structure of the study with corresponding project objectives and methods



Source: Consortium, 2022.

Quantitative data sources

The following data sources were used in this study:

EUROSTAT – which provides official statistics on the European Union, EU member states and sub-state regions – was utilised for data describing population projection in the European Union, topographical indicators such as mountain regions, data reflecting climate aspects such as soil erosion, etc. The data collected was further processed for chapter 2 and chapter 3.

The agricultural census data provided by EUROSTAT in the form of the Farm Structure Survey (FSS) which is available in two/three-years intervals and covers a wide range of structural farm factors, such as land use, labour and livestock data, as well as specific data on farm managers, were used to reflect historic trends and to conduct the case study cluster analysis (as part of chapter 2).

The following key indicators were used from FSS and Eurostat:

- change in number of farms and farmers (percentage change between 2005 and 2016, based on FSS),
- farm holding concentration – change in the share of small farms of total farms (percentage change between 2005 and 2016, based on FSS),
- change in utilised agricultural area (UAA, percentage change between 2005 and 2016, based on FSS),
- change in standard output (SO; percentage change between 2005 and 2016, based on FSS),
- change in farm labour force (percentage change between 2005 and 2013, based on FSS), and
- relative importance of agriculture – primary sector GVA share per region in 2018 (based on Eurostat)

Data from the Farm Accountancy Data Network (FADN) database was used to conduct projections (as part of chapter 3). FADN consists of an annual survey which is carried out by the MS and represents the only source of harmonised micro-economic data. The survey does not cover all agricultural holdings in the Union, rather only those which due to their size can be considered commercial. The methodology applied aims to provide representative data in terms of the dimensions of a region, its economic size and type of farming. (European Union)

The following key indicators were used from FADN:

- economic size of holdings expressed in 1000 euro of standard output,
- total labour input of holding expressed in annual work units,
- total utilised agricultural area of holding, and
- total subsidies linked to production.

For the assessment of relevant policies and their impact on farm decline, data from the European Network for Rural Development (ENRD) Database and European Commission's EAGF financial reports were used.

Methods

Interpolation of missing values

The FSS indicators, for instance, are characterised by breaks in the time-series with data only being available int two/three-years intervals. In the case of data gaps, the project team bridged these gaps by interpolation of values using the programming language R (by applying the function "imputTS" and by selecting the best fitting algorithm).

Evaluation of Drivers

As part of chapter 2.3 the main drivers as identified in the literature by Bock et al. (2020) were assessed by the project team in greater detail. For this reason, an evaluation matrix was developed which provides an analytical framework for various social, ecological, technological, policy and economic drivers. These drivers were assessed in terms of different temporal characteristics of structural change and their impact on different types of farms: (i) semi-subsistence farms (where the focus is on growing a high proportion of food to feed farmers and their families); (ii) small and medium-sized farms that are generally family-run businesses; and (iii) large agricultural enterprises which are more likely to have a legal form or be cooperatives. The drivers and their impacts on different farm types were assessed and discussed in terms of: (i) their time of occurrence (historical driver versus newly emerged driver); (ii) their

expected time horizon or stage (emerging, maturing, close to peek, peeked); (iii) their direct/indirect and positive/negative impacts, and (iv) their magnitude of impact (weak, medium, strong). To receive valid results, each organisation in the project team (i.e. ÖIR, BAB and University of Ljubljana) assessed and filled-in the matrix independently of each other based on their expert judgment. After this task, a consolidated matrix was created and further analysed.

Case studies

Five case studies were conducted at regional level to complement the quantitative information gathered. The themes explored in the case studies focused on identifying drivers and consequences of declining farm numbers, as well as the changes occurring to the European farming model in their region. In addition, the case studies provide on-the-ground insights into the micro-economic pathways implemented either by farms, or along the value chains. The case study regions were selected in order to reflect varying trends and patterns across EU-27, as identified in the regional cluster analysis (described in more detail in sub-chapter 2.4.1). When selecting case study regions, several additional selection criteria were considered such as geographical location or the presence of different territorial types. The findings from the five case studies were analysed in a cross-comparison exercise (sub-chapter 2.4.2).

Forecasting and Risk analysis (maps)

To estimate the likely scale and impacts of the decline in farm numbers, the change in the number of farms and farmers from the past was taken and projected into the future. As basis for creating a risk map on farmer decline by 2040, the rate of decline on NUTS2 level between the data derived from the latest available year and projected values by 2040 were taken. Risk classes were defined according to the predicted change in the number of farms whereas a projected decline of more than 80% is defined as very high risk; a decline between 60-80% is identified as high risk; a decline between 40-60% is identified as moderate risk; a decline between 20-40% is seen as low risk and between 0-20% as very low risk of farm decline in 2040.

To provide additional context indicators describing potential causes of predicted farming decline in the EU by 2040, past historic lines per indicator were also forecasted by using the R package "forecast" and its function "auto.arima" which returns the best ARIMA (auto-regressive integrated moving average) model according to either the AIC, AICc or BIC value. To account for the predicted number of agricultural holdings per 1000 inhabitants, forecasted numbers of inhabitants were aggregated at MS level and compared with the population projections conducted by EUROSTAT[1] . Due to the small deviations between the two projections, we assume that the forecasting method applied in this study provides a robust and valid model.

Forecasted FADN data on NUTS2 level, reflecting socio-economic indicators, were normalised, multiplied with the assigned weight[2] and added up. The composite indicator was used to create a European map reflecting the economic resilience of the regions.

Scenario lab

The territorial and socio-economic implication of the decline in farms and farmers were analysed via scenario building. Scenario building aims to create consistent and plausible visions of the future. The fundamental aspect of any qualitative policy-relevant scenario is to be consistent, realistic and evidence-based,

[1] Source: Eurostat (2020): Population Projections in the EU: https://ec.europa.eu/eurostat/databrowser/view/proj_19np/default/table?lang=en

[2] For simplicity reasons, the same weighting factor was chosen for all indicators.

supplemented with a sound and justified qualitative judgement. The methodology for the development of different scenarios was adjusted based on the available inputs, information and data collected and analysed from other working steps, as well as expected outcomes of this exercise. The development of the scenarios took place during an online workshop by using concept board and MS Teams. In order to conduct this exercise, it was first necessary to develop a baseline scenario, based on past decline of farms and farmers, and other relevant transformation processes affecting the European Farming Model. Other scenarios – so-called "megatrend scenarios" – varied around the baseline scenario, however, with a stronger focus on the effects deriving from extreme external events. The first megatrend scenario is called "climate change and environmental degradation". It describes a situation in 2040 in which the consequences of climate change are much worse than reflected in the baseline scenario. The second megatrend scenario refers to the longitudinal consequences of a sudden shock event (such as the current Covid-19 pandemic) and strategies needed to increase resilience. This task revolved around three central questions addressing: (i) expected main territorial and socio-economic impacts; (ii) adjustments on farm level including their consequences; and (iii) implications for the European farming model. The applied method of scenario building is described in more detail in chapter 3.2.

Review of relevant policies and their impact on farm structural change

Chapter 4 of this study provides a comprehensive review of public policies with a special focus attributed to their (direct, or indirect) impact on (internal, and external) drivers of farm structural change. It further reviews public policies in relation to their impact on adaptation strategies at farm and value chain level. Expectedly, priority is given to the CAP, as it represents the predominant component of public interventions in agriculture in the EU. CAP measures are bundled into ten groups according to similarities in their intervention areas, as well as their impact on structural changes:

(1) Direct payments
(2) Market Support
(3) Agri-environmental and climate measures
(4) Support for organic farming
(5) Payments for areas with specific natural constraints (Less favoured areas/Areas facing natural constraints, NATURA 2000, Water Framework Directive)
(6) Investment support
(7) Promoting cooperation (producer groups and organisations, risk management, European Innovation Partnership)
(8) Knowledge and innovation transfer
(9) Targeted support for young farmers, small farms and non-agricultural activities
(10) LEADER/ Community-led local development.

Bundling of CAP measures is also expedient due to the fact that each programming period brings slight changes to the list of eligible measures. This approach enables a consideration of CAP measures across programming periods according to common themes. The analysis is focused primarily on the EU programming periods 2014-2020, and 2023-2027. In order to conduct our analysis in line with the CAP strategic and legal backgrounds, the measures are classified in measure fiches (annex A.7), corresponding to the above ten groups. The measure fiches provide information on the legal provisions for each measure for the two programming periods (2014-2020 and 2023-2027). Each measure fiche also includes links to the sources that describe its intervention logic and implementation modalities. Financial tables on CAP expenditure on the ten groups of measures have been prepared for the period 2014-2020 at member state level.

In line with the thematic focus of this study, the analysis of CAP measures in the project report focuses on their impacts on farm structures (past and future, direct and indirect).

Key data sources for the preparation of the measure fiches are the ENRD Database (CAP Pillar 2) and European Commission's EAGF financial reports (CAP Pillar1), while the evidence of structural impacts draws primarily from evaluation reports and academic literature.

Evaluation of the potential impacts of CAP measures on farm structures

Based on a review of the legal basis and intervention logic of CAP measures (chapter 4), the study argues that no CAP objective (general, or specific) directly relates to farm structures. This of course does not mean that CAP measures do not address farm structures. A very limited number of interventions target farm types of special policy interest such as young farmers and small farms. More often, CAP measures interact with several drivers of farm structural change (chapter 2.3). For this reason, the project team slightly adapted the initially planned methodology for the ***evaluation of relevance of CAP measures.*** Instead of the initial evaluation question *("How individual CAP measures address the policy objectives associated with farm structures"),* the consideration of relevance is based on the evaluation question *"Whether and to what extent CAP measures address farm structural change?"* The evaluation is carried out in two steps. In the first step, a matrix of interactions between CAP measures and a selection of relevant drivers of farm structural change was derived. In line with the theoretical frame of this study (chapter 1.1, Figure 1), the relevant drivers were grouped into two groups: external and sector-specific. Assessment of the existence and likely scale of interactions between CAP measures and drivers of farm structural change was based on the review of relevant evidence (evaluation reports, case studies) and verified by external experts through the project workshop.

In line with our theoretical frame (chapter 1.1, Figure 1) CAP measures may also lead to ***adaptation strategies at the farm level.*** In the second step of the evaluation the extent to which a CAP measure triggers a response at the farm-level was analysed. Based on a literature review, the following adaptation strategies were taken into account: (1) Intensification, specialisation, economy of scale; (2) Adding value to agricultural production (e.g. Quality schemes); (3) Ecologisation of farming (organic, local); (4) Off-farm employment (pluriactivity); (5) Optimisation of CAP support[3]; (5) Abandonment of farming. The assessment conducted was qualitative, using a simple three numerical value criteria (no, weak or strong response to a measure at a farm level). The assessment and verification of results is carried out in the same manner as Step 1.

The ***assessment of likely impacts of CAP measures*** was carried out slightly differently than initially planned. Since no CAP objectives are directly targeted to farm structures, impacts were assessed against the three CAP general objectives: (1) Sector's resilience (incomes, competitiveness, value chain); (2) Environment, biodiversity, climate action and (3) Rural viability (diversification, rejuvenation, life quality).[4] The evaluation question considered was *"Are the measures designed in a way that contributes to achieving the CAP objective?"* Potential impacts were assessed along a five value scale: (0) the measures are not designed in a way that contributes to achieving the objective; (1) the measures have potential indirect but weak effects; (2) the measures bring direct impacts that partially contribute to the objective; (3) the measures bring direct impacts that significantly contribute to the objective and (4) the measures bring strong direct impacts that enable full achievement of the objective.

[3] ie. optimise farm organisation, or production, using CAP revenues as the main criterion

[4] The list of CAP General Objectives applies the wording of the current (2021-2027) architecture of the CAP objectives. In essence, we can observe very similar framing of CAP objectives for the previous programming periods (2007-2013; 2014-2020). In fact, the CAP objectives are shaped in line with the three criteria of sustainability, which are also forming the (multifunctional) base of the European Farm model.

The scoring of potential impacts was drafted by the Task group (University of Ljubljana) and validated at the workshop with other members of the Project group and external experts.

Estimating the CAP expenditure affecting farm structures

The qualitative comparison of the likely impacts of CAP measures served as a basis for a rough ***assessment of public funds*** associated with the goals on the preservation and development of the ***European farming model*** in the period 2014-2020 (by Member State, and aggregated, EU-27). Weighing the potential impacts of CAP measures was performed using budget weights in line with the approach described in the table below:

The 2014-2020 budget of each group of CAP measures (ABM) is divided by the sum of the assessments for impacts (IMP) of the measures according to individual CAP general objective, thus obtaining the budget value of the point (BVP) for potential impact (IMP) of each group of CAP measures.	*BVP = ABM / ∑ grades for IMP*
The value of the impact of the measure (VIM) on an individual objective of agricultural policy will be then calculated as the product between the BVP and the estimate for IMP.	*VIM = BVP x score for IMP*

With the sum of VIM for analysed for the CAP and potential other instruments, an estimate is obtained of the amount of funds allocated for individual CAP objectives according to the likely impacts of the CAP measures.

The next step of the CAP expenditure analysis concerns farm adaptation strategies. Qualitative estimates of the response at farm level triggered by CAP measures were used to assess the share of expenditure estimates for the measures in question.

In this study the diverse and dynamic notion of the European farming model was highlighted (chapter 2.1). Acknowledging the outcomes of the European Commission foresight study "Farmers of the future" (Bock et al., 2020), the already existing, or just emerging, 12 "archetypes" that make up the EU farmer landscape for 2040 as a basis for the foresight component of the financial analysis of CAP measures were applied. An expert assessment of the distribution of CAP 2014-2020 expenditure among the twelve (existing and emerging) farming types were made.

Similarly, as with previous parts of the evaluation, the estimates were verified by external experts through the project workshop.

2. OVERVIEW OF THE EUROPEAN FARMING MODEL

KEY FINDINGS

- An analysis of the European farming model (EFM) underlines the long-term processes at play, dispels the notion of a unique farming model and highlights that a key task of European agriculture is to provide land management systems that enhance multifunctionality and deliver public goods.
- While a scrutiny of the relevant policy framework points to its direct and indirect effects on structural change and related socio-economic and ecologic issues, the CAP seems of limited effectiveness to reconcile the constraints of agricultural markets with the EFM specificities and new emerging societal demands.
- The number of farms in the EU has decreased significantly over the analysed timeframe for both small and medium sized farms, particularly among small farms (below 5 ha).
- Larger farms have remained relatively stable across the timeframe, particularly larger farms (above 50 ha), which have managed to increase in relative share. This indicates significant farm concentration patterns across the EU-27.
- Unexpected events or crises illustrate how fragile our food systems are and how important resilience factors at farm and value-chain level are to deal with short-term shocks (such as the first wave of the Covid-19 pandemic) or long-term trends (such as climate change and environmental degradation, which make it necessary for EU agriculture to adapt to become more sustainable, adopt new technologies and preserve its diversity).
- While the EU farming system as a whole is, by and large, affected by the same structural, economic, as well as social and environmental drivers, they impact farms differently, depending on farm structure, size and demographic features:
- Technological drivers will have more negative impacts on semi-subsistence farms, mixed impacts on small and medium types of farms and positive impacts on large agricultural enterprises.
- The age of the EU population has negative implications on smaller farm types, whereas migration effects will mainly affect larger agricultural enterprises.
- Economic impacts are to be felt on small-sized and fragmented farm holdings operating within a market structure that favours intensive production and large-scale farms, as smaller-sized holdings have difficulty taking advantage of economies of scale, investing in machinery, irrigation, and automation, and accessing markets. However, economic drivers also have strong implications on large agricultural enterprises.
- The various CAP payments are judged as having positive impacts on farm resilience across all types of farms.
- All case study regions report an overall trend of consolidation, intensification, and loss of small family and patrimonial farms, however, in some regions this structural change is accelerated, while in others it is reported to be moving more slowly.

2.1. Characteristic features and dynamics of the European Farming Model

While the conceptual background of this study acknowledges the crucial role of the European Farming Model (EFM) through an observation of past agricultural practices and policy discourse (EC, 1997), this section underlines the dynamic character of the evolution of land management in the EU. From the time the EFM was coined until now, the main arguments were sought to address the following questions: "To what extent does Europe offer a 'unique' and identifiable rural experience? Is the 'exception européenne' […] a particular sensitivity to rural (and agricultural) landscapes, a unique socio-economic composition yielding a distinctive pluri-functionality, or simply a prior historical evolution, both real and sustainable? Is a European rurality different from that of the 'colonies of settlement' (Bolton, 1973), such as the United States, Canada, Australia and South America". How far does the European imperative differ from these nations, as they strive to define the world economic agenda within which regional and national policies relating to agricultural activity, landscape protection and human migration are ordained to comply? In short, is there still a European model?" (Buller, 2001, 1f.) Thus, from the beginning, the EFM was framed as a "series of broad policy objectives" (Fischler, 1998) subsuming the diversity of European regions, traditions and agricultural systems, responding to national cultural and institutional differences, and being shaped by different trajectories of agricultural modernisation (Cardwell, 2004). Throughout the following analysis of the literature review on this topic its diversity and highly dynamic structures will be underpinned.

In the future, the EFM is on a trajectory to becoming largely shaped by adaptation strategies that require decisions at farm-level, as well as adaptations of value chains, in order to respond to sector-specific and external challenges. In pursuit of the long-term strategic objectives attached to the European model of agriculture, the policy responses, most notably the CAP, need to address these challenges. While the CAP and other relevant EU policies can only partly and indirectly address external challenges affecting the farming sector, the scope of policies is greater and more direct in the case of sector-specific challenges. Policy instruments obviously also affect microeconomic strategies at the farm level and indirectly along the value chains through substantial market implications. While some of the core policy measures (in particular rural development and structural measures) are intended to encourage and guide structural adaptation of the farming sector, and in line with the EU strategic objectives, some changes in CAP mechanisms (in particular market measures and income support) may yield unintended structural consequences. Discussion on shifting the priorities in relevant policies had already emerged with the installation of CAP and Structural Funds multi-annual frameworks at the end of the 1980s. It achieved quite distinct foci, according to national concern and relevance. Through the incorporation of considerations on the ecological implications and regional impacts (Jollivet, 1996), designation of a concept for policy change (Buckwell et al., 1997), slow and protracted implementation of new frameworks (Buller and Hoggart, 2001) and discourses on scope for structural reform (Brouwer and Lowe, 2000) many different aspects and views were addressed.

2.1.1. Definition and key features of the European Farming Model

Structural change is not a European phenomenon alone (FAO and IFAD, 2019). It is rather visible throughout all regions of the world. It is revealed through quite diverse features and involves quite distinct farm scales (Lowder et al., 2016). What is more, the analysis of structural challenges has to include the presence of market integration and intensified interrelation and cooperation between different sectors and regions. Such an assessment would address adaption of agricultural structures to

changes of markets, market functioning, system extension, emerging technology options and shifting socio-cultural challenges and opportunities within the region and across all parts of the world.

For a long time in Europe, food security, primarily in terms of quantitative provision, has been taken for granted. With rising ecological concern, expectations have shifted to address the loss of biodiversity and ecological quality through its predominating farming systems. Consumer demands for increased product quality and contents have contributed to this concern. The policy discourse and particularly CAP reforms since the late 1980s have been confronted with these issues. In addition, the on-going decline in farm units and reduction of farm employment have contributed to doubts around securing the notion of "family farming" as the still predominant organisation mode of land management in Europe. Agricultural policy support was assumed to contribute to beneficial outcomes with regard to the competitiveness of the sector and farming incomes, suggesting that an increased level of support would at least slow the pace of decline in the agricultural labour force and farm holdings. The required alterations of strategies and policy outline was discussed in the periodical review rounds of the Common Agricultural Policy (CAP) reforms, implying a need for adopting an integrative approach comprising agricultural, regional, environmental and social aspects (European Union, 2016). However, policy implementation was usually assessed as to fall short of striking the balance between these aims (Brouwer and Lowe, 2000; Swinnen, 2015; Erjavec et al., 2018), and the beneficial correlation between CAP instruments and farm structure change could hardly be proven to be influential in most of the European regions' contexts (Maréchal, 2018).

However, as the coining of the EFM concept suggests, there is a crucial distinctive role of farming attached to EU agriculture. This is based on the following three aspects:

- the effort to identify multifunctionality and public goods provision as inherent tasks for European farming systems;
- the increasing need to asses socio-ecological changes, spatial variance and geographically fine differentiation, and consequent implications for farm structures; and
- the existence of an appropriate policy framework interacting with socio-ecological systems

Moreover, structural change is observed as a long-term process in many regions, placing great pressure on fulfilling the multiple tasks demanded from agriculture according to locational characteristics. Studies describing the substantial changes are often concerned with regional and/or local detail. Many experts address the inherent diversity of European farming stressing the need to enhance strategies to cope with marginalisation threats (Brouwer et al., 2008). Others focus on raising awareness on multifunctionality of farming and seeking its integration into rural development frameworks (Bryden et al., 2011), yet other studies focus on the relevance of value chain organisation and increased need to include environmental objectives and societal transitions (Van den Bergh et al., 2011). Observations and main findings of foresight studies on the future developments of agricultural structures close the reflections of this literature review, underpinning the dynamic perspective of the EFM. These arguments intend to underscore the high relevance of the issue throughout European regions also in future land management decisions, their implications on social and ecological developments of rural regions, consequences for food systems throughout Europe, and the rising need for policy to explicitly respond to challenges for farming from structural adaptations.

Table 1: Farm structure comparison across global regions

Region	Mean farm size (ha)	Share of farm units < 2 ha (%)	Gini-coefficient for farm structure
Central America	10.7	63	0.75
East Asia	1.0	79	0.50
Europe	32.3	30	0.60
South America	111.7	36	0.90
South Asia	1.4	78	0.54
South-East Asia	1.8	57	0.60
Africa (sub-Sahara)	2.4	69	0.49
USA	178.4	4	0.78
West Asia/North Africa	4.9	65	0.70

Source: Deininger et al., 2011, 28 (based on Eastwood et al., 2010)

Comparing European farm structures with other global regions (Table 1) only partly captures the diversity among local management features and types. It however indicates the middle range farm size, a still considerable share of small-scale farm units and a reduced level of inequality, at least in relation to structures in the USA and other parts of America. Acknowledging this diversity and small- and medium sized units, European agricultural policy engaged in a more comprehensive view of agricultural objectives since the 1980s, including a more thorough assessment of the environmental implications and the spatial dimension of different land management systems (Wilson, 2007). Conceiving these emerging tasks of agricultural activity as deeply rooted in cultural notions of land use and relationship to spaces, the respective concerns were captured by the concept of multifunctionality. This perspective led the European Council in 1997 to advocate a "European model of agriculture" whereby the Presidency conclusions argued that the agricultural sector *"must … be versatile, sustainable, competitive and spread throughout European territory, including regions with specific problems"* (EC, 1997, point 40). While this notion was still largely determined by seeking *"greater internal and external competitiveness"* and political legitimisation (OECD 2001, 2008), it supported the aim of preserving highly valued features and contributing to an optimal organisation of the diverse European regional farming situations. It was intended to secure land management in less competitive spatial contexts and to cope with increasing product market challenges at global level. Coping with productivity gaps and the relevance of the jointness of production (OECD, 2008) was the focus of respective studies. Above all, findings suggested the need to strengthen linkages to rural development and to intensify coordination of agricultural policy with rural policy issues (Belletti et al., 2003; Delgado et al., 2003).

Not by chance, the Less-Favoured Areas scheme (LFA) later termed as support for Areas of Natural Constraints (ANC) is one of the oldest policy instruments, established in 1975. Having been introduced as a scheme to provide partial compensation for farming contexts with weak productivity potential its contribution to providing essential ecological and social public goods was increasingly estimated (Dax and Hellegers, 2000). This scheme also was decisive to initiate discourse on the spatial dimension of agriculture, particularly in those areas with limited production potential (Brouwer, 2004). However, since then, socio-economic challenges have been assessed in a much broader view. They have had to

address significantly changed socio-economic contexts and respond to rising expectations of the general public on achieving beneficial ecological, social and territorial effects (Brouwer et al., 2018). Many authors have pointed to these interrelations and the contribution of "multifunctional" land management to providing beneficial outcomes (Renting et al., 2009; Nowack et al., 2021). This approach requires a long-term commitment of the CAP to tackle undesired social and ecological impacts. In principle, two such adverse developments could be observed. One development is farm and land abandonment (Schuh et al., 2020), particularly visible in areas of unfavourable production conditions. Through LFA support, the CAP provided for a long period of time a policy instrument (EC, 2009) to influence farm structures development.

The other development is the response of farmers with intensification. In this regard, harmful effects on ecology have to be explored. Many scholars argue that the "European food system is not sustainable" and an approach for "an agro-ecological Europa […is a] desirable, credible option to address food and environmental challenges" (Poux and Aubert, 2018, 3). With regard to structural development, several CAP policy instruments were assessed as influential, in particular investment support, payments for young farmers and small farmers scheme. However, impact assessment of CAP Pillar 1 support is rather mixed, revealing distributional effects of horizontal payments (Velázquez, 2011) aggravating concentration processes (European Parliament, 2017), thus providing limited support for maintaining small farms and reinforcing existing trends of structural adjustment (Pe'er et al., 2017).

Beyond, the general assessment of policy effects it is important to acknowledge the specific impact of small-scale farming on various aspects of multifunctionality. In many respects, the most direct and widely shared recognition is on the effect for maintaining traditional/historical European agricultural landscape types (Slámová and Belčáková, 2019) and the invaluable contribution by small farms (Van der Ploeg et al., 2002). The relationship is particularly strong as discussed in Mediterranean contexts, underscoring the close interaction of structure, regional integration and ecological sensitivity of areas (Pinto-Correia and Vos, 2004). Climate change effects are experienced particularly strongly in many of these regions. Case study explorations of this study (chapter 2.4) underpin this aspect by presenting increasing shifts in production, ecological threats due to structural changes and land abandonment leading to unattractive conditions for generational renewal (Matthews, 2018). In the Mediterranean, but also in other parts of Europe, pressure on agricultural structures in mountainous areas (OECD, 1998) and other remote regions, is of outmost relevance.

These interactions suggest that there is not one single "European farming model" but a set of pathways securing land management and food value chains to enable place-sensitive, sustainable and resilient farming models, which are able to integrate efficient food systems with wider social and ecological benefits to rural areas and society in general. They shall take into account the regional differences, rising challenges and the inclusion of new societal values, as well as a robust framework for assessing different motivations and practices of farmers as major analytical elements on land management types. It is important to analyse how past structural trends might continue or change, and what impacts the adoption of sustainable and resilient development modes will have on future agricultural systems.

2.1.2. A model affected by a number of changes

Focusing on agriculture as an integral part of a broader economic and social environment, other studies have explored farm management changes driven by a wide range of external aspects. From a general perspective, any changes in the wider societal, ecological and (macro-)economic context inevitably also affect agriculture (see more details on main drivers on farm decline in chapter 2.3). While the development of farm employment (Schuh et al., 2019) has immediate implications for farm structures, these are

also dependent on a number of changes of external factors. It should be accounted that these nevertheless might reveal a strong impact on structural change in agriculture and related value chains. As external factors, they tend to be overseen or undervalued in their relevance for farm management decisions and structural outcomes.

- *Demographic trends:*
  With urbanisation of last decades, the geographical location of the population has shifted towards urban areas. More people are already living in urban as opposed to rural regions on average, with significant implications for demographic changes in peri-urban and remote rural regions. While rural hinterlands of urbanised, high-income countries or regions are facing urbanisation pressure, remote rural areas – strongly represented in particular in Southern and CEE Europe – are facing the risk of abandonment of farming (Dax et al., 2021) and depopulation (Copus et al., 2021). Within these regions, aging is more pronounced and impacts the agricultural labour force and the socio-economic fabric of rural communities. The migration to the rural periphery from urban agglomerations, on the other hand, leads to functional transformation of rural areas – from representing a production space to assuming roles and features of a consumption space. Such processes depict the rise of alternative narratives and lifestyles, expressed in counter-movements towards formerly considered peripheral areas, less accessible places, including e.g. mountains, islands and in general areas of natural constraints (Membretti et al., 2022). Even if these flows were considered of minor relevance until recently, COVID-19 restrictions on mobility changed options and perceptions drastically. Restrictions of "physical distancing" were particularly experienced in densely populated areas, fuelling an unexpected increase in attractiveness of remote locations. Though these observations so far seem an anecdotal account, changes in lifestyles severely affect spatial dynamics. Urbanisation therefore has to respond directly to these demands, but also to housing, employment-lifestyle relationships, resource use, including shifts in the geography of food systems, diets and habits (Kneafsey et al., 2021).
- *Economic diversification and trade growth:*
  Economic growth and shifts in sector activities also affect the values and composition of agricultural demand, including an orientation towards a higher consumption of meat and dairy products and other more resource-intensive food items with implications for the sustainable use of natural resources (De Roest et al., 2018). With intensification of resource use, and a persisting pressure on farm income levels, a significant share of small- and medium sized farm households reveals a relative lag of agricultural income. Food price fluctuations increase structural pressures by adding aspects of temporal insecurity. These permanent risks of agricultural activities are aggravated through financial crises and the accompanying economic slowdown which have implications on the agricultural sector as demand for agricultural commodities for food, feed and fuel has temporarily declined (Bardají et al., 2016). After peaking in 2008 and 2011, food prices have fallen back to levels reached in the early 1980s (according to FAO's real food price index). Moreover, dependence on economic performance is amplified by trade developments and increasing global integration, with severe impacts on local and regional production potentials and structures.
- *Resource use intensification and increased scarcity:*
  With intensification of land use and technological change, competition of agricultural activities has increased and is now related to a much wider global framework (Wästfeldt, 2018). This has implications on the nature of farm activity, the scope of production and product range, integration to local, regional and large-scale markets, and the capacity to provide highly demanded public goods (Mantino and Vanni, 2018). Thus, intensified competition can lead to overexploitation and

unsustainable use of land and water resources. Beyond orientation on food production, agriculture is assuming additional tasks, in particular with bio-economy extension, leading to an increase in the production of biofuels and other bio-economy products. These additional activities of agriculture have an impact on land availability for food production, employment and price developments. Increased competition between the use of biomass for food and for other purposes has increased the interdependence between the food, feed and energy markets. The resulting higher land demand as well as sprawl and urbanisation processes lead to higher land prices which directly affect agricultural structures (Kirschke et al. 2021). Pressure on natural resources will be driven not only by changes in demand, but also by changes in climate, and altered inter-regional relationships.

- *Rising risks due to natural disasters and shock events*
  These developments in resource use might be exacerbated by natural disasters, crises, pandemics or political conflicts that might amplify pressure on specific groups of farming. While overall, during the COVID-19 pandemic, the EU agri-food supply chain has demonstrated a high degree of resilience and the EU response was highly effective in preserving the integrity of the single market, this health crisis has exposed the vulnerability of the EU-food chain to market disruptions (Montanari et al. 2021). The unknown challenges of the pandemic triggered research on the effects in the food production chains (Bakalis et al., 2020), the upkeep of the agricultural workforce and occasional lack of labour force (Stephens et al., 2020), interruptions in use of food through closure of restaurants and catering, as well as changes in consumers' food habits (Bracale et al., 2020). Severe restrictions of mobility and market access have influenced the primary sector in complex ways, and particularly exert pressure on groups of farmers most exposed to such risks. Geopolitical tensions can similarly affect agricultural markets, as exemplified by the Russian embargo which has negatively influenced the export of agri-food products from the European Union to Russia (Kašťaková et al., 2018).
- *Climate change pressures:*
  As a long-term process, effects of climate change are difficult to observe at a short-term period. Nevertheless, the evidence for shifting practices, and implications for changes in agricultural potential is widespread. This was confirmed in case studies that mention gradual changes in products, in location of production (internally) but also with regard to inter-regional changes (e.g. CS Spain). According to the IPCC crop production in lower-latitude countries will be "consistently and negatively affected by climate change" (Mbow et al., 2019). Due to variability of precipitation and increased drought and flood frequency, yields in general are endangered in specific regions of Europe. Adaptability of small farms is weaker than for larger, more professional farmers, but it seems important that diversification and management improvement might alleviate scale dependence substantially. Assessment of climate change effects reveals that risks for sustainable development pathways increase substantially (Agovino et al., 2019). These effects are particularly expressed in those regions most affected by harmful trends of climate change (precipitation changes or lack of water, periodicity of weather, inadequate temperature profiles etc.), as analysed for Mediterranean regions in more detail (Cramer et al., 2018). Clearly these changes include significant effects on farmers decisions (Lehmann et al., 2013) and structural change (Mendoza Tijerino, 2020).

  As a result of requests of decarbonisation, new strategies need to involve a reorientation towards a more holistic assessment of the use of the whole range of bioeconomy and turn to approaches of circular economy. The societal concern over the dependence of the economy from non-renewable resources (most notably, fossil fuels) is increasing. At the same time, technical- and cost- efficiency of biobased technologies that replace fossil-based materials with biobased is increasing. As

such, increased demand for biobased alternatives (like packaging materials, consumption products, construction materials) is creating opportunities for the agricultural sector and helps to foster alternative circular business models (FAO, 2016) which, however, depend on uptake by farm operators, and aggravate structural shifts.

- *Social demands and sustainable food systems:*
  As a macro-economic driver, the growing demand for animal welfare and environmentally friendly farming among consumers – coupled with increased awareness of the health-related benefits of organic food – influences both the agricultural markets and, directly and indirectly, the types of farm management and agricultural structures. European policies and strategies – like the *European Green Deal* and, in particular, the *Farm to Fork* and *Biodiversity 2030* strategy – are conscious of these societal demands and global challenges in their conceptualisation. Through backing up the cultivation of sustainable production patterns and particularly the production and sales of organic food throughout Europe these concerns are supported by specific instruments. Assessment of the reform process, however, estimates that the full potential of CAP reorientation towards sustainable and resilient pathways is not met, and future implementation will continue to favour unsustainable practices (Pe'er et al., 2017).
- *Policy objectives:*
  As mentioned above, CAP objectives are not sufficiently adjusted to the current, and expected, future challenges. In addition to the sector's objectives, linkages to the rural context, ecological performance, spatial implications and socio-cultural changes should not be neglected. These aspects are less widely treated in scholarly studies, but some aspects or some regional concern can be noticed. One of these is the effect on poverty and deprivation which is highly concentrated in rural areas – even in countries where poverty has been reduced (Copus et al., 2015). Changes in population and income – combined with new technological processes – affects inequality. Rural women, the elderly, first-time job seekers, and other vulnerable groups disproportionately experience poverty and exclusion. They face more barriers in economic opportunities and participation in decision-making processes, hampering productivity growth on smallholder farms and increased income inequality. A high proportion and persistence of small-scale subsistence farming is – especially in the Southern and South-east regions of the EU – a sign of a poorly functioning welfare state. In this regard, the role of agriculture can be seen as a social buffer. The social value attached to agriculture in general as well as a lagging farm income also influences the decision of young people to choose working in the agricultural sector (generational renewal). Gaps in pathways are particularly large between countries of diverse historical developments, as between West and East European countries (Davidova and Thomson, 2013; Van der Ploeg et al., 2016), implying also that status, assessment and policy priorities are differently (Bański and Mazur, 2021). Structural outcomes might hence be influenced very differently by the existing policy instruments and trade-offs attain core relevance for place- and farm type-specific effects.

2.1.3. A changing and more diverse model

Structural change is hence both an effect of past structural conditions and dependent on a number of external, non-agricultural factors and changes. Such a perspective points to path dependency as a universal characteristic for many European regions (Biró et al., 2016; Magrini et al., 2018). The respective contribution of different factors for structural change is quite difficult to assess (see chapter 2.3; Neuenfeldt et al 2019) and includes substantial overlaps and combined effects. Research in this regard focuses on a policy response to emerging challenges and how current implementation practices and reform proposals address these requirements. Discussions in previous policy reform processes reveal a

gap between empirical studies and uptake of alternative policy responses (Dax and Copus, 2016). However, the priority of sustainability goals and the need for farming systems transition are widely shared. These involve a paradigmatic turn that favours the following trends of farm adjustment (Copus and Dax, 2010, 21f.; Fuller et al., 2021):

- a shift from quantity to quality in food production;
- the growth of on-farm diversification and alignment with off-farm employment options (pluriactivity);
- extensification and the promotion of sustainable farming through agri-environmental policy (Hodge, 2002);
- dispersion of production patterns; and
- environmental regulation and restructuring of government support for agriculture.

As indicated through these trends, the future of land management in Europe depends on a wide range of aspects, not exclusively shaped by, and oriented at, agricultural and other land management activities. It will imply considerable changes in socio-economic terms, in developing stronger focus on farmers role and integration in value chains (Woodward and Hird, 2021), in land use and land abandonment (Castillo et al., 2021) and landscape patterns (Bürgi et al., 2017, 2097f.).

Various studies have tried to describe current types of farm management and explore needs for future adaptation (Van der Ploeg et al., 2016; Biró et al., 2016; De Roest et al. 2018; Guiomar et al., 2018; Woodward and Hird 2021). The scoping study underlying the EC's report "Farmers of the Future" noted an *"emergence of more diverse and experimental models of farming to face the environmental challenges and to address the diverse consumption models"* (Bock et al., 2020, 13). These overarching challenges and wide scope of drivers on the future of farming in Europe provide insight into changes and a general framework for assessing the increasing diversity of farming models expected for 2040 (Bock et al., 2020, 71). The types presented in that study include direct implications for governance needs and adaptions, and allow recommendations for place-sensitive adaptation of agricultural systems across different conditions of European regions. In the following table the 12 types are presented through their main characteristics. These types are taken up in the exploration of case studies to verify the relevance of diverse trends in changing the European model (chapter 2.4) and in our considerations for assessing scope and need for policy adjustment (chapter 4).

Table 2: Current and emerging farmers' profiles

Farmer's profile*	
Current established farmer profiles	**Adaptive-diversified farmers:** they make best use of all potential resources of the farm to maximise profit through diversification of activities and adapting to new societal demand. These are farms that go beyond food and fibre production – through involvement in other activities, including circular bioeconomy. (*keywords*: diversification, expansion, adaptive, whole-business-oriented)
	Intensive – specialised farmers: they maximise production of the agricultural goods of best possible quality as demanded by the supply chain in order to maximise profit. (*keywords*: intensive, production-focused, specialisation)
	Patrimonial farmers: they maintain the farm as heritage from the past generation to pass it on to next generations, achieving adequate profit to make a living. (*keywords*: traditional, family, heritage)

	Recreational, Non-profit farmers: they operate farm business as recreational activity (or semi-retirement) without expectation of making a profit (and accepting some losses). (*keywords*: recreational, non-profit, hobby)
	Semi-subsistence farmers: they maintain farming as means of self-provisioning and subsistence. (*keywords*: subsistence, household consumption as primary objective, high labour intensive)
	Corporate farmers: they maximise shareholder value of the company and adapting the role of the farming activity to overall corporate strategy. (*keywords*: corporate, business units, maximising efficiency, minimising costs, intensive and specialised)
Current emerging farmer profiles	**Regenerative farmers:** they create a sustainable food system through regenerative farming activity which enhances the state of the farm ecosystem. (*keywords*: regenerative, conservation, agroecology, farming activity is considered as part of nature, protection of natural resources)
	Social farmers: they maintain farm activity as a service to improve health and increase wellbeing of nearby communities through social and care activities. (*keywords*: social-inclusion, service-oriented innovation, ethical motivation)
	Lifestyle – neo-rural farmers: moving to countryside to improve the quality of life, take up farming lifestyle and contribute to development of rural areas. (*keywords*: lifestyle, neo-rural, new entrant)
	Urban micro-farmers: in a sustainable way they embed food production in cities, where most of the human activity and demand for food is concentrated. (*keywords*: urban, micro-farm, local, consumer-oriented innovation)
	Indoor – controlled environment agriculture farmers: they develop start-ups in agtech domain which disrupt the current agricultural model and allow production food in new ways such as controlled environmental agriculture. (*keywords*: indoor agriculture, technical innovation)
	Biotech start-up farmers: they develop biotechnology processes to produce food without farming activity such as cellular agriculture. (*keywords*: creating new high value market niches, radical, scientific innovation)

* These profiles are derived from the JRCs report "Farmers of the Future" (Bock et al. 2020)

The most visible outcome of structural change is through land use change, land abandonment, physical changes of farm plots, changes in production and management types, technological dependence and intensity changes. However, securing future European agriculture will largely depend also on less visible aspects of new management styles, forms of cooperation, concern for quality enhancement and recognition of public goods value of specific management systems. This wide set of aspects will concern future policy reform and place-sensitive strategies to enable a varied selection of farming types that enhance sustainable management of food systems.

Future farming models should hence not be restricted to competitive agricultural management systems alone but should also support conditions for farming practice that provide "environmentally and socially beneficial outcomes" according to societal demand at a sufficient level. While the discussions

on the need for a transition towards adopting these values and concepts in policies are widespread in academic, policy and practical circles, policy reform is still lagging behind (Maréchal, 2018). Studies highlight also the need to design responses that link new technologies to social issues and structural conditions and specificities (Rose et al., 2021). At the same time, the impact on ecological performance, including landscape development, is presented as a key factor to realising sustainability and resilience of place-sensitive structural developments. An increased "understanding of multi-level drivers and local socio-economic as physical conditions is (therefore) highly warranted" (Kristensen 2016, 762).

The ample account of literature review confirms many of the concerns voiced by on-going discourses. It puts specific attention on the following aspects:

- In most regions agricultural statistics trace a steady decline of farm numbers and agricultural work force, even if different periods and significance can be observed.
- This on-going and persistent structural adjustment leads to evident indicators of structural change. Such indicators include the increase of average farm sizes (in most of the regions, but at different pace) and the concentration of agricultural production within "large" farm units (primarily units that are larger than 50 ha).
- However, structural change also affects physical features and translates into changes of landscapes. This involves changes in character of cultural landscapes, a decrease of structuration of landscapes and ecological threats. These developments are esteemed largely as irreversible, at least in the short run.
- Structural adjustment also implies reinforced trends towards regional specialisation, implying mono-structural systems, with increasing linkages to processing capacity and marketing structures (value chains) at larger geographical scales.
- Trends are not uniform, but have to be analysed by viewing the dualisation of land use processes. This dichotomy of developments is due to, on the one hand, unsuitable land for large-scale agriculture trends which is turned to fallow land involving substantial pockets of areas of land abandonment and, on the other hand, concentration processes for more accessible parts of agricultural land.
- Structural change also affects labour input development. The steady decrease of farm labour per unit due to technology development and intensification orientation implies a low presence of agricultural populations in many rural regions.
- Reform options and studies highlight the various trends emerging on quality products, on organic farming, and on regionalising agricultural production, thereby apparently depicting increasing relevance of consumer demand for specific qualities in food supply.
- Overall, this account shows a wide range of relevant drivers for structural change, with important temporal and regional variance of influencing importance of individual drivers. Sets of drivers acknowledged are largely dependent on socio-cultural background, policy discourse and place-based regional agricultural development strategies. These might contribute to new farming types and an on-going focus on diversity of types.

2.2. Quantitative state of play and historic trends

The decline of farms and farmers and changes to farm structure across the EU-27 were analysed quantitatively on the basis of the Eurostat Farm Structure Survey (FSS) data for the EU-27 and at MS level. Due to the heterogeneity of the underlying data, the time-period of analysis varies: data on the EU-27 is available to a relatively comprehensive degree from 2003 on. In the case of "older" Member States, this analysis was extended to include 1990 due to more robust data.

A key challenge tied to this analysis is the relatively long time horizon (i.e. the past 20 to 30 years) and the heterogeneity of the available data. The FSS indicators are characterised by breaks in the time-series with data only being available in two/three-year intervals. These data gaps were bridged via the interpolation of values using the programming language R[5]. With the changes in FSS legislation in 1988 and 2008, care was paid to ensure equivalence between indicator definitions.

An additional issue taken into account is connected to the number of changes in EU MS over the analysed timeframe and the treatment of data from before accession. Specifically, the FSS does not contain data for the newer MS. The project team engaged in a comprehensive data collection effort at national statistical offices to reduce the gaps. In the case of Sweden and Finland, the project team contacted the relevant statistical offices directly, since no relevant information could be retrieved online. The full list of national databases and publications consulted is provided in annex A.1.

1) Farms and farmers in the EU

Table 3: Developments in the number of farms, according to farm size

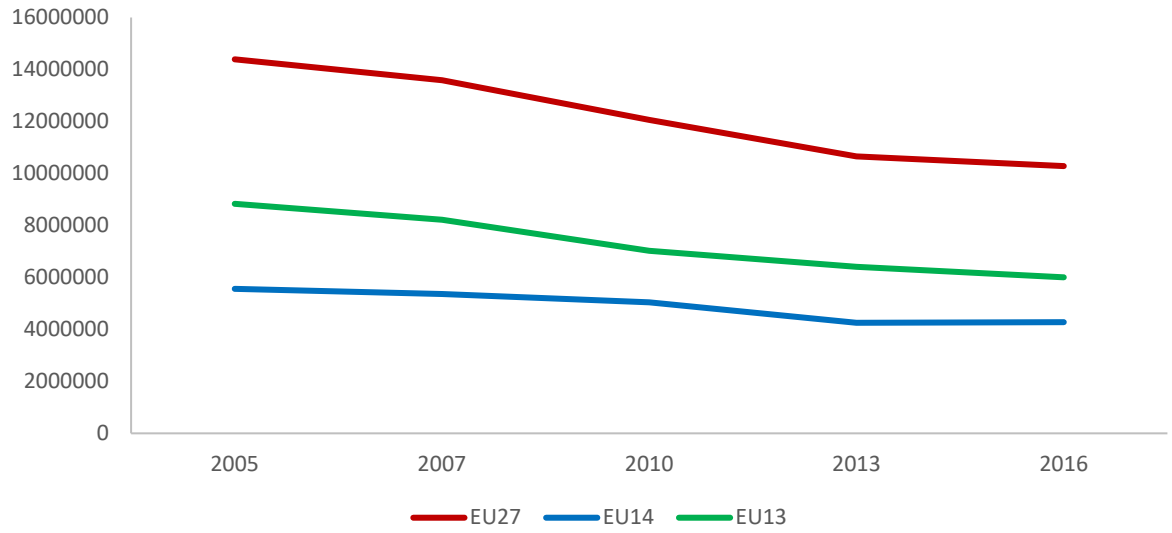
Farm type	EU-27 (2003-2016)	EU-14 (1990-2016)*
All farms	-32%	-48%
Farms (0-4 ha)	-38%	-57%
Farms (5-19 ha)	-17%	-44%
Farms (20-49 ha)	-12%	-43%
Farms (50+ ha)	7%	20%

*note: the decline in the EU-14 shown here is higher due to the longer observation period.
Source: Project team 2021, based on Eurostat FSS data

A direct comparison of the new (EU-13)[6] and the older (EU-14) Member States over the same period (2005-2016) reveals that the decline is greater in the newer Member States. While the decrease within the EU-14 in this period amounted to approx. 28.5%, the number of farmers in the EU-13 decreased by approx. 33% in the same period.

[5] In more detail, this was undertaken by applying the function "imputeTS" and by selecting the best fitting algorithm. In this case, "stine" interpolation was used.
[6] EU-13: BG, CY, CZ, EE, HR, HU, LT, LV, MT, PL, RO, SI, SK

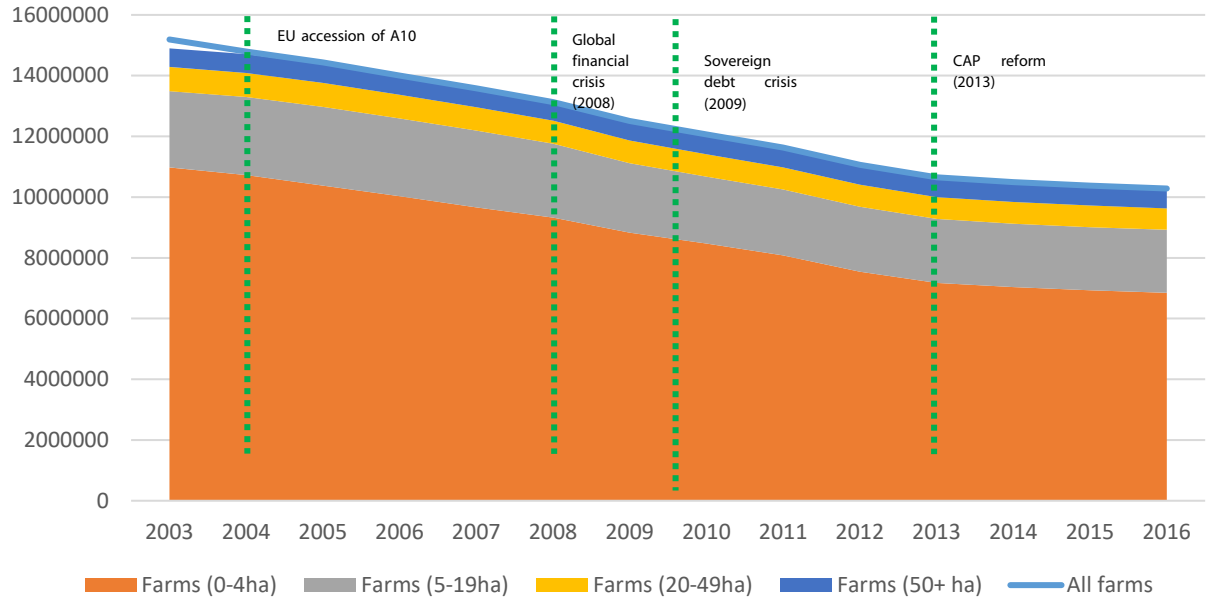
Figure 3: Number of farms and farmers 2005 to 2016 in EU-27, EU-14 and EU-13



Source: Project team 2021, based on Eurostat FSS data

The combination of interpolation and data collection from national statistical offices enabled the project team to analyse the decline in the number of farms and farmers, and the changes in farm structure from 2003 to 2016[7] for the EU-27. For the EU-14[8], this analysis approach extended the reference period to include 1990 to 2016.

Figure 4: Number of farms and farmer per size class 2003 to 2016 in EU-27

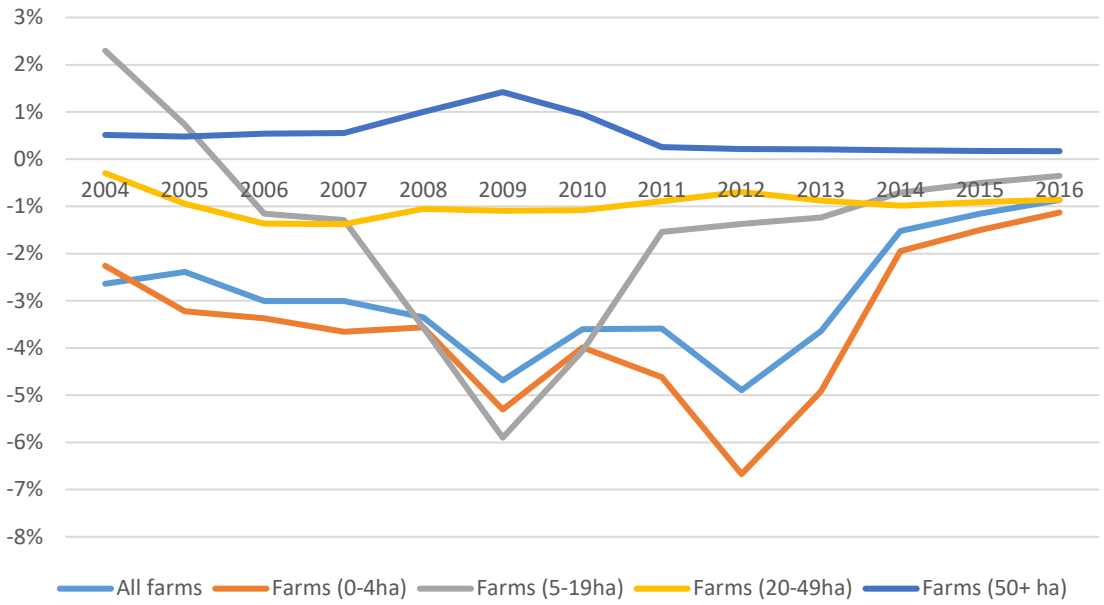


Source: Project team 2021, based on Eurostat FSS data

[7] Data values from 2000 are relatively consistently available for the EU-27, however, the values are not as robust as the ones starting from 2003.

[8] Equivalent to the EU-15 sans UK: AT, BE, DE, DK, EL, ES, FI, FR, IE, IT, LU, NL, PT, SE.
Note: values between 1990 and 1994 were linearly approximated for AT, SE, FI.

Figure 5: Annual change in number of farms by size class (EU-27; 2003-2016)



Source: Project team 2021, based on Eurostat FSS data

Across the EU-27 over the timeframe 2003 to 2016, the following observations can be made:

- Overall number of farms across EU-27 between 2003 and 2016 declined approximately from 15 to 10 million, a decline of around 32%. This decline was strongest among small farms (below 5 ha), dropping from 10.9 to 6.8 million farms, ie by 38%. Decline among medium sized farms (5-19 ha, 20-49 ha) was moderate (17% and 12%, respectively). Conversely, the number of large farms (larger than 50 ha) increased by 7% across the EU-27.
- Small farms (below 5 ha) represented around 72% of all farms in 2003. By 2016, this had fallen to 67%. In terms of relative share, other size classes grew: medium farms with 5-19 ha and 20-49 ha grew in terms of relative share, respectively, from 17% to 20% and 5% to 7%. Large farms (above 50 ha) rose in terms of relative share from 4% in 2003 to 6% in 2016.
- Farm decline was strongest between 2007 and 2013, particularly among small farms (below 5 ha). Specifically, small farms declined by 7% in 2012. Medium-sized farms (5 to 19 ha) saw the strongest declines in 2009, declining by 6%. Across the EU-27 between 2003 and 2016, larger farms (20-49 ha) and large farms (above 50 ha) remained relatively stable. After 2013, and with the CAP reform, the situation seems to have stabilised.
- The pattern of decline in terms of number of farms is stronger in the newer MS (see Figure 11): strongest decline in BG and SK with a decline of approximately 62% each. Decline is also pronounced in HR (-52%), LV (-45%), PL (-43%), LT (-40%), HU and EE (-39% each), as well as CZ (-37%).
- In contrast, RO only experienced a 20% decline. MT and CY are also relatively stable among the newer MS, with a 16% and a 22% decline respectively.
- The situation is most stable in IE (+3% increase over time period) – the only MS where a positive increase actually occurred over the timeframe.
- Among EU-14, the situation is largely more stable, with MS seeing declines of approximately 20 to 30% between 2005 and 2016.

Figure 6: Change in number of farms and farmer 2005 to 2016 at MS level

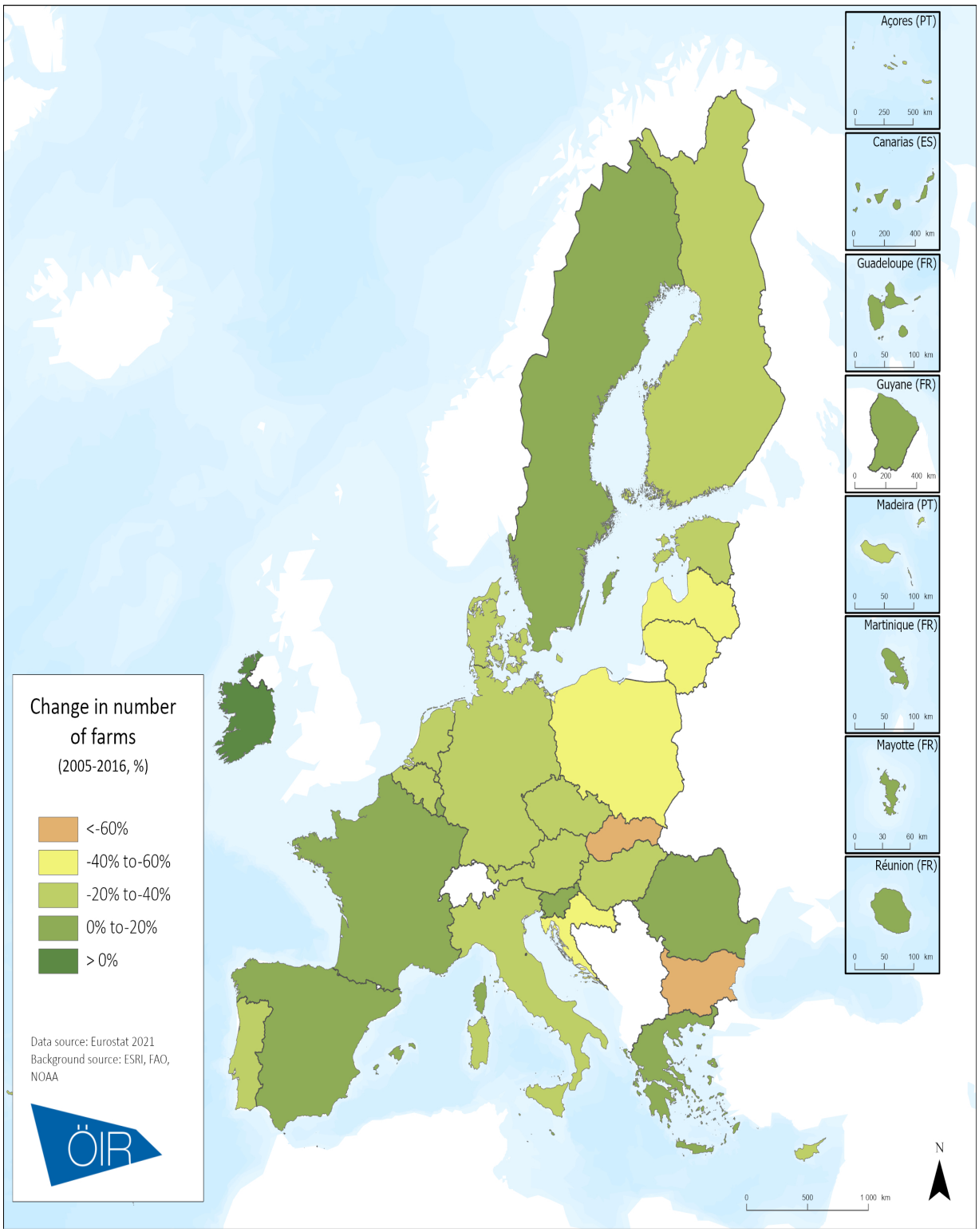
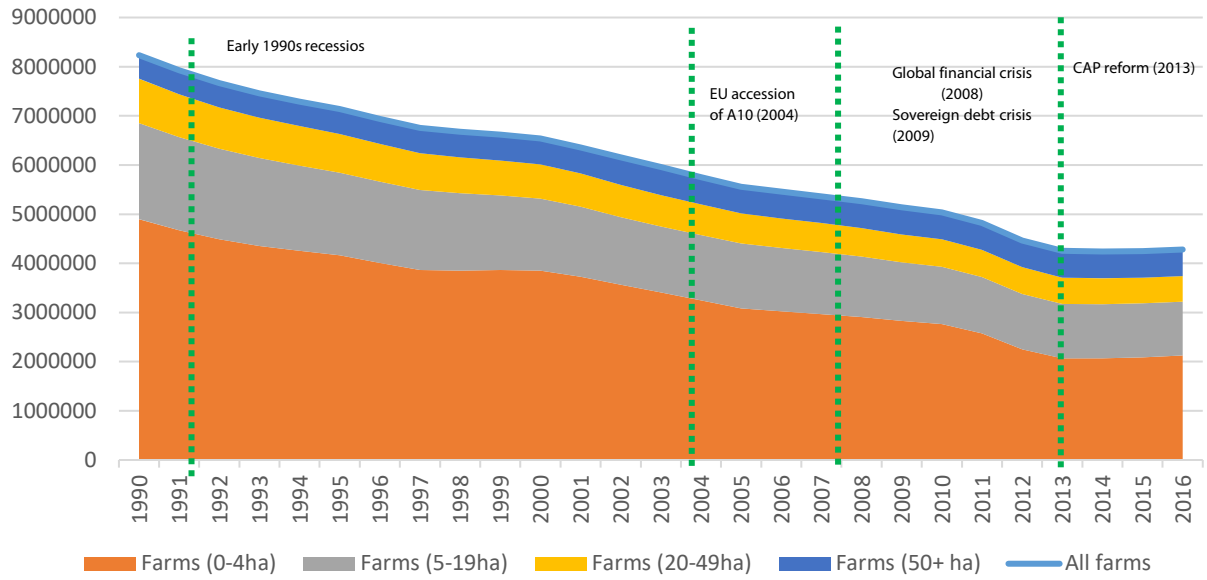
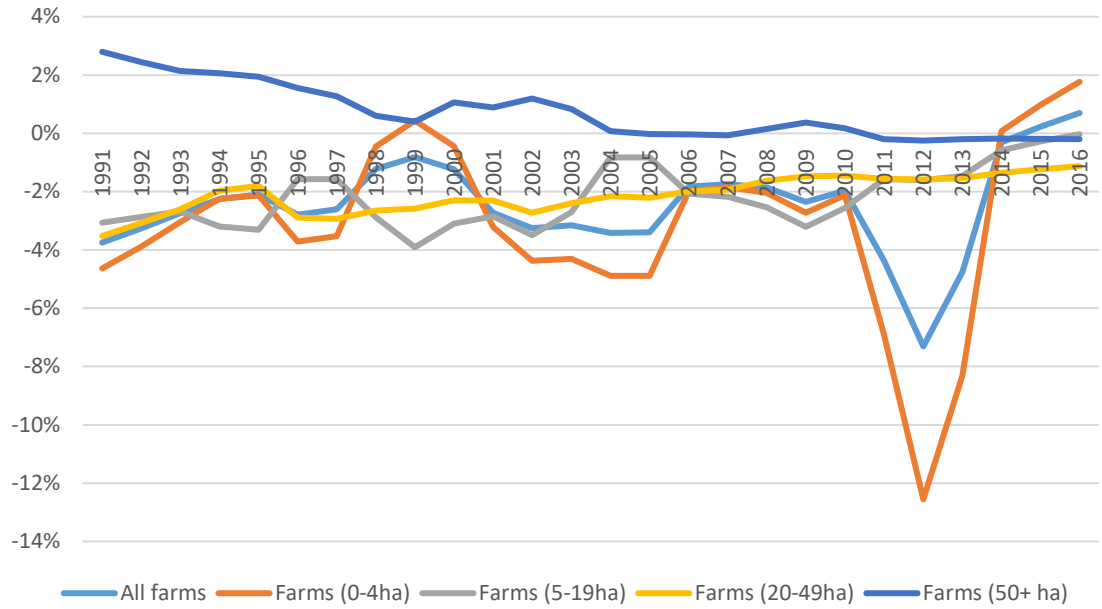


Figure 7: Number of farms and farmer per size class 1990 to 2016 in EU-14[9]



Source: Project team 2021, based on Eurostat FSS data

Figure 8: Annual change in number of farms by size class (EU-14; 1991-2016)



Source: Project team 2021, based on Eurostat FSS data

Across the EU-14 over the timeframe 1990 to 2016, the following observations can be made:

- A downward trend from the 1990s, with an estimated 8.2 million farms, reduced to approximately 4.3 million farms in 2016. This represents a decline of 48%. Small farms (below 5 ha) declined from a share of 60% in 1990 to approximately 50% in 2016. Amongst all size classes, small farms declined the strongest, by 57% (from approximately 48 million to 21 million). Decline

[9] Equivalent to the EU-15 sans UK: AT, BE, DE, DK, EL, ES, FI, FR, IE, IT, LU, NL, PT, SE.
Note: values between 1990 and 1994 were linearly approximated for AT, SE, FI.

among medium sized farms (5-19 ha, 20-49 ha) was also pronounced, declining by 44% and 43%, respectively. The only class size to increase in numbers were large farms (larger than 50 ha), rising by 19% across the EU-14 (453,000 farms in 1990 increasing to 540,000 farms in 2016).

- The rate of decline was relatively stable across the time-period, slowing after the CAP reform in 2013. The pace of decline was strongest in the early 1990s and 2010s (with the 90s recessions, and the global as well as the sovereign debt crisis). These declines were strongest among small farms (below 5 ha) in the early 1990s and, especially, in the early 2010s. For example, between 2011 and 2012, the stock of small farms decreased by 12% in the EU-14. Large farms remained mostly stable throughout the time-period, with annual increases strongest in the 1990s. Post CAP reform there are indications of recovery, particularly among small farms (below 5 ha), with positive growth rates after 2014.

2) Ownership

In general, the vast majority of farms are held by natural persons (see Figure 9). In 2005 98% of all farms in the EU-27 fell into that category. This has not changed significantly since then: in 2016, 96% of all farms remained in that category. However, other forms of ownership have gained in *relative* popularity. For example, close to three percent of all holdings were held by legal persons in 2016, increasing from 1.7% in 2005. Conversely, group holdings have also increased slightly over the timeframe, approaching 0.8% in 2016. Common land units remain the least popular form of farm holding, accounting for around 0.11% in 2016.

Figure 9: Ownership status among EU-27 farms (2005-2016)

Source: Project team 2021, based on Eurostat FSS data

3) Economic performance

Standard output, both in total across the EU and per farm, has increased continuously since 2005, increasing per farm from approximately EUR 18,000 to EUR 33,000 in 2016 (see Figure 10), an increase of 77%. On the other hand, labour input measured in AWU has decreased across the sector from 12.5 million AWU in 2005 to 9.2 million AWU in 2016, a decrease of 27%. However, labour input per farm has remained relatively stable throughout the timeframe.

Figure 10: Economic performance of EU-27 farms (2005-2016) 2005 = 100%

Source: Project team 2021, based on Eurostat FSS data

2.3. Main drivers of farm decline

European agriculture has undergone significant structural changes over the last decades, and years. The most obvious and politically relevant structural developments in EU agriculture can be seen in the declining numbers of farms, the growth in farm size and the re-specialisation of production over time (Neuenfeldt et al., 2019).

The literature offers a multitude of determinants explaining the structural change of farms (Cochrane, 1958; Harrington and Reinsel, 1995; Balmann et al., 2006; Zimmermann and Heckelei, 2012; Chau and de Gordre, 2005; Ben Arfa et al., 2015; Alvarez-Cuadrado and Poschke, 2009 – to name just a few). The consideration of different drivers in this study is undertaken by assigning the different drivers into three concrete categories (as also shown in chapter 1.1/Figure 1):

The **first set of factors** affecting farm structural change relate to the general socio-economic context and are external to agriculture, but may have a strong impact on structural change in agriculture and its value chains. Apart from general socio-economic factors, other factors, such as climate change (including extreme weather events), competition for resource use, and changing consumer preferences and societal demands, including the provision of environmental and social externalities of agriculture, are also considered.

The **second set of factors** deals with sector-specific drivers that trigger farms to adapt their practices. These are, for instance, technological advances in agriculture and digitisation, input and output prices, market and production risks, frictions along the agri-food chain, internal frictions at farm level (path dependency, social factors slowing down of the adaptation process), ongoing loss of biodiversity, obstacles to agricultural productivity and innovation, market valorisation of sustainable farming practices and ecosystem services, access to resources (particularly agricultural land), and land market regulation, among others.

The **third set of factors** relates to public interventions that have been strongly affecting the decision-making process at the farm level. In our theoretical frame, we put the main emphasis on CAP instruments, like Pillar 1 Direct payments and market interventions (CMO), LFA/ANC payments, interventions for environmental, climate and other management commitments, and investment support.

These sets of drivers are represented at Member State and Farm level in the following section. In addition, the current, as well as new emerging potential, drivers are discussed.

2.3.1. Key structural drivers at Member State level

A study published by Neuenfeldt et al. (2019) analysed drivers of farm structural change in the EU-27 by applying the multiplicative competitive interaction (MCI) model and by combining different databases (i.e. FSS and FADN) for the period 1989-2013. The applied model allows for the identification of the effect of various drivers on farm structural change represented by change in farm group shares[10]. The drivers identified can be assigned to the three set of factors described in the section above.

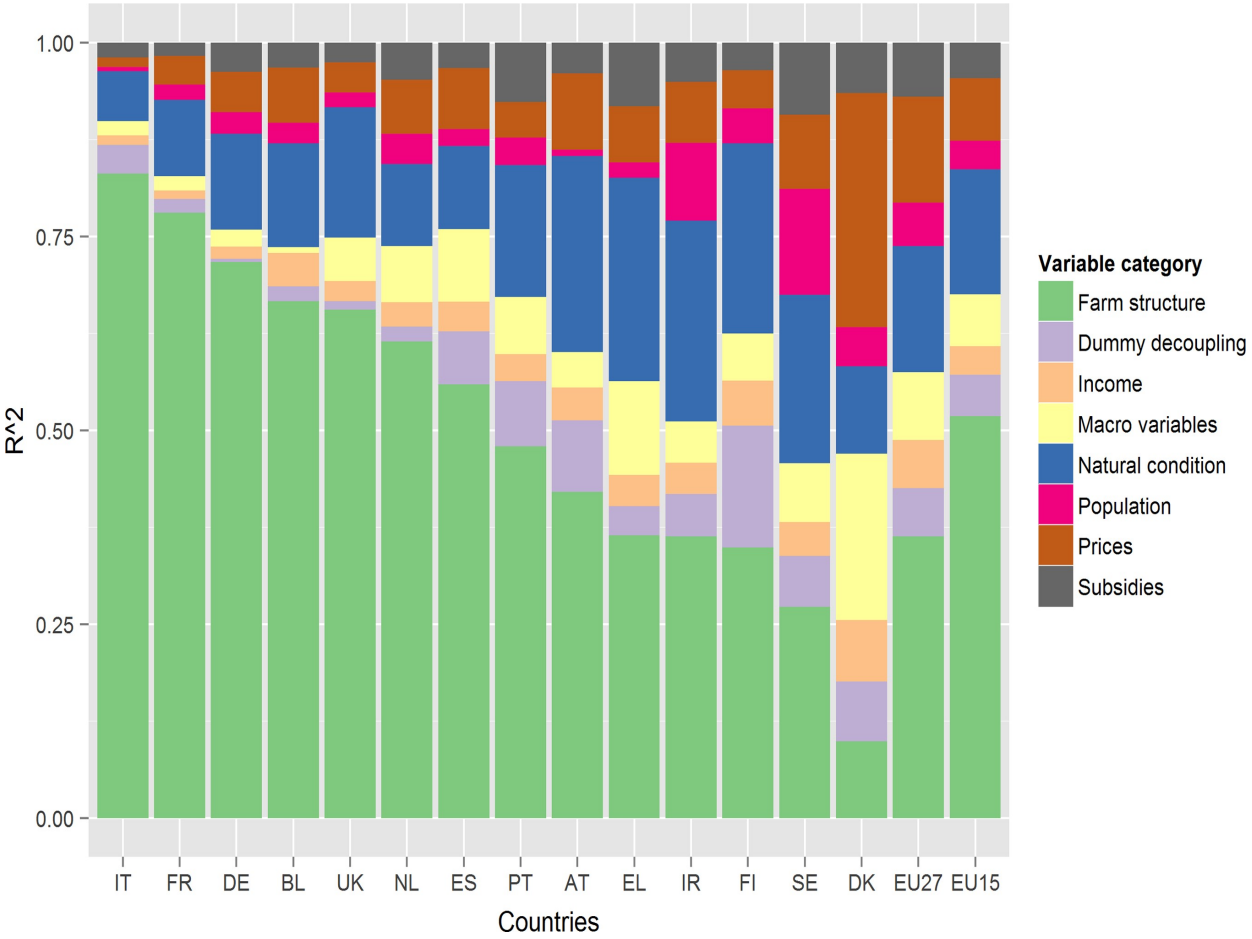
Drivers belonging to the **first set of drivers**, like natural conditions or population variables, explain about 16% or 6% of regional and temporal variation in EU-27 farm structure, respectively. In addition, macroeconomic variables account for approximately 9% of variation. Past farm structures, belonging to the **second set of factors**, represents the main determinant and explain about 36% of variation, indicating the importance of historic specialisation over longer periods and demonstrating that adjustment processes take several years. This is followed by agricultural prices (14%), and farm income (6%). Subsidies, representing the **third set of drivers**, impact farm structure by approximately 7%.

A closer look at the Member State level reveals striking differences between countries belonging to old Member States (EU-15) and those belonging to new Member States (EU-12). While the variable *"past farm structure"* explains approximately 52% of the variance of farm group shares in the EU-15, this is only the case in about 19% of farmers belonging to the EU-12. The countries most rigid and inert to external drivers are FR, IT and DE, while DK, MT, LT, LV, SI and EE show the most dynamic farm structure. The authors conclude that these results reveal a less rigid farm structural change taking place in the EU-12, compared to the EU-15, which might be a result of their recent accession to the EU and the ongoing transition process. The authors further reveal that other drivers play a greater role in new Member States than in old Member States. This is especially the case with regards to the variables: subsidies, prices, macroeconomic and population variables.

Whereas *natural conditions* (like soil type, topography and climate) are – with some variations across MS – of similar importance in explaining farm structures in different regions and structural change in both the EU-12 and the EU-15, *subsidies and income* have a stronger impact in the EU-12 compared to the EU-15. This result emphasises the significant impact of future CAP reforms on the development of farm structure – especially in the new Member States. *Macroeconomic variables* (like unemployment indicators, GDP growth rate and interest rate) are important drivers in countries like MT, LV, SI, DK and EL, whereas *population variables* (like population density or farmer's age) have a strong influence on structural change in CY, EE, IE, HU, BG and SE. *Input and output prices* have a higher impact in countries belonging to the EU-12 (20%) compared to countries belonging to the EU-15 (8%).

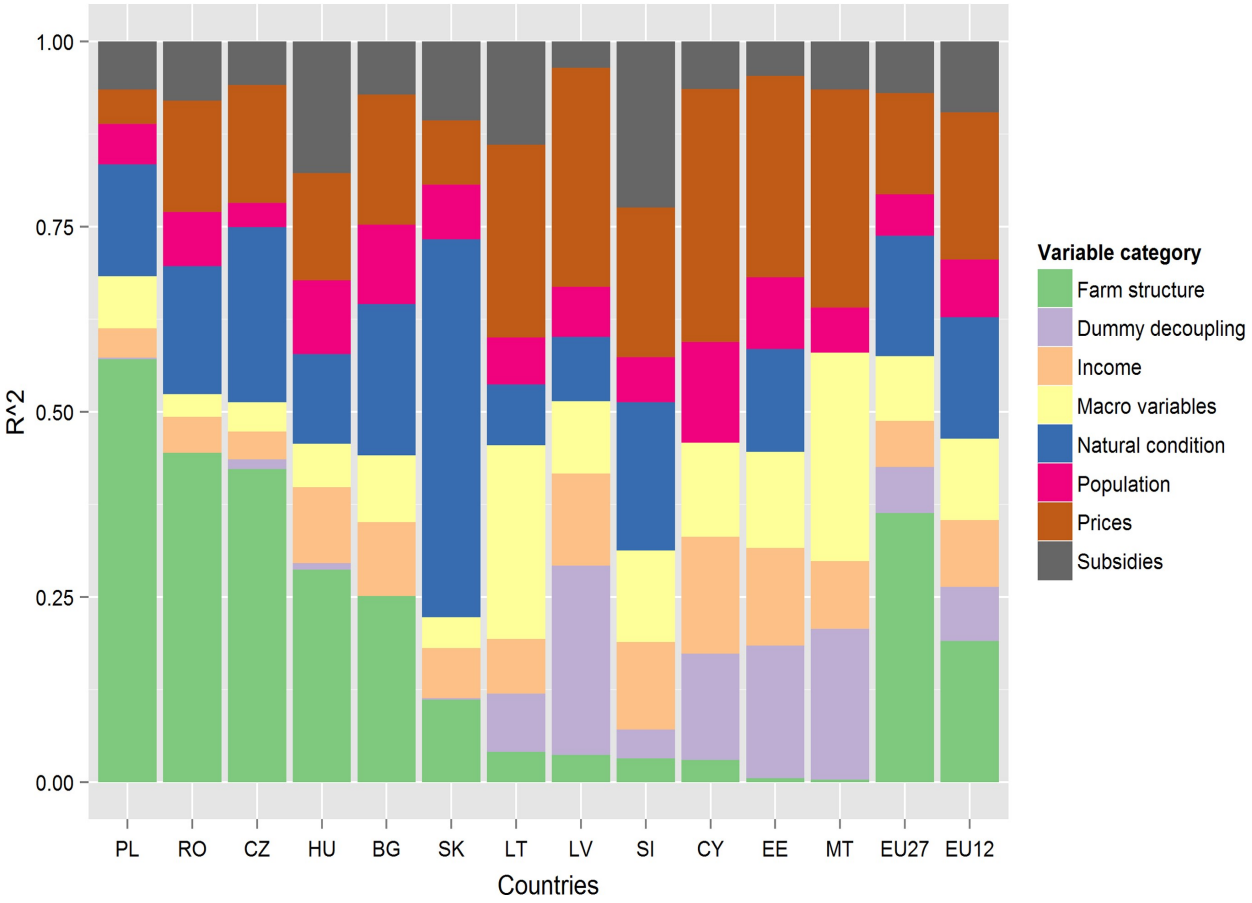
[10] The authors defined farm groups by combining size class characteristics with production specialisation of farms. In total, they considered 2 size classes (i.e. small farms with standard output (SO) < 250.000 Euros and large farms with SO > 250.000 Euros) and 8 production specialisations (i.e. field crops, horticulture, permanents, grazing livestock, granivores, mixed cropping, mixed livestock and mixed both).

Figure 11: Variance decomposition by country in the EU-15



(Note 1: Belgium and Luxemburg are treated as one MS; Note 2: The dummy decoupling captures the effect of decoupling of direct payment introduced in 2003.)

Figure 12: Variance decomposition by country in the EU-12

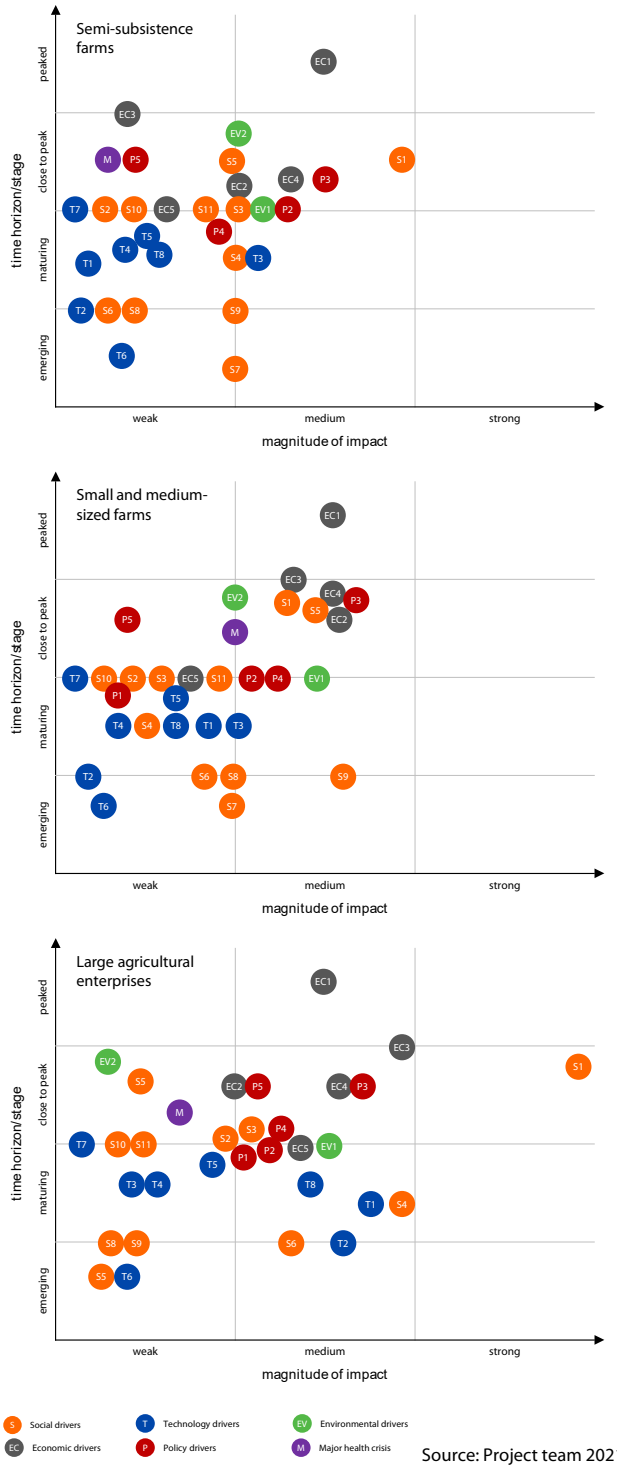


2.3.2. Key structural drivers at farm level

Based on the defined drivers of change, the project team developed a matrix to conduct a systematic analysis of drivers impacting farmers and thus also farming decline. A more detailed description of the matrix and the conducted analysis can be found in chapter 1.2 and in annex A.2 to A.4. While the analysed drivers derived from the study "Farmers of the Future" – which in return is based on literature review by the authors – the judgement is based on project team expert knowledge. In addition, an assessment was conducted of the impact of a major health crises (like the Covid-19 pandemic) in terms of its time horizon or stage (i.e. whether it is just emerging, maturing, close to peak or even peaked), against its magnitude of impact (i.e. whether it has a weak, medium, strong impact on farms) – see Figure 13. Since diverse drivers impact various types of farms differently, we distinguished between the following three types of farms:

- semi-subsistence farms (where the focus is on growing a high proportion of food to feed farmers and their families)
- small and medium-sized farms that are generally family-run businesses
- large agricultural enterprises which are more likely to have a legal form or be cooperatives

Figure 13: Experts judgement of drivers in term of temporal occurrence and magnitude of impact



Source: Project team 2021

Social, economic and environmental drivers represent examples of the **first set of drivers**. *Social drivers* range from "emerging" to "close to peak" (i.e. the maximum carrying capacity of a given condition has almost been reached). In particular, S1 (size of world population) stands out, which is judged as being close to peak and either having a medium (semi-subsistence and small and medium sized farms) or a strong impact (large agricultural enterprises) on farms. In contrast, S4 (migration) has a rather strong impact on large enterprises, while it has a rather weak to medium impact on smaller farm structures. *Economic drivers* are assed as being "closed to peak" or even "peaked" and are of particular importance for large agricultural enterprises, as well as for small and medium-sized enterprises (but to a slightly lower extend). EC1 (economic growth) has being assessed as having a similar impact on all three types of farms. Climate change (EV1), as one of the most important *environmental drivers***,** is judged as being on a "maturing" or "close to peak" stage. Its magnitude of impact is assessed as being medium within all three farming types. The newly emerged driver of *"major health crises"* is judged as having a weak to medium impact on the different types of farming.

Most of the emerging or maturing *technological drivers* (T1 – T8), as part of the **second set of drivers**, have a rather weak impact on semi-subsistence and small and medium sized farms, whereas they are judged as having more often a medium impact within large agricultural enterprises. This is especially the case for T1 (precision agriculture – Internet of Things IoT), T2 (automation and robots) and T8 (biorefinery and biofuels).

Within the **third set of drivers**, especially P3 (Common Agricultural Policy, CAP) stands out, having a medium impact within all three types of farms.

The impact of each driver was further assessed by **"type of impact"** (direct/indirect and positive/negative). Within the group of *social drivers*, "ageing of EU population" was assessed as having an indirect impact on farms, with negative implications on semi-subsistence and small and medium sized farms. "Migration" was assed as having only an indirect impact on small structural farms, with neither positive nor negative effects. In contrast, this type of driver is assessed as having both positive (e.g. immigrants as

agricultural labour can lead to an increase in the number of large agricultural enterprises) and negative impacts (e.g. immigrants could lead to a reduction of the already existing/hired labour force) on larger farms. The indirect driver "values placed on rural areas, tradition and culture" is assessed as having positive impacts on semi-subsistence and small and medium sized farms, whereas negative impacts on large agricultural enterprises. *Environmental factors* (climate change and availability of natural resources) are attributed with both direct and indirect impacts on the different types of farms. While climate change is mainly attributed with negative impacts, the (non-)availability of natural resources can encourage semi-subsistence farms and small and medium-sized farms to find alternative production opportunities in "niches" and to incorporate more adaptive practices. In terms of *economic drivers***,** some have a rather positive impact and others a more negative impact on the different farming types. While "globalisation" is seen as an indirect and negative driver for all three farm types, "economic growth" and "financial investments" have a positive impact on large agricultural enterprises. *Technological drivers* tend to have more negative impacts on semi-subsistence farms, mixed impacts on small and medium types of farms and positive impacts on large agricultural enterprises. Through improved living and working conditions, rural development policies (as one of the *policy drivers*) can have a positive impact on all three farming types. In addition, the different CAP payments are judged as having positive inclinations on "farm survival" within all three types. Whereas "food policies" was assessed as having a rather limited impact on semi-subsistence farming, its impact may be positive or negative on family-run farms or large agricultural enterprises. As a positive example, the potential of improving agricultural producers' position in domestic markets was mentioned, whereas as negative example a tightening of hygienic condition that forces farmers to invest was mentioned. This overview shows only a few examples of the extensive evaluation of the drivers. Detailed lists of the results can be found in the annex, A.2 to A.4.

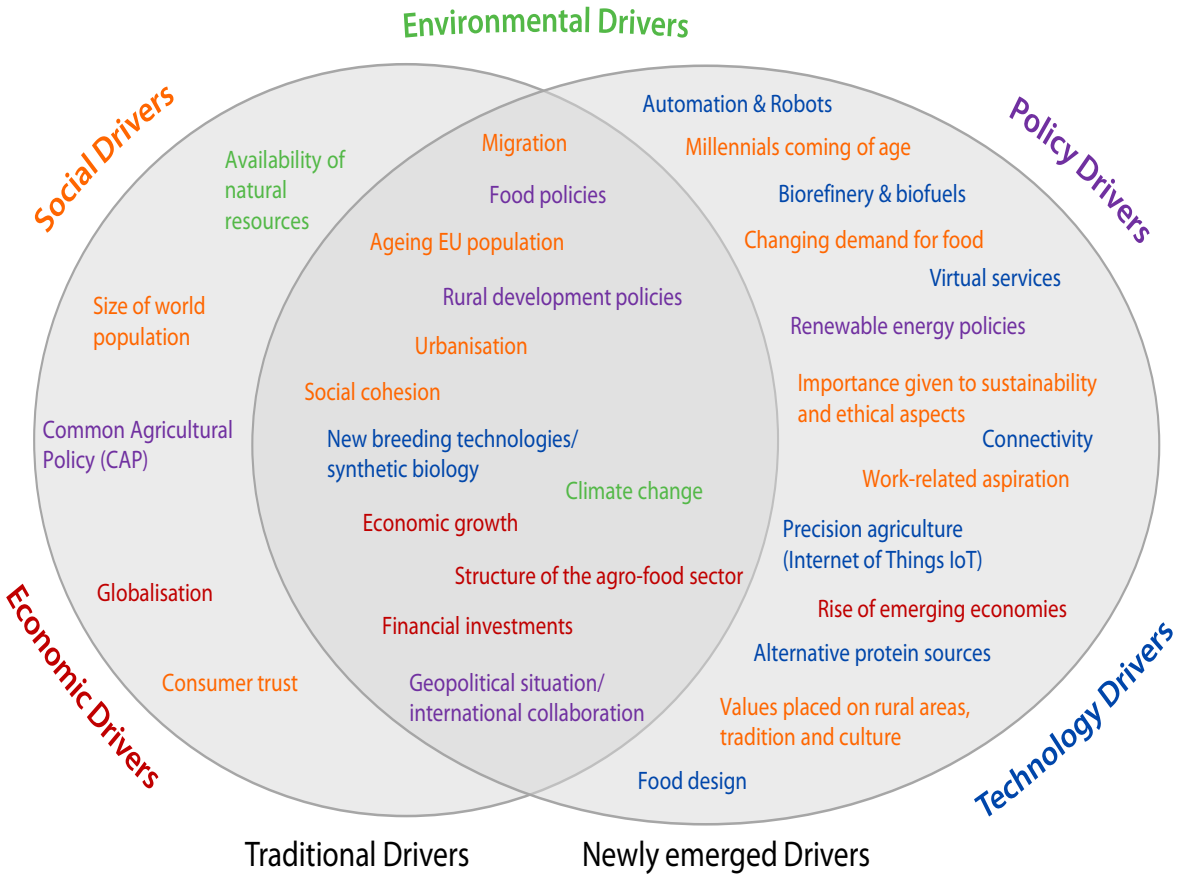
2.3.3. Occurrence of drivers and new emerging (potential) drivers

The project team further assessed the different drivers according to their occurrence – i.e. whether they are more traditional drivers or drivers that are emerging as a result of recent trends and likely to play a greater role in the near future (Figure 14). Other drivers are assigned to both types of occurrences. As can be seen from the figure below, all types of drivers (i.e. environmental, social, economic, technological and policy drivers or drivers belonging to the first, second or third set of factors) can be found in both – in traditional and newly emerging drivers.

Apart from the above listed determinants, unexpected events or crises at different levels also affect the agricultural sector. This includes extreme weather-related events (such as drought, flood or natural disasters) or economic, social or political disturbances (such as trade bans or price peaks). The ongoing **Covid-19 pandemic** is a recent and unexpected example that affects more or less all sectors and their involved actors. Even if no major food shortages have emerged as yet, the agricultural sector – including food markets – was still facing disruptions due to labour shortages caused by restrictions on the movement of people, closures of restaurants, schools and other institutions, as well as income losses. As Laborde Debucquet et al. (2020) pointed out, the Covid-19 pandemic affects all pillars of food security:

- Availability: is the supply of food sufficient?
- Access: can people get the food they need?
- Utilisation: do people absorb enough nutrients?
- Stability: can people access food at any time?

Figure 14: Occurrence or presence of different type of drivers



Source: Project team 2021, based on data from Bock et al., 2020

Likewise, Béne (2020) emphasised that the Covid-19 pandemic illustrates how fragile our food systems are and how easily they can be disrupted. Based on various sources, the author synthesised different types of adverse effects on various actors operating in food systems and subsequent levels. The following figure shows the adverse impact on producers (e.g. family-based farmer or larger dairy enterprises) and expected direct and indirect effects on various actors' food security.

Figure 15: Adverse impacts on producers and effects on food security due to Covid-19

Types of adverse impacts on producers	Expected **direct** effect on actor's food security	Expected **indirect** effect on other actor's food security
• Disruption in input supply chain (e.g. fertilizer) and/or subsequent increase in input prices; • Reduction in demand of certain products (excess supply) leading to drop in farm-gate product prices; • Reduction in labour/workers availability (due to mobility restriction, increase in public transport costs, or fear of exposure to virus)	Drop in profitability affecting producers' income, purchasing power and access to traded food	Reduced food availability for retailers, vendors and eventually consumers; disruption or reduced stability of food availability

Source: Project team 2021, based on Béné, 2020

Nevertheless, a very recent study published by Meuwissen et al. (2021) analysing the impact of Covid-19 on farming systems in Europe came to the conclusion that the impact of Covid-19 on the production and delivery of food and other agricultural products was rather limited. If challenges – such as labour shortages – already existed pre-Covid, they remained during the crisis. Further they emphasised the important role of resilience characteristics. The study authors found that characteristics of high interconnectedness and diversity contributed significantly to the ability of a farm system to deal with the crisis. Nevertheless, they stress that the short-term shock (at the beginning of the crisis) has already evolved into long-term stresses – especially at the macro-economic level. They concluded that anticipatory capacities need to be strengthen at all levels, especially the ability to detect signals of impeding threats – whether short-term (such as the first wave of the Covid-19 pandemic in spring 2020) or long-term (such as climate change or biodiversity loss).

In the long-run we will see whether the Covid-19 pandemic will either directly (due to labour shortages) or indirectly (due to new consumption trends and new macroeconomic conditions of agri-food) influence the agricultural change. As these implications on the decline in the number of farms and farmers in the EU is not yet clear.

2.4. Case studies: the causes and consequences of farming decline

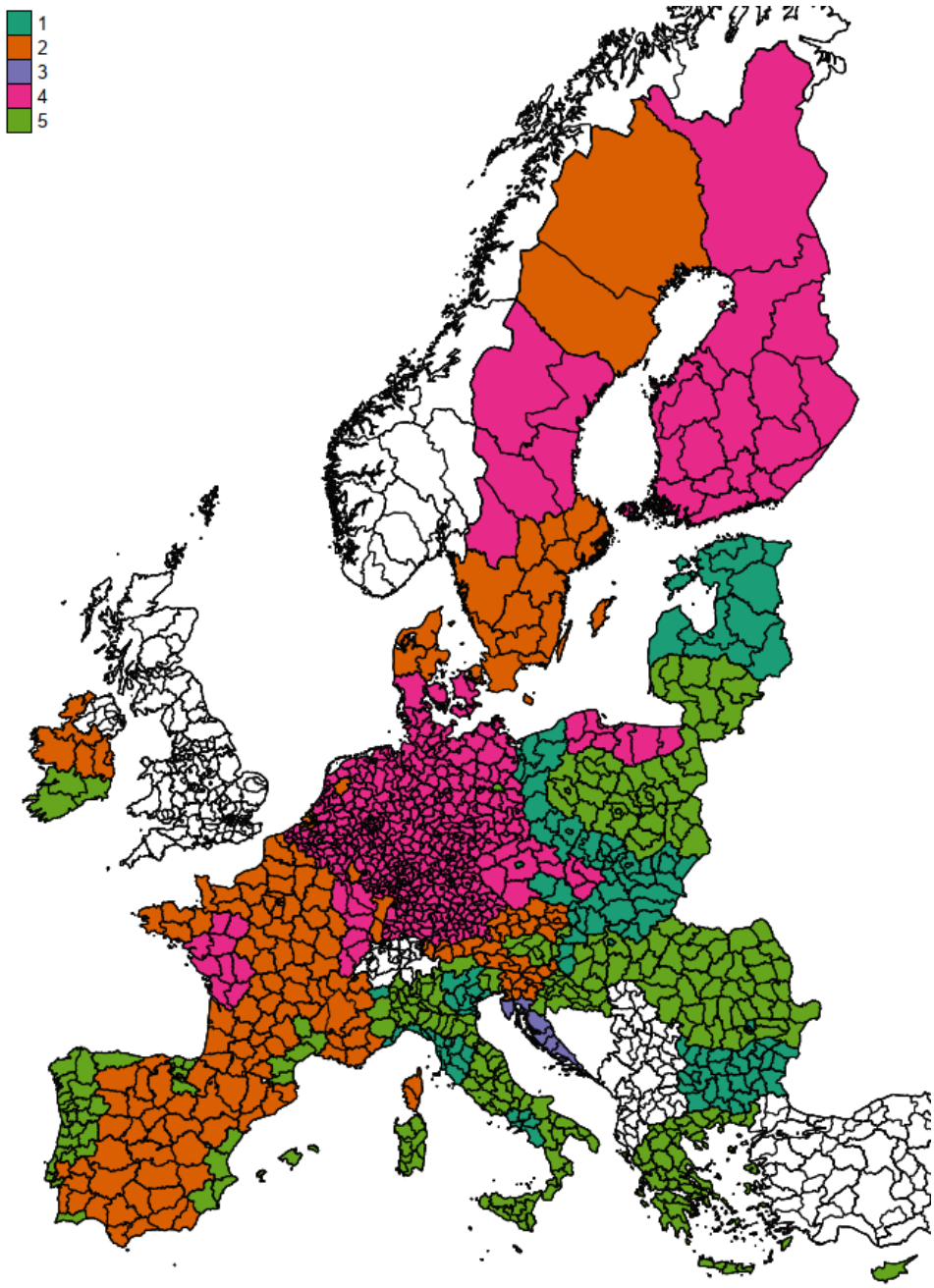
2.4.1. Case study selection

As a key input for the case study selection, the project team developed a regional typology of the scale of the farm and farmers decline according at NUTS2 level. This typology was developed via a cluster analysis[11]. A cluster analysis relies on two core principles: intra-cluster homogeneity (e.g. territories within the same cluster show similarities in the decline of farms and farmers) and extra-cluster heterogeneity (e.g. territories from two distinct clusters show different profiles).

This regional decline was analysed along the eight key farming indicators, namely: (i) Change in number of farms and farmers (2005-16); (ii) Farm holding concentration – Change in the share of small farms of total farms (2005-16) and share of small farms (2016); (iii) Change in utilised agricultural area (2005-2016) (UAA) and change in average UAA per farm (2005-2016); (iv) the economic characteristics of the farm sector (standard output in 2016 and share of primary sector value added in 2018); and (v) Change in annual work units (AWU) (2005-2013).

[11] The cluster analysis was implemented using k-pod estimations, an extension of k-means which can mitigate issues related to missing data.

Figure 16: Regional dynamics of farm decline EU-27 between 2005 and 2016



Source: Project team, 2021, based on Eurostat and DG AGRI data

The cluster analysis (see Figure 16) produced five distinct clusters which enabled the definition of a regional typology of farm decline. An overview of the defining characteristics is provided in the table below (see Table 4).

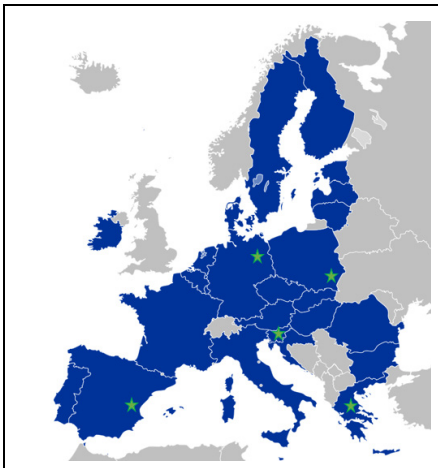
Table 4: Characteristics and dynamics of farm decline per cluster

Cluster name	Change in farms	Change in small farms	Change in average UAA per farm	Change in AWU	Economic characteristics
1 – Regions with strong farm concentration and decline	Strong decrease	Strong/moderate decrease over 2005-16, high of small farms (2005)	Strong increase	Strong decrease	Low farm output, moderate regional importance (% GVA)
2 – Regions with low farm decline	Low/moderate decrease	Low decrease over 2005-16, small share of small farms (2005)	Low increase	Low decrease	High farm output, moderate regional importance (% GVA)
3 – Residual cluster regions with growing farms[12]	Increase	Increase in small farms over 2005-16, high share of small farms (2005)	Strong increase	Strong increase	Low farm output, moderate regional importance (% GVA)
4 – Regions with strong small farm decline	Moderate decrease	Strong decrease (2005-16), small share of small farms (2005)	Moderate increase	Low decrease	High farm output, low regional importance (% GVA)
5 – Regions with moderate decline and farm concentration	Moderate decrease	Low decrease, high/moderate share of small farms	Moderate increase	Moderate decrease	Low farm output, high regional importance (% GVA)

Source: Project team, 2021, based on Eurostat and DG AGRI data

[12] As this cluster represents the special case of Adriatic Croatia, it is treated as a residual cluster.

Based on this analysis, five regions were selected that cover distinct geographical locations (e.g. Southern Europe, Central and Eastern Europe, etc.) and different territorial types of patterns (e.g. coastal regions):



Country	NUTS2	NUTS3 region
Slovenia	SI03 Eastern Slovenia (Vzhodna Slovenija)	SI014 Savinjska
Greece	EL61 Thessaly	EL611 Karditsa
South Poland	PL82 Podkarpackie	PL822 Przemyski
North Germany	DE40 Brandenburg	DE40F Prignitz
Spain	ES52 Valencian Community	ES522 Castellón

Within each NUTS2 region one appropriate region was selected which is representative of the challenges in terms of farm decline and its drivers as well as where interesting micro-economic pathways have been implemented to address the consequences of farm decline. All case study reports can be found in annex A.5.

2.4.2. Cross-comparison analysis of findings

Przemyski is one of four NUTS3 regions in Poland's Podkarpackie province, a rural area categorised by mountainous landscapes and a border region with Slovakia in the South, as well as an EU-external border with Ukraine in the East. Population figures over the entire region are stagnating. The unemployment rate is 8.1%, with employment dominated by the agricultural sector (35% of economically active residents) followed by industry (26%) and the service sector (18%) (Urząd statystyczny w Rzeszowie, 2021). Przemyski offers good conditions for farming. Land is available and the soil is well-suited for agriculture enabling farmers to achieve a high level of productivity. The average farm size is approximately 50 ha, and according to interviewees, farmers can live on agricultural activities alone.

Prignitz region belongs to the German state of Brandenburg which has a population of 2.5 million inhabitants concentrated in large urban centres. In Brandenburg, the primary sector accounts for 1.98% of the region's GVA, and 3% of active employment (MLUK, 2021). Brandenburg is characterised by its flat landscape, numerous lakes and waterways, and a border with Poland in the East. Farmers here cultivate around 1.3 million ha of UAA, with an average farm size of 242 ha, far above the national average of 63 ha. Prignitz has many cooperatives and the state's highest farmer numbers, as well as the second-highest UAA surface. The number of cooperatives has been declining in Prignitz due to ageing populations and retirement, as well as sales to investors or other farming enterprises. However, interviewees have indicated that this demographic trend appears to be stabilising in recent years.

Castellón is the Northernmost province of the Valencia region in Spain containing coastal and mountainous landscapes. The 5 million inhabitants of Valencia are mainly concentrated in its coastal urban centres (EUROSTAT, 2021). The coastal area exhibits an intensive production model and a high share of irrigated lands, while the more mountainous inland farms tend to be extensive and rain-fed. The Valencia region has many small-sized agriculture holdings, with the second-smallest farm structure in Spain attributing to the structural problems observed in the region. It further has a decreasing share of

the primary sector, currently as low as 2.34%[13]. Despite this, in the Castellón region, small-scale farming demonstrates a strong position and occupies a large role in the community.

Savinjska belongs to Eastern Slovenia region which has 1.1 million inhabitants, representing more than half of Slovenia's total population (52.5%, MKGP, 2020). Intensive agriculture predominates the flat parts of the Savinja Valley, while the more hilly and less accessible areas are mostly covered with forest or are overgrown. Agricultural activity represents 3.9% of the regional GDP, while the share of employees in agriculture is 5% (RASR, 2021). The decline in farming structure is currently not as adverse as in some other regions, but is expected to worsen in the future, according to interviewees. The region is characterised by a high percentage of LFA areas (85.4% in 2016) and an average farm size of 6.4 ha, slightly below the national and regional average (SORS, 2021).Even so, some of the largest farms in the country are also situated in Savinjska. The structural trends in agriculture largely follow the wider region, exhibiting a decreasing number of small-scale farms and a concentration and slight intensification of production.

Karditsa is located in Thessaly in central Greece, the third most populated region of Greece with 722,065 inhabitants, or 6.7% of the national population[14]. Karditsa exhibits fragmented small-sized farms, high production costs, and weak bargaining power of non-consolidated primary producers relative to their purchasers as well as input and service providers. In addition, there are significant environmental challenges in terms of water shortages, which exert pressure on the existing model of production. According to interviews, agricultural structural adjustment in the Karditsa region has accelerated in the last decade, marked by a reduction in the number and increase in the size and intensification of agricultural holdings, as well as by an increased rate of farmland rental.

Drivers of farm decline

The five regions examined exhibit several common drivers of farm decline. These drivers are primarily structural, economic, and social in nature, and to a smaller degree environmental.

Structural changes in the investigated regions demonstrate two distinctive characteristics: (i) reduction of the number of agricultural holdings and enlargement of their size, and (ii) increase in farmland rental rather than purchase. The main structural driver of farmer number decline is related to small-sized and fragmented farm holdings operating within a market structure that favours intensive production and large-scale farms, an issue reported in all case study regions. Smaller-sized holdings have difficulty taking advantage of economies of scale; investing in machinery, irrigation, and automation; and accessing markets; observed in all case studies explored.

In some regions, this issue is bridged by strong cooperatives, as is the case in Prignitz and Przemyski. However, ageing and retiring populations, a concern in all regions, place pressure on cooperatives to buy out shares. In Prignitz, for example, cooperatives have sold land and downsized in response to farmers retiring. Another issue limiting the effectiveness of cooperatives in some regions, such as Karditsa, Castellón and Przemyski, is the observation that while many cooperatives are in place, they presently lack the organisation and technical skills required to adequately support farmers. In Castellón, furthermore, failing cooperatives leave farmers without access to markets on which they previously relied. In Savinjska, a collective group has managed to connect farmers with a collective brand with some success; while conversely, distrust of the LAGs has been reported.

[13] Statistical data from 2016
[14] Population statistics from 2008

Further factors constraining the efficiency of small-scale farms are limited access to processing facilities and stringent regulations (including those for on-farm slaughter). As reported in Savinjska and Przemyski, investments in processing capabilities, and perhaps, alleviation of some of the stricter guidelines around on-farm slaughter could help small farmers significantly improve their margins.

Farm regions in close proximity to growing urban centres, particularly evident in Castellón, Prignitz and Savinjska, face pressure from urbanisation and increasing prices of farm land, resulting in barriers to entry for young and new farmers, and a tendency toward land sales and speculative investments. All regions commonly report the sale of land to large-scale intensified enterprises and speculative investors as a barrier to entry. Such structural changes have been found to unfavourably impact the resilience of existing farming communities.

Barriers to entry compound the issue of both demographic change (aging populations), and rural exodus, as observed across the case study regions. Castellón interviewees report that farm decline in inland areas occurs gradually and often leads to abandonment, which has social consequences and marks an emerging trend for depopulation in parts of the area (Ortega-Reig et al., 2020). In Prignitz, nearby urban centres create a pull effect, making it difficult to attract a workforce to rural areas. The unfavourable age and education structure of many farm holders, and weak knowledge transfer (non-existing public extension service), have additionally contributed to the structural decline of the agricultural sector, noted in Przemyski, Karditsa, and Castellón. Particularly in Przemyski, the digitalisation of many technical aspects of farming is seen as a barrier for older farmers.

The economic drivers reported are strongly linked to the structural drivers observed. Notably, competition with large-scale farms is reported in all regions. Tightening margins are another problem for farmers. Increases in the cost of inputs (i.e. fertilisers, labour, land, etc.) and reductions in the prices obtained from sales, are reported to squeeze margins and particularly affect small-scale farmers in Castellón, Karditsa, Savinjska, and Prignitz. In addition, weak bargaining power of non-consolidated primary producers towards their purchasers and input and service providers (for example insurance and banks), is reported to contribute to farm decline.

By supporting a tendency toward so-called couch farmers (farm land owners not actively farming), and indirectly contributing to the observed trend of land renting, land price increases, and speculative investing, some aspects of the EU subsidy system are reported to negatively affect farming communities, and contribute to structural drivers of farm decline in some regions. This trend is reported in Savinjska, Karditsa, and Prignitz. In Savinjska, the Farmland and Forest Fund has been purchasing land in an attempt to reverse this trend. On the other hand, in Przemyski, it is reportedly unthinkable to run a farm without CAP support. While case study regions report concerns with the EU subsidy system, the overall consensus is that subsidies are indispensable, but should be further tailored to reverse some of the negative aspects observed.

Warmer regions prone to drought, and particularly those without irrigation, such as in parts of Castellón and Karditsa, cite rainfall as an important environmental driver of farmer decline that exerts pressure on existing agricultural practices. In Karditsa, unsustainable agricultural practices, including repeated plowing and a lack of crop rotation practices, are considered an environmental concern for the long-term sustainability of the agricultural region. Apart from this, few other environmental drivers were reported. Respondents from Prignitz recognised that environmental factors would likely present serious issues in the near future, but reported that, at present, the agricultural regions have been adjusting adequately.

Overview and analysis of micro-economic pathways implemented by farmers in the 5 region, and corresponding consequences of farm structures

Study findings highlight different adaptive micro-economic pathways among the case study regions. The differences in approach can be attributed to variations in the regions' economic development, structural characteristics, geography and infrastructural capacities, farmer knowledge and skillsets, the presence and strength of cooperatives and other organisations, and the type of primary production in place.

All regions, however, report intensification and economy of scale as highly relevant microeconomic pathways. In Castellón, Savinjska, Karditsa and Przemysk, these pathways were found to be the most relevant contributing to structural change, while the Prignitz region reported them as important adaptive strategies. The Savinjska region noted intensification as particularly relevant among hop growers and farmers wishing to expand, whereas in Przemysk intensification is the dominant strategy among all farms. Prignitz reports that intensification, while relevant, has been relatively stable over the last 10 years.

In the region of Castellón, small and medium-sized farms exhibit less flexibility in choosing a particular pathway, as small farm groups often lack the background conditions (including professional skills, access, and availability of information and collaboration) required to select specific development pathways. This can also contribute to the gradual decline of small farming observed in the region. That said, respondents reported that specific niche strategies and case-by-case positive future outcomes may be possible even within very small farms.

Other regions report more variety among other adaptive measures. For example, value added is a particularly important development strategy for Przemysk, where farmers report many benefits from value added and have a high interest in expanding processing capabilities. Farmers in Prignitz focus on policy optimisation, where it is reportedly completely integrated in the day- to-day work of a farmer, and seen as an important adaptive strategy for future innovation. In the Karditsa region, the closing of operations and aggravated environmental conditions potentiate a permanent abandonment of farming in areas with natural constraints. In Savinjska, generational change has contributed to the abandonment of milk production, and the transition to suckler cow production, which is less labour-intensive.

A table summarising the microeconomic pathways applied and their level of occurrence across the case study regions is presented below.

Microeconomic Pathway	**Intensity of occurrence**				
	Castellón	Savinjska	Karditsa	Przemyski	Prignitz
Intensification, specialisation, economy of scale	1	1	1	1	3
Adding value to agricultural production (e.g. Quality schemes)	6	3.5	3	2	4
Ecologisation of farming (organic, local)	4	3.5	6	3	5
Off-farm employment (pluriactivity)	2,5	2	4	3	6
Policy optimisation	5	6	5	not relevant	1
Abandonment of farming	2,5	5	2	4	6

*the most intensively occurring pathway (ie. the most numerous in terms of no. of farms attached) is denoted by 1

Changes to the farming model

The reported changes to the European Farming Model (EFM) vary across the case study regions investigated, both in terms of the speed of structural changes and the perception of these trends, which may be seen as positively or negatively impacting local development. All case study regions report an overall trend of consolidation, intensification, and loss of small family and patrimonial farms, however, in some regions this structural change is accelerated, while in others it is reported to be moving more slowly. In Przemyski, this consolidation and intensification trend is seen as positive, as it has been increasing the productivity of the farming sector. Many regions, including Karditsa, Castellón, Przemyski, and Savinjska see adaptive and diversified farms as the future, with the regions Karditsa and Castellón further observing that young and new farmers most positively support this trend. The importance of CAP implementation is recognised across the regions, albeit Savinjska, Przemyski, and Prignitz report the need for further adjustments to fully maximise the potential for an adaptive, future EMF. A brief summary of the main points reported in each of the regions explored are provided below.

In the **Karditsa** region, according to interviews, the main features of the changing EFM are enlargement of farm size, reduction of agricultural holdings owned by elderly farmers, implementation of more environmental-friendly agriculture, and increased contract farming, which applies to livestock farms as well. Adaptive and diversified farms are seen as among the best-suited for the increasingly unstable environmental, market, and institutional conditions in which agricultural production will operate in the future. This is an emerging farm model, primarily represented by young farmers and new entrants, while intensive, specialised farmers represent the backbone of the regional farm model, with the prevailing production orientation being intensive livestock. According to respondents, this farming type is less adaptive to changes and its representation in the future is expected to decrease. Interview results emphasise the importance that CAP instruments and Pillar 2 measures have in safeguarding socio-economic stability and decelerating depopulation.

In **Castellón,** the high share of small-scale farming appears to support the continued relevance of the EFM, even if this share is gradually decreasing, and with it, its economic influence of small-scale farms in this region. However, there is no evidence to indicate that a sharp decrease or end to small-scale farming should be anticipated in the short and medium-term future. As such, it is useful to consider how multifunctionality can be achieved by small and medium-sized farmers in the region. Assessments show that small and medium-sized farms perform an important function in maintaining rural populations by conserving actual population members, preserving land management and related landscape shaping and ecological functions, and mitigating shrinking trends for rural areas.

In **Przemyski,** even though small farms are statistically dominant, they rarely pursue agricultural activities, which is reported as problematic. Therefore, moving away from very small farms is not necessarily seen as giving up the EFM of diversified agriculture in the region, but rather as supporting it, since it makes space for mid-sized farms to thrive. Generally, viability in this region requires running somewhat larger farms (mid-sized to large-sized), according to respondents. However, the basis for fruitful development of small-sized farms lies in partnerships between farmers and processing and production companies.

Changes in the farming structure of the **Prignitz** region appear to favour a convergence of farming sizes. Smaller family farms either grow or close, and cooperatives are shrinking in terms of surface area and membership. Specialised focus on one product (such as cereal, milk, or meat) and integration of the value chain have been noted, but only in some branches of the primary sector. In Prignitz, there is a growing interest in green energy production in the form of bio-gas or land leasing for photovoltaic panels or windmills. Land leasing in this regard has been seen as both positive and negative, as it can

compete with productive land. In the energy sector, according to respondents, farm cooperatives could be more advantageous than a familial model, as they allow for more economy of scale and economical resilience.

In **Savinjska,** the trend toward adaptive and diversified farms is already present, as young, entrepreneurial farmers taking over farms look to the future. These agricultural holdings will become either diversified or intensive. Large-scale intensification will also depend on the policy framework, which in the Savinjska region has been reported to sometimes stimulate farmers to make investments based on unrealistic assumptions. Although patrimonial farmers currently exist, they will likely disappear in the future, as younger generations' decision-making is unlikely to be based on emotional attachment. Semi-subsistence farmers are present, but their existence is largely dependent on the economic situation. In Savinjska, farms serve as a social buffer, and agricultural policy, therefore, does double duty as social policy in rural areas.

Recommendations

Many common recommendations are observed among the case studies explored. These can be summarized as (i) support for small and mid-sized farmers and improved market integration, (ii) digitalisation, (iii) generational renewal and support for young farmers (iv) increased focus on the CAP and advisory services with the aim of supporting small and mid-sized farmers.

Even though the regions explored experience a different degree and rate of farm intensification and loss of small-sized farms, a main recommendation across all regions is to strengthen the support of small and mid-sized farmers through policy measures, cooperatives, processing capabilities, and better integration within the market. Small and mid-sized farmers are seen as the primary group likely to support innovation, diversification, and ecologisation, and it is therefore recommended that concern for this farmer group emphasizsd, and that collective action is enhanced and implemented in a more innovated way.

As per findings in Karditsa, meeting the challenges of the agricultural sector requires technical and organisational advancement which can be enabled through the digitisation and implementation of precision agriculture. Advisory services are seen as integral in supporting this development, and are seen as an important node of support across case study areas.

Creating a favourable environment for the entry of young and new farmers is reported as highly important across all case study regions. Mechanisms though which this can be supported include removing some of the barriers to entry (such as high land prices), provision of advisory services, and improved market integration for agricultural products among small and mid-sized farms.

According to findings from Castellón and Przemysk, at present, there seems to be an important lack in current policy orientation towards these aspects, with CAP and national implementation (through the responsible provincial framework) revealing very low impact on these structures. Respondents in Karditsa state that in order to improve the position in the market, farmers should be supported toward participation in collective schemes (producer groups, producer organisations). While respondents in Castellon state that continued LFA payments are highly relevant, and that less stringent or simplified obligations (such as for on-farm slaughter) should also be considered. Further, in Prignitz respondents reported the need for more equity in CAP support, and increased funds for research and development to help anticipate and adapt for climate change.

3. FUTURE PROJECTIONS

KEY FINDINGS

- Projections from past developments into the future indicate a significant decline in the number of farms, both in absolute terms and per 1000 inhabitants by 2040 in the EU-27.
- By 2040, islands, Southern, and Eastern European regions might be affected by a lower agricultural economic resilience, resulting in higher risks of decline in farms for the Southern and Eastern regions.
- Mountain areas are also facing a higher risk of agricultural land abandonment and decrease in the number of farms in the near future, due notably to an aging farming population, a more difficult farming environment and increased soil erosion.
- The **Baseline Scenario** forecasts an increase in farm abandonment with a simultaneous expansion of the average agricultural areas per farm and a trend towards specialisation. Overall, a polarisation of farming structure with rising emissions is expected.
- The **Climate Change Scenario** forecasts a shift of agricultural production towards the North of Europe and farm abandonment in South of Europe. Land-use and resources conflicts would highly increase.
- The **Sustainability Awareness Change Scenario** anticipates a re-regionalisation of the production and value chain of agricultural products and a higher need for local resilience which could lead to increasing conflicts around access to local resources.

3.1. Scale and impacts of decline by 2040

No one knows what the year 2040 will look like. Nevertheless, it is important to take a closer look at possible developments in order to counteract undesirable outcomes. The analysis conducted in chapter 2 provides a detailed overview of the main longer-term structural trends and a description of the main drivers that put at risk the traditional multidimensional role of the agriculture in the EU. A simple projection of the past should not be considered as a forecast, since it only shows what would happen to the resulting past structural change if assumptions are held constant over the entire period under consideration. In other words, the projection is simply a continuation of past trends without consideration of changing parameters. Nevertheless, if we mirror past developments further into the future, for example into the year 2040, we get a first impression of how structural development may look in the near future.

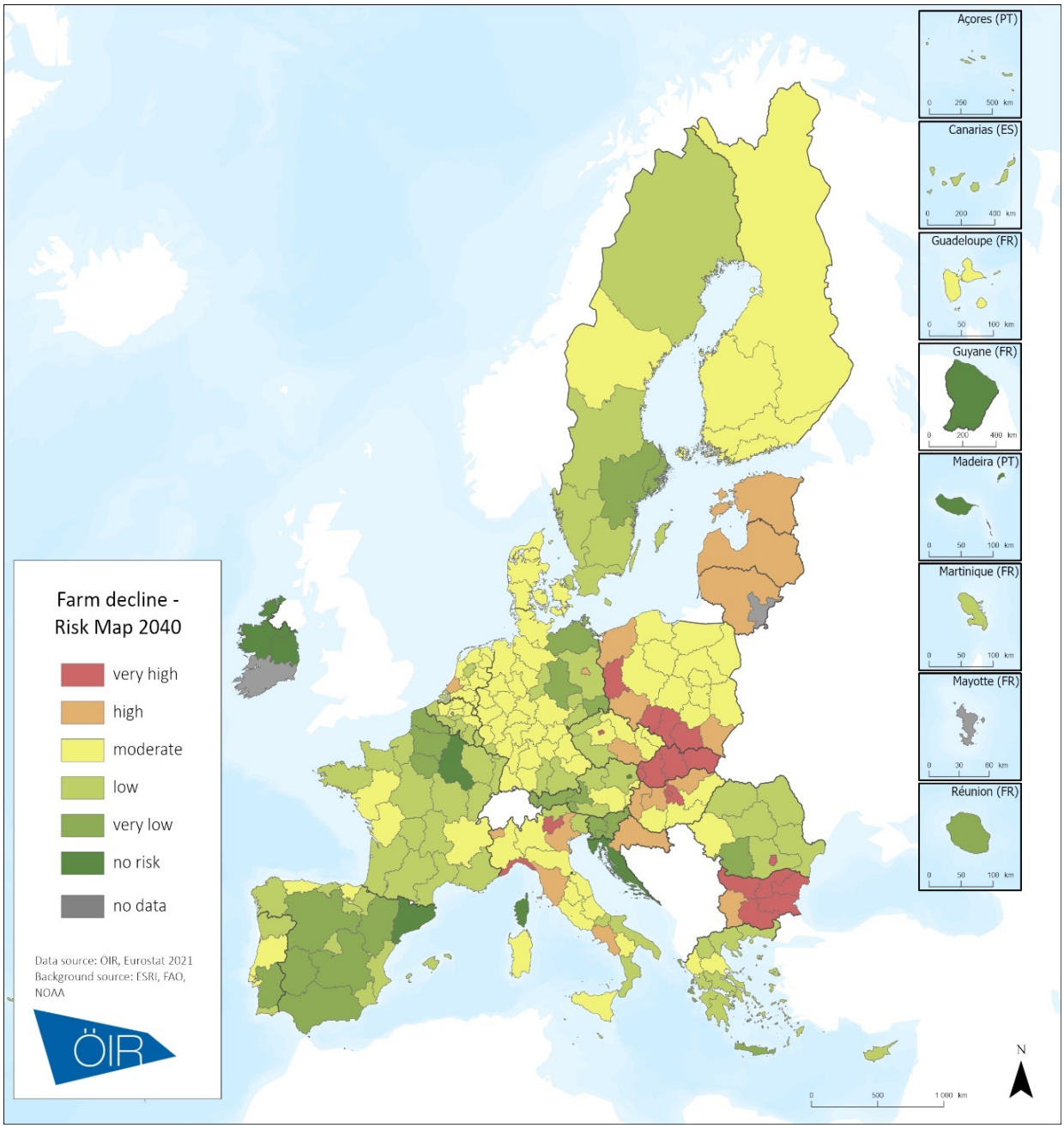
As a basis for the estimation of the likely impact by 2040, the change in number of farms and farmers from chapter 2.2 was taken and projected further into the future (trend scenario).

In 2016, the number of farms was approximately 10,3 million in the EU (see chapter 2.2). By forecasting past farming numbers until the year 2040, the EU might lose an additional 6.4 million farms – resulting in a remaining number of approx. 3.9 million farms across the EU in 2040. This is representative of an impressive 62% decrease. Based on this forecasted calculation the EU may lose more than 267.000 farms per year; more than 22.000 farms per month; more than 700 farms per day.

Figure 17 aggregates the potential risk of farm decline in 2040 across the EU, while Figure 18 displays the share of potential risk at NUTS-2 level. Most of the EU NUTS-2 regions are projected to be under moderate risk of farming decline (i.e. 40-60% decrease). This, however, still leaves around 16% of NUTS-

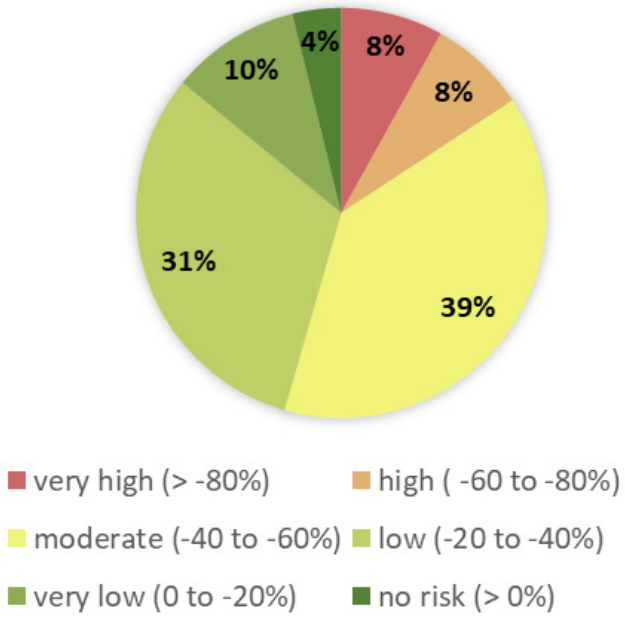
2 regions under high (8%) and very high (8%) potential risk of farm decline respectively, primarily regions in BG, HU, PL, IT, SK, CZ or in the Baltic States.

Figure 17: Potential risk of farm decline in the EU in 2040, accumulated NUTS-2 regions



Source: Project team, 2021, based on EUROSTAT 2021

Figure 18: Estimated potential risk of farm decline in 2040 at NUTS-2 level in the EU



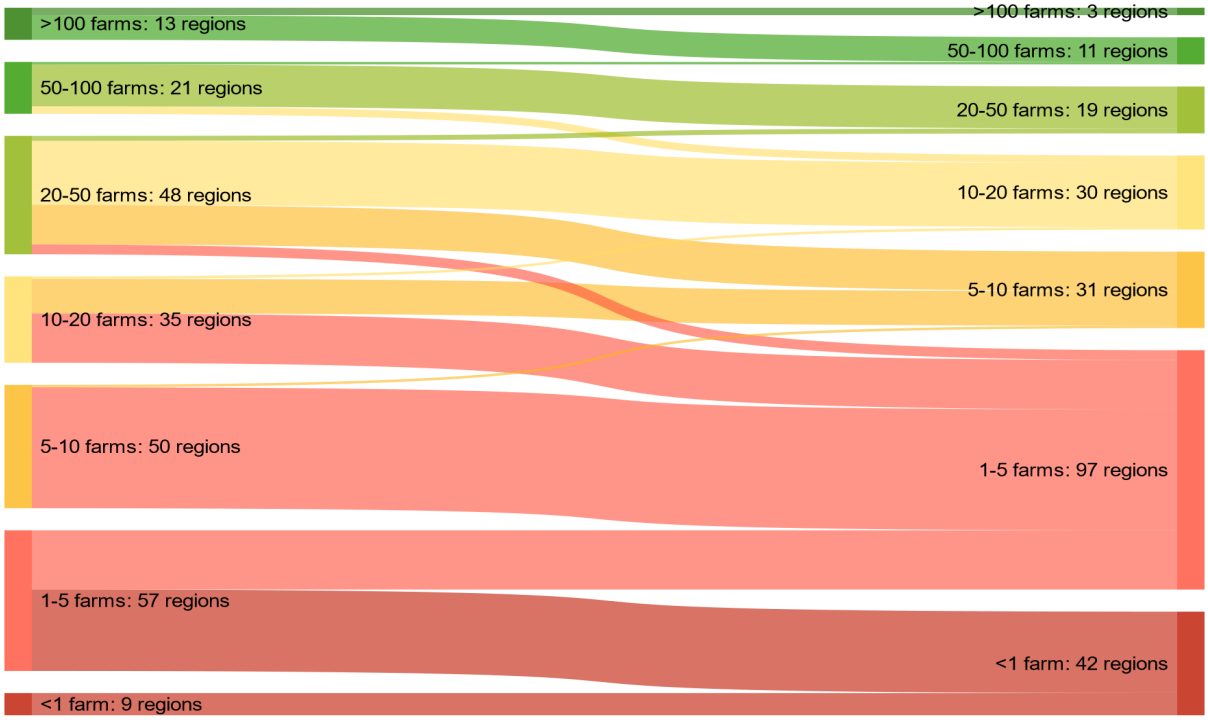
Source: Project team, 2021, based on EUROSTAT 2021

When further comparing the projected number of farms with a projected number of populations per NUTS-2 region, it becomes obvious that the number of farms per 1000 inhabitants decreases significantly. In the continuation of past trends, the number will decrease from about 23 farms per 1000 inhabitants in 2016 to about 8 farms per 1000 inhabitants in 2040 in the EU-27. The change in the number of farms per 1000 inhabitant in the EU between 2016 and 2040 is illustrated in the following Sankey figure (Figure 19).

Across almost all NUTS-2 regions, the number of farms per 1000 inhabitants is decreasing be-tween the two points in time. The vast majority of NUTS-2 regions experienced the conversion of the number of farms predominantly into 1-5 farms per 1000 inhabitants, followed by less than 1 farm per 1000 inhabitants by 2040.

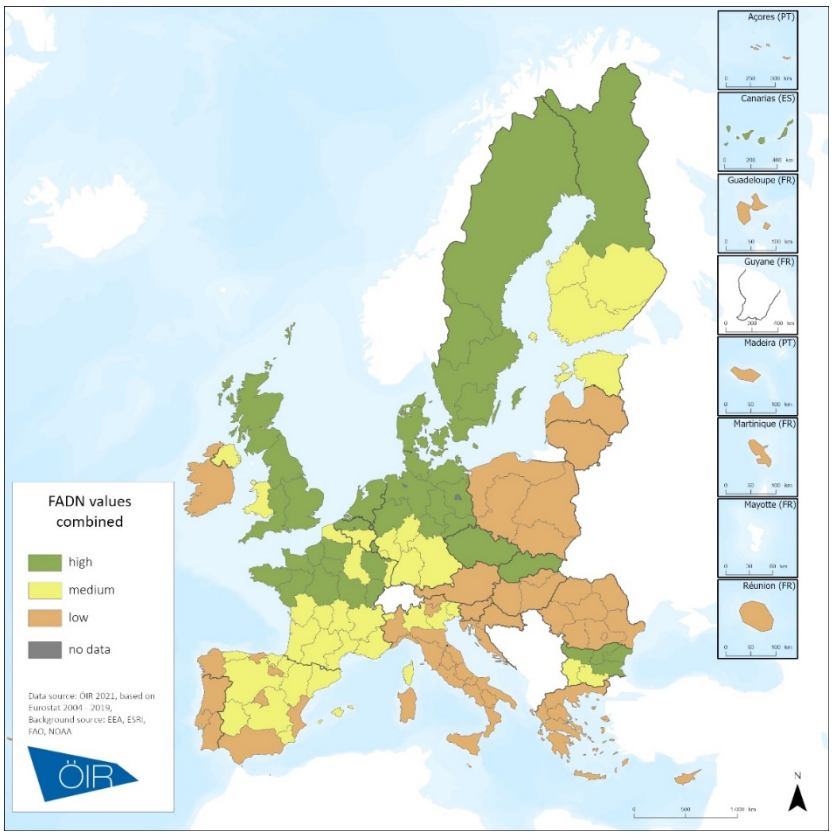
Structural changes in the near future will be further influenced by various external factors (such as socio-economic, territorial and climatic factors) as described in chapter 2.3. To quantitatively analyse these drivers and their potential impacts in the future, data from FADN and EUROSTAT were used and further processed to develop additional explanatory maps based on thematically relevant indicators for the year 2040. To this aim, the following FADN data was used: (a) economic size of holdings expressed in 1000 euro of standard output, (b) total labour input of holding expressed in annual work units, (c) total utilised agricultural area of holding, and (d) total subsidies linked to production. The map below demonstrates the result of these indicators, in a forecasted, normalized and composite way. As the following Figure 20 shows, especially islands, Southern, and Eastern European regions are characterised by a low composite indicator – indicating lower economic resilience (individual maps for each indicator can be found in annex A.6).

Figure 19: Change in the number of regions with a number of agricultural holdings per 1000 inhabitants at EU27 level 2016 to 2040



Source: Project team, 2021, based on EUROSTAT 2021

Figure 20: Map of potential economic resilience in 2040

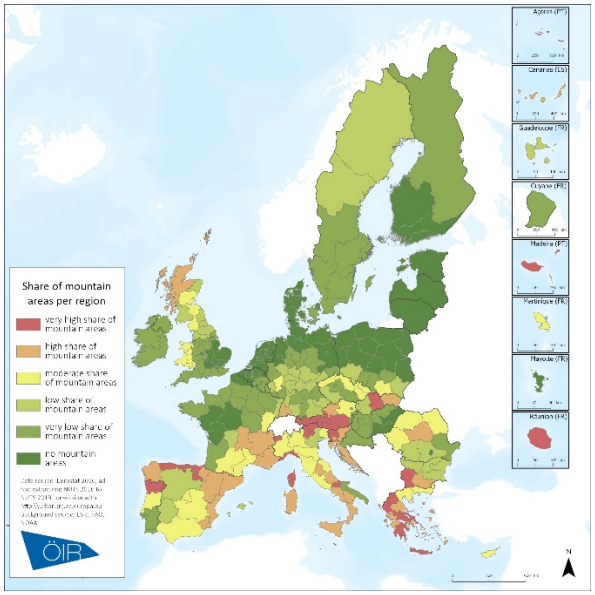


Source: Project team, 2021, based on FADN Data

Besides socio-economic drivers, territorial factors also play an important role in the abandonment of farmland and thus the number of farmers. The recently published EP study on "The challenge of land abandonment after 2020 and options for mitigation measures" indicates a higher occurrence of agricultural land abandonment in mountain regions. In other words, the higher the share of mountains within a certain region, the higher the risk of agricultural land abandonment (Schuh et al., 2020). Figure 21 shows the share of mountain regions on NUTS-2 level.

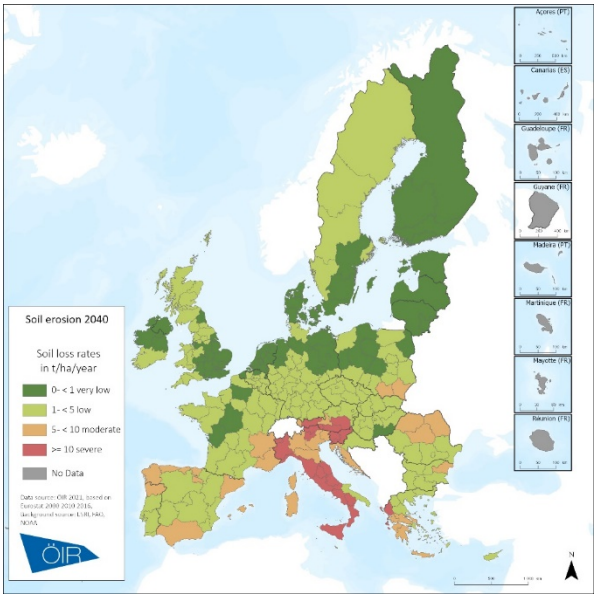
A consequence of volatile and harsher weather conditions – such as changed intensity and frequency of precipitation rate, which increases the occurrence of rain splash or overland flow – is increasing soil erosion by water. Soil erosion by water belongs to the most widespread forms of soil degradation in Europe, with a negative inclination on cultivable and fertile land. Mountainous areas are especially more prone to soil erosion, when compared to flat areas. Applying past EUROSTAT data on the rate of soil loss in tonnes per hectare and mirroring this development into the future, the following map on NUTS-2 level was developed (Figure 22). Southern and Eastern European regions, in particular, are already affected by soil erosion. This could become even more pronounced among these regions in the future.

Figure 21: Share of mountain regions on NUTS-2 level



Source: Project team, 2021, based on EUROSTAT

Figure 22: Forecasted soil erosion (tonnes per hectar) in 2040



Source: Project team, 2021, based on EUROSTAT

Although the development of agriculture in Europe will depend on a variety of additional and interacting factors, this quantitative analysis and projection of past data shows possible developments and explanatory patterns of future European farming conditions. This analysis reveals that primary Southern and Eastern European regions (like IT, PL, BG, or the Baltic States) will face a higher risk of farming decline.

3.2. Main socio-economic and territorial implications

The territorial and socio-economic implication of the decline in farms and farmers was analysed via scenario building. The analysis explicitly accounts for the resulting effects from the traditional drivers of structural changes and recent megatrends affecting European agriculture and the European farming model. The development of scenarios took place during a workshop ("scenario lab") which gathered project team experts to commonly interpret the data and formulate synthetic scenarios. In order to conduct this exercise, it was necessary to develop a baseline scenario, which mirrors past structural changes based on traditional drivers into the future. For this purpose, the risk map from the previous chapter and the drivers described in chapter 2 served as a basis. On top of the baseline scenario, two "megatrend" scenarios were developed:

- Climate change and environmental degradation
- Sustainability Awareness Change Scenario

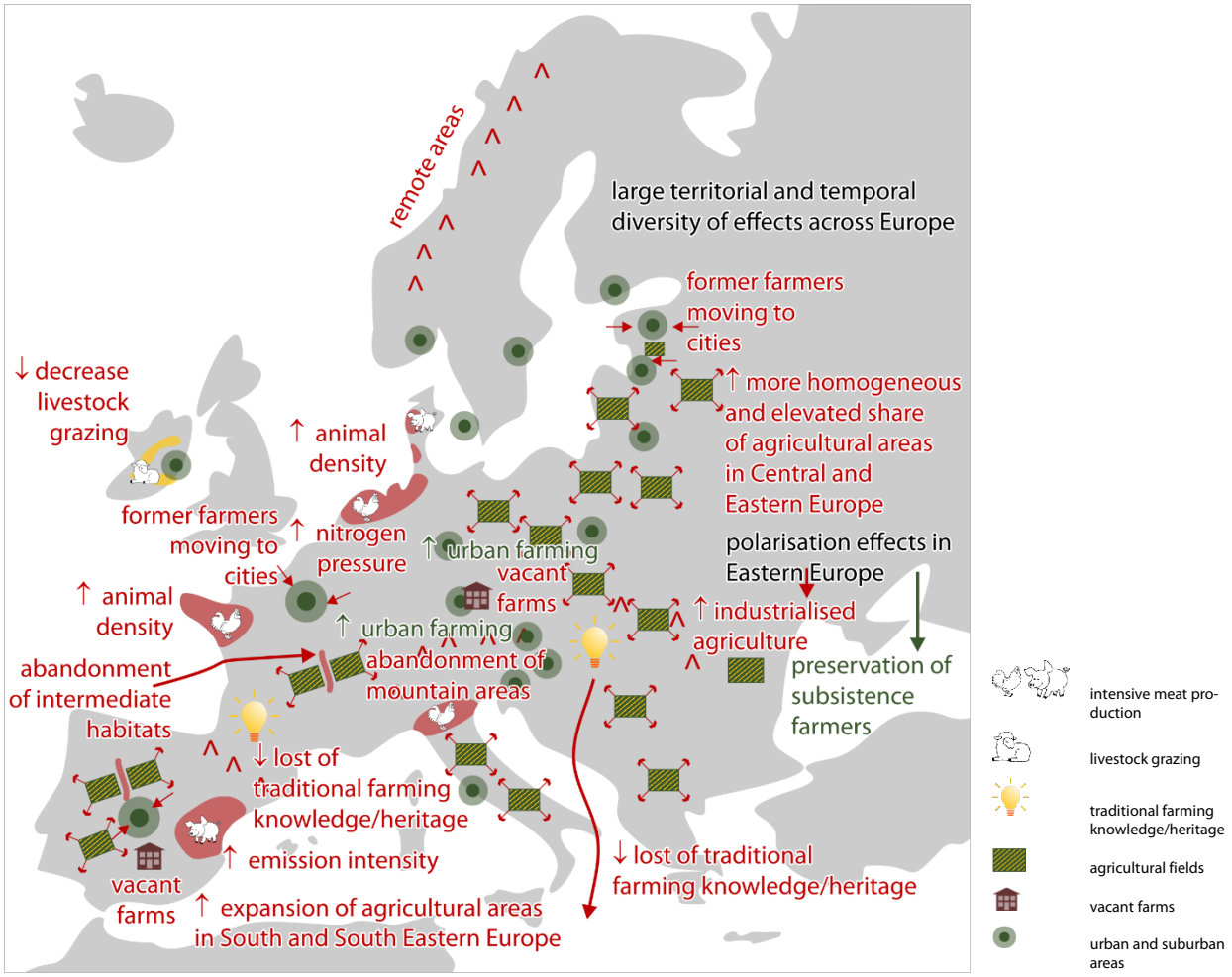
The first megatrend scenario describes a situation in 2040 in which the consequences of climate change are much worse than reflected in the baseline scenario. Due to the rise in temperature, Europe is suffering extreme heat, droughts and flooding – all of which requires changing production methods and products and changing consumer demand. The second megatrend scenario refers to a switch towards a more sustainable farming model (possibly amplified by an external shock similat to the current Covid-19 pandemic), and its amplified reach of people's awareness of the role of the agricultural sector. Farmers of the future have learned that measures and strategies are needed to become resilient to such crises in order to keep food supply chains alive and to ensure regional food safety.

During the Workshop the following questions were assessed:

(1) What are the expected main territorial and socio-economic impacts of the losses of farms and farmers and other structural changes in the near future (2040)?
(2) What adjustments are needed on farm level and what consequences (positive/negative) do they have on the environment, society and economy?
(3) What farm profiles will emerge in the future (2040) as a result of long-term structural trends and megatrends in relation to the three scenarios discussed?
(4) What implication does this have for the (classical) European Farming Model?

3.2.1. Baseline Scenario

Figure 23: Baseline Scenario – Main territorial and socio-economic impacts

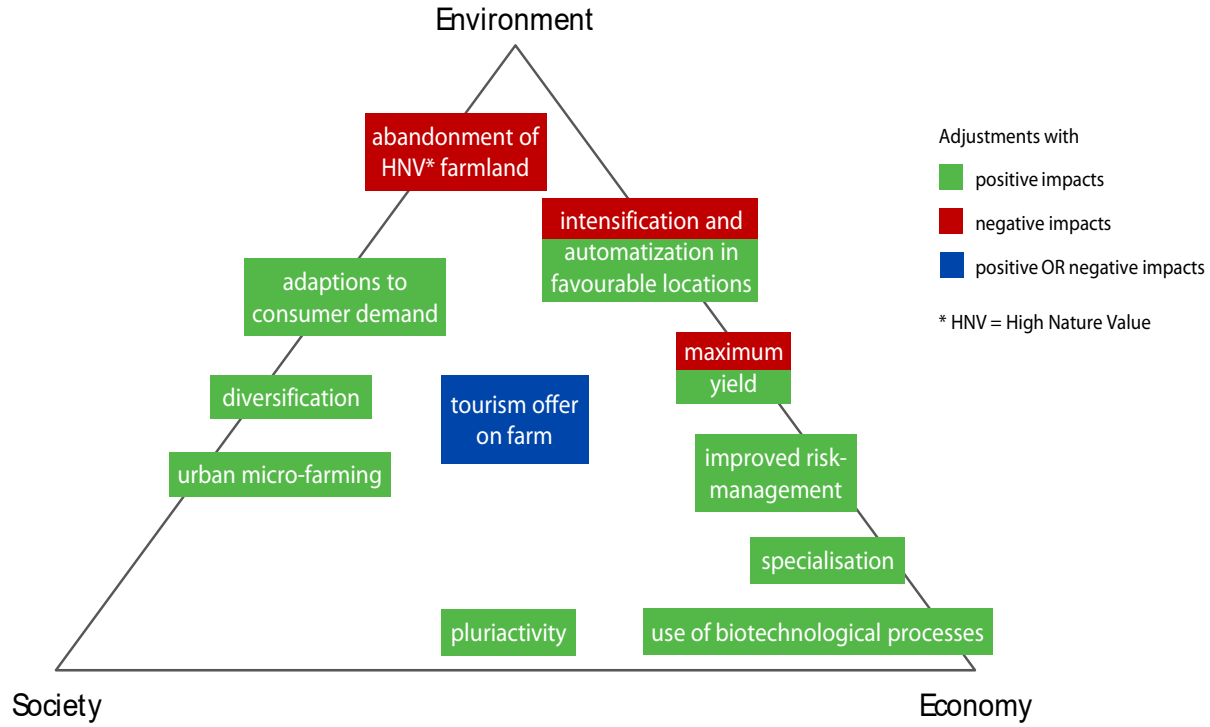


Source: Project team, 2022

Main territorial and socio-economic impacts

The main territorial and socio-economic impacts caused by the continuing decrease in the number of farms and increase in their size were assessed to be the following. In terms of farming structure, the economic viability of bigger, industrialised farms would prevail. The ongoing growth in the average size of farms comes with the increased need for productivity and specialisation therefore an increased industrialisation of agriculture. The need for maximised production per hectare of land or per animal would thus lead to a specialisation of the farms and regions. Further consequences of such trends would be the decrease of grassland and livestock grazing and increased animal density, thus decreasing the landscape diversity within landscapes such as the alpine pasture. Another environmental consequence of this situation would also be the increased emission intensity, more particularly in terms of nitrogen pressure and emissions in the aquatic system and the air. The expected total decrease in farms would lead to more vacant farms and a continuing abandonment of intermediate habitats, remote areas and mountains. With the cessation of these activities, traditional farming knowledge and agricultural heritage would be lost, as well as the social awareness of agricultural production processes and value. These former farmers moving to urban areas however could support the development of urban farming.

Figure 24: Baseline Scenario – Adjustments at farm level



Source: Project team, 2022

Overall, an increase in agricultural technological innovation is expected resulting from an increased need in maximised production and a growing tendency of urban farming.

The described impacts would however have different temporal and territorial impacts in Europe as specific regional aspects highly influence the structural evolution of the farming sector. For example, a higher polarisation effect is expected in Eastern Europe where the gap between highly industrialised farming models and subsistence farming is expected to grow more than in Western Europe.

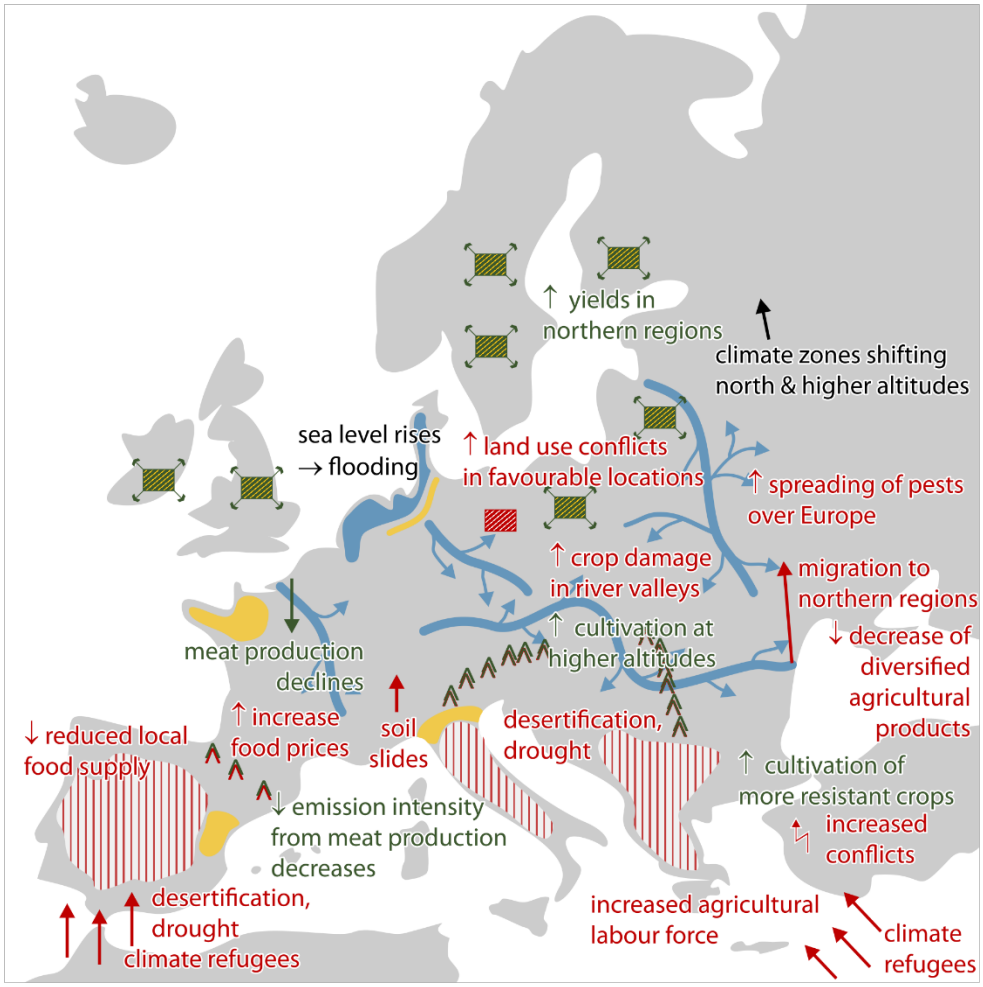
Adjustments at farm level

In the context described above, the expected adjustments in the agricultural sector would have rather negative environmental consequences through adjustments such as the abandonment of High Nature Value farmland, an intensification of agriculture in favourable locations, and the search for maximum yield. On the other hand, the economic capacities of such farms are expected to be improved. Indeed, bigger sized farms should be able to improve their risk-management, and the specialisation of the farms should also lead to more competitiveness and therefore economic benefits. The expected technological innovation could also support the development and use of biotechnological processes.

From a societal point of view, certain advantages are seen in the form of more adaptation to the consumer demand and therefore a diversification of agricultural products. The development of urban micro-farming in response to the development of industrialised farming is seen as positive for the society. Further adjustments linked to a search for more yields could encourage the development of pluriactivity in farms, especially in medium to small farms with the expansion of tourism offers for example.

3.2.2. Megatrend Scenario 1 – Climate Change and environmental degradation

Figure 25: Megatrend scenario "Climate change and environmental degradation" – Main territorial and socio-economic impacts



Source: Project team, 2022

Main territorial and socio-economic impacts

In this scenario the combined impacts of the current sectoral trend observed and of the worst-case scenario of Global Warming anticipated by the IPCC were scrutinized.

Overall negative impacts are expected in this scenario, especially in the regions from the South of Europe. As a shifting of the climates zones toward the North and to higher altitudes are expected, these regions will be the most impacted by desertification and droughts. Such phenomena would lead to a drastic decrease in farms in the southern regions due to irrigation problems, accentuating their dependency on northern regions in terms of food supply. The expected arrival of climate refugees from the South would put additional pressure on the food supply and prices for these regions.

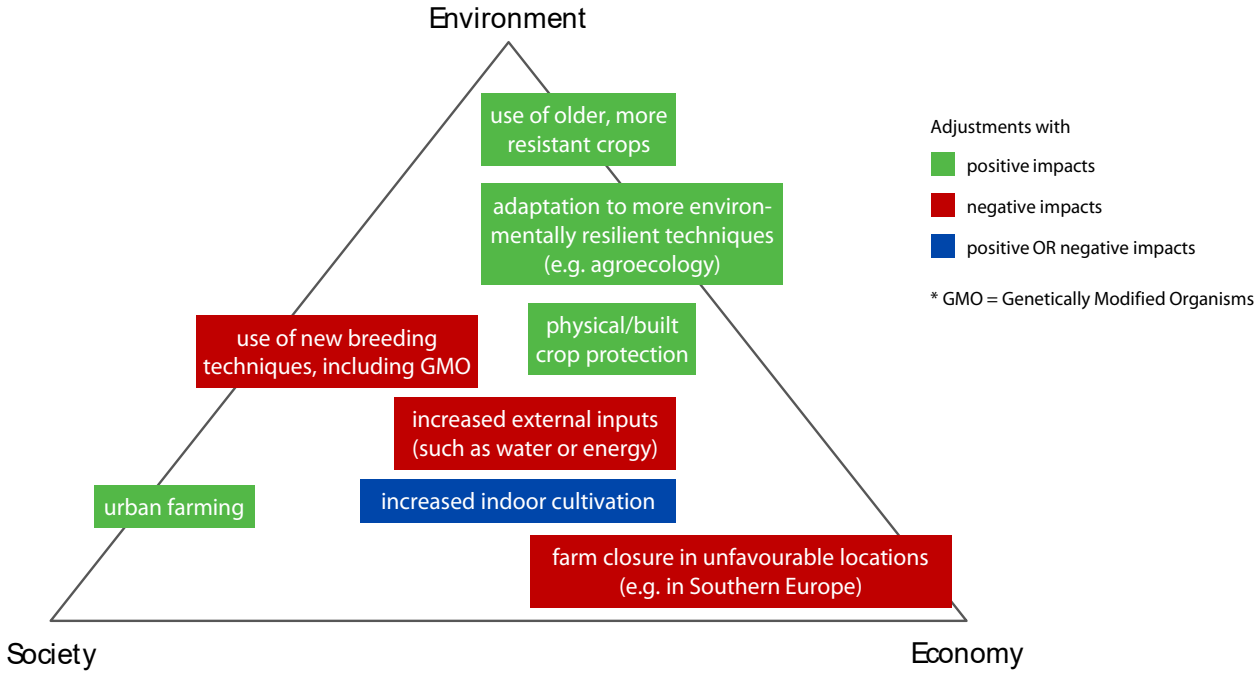
The European mid latitude, on the other side, would have to face more risks of flooding due to sea-level rises and therefore lose agricultural land to the sea and suffer crop damages in river valleys. However, the northern regions would see their yields increase due to climate change, and an overall intensifica-

tion of land use conflicts for favourable land, with an abandonment effect in dry, degraded and exposed areas. Cultivation would also become possible at higher altitudes, however farmers would face more soil and landslides in these regions.

Overall, the need for the cultivation of more resistant crops would increase and meat production would decrease due to a lack of water, land and other resources, again reinforcing land-use conflicts. This would be accompanied by a shift of meat consumption in the population due to an increased consideration for the environment and animals. The reduction in the meat consumption and production would lead to a decrease in emission intensity.

Overall, even if a migration of the agricultural activity to the North of Europe is expected, the overall diversity of agricultural products would decrease due to the climate change.

Figure 26: Megatrend scenario "Climate change and environmental degradation" – Adjustments at farm level



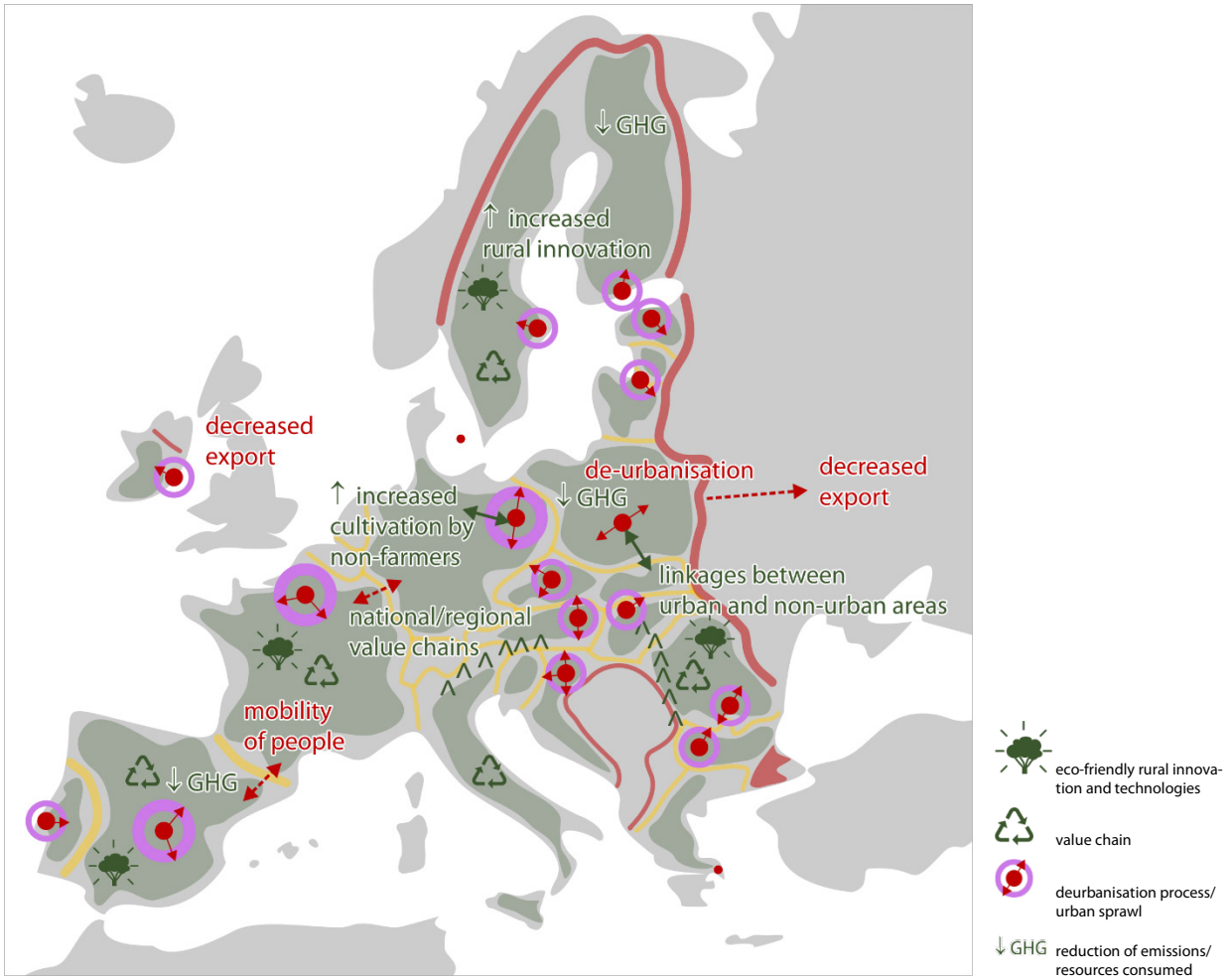
Source: Project team, 2022

Adjustments at farm level

In this scenario, the adjustment on farm level would tend to have positive environmental impacts to compensate for the situation at hand. These include the use of older more resistant crops and adaptation to more environmentally resilient techniques (e.g. agroecology). Physical/built crop protection and increased indoor cultivation are also to be expected with neutral to positive impacts on the economy and the environment. The development of urban farming is also expected to have positive impacts on the society. Some impacts on the environment are expected in the form of new breeding techniques, including GMO. The economy would also be hit since in unfavourable locations no adaptation other than farm closure might be available. Overall, an increased need for external input will be observed in the agricultural sector, which in the context of a global warming worst-case scenario, and without sufficient spread from agricultural new technologies, would have negative impacts on all three aspects: environmental, social and economic.

3.2.3. Megatrend Scenario 2 – Sustainability awareness change scenario

Figure 27: Sustainability awareness change scenario (amplified due to the Covid-19 pandemic) – Main territorial and socio-economic impacts



Source: Project team, 2022

Main territorial and socio-economic impacts

In this scenario, the impacts of an external shock, such as the Covid-19 pandemic, and its amplified reach of people's awareness of the role of the agricultural sector were examined. Unlike with other scenarios, an important change of scale is expected. Indeed, the associated limited mobility of people (especially relevant for seasonal worker) as well as reduced EU import/exports, due in particular to closed borders, would have important consequences for agricultural production and the value chain. It was assessed that an external shock might change consumers' trust and engagement in agriculture, increasingly favouring eco-friendly, regional, seasonal products. This gained awareness, combined with the threat of decreasing food security, would bring more importance to regional production and national value creation. This trend would lead to an increase in shorter value chains and the prevalence of territorial and eco-friendly branding. It would also link local knowledge with place-based production and quality. The already known trend of increasing sanitary measures in agricultural production and food processing is expected to be reinforced as well as the normalisation of sustainable, eco-friendly production. The intensified research in technology to support sustainable production allows for a mas-

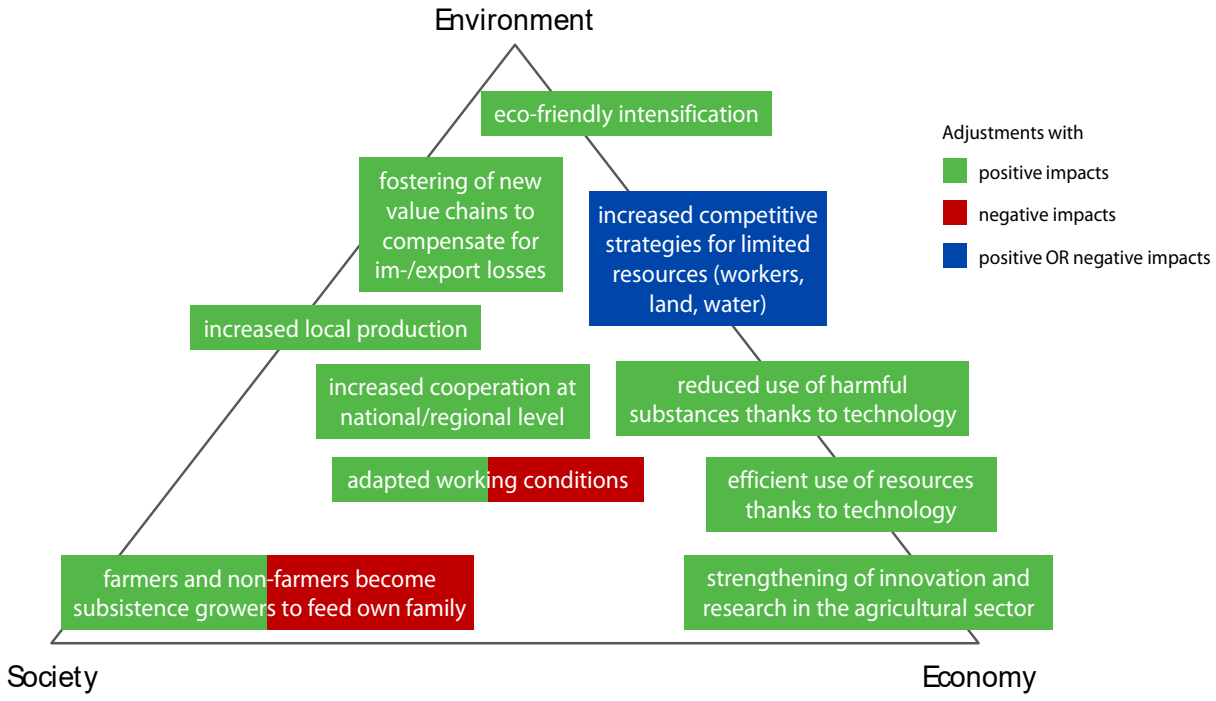
sive reduction of the use of harmful substances and a more efficient use of resources. A rise of cultivation by non-farmers as a new art of subsistence farming can additionally be expected, which itself might also lead to de-urbanisation. The generalisation of home office and online meetings is also deemed to have lasting effects on the urbanisation process and a further de-urbanisation. This would reinforce the interlinkage between urban and rural areas giving farmers a greater importance and more levy on their products' prices. Such an urban sprawl would revive rural areas fostering innovation and liveliness. The counterpart of this de-urbanisation trend could however contribute to increase the land-use conflict between agriculture, housing and environment already taking place.

Another trend assumed to be reinforced by a changing awareness on farming, is the further expansion of digitisation and new agricultural technologies, which would then reach all sectors. This trend would on one hand further contribute to an increased use of resources (water, land, energy, rare metals, etc.), but on the other hand directly reduce the use of resources in the agricultural sector.

The need for more resilience and the lack of food autonomy among cities might encourage urban centres and rural regions to shift towards high-tech production to improve capacity for rapid production and increases in stockpiling capacities for non-perishable food products. This imbalance between production and consumption areas might also redistribute governance and value chain management.

Overall, an increase in socioeconomic disparities, manifesting in social tensions is to be expected. Indeed, the increased difficulties in food production and the access to resources would increase the average household's food budget, which would have an impact on their possibility to consume other types of goods. Accordingly, there will be a greater need for solidarity measures and macroeconomic integration.

Figure 28: Sustainability awareness change scenario (amplified due to the Covid-19 pandemic) – Adjustments at farm level



Source: Project team, 2022

Adjustments at farm level

Led by the need to ensure food security at national level, the following adjustments in the agricultural sector are expected. In line with the baseline scenario, an intensification of production is expected but this time at local level and with increased cooperation at national/regional level. This is expected to have a rather positive impact on the environment and society. A growing importance of subsistence growers in order to feed their own family is expected to have a rather positive impact on society but a rather negative one on the economy, withdrawing working-time to other sectors.

The overall structure of farming might endure a polarisation with the disappearance of intermediate farming structures, even more than in the baseline scenario with a reinforced establishment of adaptive-diversified and regenerative farmers. The consequences of this impact on environmental, social and economic aspects could not be defined yet as they would depend on national/regional characteristics but an overall positive impact on the environment and the resilience of European farming is expected. New value chains would be developed at national/regional level to compensate for import/export loss.

Overall, the increased need for competitive strategies towards limited resources (workforce, land, water) is expected to strongly shape the agricultural sector, with potentially positive and/or negative impacts on the environment and economic performance. The increased difficulty to recruit agricultural workers would oblige farmers to adapt the seasonal workers' salary and working conditions to render these jobs attractive, improving the social working conditions for seasonal workers. If this raise in salaries is expected to firstly have a negative impact on the farmers' economy, the loss would be compensated in a second period by higher prices.

3.2.4. Potential Farm Profiles of the Future and implication for the European Farming Model

The outcome of the scenario discussions is that the European Farming Model is highly impacted by market forces and barely maintained by public funding. All three scenarios forecast an (already ongoing) complexification of the farming profession and the need for high investments in infrastructure and also in education and skill-building (marketing, e-commerce, risk-management, etc.). According to the climate change and sustainability awareness change scenario, the importance of the regional context and infrastructure will be growing and might nurture the farming sector depending on the economic, social and cultural trends.

The **different Farmer Profiles** that might continue to grow or emerge the most prominently in the future would therefore be the following:

- Adaptative-diversified farmers as a potential evolution of family farming and small/medium farms, with a concentration on highly valued niche products, potentially developing in regenerative farming profile;
- Intensive-specialised farms benefitting through growth in production capacity and high-tech investments;
- Regenerative farmers are envisaged if the purchasing power is maintained or is increasing, and the level of awareness of their contribution to climate change is growing. The development of this profile is however also deemed as especially dependent on the legislative European Framework on certification.
- Urban farming and lifestyle-neo-rural might continue to develop especially in regions were the lack of resilience of nearby cities is the most blatant;

- Indoor-controlled environment agriculture would be mostly expected in cases of extreme scenarios such as the climate change scenarios;
- Semi-subsistence is mostly expected in the case of an external shock event;

Still, a European diversity exists and the differences in structures' evolution and temporality have to be taken into account when thinking of the development of agricultural structures. The development of each farming profile will also depend on the framing of the agri-ecological challenges as well as on the international context and on agricultural product prices. The capacity of certain regions to let a diversity of farming profiles flourish could be seen as a particular strength.

4. PUBLIC POLICY RESPONSES, FARM ADAPTATION STRATEGIES AND IMPLICATIONS FOR THE FUTURE

KEY FINDINGS

- Although the framing and terminology has been changing with each programming period, CAP general objectives remain consistent over time and pursue the three elements of sustainability (economic, ecological, social) and do not include farm structures as key objectives of the CAP toolbox.
- Numerous CAP measures address the drivers of farm structural change, whereas only a limited number of these focus on specific structural challenges (generational renewal/young farmers, organic farming).
- The policy focus (policy areas targeted, public expenditure) of CAP is primarily on economic challenges (incomes from farming, coping with competitive pressures), resulting in disproportional expenditure shifted to large farm operations, implicitly accelerating their growth.
- If a clearer transition to sustainability is desirable, then measures require a thorough overhaul, also in terms of addressing structural objectives. The consideration of drivers should also be taken into account, encouraging those who establish sustainability and limiting those who deviate from sustainability.
- In general, CAP measures need to be defined more clearly and in a targeted manner. As seen from current experience, targeted measures (e.g. young farmers, organic farming) also achieve more targeted goals in terms of resulting structures and sustainability.
- The CAP must be more open to new forms and types of agriculture. The notion of the roles of agriculture in society is changing and expanding, as is the potential for innovation.

4.1. CAP post-2022 and other relevant policies

4.1.1. CAP objectives related to farm structures

EU policies must follow a strategic logic based on the identification of needs, objectives derived from them, and choice of measures – maximising the effectiveness and efficiency of public interventions. In the field of the CAP, this logic is only now becoming fully implemented through the CAP Strategic Plans, which are in the process of being adopted at Member State and European Commission level. Therefore, an analysis of the European Farming Model (EFM) and structural changes in agriculture should be placed in the context of the CAP's concept for the period after 2022 and to determine the scope and mode in which the objectives of the CAP (directly and indirectly) address agricultural structures. This represents the basis for the analysis of the full range of CAP measures below and their intervention logic applied to address the structural objectives in agriculture.

The CAP is based on the objectives of agricultural policy as set already by the Treaty of Rome establishing the EEC (1957) and still valid under the Treaty on the functioning of the European Union (as renamed by the Treaty of Lisbon in 2008). The objectives, which emphasise the economic situation in agriculture, productivity and food supply are very general, and reflect above all the EU's commitment to direct public funds towards agriculture. With every CAP reform, the general objectives are upgraded

somewhat, with redefined general and specific objectives. Since Fischler's 2003 CAP reform (Swinnen et al., 2008), the general objectives are broadly based on the three pillars of sustainability (economic, environmental, social), which are then translated into individual specific objectives with different emphases and priorities for action.

Even a simple review of the materials (strategies, regulations) that substantiate the CAP after 2003 reveals that there are no specifically defined structural objectives under the CAP. Neither the EFM nor any other specific structural objectives in terms of target form, size or composition of agricultural holdings and their farming methods, are highlighted in strategic objectives and legislative materials. The conclusions of the EU Presidency in 1997 did not lead to a more precise strategic definition of the EFM, which remained at the level of general perception and political statements. However, this does not mean that the structural objectives of agriculture and thus the EFM cannot be inferred from the definition and implementation of the CAP. Here we can rely on sustainability criteria, which are defined through the general and specific objectives of the CAP after 2022, and thus indirectly define the structures of agriculture that might contribute to achieving these objectives.

The structural objectives of agriculture, or the EFM, as understood by the majority of CAP decision-makers, can be understood as an array of forms of farming that contribute to the realisation of sustainable agriculture. This is not a single form of agricultural holding, but very different multi-functional forms of farms, which together are to contribute to efficient and competitive farming (economic aspect), environmental protection and the achievement of climate goals (environmental aspect) and territorially and socially balanced rural development.

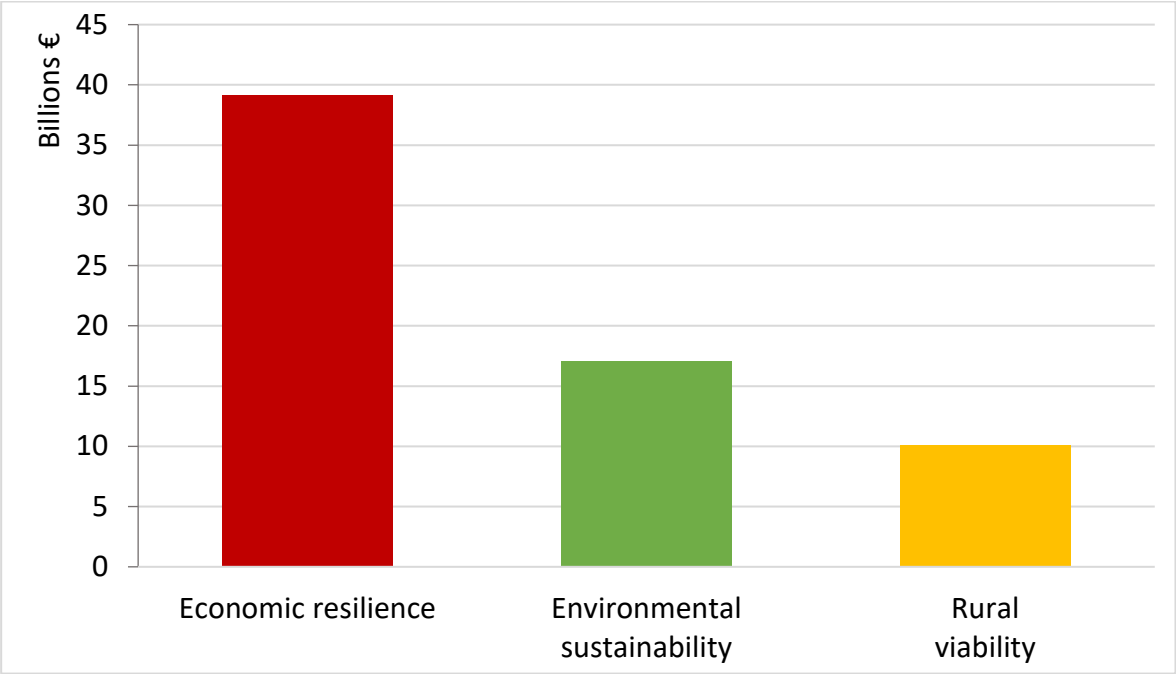
We can therefore state that sustainability can be pursued by farms that are:

- economically efficient and competitive (economic criterion);
- environmentally sustainable and climate-friendly (environmental criterion);
- socially inclusive and territorially dispersed (social criteria).

Because it is difficult to achieve these goals in a balanced way on an individual farm, in actuality very different forms of farms that meet these criteria in different combinations can contribute to achieving sustainability. It is important that all forms together meet the sustainability criteria for agriculture (and rural areas) as a whole. We assume that all three criteria contribute to the socially desired effects separately. At the very least, a balanced relationship between the goals should be sought, if not even a greater focus on environmental and social criteria; the latter could namely serve to correct the economic objectives that promote the autonomous process of structural change leading to specialisation, concentration of resources and intensity of production.

However, the relationship between all three sustainability criteria is not necessarily balanced, as the CAP's political substantiation suggests. The history and reality of the implementation of agricultural policy measures lead to the attribution of different weights to individual criteria in practice, and thus also directs structural changes in agriculture. In order to determine the weight of individual elements of sustainability, we endeavoured to define the contributions of groups of CAP measures to the sustainability criteria and weighted them with the budgetary distribution for individual measures. In this way, we obtained an approximation of the assessment of which sustainability criteria and thus indirectly structural changes and forms of agricultural holdings are stimulated by CAP measures and funds (Figure 29).

Figure 29: Estimated CAP expenditure (2014-2020, annual averages) on CAP general objectives



Source: Project team, 2022

This rough analysis for the period 2014-2020 shows that most of the measures weighted by CAP budget transfers are directed towards the economic criterion, thus favouring structural change and development and the creation of agricultural holdings with a strong emphasis on economic sustainability. We estimate that this effect is around 60% given the measures and resources available. Both other criteria together amount to less than half of the effect, the weaker part being devoted to the rural vitality criterion (15% effect). The environment and climate, a high priority for the CAP after 2022, are also estimated to be less than a quarter of the budgetary impact thus calculated for the previous period.

The results thus show that the CAP, through its measures and distribution of resources, weakly supports environmentally sustainable and multi-functional agricultural holdings, while there is a more pronounced emphasis on the improvement of their economic performance, leading to weak environmental and social effects. Taking a closer look at the CAP reform process after 2022, the failure to actually strengthen policy orientation towards stronger guidance on sustainable development and resilience objectives is still ongoing. Even if Member States are expected to strengthen goal-oriented strategic planning, detailed compliance with very specific rules set out in legislation gives way for a more performance-based approach (Matthews, 2021). On the other side of the farm size distribution, a lack of policy effectiveness and sufficient support on small-scale structure is voiced by many analysts.

4.1.2. CAP measures and their intervention logic: to what extent are they addressing farm structures?

CAP instruments are intended to address the economic, social and environmental needs and challenges facing agriculture, forestry and rural areas in the EU. The CAP's intervention logic describes the link between these needs and challenges, on the one side, and the underlying drivers and available policy options on the other. CAP general objectives have the highest position in the hierarchy of objectives and remain essentially unchanged throughout the EU programming periods: (i) economic resilience, (ii) environmental sustainability, and (iii) rural viability. The next level in the objective hierarchy,

the CAP specific objectives, is more dynamic. Two of the twelve CAP specific objectives for the period 2014-2020[15] referred to farm structures, which are in the focus of this review. The first, which is transversal for both Pillars of the CAP, is striving for the maintenance of agricultural diversity. The second, which is linked to Pillar 2, refers to competitiveness of all types of agriculture and farm viability.

Among the instruments designed to fulfil the CAP objectives in 2014-2020[16], only a handful were found to specifically address farm structures, namely in connection with particular farm types (young farmers, small farmers, entrants to farming). In an effort to stimulate generational renewal, young farmers were eligible for a supplement to direct payments. In order to slow structural change, preserve traditional farming types, or reduce rural poverty, the Member States could also introduce simplified payment schemes for old farmers. Within CAP Pillar 2, start-up grants for young farmers have been widely introduced to accelerate generational renewal of farms. In addition, several RDPs improved access to capital for young farmers by setting more favourable conditions for investment support. For the upcoming programming period 2023-2027, the scope of start-up support is extended to the new entrants to farming.

Apart from the abovementioned measures with a direct but relatively limited range, the CAP and other public policies have a more indirect impact on changing farm structures. More often, CAP measures interact with other drivers of farm structural change, such as changing market conditions (profitability of production, demand trends), ownership and production structures, the institutional setting of land markets (Ciaian et al., 2010), and land use competition, to name just a few[17]. Even though the mix and relative importance of the drivers of farm structural change are context-specific and vary greatly – both among and within EU member states – some generic findings can be identified on the interaction of CAP measures and a selection of relevant drivers of farm structural change. For the sake of consistency with the theoretical frame of this study (chapter 1.1, Figure 1), we distinguish among two groups of drivers of structural change in agriculture: external and sector-specific.

The interaction among the CAP measures (bundled into ten groups[18]) and the selected drivers of structural change is presented in Table 5 and further discussed in the text that follows.

[15] In the period 2014-2020, the CAP specific objectives, applicable to both Pillar 1 and Pillar 2 referred to: (a) farm incomes; (b) agricultural competitiveness, (c), market stability, (d) environmental public goods; (e) innovation promotion and (f) maintenance of agricultural diversity. In addition to these, specific objectives for CAP Pillar 2 strived for: (g) knowledge transfer and innovation, (h) competitiveness of all types of agriculture and farm viability, (i) food chain organisation and risk management, (j) restoring, enhancing and preserving ecosystems, (k) resource efficiency and shift to low-carbon economy and (l) Social inclusion, poverty reduction and economic development of rural areas.

[16] See Annex A.7 (Measure Fiches) for a comprehensive list and review of CAP measures for EU programming periods 2014-2020 and 2021-2027.

[17] See chapter 2.3 for a more comprehensive analysis of drivers affecting farm decline.

[18] See chapter 1.2 for a more detailed methodological explanation.

Table 5: Relevance of CAP measures (2014-2020) on drivers of farm structure change (own assessment)

Drivers of farm structural change / 2014-2020 CAP measures	SECTOR-SPECIFIC									EXTERNAL			
	Technological advances in agriculture, digitisation	Input and output prices	Markets for land and other production factors	Market and production risks	Competing uses of agricultural land and/or pressure on land abandonment	Expanding non-food uses uses of agricultural (by-)products, bioeconomy	Obstacles to productivity growth	Internal frictions -farm level (sunk costs, dependence on subsidies, generational renewal)	Valorization of ecosystem services	Climate change and its impacts on farming	Macroeconomic conditions, investment cycles, trade	Demographic change, urbanisation and related changes in food consumption	Public policies and societal demands (environmental sustainability, food, health, animal welfare)
1) DIRECT PAYMENTS													
basic payments, SAPS, redistributive payment	■		■	■	■				■				
greening component, specific nat. constraints	■		■	■	■				■	■			■
Payment for young farmers			■	■	■			■	■				
Volutary coupled support		■	■	■									
Small farmers scheme		■	■	■									
2) MARKET SUPPORT	■	■		■	■				■				
3) AGRI-ENVIRONOMENT & CLIMATE PAYMENTS													
Agri-environmental & climate measures (AG&FOREST)			■						■	■	■	■	■
Animal welfare	■							■					■
4) SUPPORT FOR ORGANIC FARMING					■				■	■			■
5) LFA/ANC, NATURA 2000 AND WFD PAYMENTS			■		■		■	■	■				■
6) INVESTMENTS IN PHYSICAL ASSETS	■			■	■	■	■	■		■	■	■	■
7) COOPERATION (PGs, POs, RISK MGMT., EIP)	■			■			■	■	■	■		■	■
8) KNOWLEDGE TRANSFER	■			■			■	■	■	■			
9) YOUNG FARMERS, SMALL FARMS, NON-AGR ACTIVITIES	■				■		■	■					
10) LEADER / CLLD												■	■

Measure and the driver are not related
Measure partially/indirectly addresses the driver
Measure addresses the driver to a considerable extent

Source: Project Team, 2022

(a) Direct payments

In the area of direct CAP payments, which account for 70% of the total EU CAP budget, there will be more mandatory and optional schemes in place after 2022, and Member States will have the possibility to adjust the scope and specific provisions for implementing measures while meeting certain general criteria. The structure and purpose of payments have changed slightly since 2022, when compared to the current period. They are: i. basic income payments; ii. redistributive payments, iii. payments for environmental purposes (green payment until 2022 and eco-scheme after 2023); iv. production-coupled payments; v. payment (supplement) for young farmers; and vi. payment for smaller farms. In this period, there are also payments for areas with natural handicaps, which are similar in purpose and effect to payments for the ANC of the second pillar of the CAP, and will be covered accordingly. The system of direct payments should be seen primarily as a single framework for income support summed up at individual farm-level; everyone receives the basic payment (including the green component until

2022), together accounting for 70-90% of all direct payments in each Member State. Therefore, the direct payment system could be considered as a single mechanism with common effects on structures, with some specific effects attributable to certain payments.

The system of direct payments as a whole has both a direct and indirect impact on the formation of agricultural holdings and structural change. The structural impact stems mainly from the distribution of payments. At EU level, 80% of direct payments go to 20% of agricultural holdings (which reflects the concentration of land – 20% of the largest farms hold 82% of land). Furthermore, 58% of funds go to 15% and 0.5% of all beneficiaries receive 16.3% of the total direct payment envelope (DG AGRI, 2018). Direct payments thus mainly support larger holdings through the distribution of funds. This makes it easier to invest, as well as grow, which accelerates structural change. It also affects technological innovation, which is again easier for larger economies, and risk management, as those with higher direct payment incomes (i.e. of larger size) stabilize incomes more easily.

Although this is difficult to state unequivocally, the literature shows (e.g. Brady et al., 2017, but see also Graubner, 2018) that direct payments, especially basic payments, also affect the price of inputs (they are more expensive, especially the price of land) and the price of outputs (they are cheaper). This again favours larger holdings, which are on average economically and capitally stronger than smaller farms. Larger funds for agricultural holdings also affect greater knowledge uptake on larger holdings and thus affect structural changes. On the other hand, direct payments do contribute to slowing down the abandonment of marginal agricultural land, which is however likely to be taken over by larger holdings due to the distribution of payments. In terms of more direct effects, the system of direct payments with a supplement for young farmers has an impact on generational renewal. Payments for small farms, like redistribution payments, are intended to support smaller, economically weaker holdings. There is no detailed research on their actual effects, but given the total amount of funds for these purposes and funds per individual farm, it is judged that their effect on maintaining the structure of smaller farms and thus maintaining rural vitality will be limited in the long run. These forms of support have more of a symbolic political significance, signalling that agricultural policy also has this aspect of the agricultural structure in mind. There may be short-term effects of persistence in agricultural production, but this is very likely to change at the latest with generational change on the farm.

The green component was intended to contribute to the environmental and climate objectives of agricultural policy in the period 2015-2022. Due to the softening of conditions, this impact on environmental sustainability is only partial (ECA, 2017), but it certainly does not contribute significantly to the strengthening of agricultural holdings providing more environmental benefits.

Coupled payments are targeted at sectors experiencing difficulty. Most of the funds are allocated to livestock farming, especially milk production, beef cattle breeding and small ruminants. Decision-makers also substantiate such interventions with the prevention of farmland abandonment (especially grassland), preservation of small farms and meeting of production targets. The impact of these measures is primarily in maintaining intensive management, since the measures directly stimulate the mobilisation of inputs into agricultural production. This measure has certain positive effects on mitigating the processes of production abandonment.

However, it is not clear whether the direct payment system only supports intensive and conventional production, as some farms can only accumulate agricultural land and manage it extensively. Environmental types of farms also receive these payments, but it is certainly an economic-income measure that favours the economic aspect of sustainability and encourages the creation of larger, more intensive and conventional types of management. The impact on the creation of environmentally sustainable types of production is small to negligible, but due to the distribution of payments it definitely does

not contribute to the long-term preservation of smaller holdings and thus to the vitality of the countryside. Although European agriculture is very diverse, it is probably true that, in the long run, direct payments even contribute to structural changes, which can be understood as abandonment of production by smaller holdings and taking over resources from larger holdings.

The upcoming changes in the organisation of direct payments (eco-schemes and flexible arrangements of production-coupled support as two prominent features of the CAP post-2022 in this respect) may yield results in a redistribution of payments in several dimensions (between sectors, between regions, between land types) and potential disruptions to the existing farm structure (Volkov et al., 2019). Targeted payments (e.g. the CAP post-2022 envisages complementary income support for young farmers) may have a direct impact on generational renewal. Part of CAP Pillar 1 direct payments attributed to schemes for the climate and environment (so-called "eco-schemes") may further stimulate an adjustment of agricultural production towards more environmentally sustainable practices.

(b) Market Support

CMO measures cover a whole range of measures, which can be divided into three groups. The first is market interventions, which cover internal market and trade measures and act as a safety net, i.e. they are triggered in extremely rare emergencies. Therefore, it has been estimated by the project team that their actual impact on structural changes is negligible.

The second group consists of school fruit and school milk, which create additional demand for agricultural products and also have certain dietary goals. The third group consists of sector-specific structural support, which is important especially in viticulture, but also in beekeeping, hop growing, olive growing and some other sectors. With the latter two groups of measures, it is possible to identify an impact on prices; they reduce market and production risks and affect the preservation of production potentials. It can only be conjectured regarding the impact on structural changes – however the estimate is that the impact is quite limited. These measures, with the exception of sectoral ones, which may also address environmental objectives, have a predominantly economic note of sustainability. However, small and medium-sized producers also have access to these measures. It is estimated that they mainly favour conventional agriculture and agricultural holdings, and because the support usually depends on the size of the holding, it favours larger ones and, like direct payments, accelerates structural changes.

(c) Support to environment and climate change

The first set of measures in this policy domain includes (i) payments for agri-environment-climate commitments (AECM) and (ii) support for sustainable management of genetic resources in agriculture. In 2014-2020, they accounted for some 6% of CAP expenditure. AECM are mandatory and therefore included in all programming documents (RDPs, CAP SPs). Implementation of these measures varies greatly among Member States in terms of the territorial level at which the operations are designed, as well as in the types of supported operations and other implementing provisions (e.g. collective approaches)[19].

These measures focus on the promotion of sustainable farming practices in terms of biodiversity, landscape, water and soil. Evaluation reports and academic research do not make direct links between AECM and farm decline nor any other attribute of farm structural change. Nevertheless, AECM can be

[19] The ENRD RDP analysis (n.d.) is a good source to get a broad overview of the implementation of these measures in 2014-2020.

associated with several drivers of structural change. By providing (quasi-)market payments for environmental externalities, AECM can be seen as a tool for addressing societal demands in terms of environmental sustainability of agricultural production, including the valorisation of ecosystem services and the sector's adaptation to climate change.

It is impossible to overlook the income effect of AECM, especially in their "broad and shallow" versions having relatively simple requirements which can be met by large numbers of farmers. Although the initial purpose of this measure is payment for environmental externalities linked with agricultural production, it provides an income incentive and as a result certain farming types adjust their production strategies accordingly (e.g. extensive livestock farms on marginal agricultural land, Baldock et al., 1996). Similar to direct payments, these policy disbursements may affect markets for land and other production factors. Revenues from AECM payments (designed as payments per hectare), also trigger scale effects such as increased financial leverage for farm investment or acquisition of additional agricultural land by larger farms; such investment is potentially associated with farm level issues such as sunken costs or weakened economic performance. Transition from compliance-based to result-based payments may also change the spatial patterns of farms participating in this measure (e.g. through changes in eligibility conditions, influencing decisions to participate and consequently affecting farms' bottom lines), potentially also influencing farm structures.

In the case of support for sustainable management of genetic resources in agriculture, similar effects can be expected as in the case of AECM.

The second set of measures in this group is focused on support for animal welfare. In terms of financial volume, these measures accounted for less than 1% of CAP expenditure in 2014-2020 and targeted a smaller subset of farm holdings. Payments that reward improved animal welfare on livestock holdings reflect societal demands in this respect. In the case of farms applying for this measure, enhanced animal welfare requires investments in improved technologies. Once they are capable of meeting higher animal welfare standards, they have set a basis for market valorisation of improved animal husbandry practices through certification and labelling. Adding to this income effect, which increases with the scale of farms benefiting from this measure, it can inferred that the interest for these measures, as well as the benefits from them, are on the side of larger, specialised farm operations.

(d) Support for organic farming

Support for organic farming is meant to reward the environmental benefits associated with organic farming practices (improved soil and water quality, mitigation and adaptation to climate change, improved biodiversity). In addition, it responds to growing consumer demand for organic produce by stimulating further growth of the organic sector. This is even more obvious in view of the fact that the measure applies to farmers who fit the active farmer definition, therefore leaving out the farming types whose agricultural activities form an insignificant part of their overall economic activities. In some cases (for example IT, some regions), priority is given to projects implemented through a collective approach. This may improve the economic resilience of small- to medium-scaled farm operations through joint market presence.

Even more directly than in the case of AECM, support for organic farming increases the participating farm's ability to valorise ecosystem services (organic food, improved environmental performance).

As can be seen from the analysis of RDPs in the 2014-2020 period (ENRD, n.d.), many countries and regions opted for a preferential allocation of support for organic farming to certain locations of special importance (e.g. farms within Natura 2000, nitrate vulnerable areas, agricultural areas located in river

basin management plans). Such an approach has been highlighted primarily in the context of preventative actions against the abandonment of farming in environmentally vulnerable areas, with possible further negative environmental effects (landscape, biodiversity).

The relevance of support for organic agriculture for participating farms is also reflected in a substantial public budget. With about 3% of the total CAP expenditure in 2014-2020, this is the fourth highest budgetary allocation of Pillar 2 measures.

(e) Payments for areas with constraints (LFA/ANC, NATURA 2000, WFD)

Support for farming in Less Favoured Areas (LFA), recently renamed to Areas with Natural Constraints (ANC), is designed as an annual per hectare payment to farmers to compensate for the additional costs and income forgone associated with farming in disadvantaged areas. The measure aims to lessen/prevent the negative consequences of the abandonment of farming, or even reverse such trends in early stages. In addition to this, some member states undertake an additional policy effort to tackle the land abandonment problem (Castillo et al., 2021).

Compensation payments for farming in areas with adverse natural conditions for agricultural production have had an undisputed role in retaining agriculture in these areas since the introduction of the scheme in the mid-1970s (Schuh et al., 2020). The spatial pattern of land abandonment across Europe varies, however (Perpiña Castillo et al., 2021), suggesting a differing degree of efficiency of this scheme between Member States. This may have to do with very dissimilar LFA/ANC delimitation criteria in previous periods (ECA, 2003).

A more critical early evaluation of the measure (Cooper et al., 2006) revealed that the evolution of farm structures in LFA did not differ significantly from other areas, although variations were detected among Member States in this respect. Moreover, the data provided no evidence of a disproportionate loss of agricultural land. The result could be interpreted as evidence as to the effectiveness of the LFA measure in alleviating farm decline. A note of caution was added to this interpretation, as the convergence in the farm structures in LFA and other areas occurred irrespective of the (large) differences in payment rates between Member States. For this reason, the evaluation concluded that LFA payments were only one of the factors that contributed to this trend. The same evaluation (Cooper et al., 2006) noted that at a micro-scale, the dynamism in agricultural land use is far more pronounced than the macro-trends detected at the national level. At that time, the evaluation found evidence of an accelerated withdrawal from farming and loss of agricultural land on permanent pastures and stronger inclinations in IT and PT.

Since its introduction in 1975, the objectives of the measure have evolved, slowly shifting from social objectives (e.g. mitigating rural depopulation and the abandonment of farming) towards environmental ones (e.g. maintaining land use and sustainable farming systems). From this we can infer the decreasing role of LFA/ANC payments in mitigating farm decline, whereas the role of LFA/ANC payments in preventing the loss of agricultural land remains more articulated.

With regard to the financial scope of the measure (with 6.5% of total CAP expenditure, the measure is the third largest item of CAP Pillar 2 measures), its importance in terms of the contribution to farm incomes is indisputable. The relevance of the income effect was even more expressed up until the early 2000s, with considerable disparities observable between Member States in terms of the designation of eligible areas, level of payments per beneficiary, and corresponding effects on farm incomes. Following the review of the measure by the European Court of Auditors (ECA, 2003), the legal basis of the measure sought to unify the designation criteria and to set payment ceilings. In addition to this, the measure

today anticipates regressive payments above a maximum size threshold. Common rules for the designation of LFA/ANC from 2018 result in the CAP post-2022 being the first programming period with the measure placed on equal terms for all Member States.

In the same way (annual per hectare compensation payments for additional costs and income forgone), support is also allocated to farmers and foresters in their implementation of the Birds and Habitats Directives, and the Water Framework Directive (only farmers). In contrast to LFA/ANC payments, beneficiaries do not have to meet the active farmer definition, making the payment also available to holdings whose agricultural activities are not motivated by economic objectives.

Natura 2000 and WFD payments have been established fairy recently (in the 2014-2020 programming period), reflecting in a relatively limited scope of implementation. They are among the measures receiving the smallest share of the CAP expenditure, and their impact on farming structures is limited.

(f) Investment support

Investment support is intended to increase the fixed assets, credit-to-debt ratio and labour productivity of supported operations. As such, it should improve supported farms' economic performance and long-term economic viability. Evidence shows, however, that effects of farm investment support on farm structural change is varied, and tends to be farm-group specific (Kirchweger and Kantelhard, 2015). As a rule, investment support tends to increase production intensity. If associated with investment in supplementary activities on farms, it improves supported farms' employment potential.

As outlined in the Measure fiches and presented in greater detail in suggested sources, investment in physical assets in agriculture in the expiring programming period (2014-2020) consisted of four sub-measures covering different aspects of modernisation of the agri-food chain. This includes agricultural holdings, processing and marketing, land management measures and infrastructure, and non-productive investments. Investment support accounted for about 8.5% of total CAP expenditure in 2014-2020, making it the largest item of CAP Pillar 2 expenditure.

The extent of structural change induced by these measures highly varies according to the modalities of implementation. The largest part of this support is attributed to the modernisation of farm holdings with immediate impacts on the improvement of the supported farms' technological and presumably also economic viability and competitiveness. In some regions, in particular in the South of Europe (EL, PT, IT), the focus of farm investment support is on environmental purposes (adaptation to climate change), improving the supported farms' resilience to climate-related production risks. Several Member States have decided to ring-fence funds by sectors and implement sector-specific calls, which should contribute to achieving the desired sectoral structure of agriculture. Some Member States are giving preference to collective investments, which are expected to strengthen the performance of assisted value chains (European Parliament, 2016). Through positive discrimination of socially desirable farming types (e.g. organic farmers and young farmers), some Managing Authorities[20] have decided to accelerate improvements of their farm structures.

The ENRD (n.d.) reports of increased interest in investment on energy efficiency, renewable energy and biomass projects. This resonates well with the increasing demand for non-food uses of agricultural (by-) products in accordance with the principles of circular bioeconomy. A cost-efficient and stable supply of biomass are of key importance for viable operations in this domain. Larger and consolidated agricultural holdings are in an advantageous position.

[20] ENRD reports that in 2014-2020, about 10% of RDPs were giving priority to organic farmers and young farmers.

As supported investments require own financial participation, larger and specialised holdings with stronger financial leverage are in a better position to participate in these schemes. In order to better balance the investment support, managing authorities may design special schemes for small farms with lower rates of own financial participation, or more favourable financing conditions (e.g. grants vs. financial instruments). In this context, highlighting are the special investment support schemes for semi-subsistence farms, introduced with the substantial enlargement of the EU in 2003 and 2007. The actual effect of these schemes on the long-term viability of supported farms remains controversial (Davidova et al., 2013).

The long-run impacts of investment support are related to the eligibility criteria and implementing provisions, which vary greatly among RDPs. When applied efficiently (i.e. selecting viable projects), investment support is expected to improve the supported farms' viability and decrease their dependence on subsidies; if the contrary is the case (implementation based on vague criteria), negative effects in the form of sunk costs may emerge.

In the case of non-productive investments (mostly improving biodiversity management and environmental performance), supported investments are often focused on environmentally vulnerable areas and Natura 2000 sites, which has a positive effect on maintaining agricultural use in those areas.

(g) Promoting cooperation (producer groups and organisations, risk management, EIP)

Measures promoting cooperation combine very diverse public interventions with a common goal of improving the farming sector's (technological, economic, environmental) performance and viability through common action.

Joint market presence of farmers' cooperating in producer organisations (PO) and producer groups (PG) improves their position in the agri-food value chain and increases their resilience. It is increasingly common that the cooperation in POs or PGs is associated with higher quality standards, either in terms of product quality, or in terms of more sustainable practices (e.g. animal welfare, organic production, nature protection). In such cases, cooperation encourages market valorisation of ecosystem services.

The cooperation of farmers taking group approaches towards risk management (e.g. hedging, mutual funds, insurance schemes) improves the participating farmers' resilience to production and market risks associated with their primary production. In this sense, a more efficient coping with risks can be seen as a strong stabilising element for agricultural structures in areas with high participation rates.

Cooperation among farmers brings beneficial outcomes also in terms of knowledge and innovation transfer, such as through their participation in EIP projects. Expected benefits vary with respect to the guiding theme of knowledge and innovation transfer, spanning from technological advances in agriculture (e.g. digitisation of processes, productivity gains), improved farming practices in terms of climate change adaptation, or by adopting social innovations. The common denominator of all these approaches is enhanced resilience and stability of farming structures in the participating areas.

Cooperation actions have accounted for about 1.5% of overall CAP expenditure in the programming period 2014-2020.

(h) Knowledge transfer

The tasks of public services associated with knowledge transfer towards farmers are diverse. These may include consultation in the field of technology, economics, food safety and environmental protection, advice and assistance in drafting development plans, implementing agricultural policy measures, or-

ganising and operating various forms of producer associations, advising on relevant regulations, promotion and awareness-raising and other tasks. These services should be open to all farmers, irrespective of their type, size or production orientation. In practice, however, gains from extension services depend from the participating farmers' commercial motivation to adapt their practices, which is not equally distributed among different farming types.

In the EU, most activities associated with farm extension work and other forms of public services of knowledge transfer are financed from Member States' national budgets. The organisation, and intensity of these services varies greatly among them. Knowledge transfer actions financed through the RDPs (CAP Pillar 2) cover only a limited range of activities (e.g. environmental management) and are only symbolically represented in CAP expenditure. For this reason, no structural adjustment of farms can be associated through knowledge transfer activities financed through the CAP. Obtaining credible information on the structural effects of agricultural extension from national schemes would require additional research, which falls outside of the scope of this task.

(i) Targeted support for young farmers, small farms and non-agricultural activities

Although the agricultural sector across the EU is undergoing significant structural change, the ageing of the farming population remains one of the top challenges. Generational transmission of farms is hampered by various factors, such as unfavourable conditions on land markets, low earning capacity from farming, difficult access to credit and insufficient skills (EC, 2020). This is seen as one of the key challenges of the CAP and is tackled with a set of stimulative instruments for the generational renewal of farms. In the programming period 2014-2020, these instruments were: (i) top-up direct payments for young farmers (Pillar 1), reaching about 7.5% of all recipients of CAP direct payments; (ii) installation grant (Pillar 2), (iii) supported business development plans/investments for young farmers (Pillar 2), both reaching about 1.1% of all agricultural holdings in the EU. Intensive CAP support is however reported to be insufficient, on its own, to address main entry barriers into farming: inaccessibility of land, poor access of capital vitality of rural areas. Especially access to land is pointed out in this respect.

National policies, such as pension schemes may additionally contribute to a poor liquidity of agricultural land markets. In the absence of adequate pension schemes, older farmers work part retirement. This may be amplified by their participation in the CAP small farmers scheme, a simplified income support scheme granting a one-off payment (limited up to EUR 1,250, or lower in some Member States). The measure contributes to social stability of smallholders but at the same time also inhibits generational renewal in the agricultural sector.

Regulation of the CAP for 2014-2020 CAP provided for investment support in the creation and development of non-agricultural activities. The instrument was available for micro- or small enterprises in rural areas or operations, managed by members of a farm household. Especially in the latter case, the measure was meant to improve the earning capacity and resilience of farm holdings engaging in ancillary activities.

(j) LEADER/CLLD

LEADER approach towards rural development is aimed at engaging local actors in the design and delivery of local development strategies, project selection and the allocation of public funds for the development of their rural areas. It is an obligatory instrument of the Member States' Rural Development Plans, accounting for about 4.5% of total CAP public expenditure in 2014-2020.

Projects implemented as part of a local development strategy are diverse in terms of themes and sectors covered. The focus is usually given to projects that add value to rural communities in terms of

quality of life (e.g. better connectivity of rural areas, accessibility of public services), social cohesion (e.g. preserving rural heritage, promoting inter-generational exchange), and rural viability (e.g. investments in co-working facilities, start-up aid for micro-enterprises).

As originally designed, projects supported through LEADER would concern farming structures only indirectly, by improving the quality of life and viability of rural areas. In reality however, particularly in some CEE countries, reports reveal a strong bias of supported projects local agri-food supply chains. In this view, the supported projects may improve the livelihoods, and resilience of the farming sector.

4.2. CAP-related farm adaptation strategies and their implications for further evolution of farming structures in the EU

4.2.1. CAP measures and their intervention logic: to what extent are they triggering farm adaptation strategies?

Described in this section are the adaptation strategies that may be adopted at the individual level. This, therefore excludes various cooperation strategies, as the final decision as to the future of the farm ultimately falls on the individual farmer. These strategies are based on a literature review, the majority of which focuses on segmenting current farms based on a limited number of indicators, rather than the strategies they adopt (e.g. Dos Santos, 2013; Davidova, 2003; Iraizoz et al., 2007; Guarín et al., 2020), and discussions among the authors of this study. It should be noted that they are not necessarily mutually exclusive, and may indeed in some cases be complementary.

(a) Intensification, specialisation, economy of scale

The strategy of intensification, specialisation and economies of scale has long since been the main way of combatting the "technological treadmill", as proposed by Cochrane (1958) and confirmed by subsequent research. While larger farms are more likely to achieve economies of scale and successfully adopt new technologies, "laggards" will likely get squeezed out of production, leaving the land to be overtaken by more successful farms or simply taken out of production. Larger, consolidated, land parcels allow for a greater degree of intensity and input optimisation, while specialisation simplifies production, necessitating less complex knowledge, fewer kinds of machines (enabling optimal use of existing machines), but also usually a higher level of off-farm inputs. Higher yields resulting from this strategy likely serve to lower overall prices, reinforcing the cycle. Farms adopting these strategies are expected to have higher levels of employed (non-family) labour, rented land, and sufficient capital to invest in land acquisition and adoption of new technologies. While most likely being recipients of farm subsidies, these farms are envisaged as being more market-oriented rather than relying on subsidies. As such, they are potentially also the most likely to engage in cooperative activities to improve their bargaining position with regard to the processing and retail sector.

(b) Adding value to agricultural production

The technology treadmill, in theory, applies to markets of basic commodities (Berdegué, 2002) – when a large number of farmers produces an undifferentiated commodity, pushing them into the position of price taker. Therefore, a sensible strategy to escape the abovementioned cycle is to seek different markets and higher prices through product differentiation – offering either less commonly produced basic commodities or adding value, either through processing or by means of linking them to consumers of higher purchasing power and attaching a higher value to their products (i.e. a characteristic such as

localness, specificity, appropriateness for certain consumer groups such as vegans, people with allergies, religious adherents). Farmers adopting this strategy are likely to be more innovative and therefore may be younger and/or better educated than those belonging to the other groups. Depending on the specific form of adding value, this strategy may necessitate a certain amount of initial capital.

(c) Ecologisation of farming

The common characteristic of farms belonging to this category is that they aim to have a lower environmental footprint. However, the motivations and modes of this group of farmers are actually quite diverse. In this group one might find highly motivated permaculturists who adopt farming, perhaps anew, as a counterculture lifestyle, or highly productive market-oriented large-scale organic farmers. Lowering environmental footprints can be achieved through a number of pathways with different foci and technologies, for example, organic farming, agroecology, conservation/minimum tillage, integrated pest management, biodynamic farming, permaculture, to name a few.

(d) Off-farm employment

Seeking additional income off-farm is a characteristic of family farms run by owners who do not wish to abandon farming entirely. Sometimes this is undertaken to disperse risk or acquire additional capital for investment (van der Ploeg, 2016). This can entail that only some family members, or spouses, participate in seeking employment elsewhere, while one family member stays on the farm. Habitually such farms are smaller, of lower intensity, and produce for themselves rather than for the market, perhaps selling surplus produce. These farms act as important social buffers, offering a certain level of security during crises. In some cases, new non-farming activities may be adopted by members of family farms that actually occur within the farm, this can be referred to as on-farm diversification of multifunctionality (ibid.).

(e) Optimisation of CAP support

This group, sometimes referred to as "sofa farmers" (Matthews, 2012) or "armchair farmers" (Breen, 2020), may also contain a wide array of profiles. At the most extreme end are landowners who do not farm at all, but own land which is eligible for agricultural subsidies; a category that is highly pertinent to the debate on "active farmers" at the EU level and particularly problematic in some post-socialist countries. Some of these landowners do rent their land to farmers who actually work it (to different levels of intensity), but collect the subsidies themselves (see e.g. Gebrekidan et al., 2019). A somewhat less extreme variety of this strategy is tailoring production in order to maximise the yield of subsidies (rather than produce) within what is technologically possible on the farm and without much regard to the marketability of produce.

(f) Abandonment of farming

A converse of the first strategy, farmers adopting this course of action will abandon farming entirely due to low incomes (price squeezes) and/or low attractiveness (societal perception) of the profession. These farms are likely marked by smaller sizes, ageing owners, a lack of successor, a lack of formal agricultural education, and lack of capital.

(g) Evaluation of the micro-economic strategies triggered by CAP measures

In line with the approach of this study (chapter 1.1, Figure 1), the next step in our evaluation concerns the farm-level adaptation strategies triggered by CAP measures. Table 6 presents the results of a qualitative assessment[21] of the existence, and likely scale, of interactions between CAP measures and microeconomic pathways at farm-level.

Table 6: CAP measures (2014-2020) and likely farm adaptation strategies (own assessment)

Farm adaptation strategies 'microeconomic pathways' / 2014-2020 CAP measures	Intensification, specialisation, economy of scale	Adding value to agricultural production	Ecologisation of farming	Off-farm employment	Optimisation of CAP support	Abandonment of farming
1) DIRECT PAYMENTS						
basic payments, SAPS, redistributive payment						
greening component, specific nat. constraints						
Payment for young farmers						
Volutary coupled support						
Small farmers scheme						
2) MARKET SUPPORT						
3) AGRI-ENVIRONOMENT & CLIMATE PAYMENTS						
Agri-environmental & climate measures (AG&FOREST)						
Animal welfare						
4) SUPPORT FOR ORGANIC FARMING						
5) LFA/ANC, NATURA 2000 AND WFD PAYMENTS						
6) INVESTMENTS IN PHYSICAL ASSETS						
7) COOPERATION (PGs, POs, RISK MGMT., EIP)						
8) KNOWLEDGE TRANSFER						
9) YOUNG FARMERS, SMALL FARMS, NON-AGR ACTIVITIES						
10) LEADER / CLLD						

No specific farm response
Measure triggers weak response at farm level
Measure triggers strong response at farm level

Source: Project Team, 2022

Farm-level strategies, leading towards, or strengthening, the **intensification, specialisation, and economies of scale** are most likely to occur in conjunction with CAP Pillar 1 direct payments, and CAP Pillar 2 support for investments in physical assets. As explained in a greater detail in paragraph (a), direct payments act not only as income support, but also as financial leverage to support further farm growth. In our opinion, this is most pronounced for intensive specialised, and large corporate farmers. As it is an instrument available to most agricultural holdings engaged in commercial agricultural production, this pathway is not limited exclusively on the two abovementioned farming types, but also

[21] The estimation was based on the review of relevant evidence (evaluation reports, case studies carried out within this project) and verified by the project group and external experts at the project workshop (17 January 2022).

other ones, such as patrimonial farms and adaptive-diversified farms. Although other farming types may obviously also be eligible for direct payments, it is less likely that these would lead to farm specialisation. A similar observation is estimated for investment support. In line with the evidence summarised in paragraph (e), the motivation for further growth and intensification of production is most pronounced in the case of intensive specialised and large corporate farms. To some extent, similar pathways can be expected on adaptive-diversified farms. Where such schemes exist, investment support for small (semi-subsistence, or non-commercial farming types) also leads to certain intensification. Among CAP Pillar 1 instruments, market support is likely to act in favour of further intensification and specialisation of agricultural production, whereas in the case of CAP Pillar 2, this is expected in conjunction with Cooperation measures, Knowledge transfer, and targeted support for Young farmers and ancillary activities on primarliy adaptive-diversified farms.

Adding value to agricultural production is the strategy which is most commonly related to adaptive, diversified farms. This is the most strongly pronounced in the case of CAP Pillar 2 measures supporting investment in physical assets, and certain measures appearing in the group "Cooperation" (establishment and operation of Producer groups and Producer organisations, to some extent also improved farm management resulting from their cooperation in EIP projects). With regard to the "Cooperation" measures, also other farming types may be motivated for at least a partial shift to adding value to their agricultural production on-site. Adaptive-diversified farms are expected to strengthen their added-value strategies also in conjunction with other CAP instruments and measures, such as CAP Pillar 1 Direct payments and Market support, and CAP Pillar 2 measures AECM and support to organic farming (both together with regenerative farms), LFA/ANC payments and support for Knowledge transfer (together with various other farming types, such as semi-subsistence, corporate, but also new entrants to farming), support for Young farmers and LEADER/CLLD projects (again, together with other farming types, such as specialised farms, traditional and semi-subsistence farms, as well as some specialised farming types, such as social farms).

Farming related motives and personal motives are prominent in the **decision of farms to convert to organic agriculture** (Padel, 2001). CAP measures, in particular payments for organic farming, may also have a stimulating role for farmers in this respect, but the evidence suggests that this role is not a decisive one (Jarczok-Guzy, 2020). Ecologisation of farming as a microeconomic pathway can hardly be associated with a specific farming type. In assigning the CAP expenditure on support to organic farming and other potentially relevant measures,[22] our assumption is that the largest share goes to the existing organic farms. Further, our assumption is that other farming types that are eligible for CAP payments enter the organic farming scheme in accordance with their relative weight in the farm structure.

There is no CAP measure that one could associate with a strong response in terms of **off-farm employment.** CAP measures gearing towards rural viability beyond the agriculture sector (support for non-farming activities, part of the projects supported within LEADER/CLLD) may however accelerate the transition of persons from agriculture to off-farm employment. However, considering a relatively finite financial scope and scope of implementation, this is limited. Again, this pathway can be hardly associated with any of the farming types eligible for CAP support, albeit it is less likely to occur on intensive-specialised or corporate farms.

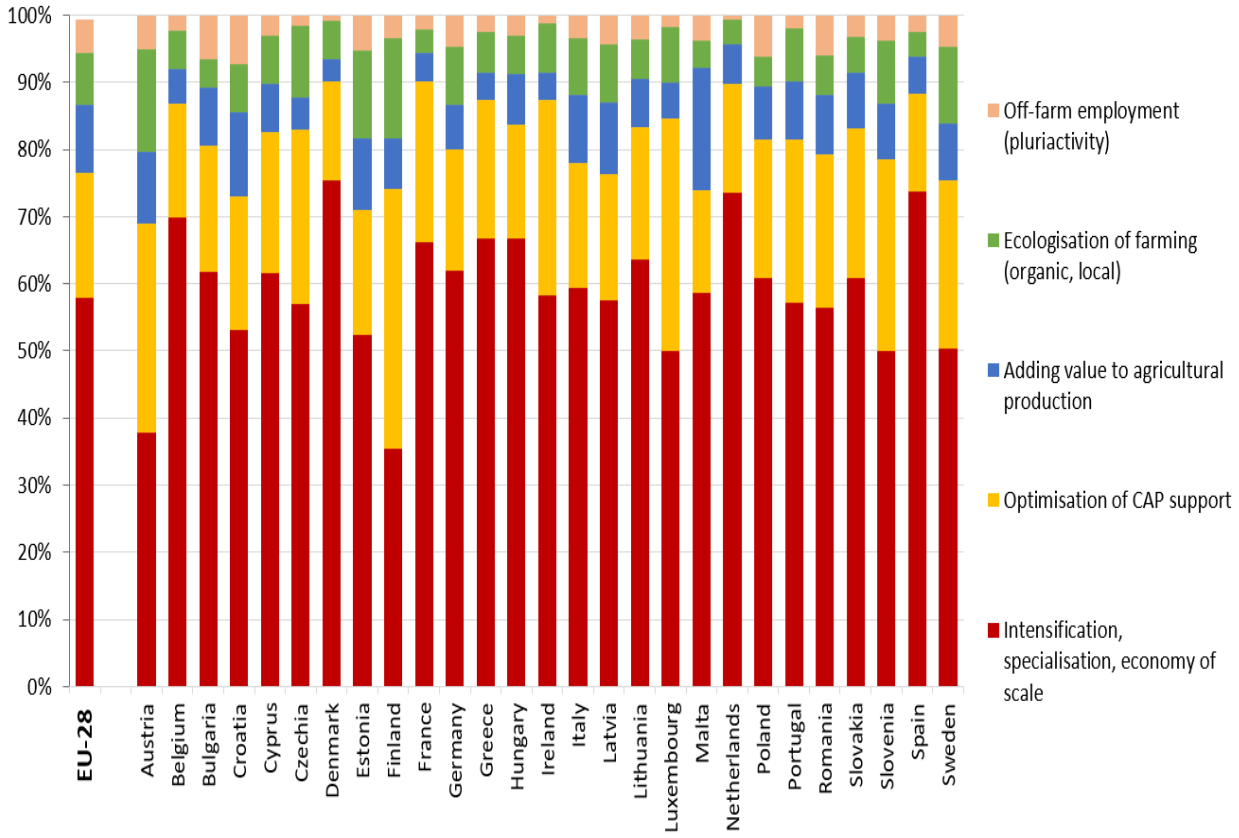
In some cases, the implementing provisions of CAP measures trigger strategic behaviour of farms in terms of **optimisation of CAP support.** An extreme, and fraudulent, case would be by splitting large,

[22] 'Other relevant CAP measures' include the measures to allow synergies with organic farming; AECM and LFA/ANC payments, Investment support, Support for cooperation, Support for knowledge transfer are the measures that stand out in this respect.

specialised or corporate agricultural holdings and requesting aid via several linked units to evade degressive reduction on direct payments (European Commission, 2021). More frequent are strategies, where farms take into account various CAP payments (for instance coupled direct payments, some market support measures, AECM, payments for organic farming) in making their production decisions. A different case of optimising occurs in conjunction with the investment support, when farms would have undertaken comparable investments also without the investment support, creating deadweight losses of CAP support (Michalek et al., 2013). Also in the latter two cases, strategic behaviour of farms is assumed to take place in accordance with the structure of farms eligible for CAP support.

The farm-level strategies discussed in this chapter were allocated along the CAP measures in accordance with the estimated linkages (Table 6), whereas their financial weights were defined in accordance with the average yearly CAP expenditure in the programming period 2014-2020. Results are presented in Figure 30.

Figure 30: Farm-level strategies (microeconomic pathways) stimulated by CAP expenditure (estimate, 2014-2020)



Source: Project Team, 2022

The results suggest that more than half of CAP expenditure can be associated with farm level strategies leading towards intensification, specialisation and economies of scale. The result is hardly surprising, as the farming types engaging in these strategies are the largest recipients of the CAP direct payments, which is by far largest item of CAP expenditure. Nevertheless, the result also suggests that the current legal and implementing arrangements for the CAP amplify the existing structural trends of further concentration and intensification of agricultural holdings. According to our estimates, almost 20% of CAP expenditure triggers strategic behaviour of farms when farms take into account CAP measures in their

production decisions. The other three farm-level strategies (adding value to agricultural production, ecologisation of farming, off-farm employment) account for slightly more than 20% of CAP expenditure.

4.2.2. Which (present and emerging) farming types are tackled by current CAP and to what extent?

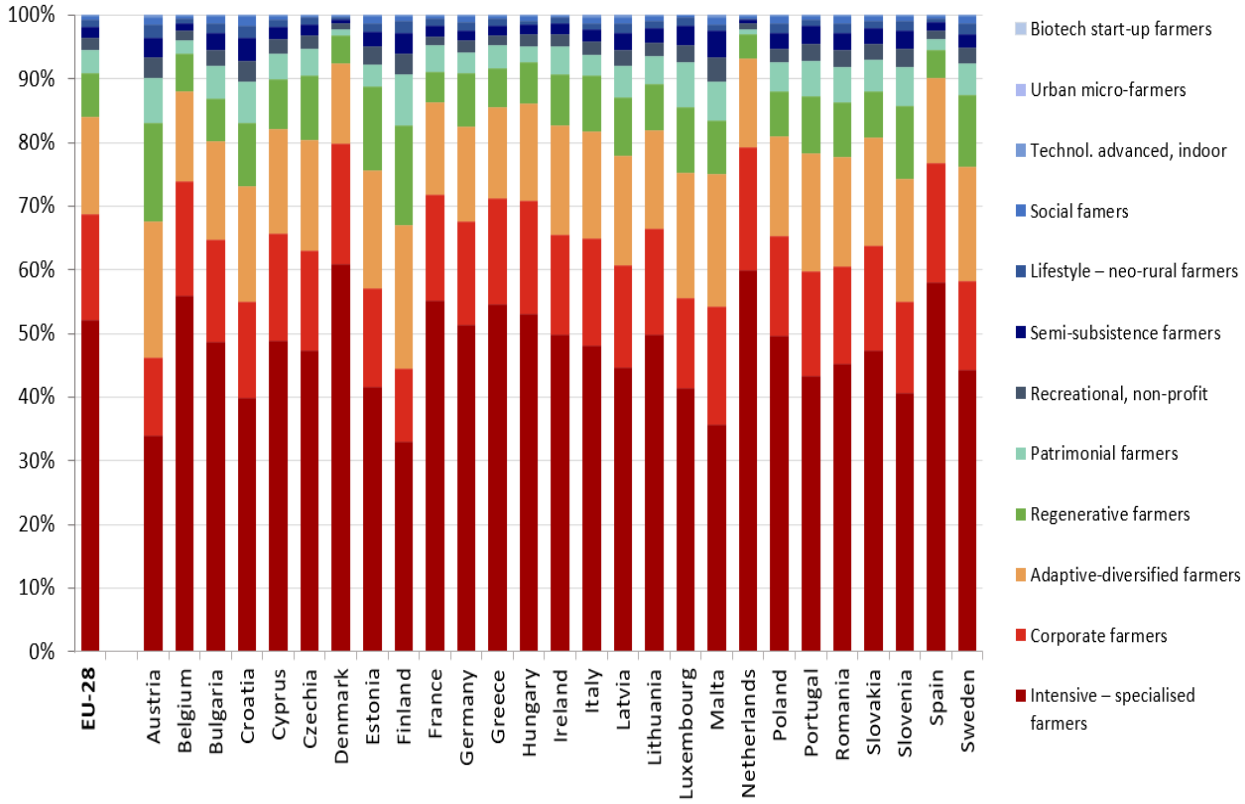
As discussed in greater detail in chapter 2.1, this study highlights the dynamic notion of the European Farming Model (EFM). The macro-economic, societal, and environmental context in which European agricultural sector is operating is increasingly complex and dynamic. As such, it requires constant adaptation. In previous sections of this chapter, we described the interplay between CAP instruments and measures and various[23] drivers of structural change (chapter 4.1.2), as well as responses at the farm-level (chapter 4.2.1). As a result of this interplay, together with farm structural change that falls beyond the scope of CAP intervention, an increasingly diverse set of farming types has emerged. The increasing diversity of farming types determines the structure of European agriculture today and in the foreseeable future. In defining these farming types, our study draws on the results of a recent foresight study "Farmers of the future" prepared by the EC analytical services (Bock et al., 2020). While testing at the Case Study level, it was found that the 12 profiles of existing and emerging farming types mark an appropriate starting point for the projection of structural features of European agriculture, as well as for making recommendations to planners and decision-makers in agricultural policy and other policies that affect the direction and dynamics of agricultural development.

In line with our assessment of the farm-level responses triggered by CAP measures, we assessed the intensity of the implementation of CAP measures by different types of farms. While our assumptions for this assessment are described in previous chapter (4.2.1), Figure 31 presents the estimated allocation of CAP expenditure along the twelve farming types defined in the EC study (Bock et al., 2020), applying the budgetary weights of the CAP implementation for 2014-2020.

Our results reveal that the largest part of CAP expenditure (close to 70%) is allocated to the intensive specialised farms and corporate farms, for example the types of agricultural holdings which are currently dominating the process of farm growth and farmland use, and are projected to retain this role in the future.

[23] In our study, we broadly distinguish between external, and sector-specific drivers of farm structural change (Figure 1, chapter 1.1), applying to both, supply- and demand-side of agri-food markets.

Figure 31: Estimated CAP expenditure by farming types, 2014-2020



Source: Project Team, 2022

Further 25% are allocated to farms, which are most frequently represented in the current structure of European agriculture; according to the typology developed in the EC foresight study (Bock et al., 2020). These farms are classified among adaptive-diversified, regenerative and patrimonial farms. Other farming types, whose representation in the structure of the EU agricultural sector is likely to grow in the coming decades and who equally contribute to the three general CAP objectives (competitive and resilient agri-food sector, environmental sustainability, rural vitality), are currently only symbolically addressed in CAP instruments.

5. SYNTHESIS OF FINDINGS AND POLICY RECOMMENDATIONS

Structural change in agriculture is an autonomous process, which occurs as a result of an interplay of various drivers. In this study, we roughly distinguish between drivers that are sector-specific, and external. Throughout the process of structural change, farms develop their own survival, or development strategies, which results in a diverse set of farming types. For several decades, evolution of farm structures in Europe has been moving in a recognisable direction of a bipolar structure, with large specialised agricultural holdings on one side, and an increasingly diverse group of farming types on the other. While the farms on the "diverse" side of the distribution are significantly smaller, they are pursuing different objectives. Some of them are compensating small scale with agility, flexibility and diversification. Others are seeking to improve the ecological performance of their farms. Quite opposite, some farmers are adopting the latest technologies to grow food in a controlled environment, possibly combining this with the advances in agricultural biotechnology. There is also a growing subset of farms in which economic goals play only a side (semi-subsistence farmers), or even insignificant (recreational farms, urban micro-farming), role. With respect to farming types, personal (patrimonial farmers) or inclusive (social farms) motivations prevail. Enumerating these different types of farming – some of them declining, some of them stable, some are just emerging – it becomes obvious that agricultural policy has only a limited impact on their production decisions and behaviour.

The European Farming Model (EFM) as the central concept of European agriculture to be pursued by the Common Agricultural Policy (CAP) originated in the late 1990s. Although prominent in policy discourse, in the last 20 years, in a good two decades of its existence, EFM has not found a direct confirmation in the proclaimed objectives of the CAP. This becomes especially important in strategic planning of agricultural and rural policies, which requires the identification of needs and the development of an intervention logic associating the range of measures selected with desired outputs, results and outcomes.

Nevertheless, structural objectives linked to the agricultural sector can be indirectly identified through the derivation of the intervention logic of the CAP. If we narrow down the objective hierarchy to the CAP general objectives, and if we ignore small semantic differences throughout the EU programming periods, the general objectives of the CAP are broadly based on the three pillars of sustainability (economic, environmental, social), which are then translated into individual specific objectives with different emphases and priorities for action.

If we allow ourselves to adopt such a generic understanding of the objectives of the CAP, an insight into the contents and implementing provisions of the CAP measures allows us to assess the extent to which the CAP contributes to the three criteria of sustainability, which are also components of the EFM. Namely, we assume that the concept of sustainability with its three criteria determines farming practices. It follows that, through an analysis of the CAP measures and their effects, we can assess the extent to which agricultural policy contributes to its general objectives (the sustainability criteria, equalling the components of the EFM). We point out that this is a specific reading and understanding of the EFM that must be taken into account when understanding our analytical findings and proposals.

By analysing measures in terms of their contribution to sustainability criteria (or components of EFM) and adding the financial weight of each group of measures, we have identified the extent to which the CAP supports its three general objectives. Although the structure of expenditure by the three CAP general objectives varies from country to country, at least half of the overall CAP public expenditure refers to economic resilience. This confirms the thesis that the CAP predominantly supports economic goals, benefiting most the farming types that are formed primarily through the economic transformation,

resulting from the concentration and intensification of agricultural production. The small share of CAP expenditure devoted to rural vitality may indicate that the CAP implicitly contributes to the marginalisation of small but also medium-sized farms. Environmental objectives, which require a fundamental change in farming and would be expected to be at the heart of the today's CAP, account for less than half of the weight of the economic objectives. Thus, it is difficult to expect a significant change in the structure of agricultural holdings towards stronger ecological performance.

Only a few measures (e.g. installation grants for young farmers, start-up aid for new entrants into farming, support for organic farming) have a direct impact on structures. More often, CAP measures affect the participating farms' production decisions and thus interact with various drivers of structural change. This is especially true for direct payments, which, despite consisting of a web of different schemes (young farmers, green payment), are based on income support and thus have a significant impact on the capitalisation and intensification of agriculture. The same is true for capital investment and LFA/ANC support. We would expect a greater impact of environmental and climate measures on the adaptation of farming practices towards greater environmental sustainability, but the evaluations reveal rather modest results. There is a clearer link between the support for organic production and young farmers which both contribute to the installation, and the growth of the two farming types that are prioritised in the desired structure of farming in the future.

Efficiency and effectiveness of agricultural policy measures in creating the desired farm structure (which defines sustainability and thus the EFM) also depends on how strongly it contributes to the different adaptation strategies at the farm-level. Some of these strategies contribute to the sustainability criteria (and thus to EFM) more, while others less. The results of our assessment on the interactions between CAP measures and microeconomic pathways at farm-level show that most measures have a weaker impact, as they generally address more objectives and thus affect farm-level strategies only indirectly. This suggests the thesis that the effects of the current arrangement of CAP measures on the development of farm structures is rather limited. The bulk of the CAP expenditure is allocated to a large number of different beneficiaries with a less clear intervention logic. Taking into account that the structural objectives of the CAP are not directly defined, one cannot expect the policy to have a strong impact on the preservation, or strengthening, of the EFM.

In the process of structural adjustment, different farming types are emerging in European agriculture. In defining these farming types, our study draws on the results of the recent foresight study "Farmers of the future" prepared by the EC. We estimated the allocation of CAP expenditure along the twelve farming types defined in the above study, applying the budgetary weights of the CAP measures. The results of this estimation clearly show that the CAP largely supports traditional, more conventional and economically defined types of farms. On the other side of the farm structure distribution, types of farming exist that are not reached by the current CAP instruments and measures (eg. controlled environment and biotech farming, social farming, urban micro-farming). Roughly speaking, the bulk of CAP expenditure is obtained by intensive-specialised, corporate and patrimonial farms. The results reveal that the CAP has not yet internalised the new reality that brings the ever-increasing diversity of farming types, for which it is difficult to argue their lack of contribution to the CAP general objectives, but which obviously depart from the concept of the EFM as established in the 1990s. Perhaps the time has come for a more open, and dynamic notion of the EFM and for the CAP to adapt accordingly?

Recommendations derived from the analysis of public policy responses, farm adaptation strategies and the implication for the future of farming (chapter 4)

- Clear structural objectives for agricultural policy need to be established. If the CAP wants to pursue sustainability, then it is necessary to define more clearly what this means in terms of the design of production processes, types of farms supported and structural changes occurring. Given the heterogeneity of European agriculture, the basic principles need to be set first at EU level, and translated into more context-based objectives at national level. A heterogeneous structure of agriculture will contribute to the resilience and sustainability of the sector and the CAP should reward particularly those farms with greater sustainability potential.
- In order to achieve the goal of a clearer transition to sustainability, then measures need to be thoroughly overhauled, also in terms of addressing structural objectives. Addressing drivers should also be taken into account especially encouraging those who establish sustainability and limiting those who deviate from sustainability.
- Farmers of all sizes require access to markets to benefit from their work. Small and mid-sized farms particularly have issues accessing markets, achieving an appropriate share in the EU food chain including value added processing, and maintaining bargaining power. A greater focus on measures that address such issues directly would be beneficial,
- In general, CAP measures need to be defined more clearly and in a targeted way. As seen from current experience, targeted measures (young farmers, organic farming) also achieve more targeted goals in terms of structures and sustainability.
- Cooperatives are one way to improve farmers' access to markets and strengthen bargaining power, which have proven very successful in certain cases. With cooperatives, vertical integration can often play a big role in increasing the benefits felt by farmers. Greater attention could be paid to best practice examples of cooperatives, and similar models of operation should be supported through policy instruments, even if not technically conforming to the cooperative structure.
- The CAP must be more open to new forms and types of agriculture. The notion of the roles of agriculture in the society is changing and expanding, as is the potential for innovation.
- An important element of the policy is also the promotion of socially desirable adaptive strategies at the farm level. Appropriate measures encourage those that lead to sustainability.

5.1. Triangulation of research results

The ultimate purpose of this study is to provide relevant, feasible and appropriate recommendations at EU level, in particular to EU policy makers. The evidence collected in the previous working steps comprises the basis for the formulation of policy recommendations. As such triangulation of the findings was undertaken to increase the credibility and validity of the different findings and allows the analysis of the same research question using different (quantitative and qualitative) methodological approaches.

"How EU policy tools can be better targeted in order to shape the current and future structural change and to reinforce the resilience and sustainability of the European farming?"

As the literature demonstrates (see chapter 2.1), the EU Common Agricultural Policy (CAP) is presented as a means of mitigating structural change in farming. This is corroborated by the results from Neuenfeldt et al. (2019), which revealed that subsidies affect (positively or negatively) 5% of the structural change in the EU15 and 10% of the structural change in the EU12 (see Figure 11 and Figure 12, chapter 2.3). This underlines the fact that CAP instruments have a certain potential to direct structural changes but must be consciously selected to do so. Possible contrary effects from other instruments should also

be preventively researched. The importance and the anticipation of budgetary support in the farms budget, especially Pillar I support, are depicted by the indicator "share of DP and total subsidies in agricultural factor income" and confirmed also in terms of planning and investment behaviours among case study interviewees from Germany and Poland.

The literature, case studies and the expert workshop emphasise the mixed outcomes of past, current and planned CAP instrument. Overall, the CAP is deemed to provide a framework for the continuation of the status quo, which in effect compensates for the prevailing structural trends, rather than demanding actual shifts in farm strategies and orientation. Indeed, as depicted in chapter 4, the current CAP objectives and measures mostly indirectly tackle the structural changes of farms, through its drivers. Literature on the CAP's impact assessment argues that the overall framework needs to change to provide an impact on structural development and reinforce resilience of farming structures in the long run in order to contribute to maintaining the targeted farm structures. This tendency was corroborated by the Spanish case study where a certain acceptance towards on-going farms' concentration is outlined. This implies instruments or integrated approaches towards LFA/ANC areas, with place-sensitive elaboration of policy programmes for different types of areas and farm sizes (e.g. mountains, islands, High Nature Value farming areas, protected areas young farmers, small farms, new entrants to farming, social farms etc.).

To reinforce the resilience of European farming, more measures targeting structural characteristics of the farms are needed. The most vulnerable farming type that may require special policy attention, according to the experts' workshop and case studies, are:

- small market-oriented farms, especially in terms of requiring an upgrade towards high-quality production facilities to help them become profitable again (see CS Poland, Spain and expert workshop);
- market-development and awareness-raising towards organic and other value-added products to stimulate the demand for such products (CS Poland);
- Assistance for small farmers in making long-term plans and investments by facilitating investment conditions, access to insurance and a more stable legal framework, especially concerning environmental and quality standards (CS Slovenia, Poland, Greece and Germany);
- Measures targeting organisational conditions, cooperation arrangements and integrating farms of different sizes, cooperatives and other actors according to their capacity to contribute to production, quality and entrepreneurial orientation are also deemed to be useful, especially to help optimising production and the activities of owners in spatially dispersed plots (CS Spain, Greece and Slovenia).

The experts' workshop within this research first re-emphasised the need for measures targeting small farms, as their closure is directly linked with land abandonment. Furthermore, small farms have an important role to play in rural and local development, therefore there is a need for their inclusion not only to coordinate CAP and national agricultural policies, but also other policies with concerned with cohesion, spatial, environmental and social aspects (as for example local development plans). Keeping in mind the differences in needs between rural areas is deemed necessary by expert workshop participants and also with regard to the literature findings. Another target to help resilient European farming should be to support and ensure the installation young farmers and new entrants in farming (expert workshop and CS Greece). Concerning Pillar I, experts as well as interviewees, underlined its deep integration in the farms' budget and therefore the need to maintain it. However, some experts suggested a wider implementation of capping of payments to avoid the bias towards larger farms.

According to some experts, a more targeted and tailored approach and a "harmonisation" of EU tools towards the objective of achieving the desired farm types and changes is necessary. One main issue in the current CAP policy design is that policy fields (e.g. income, biodiversity, vital rural areas) operate on their own and are, at best, complementary with others, rather than being coordinated towards specific farm structure objectives from the outset.

Recommendations

"How can EU policy tools be better targeted in order to shape the current and future structural change and to reinforce the resilience and sustainability of the European farming?"

- EU policy objectives and targets should include clear priorities related to farm types and structural changes, leading to more targeted approach. All three pillars of sustainability should be included in this framework. In addition, EU policy tools should take into account the wide range of farmer beneficiaries. This includes individual capacities and skillsets, as well as differing structural and socioeconomic contexts of EU member states. Therefore, better targeted and context specific measures addressing the structural characteristics of farms are needed.
- Farmers of all sizes require access to markets to benefit from their work. Small and mid-sized farms particularly have issues accessing markets, achieving an appropriate share in the EU food chain including value added processing, and maintaining bargaining power. A greater focus on measures that address such issues directly would be beneficial,
- Certain farmer groups rely more on targeted policy support than others. Therefore, a prioritisation of structural change and farm types, categorisation of beneficiaries, and adjustment of policy tools to directly target each of these groups is important to improve targeting.
- Place-sensitive programmes, such as LFA/ANC are seen as highly relevant in terms of preventing farmland decline. Other such programmes targeting specific farmer groups, such as young farmers and especially new farmers and emerging farm types (urban, bio-tech, etc), require a greater emphasis to enable such groups to overcome barriers to entry caused by structural changes.
- The farm structures most in need of support, according to study findings, are small to mid-sized farmers and farmers in mountainous and ANC areas. However, findings suggest that farm structures and support systems required vary across the EU and are linked closely to regional contexts. In this regard, while general areas of support include interventions such as upgrades towards high-quality production facilities, market-development and awareness-raising toward organic and ecological production, and access to insurance and financial assistance, the specifics still require development in a highly context specific manner with the support of well conceptualised local development plans.
- Farmer cooperatives are seen as very relevant for organising groups of farmers, streamlining access to markets, and creating an economy of scale that can help overcome many barriers, such as land prices, equipment and access to financial support. However, the intensity and effectiveness of such integration varies greatly across Member States and regions. Increasing the capacity of cooperatives is seen as an important policy area, not sufficiently addressed by the current CAP.
- Cooperatives are one way to improve farmers' access to markets and strengthen bargaining power, which have proven very successful in certain cases. With cooperatives, vertical integration can often play a big role in increasing the benefits felt by farmers. Greater attention could be paid to best practice examples of cooperatives, and similar models of operation should be supported through policy instruments, even if not technically conforming to the cooperative structure.
- With respect to CAP Pillar I direct payments, their share in CAP funding and decision-making is unanimously highlighted. However, in the aim of supporting resilient and sustainable farming, more attention should be given to avoiding bias toward larger farms, and secondary effects such as speculative farmland purchasing and renting.

"How can the EU use the emerging new farmers' profiles as an opportunity to refresh its rural development approach, notably in the light of the new attractiveness of rural areas and the new consumer expectations after the COVID-19 pandemic?"

Even though many factors vary, the cluster analysis reports an overall trend of farm size growth, consolidation, intensification, and loss of small family and patrimonial farms. In parallel, chapter 2.1 shows that to date, young farmers, new entrants, farming regeneration, Community Supported Agriculture and others are emerging trends. These trends originate through the efforts of individuals or groups in creating initiatives to respond to societal and environmental challenges and to changing consumption modes. However and as shown by chapter 2.1, many grapple with being acknowledged as useful contributors to securing agricultural functions and societal demands. Therefore, a stronger support and discourse on this diversity is needed.

As seen in chapters 2 and 4, the emerging new farmers' profiles as described in the recent JRC study ("Farmers of the Future", 2020) reflect the diversity of the farming sector in the decades to come and such types can contribute to a sustainable agricultural sector in the EU in the future. It is important, however, that all forms together meet the sustainability criteria for agriculture and rural areas as a whole. This implied, economically efficient and competitive farms, environmentally sustainable and climate-acceptable, socially inclusive and territorially dispersed. The JRC's emerging farmer profiles could be applied to enhance the environmental and social aspects of sustainability in the farming sector, as giving priority to economic goals promotes an autonomous process of structural change leading to specialization, concentration of resources and intensity of production (see chapter 4). This diversity is expected to contribute to the resilience of European farming and therefore to the vitality of rural areas (see chapter 2.3). The experts' workshop further emphasised that the multifunctionality of small farms, networking of farms and learning processes should be put at the centre of policy considerations. Here again results from the chapter 2.1 go in the same direction, underlying that diversity and interconnectedness contribute to the ability of farms to deal with crises (see chapter 2.3).

While the need for a broad diversity of profiles – i.e. all JRC farmer's profiles – is agreed upon according to the different chapters of this study (see chapter 2 and 4, the experts' workshop, the case studies), the literature on drivers shows that path-dependency is a strong explanatory factor for farm structures. External incentives such as subsidies, market demand or even the upcoming emphasis of climate changes are insufficiently impactful to drive a wave of structural change towards the desired farmers' profiles (chapter 2.3, CS Spain, Poland). It seems important, in these cases, that the types of farmer profiles supported reflect regional conditions and thus may develop based on their contextual background, and allow for a place-sensitive adaptation of agricultural systems for the extremely different production conditions across European regions.

Recommendations

"How can the EU use the emerging new farmers' profiles as an opportunity to refresh its rural development approach, notably in the light of the new attractiveness of rural areas and the new consumer expectations after the COVID-19 pandemic?"

- Emerging new farmers' profiles can serve as a basis for a more multifaceted understating of the agricultural and rural sector, reflective of the diversity of the farming sector and its potential to contribute to social, ecological, and economic sustainability in rural areas.
- Policy support taking these profiles into account has the potential to result in more targeted instruments which can enhance the environmental and social aspects of sustainability in the farming sector.

- Supporting multifunctionality, particularly attributed to small and medium farms, should be put at the centre of policy considerations. The new farmer's profiles are adding new aspects and dimensions of multifunctionality in the agricultural sector.
- Presently, many drivers apart from policy instruments continue to shape the farming sector. The types of farmer profiles supported should reflect regional conditions and allow for a place-sensitive adaptation of agricultural systems for the extremely different production conditions across European regions.

"How can the EU make sure that family farmers of the future will have the skills and the ambition to adapt to the challenges of sustainability, digitalisation, networking with the food chain actors and crisis management?"

The results of the literature review rarely cover the skills or changes to the framework necessary to engage specific structural features, nor help outline its structural implication. However, as derived from chapter 4 and from the case study results, skills in the domains of technology, business and finance activities, food safety, environmental protection, as well as in the drafting of development plans, implementing agricultural policy measures, organising and operating various forms of producer associations are lacking. These skills are already conveyed through extension services financed by some Member States, but in an insufficient manner and with marked differences in efficiency. Some Member States even lack such services and overall, chapter 4 shows that these services are insufficient to evoke structural changes. The case studies further underline this insufficiency or inefficiency of advisory and extension services, especially for small and medium structures (see CS Spain, Slovenia, Germany, Greece).

Case study results, such as in Poland, also emphasise that all rural regions have not made a very necessary digital leap. This might be partly due to a lack in infrastructure but also due to digital illiteracy, especially among older generations. The Spanish case study also emphasised the need for skills in product processing (also mentioned in the Poland case study) and marketing as those skills are of particular interest for the exportation of agricultural products. Furthermore, capacities in terms of risk management and knowledge on hedging, mutual funds and insurance schemes are also expected to be increasingly needed among farmer groups (see chapter 4).

One of the methods suggested for conveying such skills and supporting the emerging JRC farmer profiles is the organisation of farmers in groups and cooperatives, where risks and skills can be mutualised (see chapter 4, CS Spain, Slovenia, Germany). Cooperation of farmers should bring beneficial outcomes in knowledge and innovation transfer, such as for example through participation in EIP projects. Expected benefits may vary with respect to the guiding theme of knowledge and innovation transfer, spanning from technological advances in agriculture (e.g. digitisation of processes, productivity gains), improved farming practices in terms of climate change adaptation, or by adopting social innovations. The common denominator of all these approaches is the enhanced resilience and stability of farming structures in the participating areas. Further methods evoked were the use of good practice examples (see chapter 2.1) and experience-based demonstration farms. However, in this case, an orientation towards the agricultural sector and not only the wider public is needed (experts' workshop). The role of universities and research institutions in this regard was also deemed as not adapted to the latest agricultural innovation, sustainability re-orientation and especially concerning atypical farming and an extension of the curricula was suggested (see experts' workshop in the Annex 9).

Recommendations

"How can the EU make sure that family farmers of the future will have the skills and the ambition to adapt to the challenges of sustainability, digitalisation, networking with the food chain actors and crisis management?"

- Structural changes toward intensification and a reduction in the number of small and medium farms has been recognised through this study and linked to economic drivers. Ensuring a future for family farms which contribute to the rural vitality and social elements of sustainability requires efforts in offsetting such drivers.
- Ambition is strongly linked to the perception of opportunity among new and young farmers. Policy instruments are needed that support the creation of an environment that presents opportunities and reduces barriers to entry, and attracts new and young farmers, along with their ambition and innovative capacities.
- Access to markets and poor bargaining power is a concern for new entrants, particularly if small and medium sized, and those entering the farming sector with less capital. In order to create a climate of ambition, forward-thought, and innovation, the persistent concerns around farmers' share in the profits of the food chain must be addressed systematically.
- Universities, research institutions and innovation hubs can create opportunity and critical mass in developing new knowledge, transferring skills and implementing new adaptive approaches in farming.
- The importance of extension and advisory services is recognised. Extension services can help support skill sets in technology, economics, food safety, environmental protection, marketing, e-commerce, development plans, accessing agricultural policies, organisation and operation of producer associations. However, the effectiveness of the implementation of extension services has been brought into question. According to study findings, extension services are insufficient to support structural changes in a given direction, and have been found to be inefficient in practice. A rethink of the manner through which extension services operate and their quality control could be considered.
- Supporting capacity building at farm level in sustainability and digitisation can enhance value added and efficiency. However, networking with food chain actors requires a more integrated and systematic approach. This is often difficult to achieve at the level of an individual family or small-scale farmer. Therefore, targeted policy support and knowledge transfer that systematically considers the local context and is conceptualised in a manner best able to overcome such issues of theme and reach should be supported.
- Cooperatives demonstrate both positive and negative results. Negative results are primarily attributed to poor coordination, management or capacities at the cooperative level. On the other hand, skilled and strongly organised cooperatives have successfully served as innovators, leaders, and market access providers for small and medium farms. They present an opportunity for networking within the food chain, adaptability and innovative approaches. However, even in best-practice cases, pressure from land prices and reductions in margins is reported as a concern by cooperatives. Therefore, while cooperatives are one potential node for supporting small and family farmers in adapting to challenges, they too face external pressures which should be recognised.
- There are important lessons that can be learned from best practice examples of cooperative structure across the EU, particularly when it comes to some of the greatest barriers facing small and mid-sized farmers such as market access, bargaining power, and eligibility for financial support. Increased attention should be paid to the very crucial aspects of cooperatives that work well. Perhaps, in the future, new and more flexible organisational structures can be identified across the EU, and supported, which also achieve the important benefits observed among cooperative.

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ANNEX

A.1 Overview of consulted national databases on farm characteristics

MS	Details
AT	Statistik Austria: Farms and agricultural businesses in Austria (1951-2020), differentiated by farm area and production (1970, 1980, 1990)
BG	National Statistical Institute: "Structure of agricultural holdings in Bulgaria in the economic year 1999/2000"
CY	FAO (2010). 2000 World Census of Agriculture Cystat (2021). AGRICULTURAL STATISTICS, 1960-2019 The 2003 Census of Agriculture was the fifth conducted in the Republic of Cyprus after its independence. The previous ones were undertaken in 1960, 1977, 1985 and 1994.
CZ	FAO (2010). 2000 World Census of Agriculture, Appendix: CZECH REPUBLIC – Agricultural Census 2000 – Main Results
EE	FAO (2010). 2000 World Census of Agriculture
HR	FAO (2010). 2000 World Census of Agriculture The first Agriculture Census in the Republic of Croatia since independence was conducted in 2003. Previously, a comprehensive and independent full census of agriculture was undertaken in 1960, while in 1969 the census of agriculture was conducted by using the sample method. In 1971, 1981, 1991 and 2001, enumeration of agricultural holdings was included in the Population Censuses.
LT	Statistical department of the Republic of Lithuania (1997, 2000, 2002). Agriculture in Lithuania (1996, 1999, 2001)
MT	FAO (2010). 2000 World Census of Agriculture
RO	No General Census was carried out since 1948. The Agricultural Census 2002 was conducted by the National Statistics Institute and the Ministry of Agriculture as part of the National Program of Agricultural Statistics. The census was based on FAO and Eurostat recommendations.
PL	FAO (2010). 2000 World Census of Agriculture The Agricultural Census 2002 was conducted together with the National Population and Housing Census 2002.

MS	Details
FI	Beginnings with 1910 agricultural censuses have been conducted in Finland almost at every ten years. The last ones were in 1959, 1969, 1990 and in 1999/2000. The information for inter-censual years has been collected through administrative sources like Rural Business Register, or by means of annual sample survey.
SE	Jordbruks verket (Swedish Board of Agriculture) (2021). Facts about Swedish Agriculture Farm Statistics have been compiled in the country since early twentieth century. From 1968 to 1995 a Farm Register (LBR) served the administrative and statistical needs. Agricultural surveys were carried out every year between 1968 and 1995 on the basis of this register with reference dates between 8 to 15 June. With the country joining European Union (EU) in 1995, the statistical system was adapted to EU standards and annual Farm Structure Surveys (FSS) was carried out. However, the item coverage and sample size of these surveys was varied keeping in view national needs and the requirements of Eurostat.

A.2 Semi-subsistence farms (where the focus is on growing a high proportion of food to feed farmers and their families)

Short name of driver	Brief description of driver	Main type of driver	Group of drivers					Type of impact				Short commentary on the choice
			S	T	EV	EC	P	Direct	Indirect	+	-	
Size of world population	Increase in population leads to an increase in food demand	Demographic developments	X					X		X	X	positive: this driver might lead to a stabilization of small-scale structure which lead to an on-going process negative: ageing of rural population occurs strongly in regions with predominance of semi-subsistence farms; with generational change, they cease to exist
Ageing EU population	Ageing rural population, ageing farmer population, decreased availability of workforce	Demographic developments	X						X		X	negative: loss of local knowledge and linkages; shifts in land use to be expected, land abandonment and biodiversity loss; two outcomes are possible: (i) farm decline by aged farm holder versus farm survival because of farming as lifestyle choice, or as a social buffer in Member States with weak welfare system (the latter might have a weaker impact)
Urbanisation	Depopulation of rural areas (out-migration)	Demographic developments	X						X		X	Negative: Many semi-subsistence farmers try to remain involved in "farming", horticulture, etc.; they disappear partly due to migration of potential farm successors, partly due to abandonment of agricultural land use by the new rural residents
Migration	Diversity and size of rural (and urban) population, availability of workforce	Demographic developments	X						X		(x)	neither positive/negative: very slight impact (if any) e.g. in terms of loosing access to land

Short name of driver	Brief description of driver	Main type of driver	Group of drivers					Type of impact				Short commentary on the choice
			S	T	EV	EC	P	Direct	Indirect	+	-	
Millennials coming of age	Generational shift of farmers and consumers	Demographic developments	X					X	X	(x)	X	negative: similar effect as ageing of EU population (potential) positive: increases strong diversity in views and behaviour
Changing demand for food (i.e. Dietary shift in rest of the world)	Possible shift towards a "western diet" and respective demand for resources	Changing demand for food	X						X	(x)	(x)	only indirectly relevant for this type of farmer; stronger competition could lead to price pressure resulting in alternative production in "niches"; semi-subsistence farms, however, tend to be decoupled from this driver; potentially negative impacts could result from land pressure as large farms increasingly demand agricultural land.
Values placed on rural areas, tradition and culture	Attitudes towards landscapes as public goods and multi-functionality of farming, diversification of farming – leisure, tourism, and counter-urbanisation (in-migration), openness to innovation	Shifting values of EU society	X						X	X		positive: increased motivation to stay in agriculture; agriculture as a lifestyle attracts new potential farmers; stronger competition and price pressure leads to alternative production in "niches".
Importance given to sustainability and ethical aspects	Diversification of lifestyles and diets, change of diets towards flexitarian, less consumption of animal proteins, vegetarian, vegan diets, animal welfare, conversation farming	Shifting values of EU society	X					X	X	X	(x)	positive: increased motivation to stay in agriculture; agriculture as a lifestyle attracts new potential farmers; stronger competition and price pressure leads to alternative production in "niches".
Work-related aspiration	Other priorities than high income, appreciation of free time, implications for farmers and farm employment	Shifting values of EU society	X						X	X		positive: same impact than above (alternative production in "niches", increased motivation to stay in agriculture)

Short name of driver	Brief description of driver	Main type of driver	Group of drivers					Type of impact				Short commentary on the choice
			S	T	EV	EC	P	Direct	Indirect	+	-	
Social cohesion	Influence on community values and activities, and implications on attitudes and lifestyle	Inequality & trust	X						X	X	(x)	positive: in suburban rural areas (lifestyle farming or as social buffer); possibility to create alternative production in "niches" negative: in more remote and traditional areas (where farming is backward)
Consumer trust	Influences food choice, consumer engagement in the food chain	Inequality & trust	X						X			Driver has low (if any) relevance on this farming type; due to stronger competition and price pressure it might lead to alternative production in "niches"
Precision agriculture (Internet of Things IoT)	Affects efficiency of agriculture, implications for skill needs and farmer role (farm technician), inequality in technology access and adoption	Digitalisation		X					X		X	negative: theses farms are not in position (skills, capital) to digitise, does not prevent, or even accelerates farm exit
Automation & robots	Reduced farm labour needs, less manual labour, 24/7 operations, potentially less/changed non-farm labour, changed skills needs, implications for attractiveness of rural areas (commuting – driverless cars)	Digitalisation		X					X		X	negative: similar effect as precision agriculture
Connectivity	Facilitates living in rural areas, tele-working, gig-economy activities*	Digitalisation		X					X	X		positive: contributes to alternative production in "niches"; improves living and working condition and thus decreasing farm exit

Short name of driver	Brief description of driver	Main type of driver	Group of drivers					Type of impact				Short commentary on the choice
			S	T	EV	EC	P	Direct	Indirect	+	-	
Virtual services	Potentially facilitates access in rural areas to e.g. education, healthcare, online platform	Digitalisation		X					X	X		positive: improvement of living and working conditions, access to knowledge about alternative production possibilities
New breeding technologies/ synthetic biology	New varieties and products, potentially improve efficiency	Biotechnology		X				X	X		X	negative: this type of farms are not likely to be (at least not early) adopters of these new technologies; increased pressure for resources through the tech-adopters.
Alternative protein sources	Artificial/synthetic meat, algae, insects	Biotechnology		X					X			no direct connection between this driver and semi-subsistence farming (however, in some cases it might lead to alternative production in "niches")
Food design	E.g. tailored/personalised food products, might imply diversification of agricultural product demands by food industry	Biotechnology		X					X	(x)		might stimulate alternative production in "niches"; however, no direct connection between this driver and semi-subsistence farming
Biorefinery & biofuels	Implications for rural economy, opportunity for diversification of products – bioeconomy, biomass production	Biotechnology		X					X			no direct connection between this driver and semi-subsistence farming
Climate change	Volatile, harsher weather conditions, changing transboundary pests and diseases	Climate Change			X			X	X		X	negative: production losses due to climate change accelerate exit decisions of farms (in some cases, alternative – more resilient – production in "niches" is possible)

Short name of driver	Brief description of driver	Main type of driver	Group of drivers					Type of impact				Short commentary on the choice
			S	T	EV	EC	P	Direct	Indirect	+	-	
Availability of natural resources	Expected increasing scarcity and competition for access (water, land, soil, minerals, fertiliser, etc.), environmental degradation such as air and water pollution, habitat loss, decline of biodiversity, soil quality etc. affects agriculture, necessary sustainable transition might disrupt labour markets, create new jobs with implications for farming	Natural resources			X			X	X	(x)	X	(potential) positive: due to stronger competition and price pressure, farmers are "forced" to find alternative production in "niches" negative: increases pressure on agricultural land and environmental resources accelerates farm exit
Economic growth	EU and worldwide – sets framework conditions for policy, public budget	Economic growth and globalisation				X		X	X	X	X	positive: policy support decreases motivation for farm exit, however less relevant for semi-subsistence farming as with other farm types negative: stronger competition, prices pressure
Structure of the agro-food sector	Power distribution within the sector, structural change of farm holdings, relative importance of agriculture in rural economies & diversification	Structure of the agro-food sector				X		X	X	(x)	X	positive: (less frequent) increasing engagement in farming; alternative production in "niches" negative: with generational change, new holder of this farm type may decide in diversifying outside of agriculture (i.e. farm exit)
Globalisation	Trade liberalisation, implications for supply chain complexity and agricultural trade	Economic growth and globalisation				X			X		X	negative: Liberalisation pushes down the prices of primary products; cost-efficient supply chains keep the food prices low; motives for self-subsistent production decreasing

Short name of driver	Brief description of driver	Main type of driver	Group of drivers					Type of impact				Short commentary on the choice
			S	T	EV	EC	P	Direct	Indirect	+	-	
Financial investments	Access to finance, interest rates, have implications for farm investments, available of new forms of finance (crowed-funding), stability of markets for land assets, global investments/speculation in agricultural land affect competition for and access to land	Economic growth and globalisation				X		X		(x)	X	positive: alternative production in "niches" negative: especially competition for agricultural land motivate farm exit
Rise of emerging economies	Implications for power and influence of EU worldwide, agricultural trade	Economic growth and globalisation				X			X			the link between this driver and this farm type is small
Geopolitical situation/international collaboration	Conflicts & crises, competition, access to energy and other resources etc., implications for standard setting, trade, sanitary measures	International situation					X		X	X	X	positive: increasing instability stimulates private risk management options (including semi-subsistence farming) negative: stronger competition, prices pressure
Rural development policies	Implications for urban-rural relationship, neglect of rural areas, distance to agricultural and social infrastructure, alternative employment opportunities	Policies & regulatory frameworks					X	X	X	X	X	positive: Rural development policies improve living & working conditions in rural areas (including semi-subsistence farming) negative: potential stronger competition, price pressure
CAP	Sets framework conditions for farming in the EU	Policies & regulatory frameworks					X	X		X	(x)	positive: CAP payments (DP, LFA/ANC, Agri-environment) motivate farm survival

Short name of driver	Brief description of driver	Main type of driver	Group of drivers					Type of impact				Short commentary on the choice
			S	T	EV	EC	P	Direct	Indirect	+	-	
Food policies	Sets framework for food production in the EU and elsewhere	Policies & regulatory frameworks					X	X	X			driver is not very relevant for this type of farm; however, it may promote alternative production in "niches" due to stronger competition and price pressure
Renewable energy policies	Implications for biomass growth and use for energy (in EU and elsewhere)	Policies & regulatory frameworks					X		X			Driver not very relevant for this type of farm; however, stronger competition and price pressure might lead to alternative production in "niches"
Major health crises	e.g. Covid-19 Pandemic	Major health crisis							X	X		positive: Increasing instability stimulates private risk management options

* gig-workers are independent contractors, on-call and temporary workers

A.3 Small and medium-sized farms that are generally family-run businesses

Short name of driver	Brief description of driver	Main type of driver	Group of drivers					Type of impact				Short commentary on the choice
			S	T	EV	EC	P	Direct	Indirect	+	-	
Size of world population	Increase in population leads to an increase in food demand	Demographic developments	X					X	X		X	negative: insecure of effects; highly dependent on linkage to other farming systems; similar observation as within the group of semi-subsistence farming, only at lower magnitude
Ageing EU population	Ageing rural population, ageing farmer population, decreased availability of workforce	Demographic developments	X						X		X	negative: mainly due to farm decline by aged farm holders
Urbanisation	Depopulation of rural areas (out-migration)	Demographic developments	X						X		X	negative: due to slow structural adaptation; similar observation, than with semi-subsistence farming, only at lower magnitude
Migration	Diversity and size of rural (and urban) population, availability of workforce	Demographic developments	X						X			neither positive/negative: rather difficult to enter small- and medium farms for migrants; therefore no additional impact in either way
Millennials coming of age	Generational shift of farmers and consumers	Demographic developments	X					X	X		X	negative: stronger negative trend than for semi-subsistence, similar effects as ageing EU population
Changing demand for food (i.e. Dietary shift in rest of the world)	Possible shift towards a "western diet" and respective demand for resources	Changing demand for food	X						X	(x)		The impact depends on policies and/or access to new markets; however, small and medium-sized farms are only weakly affected by this factor; compared to semi-subsistence farming, they are less motivated to give up farmland

Short name of driver	Brief description of driver	Main type of driver	Group of drivers					Type of impact				Short commentary on the choice
			S	T	EV	EC	P	Direct	Indirect	+	-	
Values placed on rural areas, tradition and culture	Attitudes towards landscapes as public goods and multi-functionality of farming, diversification of farming – leisure, tourism, and counter-urbanisation (in-migration), openness to innovation	Shifting values of EU society	X						X	X		positive: leads to a strengthening of the family structure in agriculture and the creation of new "niches"; increases motivation to stay in agriculture – market valorisation of ecosystem services (organic farming, gastronomy/tourism, etc.) leads to a strong role of new farmers
Importance given to sustainability and ethical aspects	Diversification of lifestyles and diets, change of diets towards flexitarian, less consumption of animal proteins, vegetarian, vegan diets, animal welfare, conversation farming	Shifting values of EU society	X					X	X	X		positive: ecological aspects are important; creation of new "niches"; increases motivation to stay in agriculture and attracts potential (new) farmers (same effects as above)
Work-related aspiration	Other priorities than high income, appreciation of free time, implications for farmers and farm employment	Shifting values of EU society	X					X	X		X	negative: this leads towards less labour-intensive farm practices; motivated for exit or to change to semi-subsistence farming, or to downscaling of agricultural production; farmers might look for better paid off-farm work
Social cohesion	Influence on community values and activities, and implications on attitudes and lifestyle	Inequality & trust	X						X	(x)		positive: family farm structures would benefit from social cohesion (similar than with semi-subsistence farming)
Consumer trust	Influences food choice, consumer engagement in the food chain	Inequality & trust	X					X	X	X		positive: for specific groups of farmers (however definition of systems important); new consumption trends often address this farm type
Precision agriculture (Internet of Things IoT)	Affects efficiency of agriculture, implications for skill needs and farmer role (farm technician), inequality in technology access and adoption	Digitalisation		X				X	X	(x)	(x)	This driver has limited impact/scope for application; negative impacts are similar than for semi-subsistence-farming (just at a lower scale)

Short name of driver	Brief description of driver	Main type of driver	Group of drivers					Type of impact				Short commentary on the choice
			S	T	EV	EC	P	Direct	Indirect	+	-	
Automation & robots	Reduced farm labour needs, less manual labour, 24/7 operations, potentially less/changed non-farm labour, changed skills needs, implications for attractiveness of rural areas (commuting – driverless cars)	Digitalisation		X				X	X	(x)	X	positive: some applications are possible, depending on differentiation by area and farm type negative: similar effect as with precision farming
Connectivity	Facilitates living in rural areas, tele-working, gig-economy activities*	Digitalisation		X					X	X		positive: provides some scope for diversification; improves living and working conditions and thus decreases farm exit
Virtual services	Potentially facilitates access in rural areas to e.g. education, healthcare, online platform	Digitalisation		X					X	X		positive: contributes to preserve current structure and improves living and working condition
New breeding technologies/ synthetic biology	New varieties and products, potentially improve efficiency	Biotechnology		X				X	X		X	negative: they are rather late adopters of new technologies; losing competitiveness against early adopters
Alternative protein sources	Artificial/synthetic meat, algae, insects	Biotechnology		X				X	X		X	negative: new products increasing market competition
Food design	E.g. tailored/personalised food products, might imply diversification of agricultural product demands by food industry	Biotechnology		X				X	X	X		positive: provides a possible market niche for some farms from this group, emerging group of labels and designed products, which requires cooperation

Short name of driver	Brief description of driver	Main type of driver	Group of drivers					Type of impact				Short commentary on the choice
			S	T	EV	EC	P	Direct	Indirect	+	-	
Biorefinery & bio-fuels	Implications for rural economy, opportunity for diversification of products – bioeconomy, biomass production	Biotechnology		X				X	X	X		positive: offers room for diversification; increasing demand for agricultural products and biomass side streams, but these farms are not addressed as strongly as larger farms
Climate change	Volatile, harsher weather conditions, changing transboundary pests and diseases	Climate Change			X			X	X		X	negative: Production outages and/or increased costs (prevention measures) accelerate farm exit decisions; according to market integration and changes – more or less severe implications for farms
Availability of natural resources	Expected increasing scarcity and competition for access (water, land, soil, minerals, fertiliser, etc.), environmental degradation such as air and water pollution, habitat loss, decline of biodiversity, soil quality etc. affects agriculture, necessary sustainable transition might disrupt labour markets, create new jobs with implications for farming	Natural resources			X			X	X	X	X	positive: for adapting farms negative: for others a challenge or even disruptive; increased competition for resources, simultaneously with aggravating environmental conditions accelerate farm exit
Economic growth	EU and worldwide – sets framework conditions for policy, public budget	Economic growth and globalisation				X		X	X	X	X	positive: policy support decreases motivation for farm exit negative: growth destructive for existing small and medium-sized farm structure
Structure of the agro-food sector	Power distribution within the sector, structural change of farm holdings, relative importance of agriculture in rural economies & diversification	Structure of the agro-food sector				X		X	X		X	negative: contributes to agro structural adjustment; weak position in value chain, business is difficult, motivates either to grow, or quit farming (more frequent)

Short name of driver	Brief description of driver	Main type of driver	Group of drivers					Type of impact				Short commentary on the choice
			S	T	EV	EC	P	Direct	Indirect	+	-	
Globalisation	Trade liberalisation, implications for supply chain complexity and agricultural trade	Economic growth and globalisation				X			X		X	negative: The driver pushes down the revenues from primary agricultural production
Financial investments	Access to finance, interest rates, have implications for farm investments, available of new forms of finance (crowed-funding), stability of markets for land assets, global investments/speculation in agricultural land affect competition for and access to land	Economic growth and globalisation				X		X		(x)	X	positive: due to alternative financing opportunities (limited) negative: similar to semi-subsistence farming; increasing financial difficulties and dependence; limited access to finance, low return on investments and competition for agricultural land, motivate farm exit
Rise of emerging economies	Implications for power and influence of EU worldwide, agricultural trade	Economic growth and globalisation				X			X	(x)	(x)	international aspects only very indirectly affecting this group (potential) positive: some market opportunities though market niches, that this farm type can efficiently supply (potential) negative: Increased competitive pressures motivate farm exit
Geopolitical situation/international collaboration	Conflicts & crises, competition, access to energy and other resources etc., implications for standard setting, trade, sanitary measures	International situation					X		X	X	X	positive: Less competition from international trade partners, increased driver on domestic markets, motivates farm survival and growth negative: might face disruption due to impacts of crises
Rural development policies	Implications for urban-rural relationship, neglect of rural areas, distance to agricultural and social infrastructure, alternative employment opportunities	Policies & regulatory frameworks					X	X		X	X	positive: Rural development policy improves the general living and working conditions in rural areas; even more important are the positive effects of rural development measures aimed at increasing the competitiveness of agriculture and agri-environmental measures negative: The Rural Development Plan offers some scope for diversification and structural adjustment, but only limited opportunities

Short name of driver	Brief description of driver	Main type of driver	Group of drivers					Type of impact				Short commentary on the choice
			S	T	EV	EC	P	Direct	Indirect	+	-	
CAP	Sets framework conditions for farming in the EU	Policies & regulatory frameworks					X	X		X	(x)	some positive/some negative effects; depending on orientation of farms, types, location etc. positive: CAP payments (DP, LFA/ANC, Agri-environment) motivate farm survival
Food policies	Sets framework for food production in the EU and elsewhere	Policies & regulatory frameworks					X	X	X	(x)	X	Driver can act either way; positive: food policies can improve agricultural producers' position in domestic markets; negative: tightening of hygienic sanitary conditions than farmer need to invest → farm exit; very diverse experiences in different countries; but overall negative for small family farming
Renewable energy policies	Implications for biomass growth and use for energy (in EU and elsewhere)	Policies & regulatory frameworks					X	X	X	X	X	positive: Driver may increase agricultural biomass production within this farming type, incl. side streams, potentials to improve farm revenues negative: hardly possible to make use with small area
Major health crises	e.g. Covid-19 Pandemic	Major health crisis							X	X		positive: adjustments possible; big scope of reactions on short-term crises; increased interest in farming and linkages to farming; increased market opportunities for this farm type (local supply chains)

* gig-workers are independent contractors, on-call and temporary workers

A.4 Large agricultural enterprises which are more likely to have a legal form or be cooperatives

Short name of driver	Brief description of driver, which impacts farmers/farms and their role in the EU	Main type of driver	Group of drivers					Type of impact				Short commentary on the choice
			S	T	EV	EC	P	Direct	Indirect	+	-	
Size of world population	Increase in population leads to an increase in food demand	Demographic developments	X					X	X		X	negative: in contrast to general belief, disconnection of families from land aggravates problems of food security; in addition two outcomes – depending on farming conditions – are possible: abandonment of marginal agricultural land versus consolidation/growth in more favourable agricultural areas
Ageing EU population	Ageing rural population, ageing farmer population, decreased availability of workforce	Demographic developments	X						X			Neither positive nor negative: no direct effects. Only indirect effects, but depend on other accompanying factors and not directly on the ageing of the population
Urbanisation	Depopulation of rural areas (out-migration)	Demographic developments	X						X	X	X	positive: urbanisation might favour big structures of (agricultural) land use negative: competition for agricultural land with non-agricultural investors
Migration	Diversity and size of rural (and urban) population, availability of workforce	Demographic developments	X						X	X	X	positive: immigrants as agricultural labour lead to an increase in the number of large agricultural enterprises negative: could lead to a reduction of the already existing (hired) labour force
Millennials coming of age	Generational shift of farmers and consumers	Demographic developments	X						X	(x)		neither positive nor negative: the few big entrepreneurs depend on international influence and actors; similar effects as ageing EU population
Changing demand for food (i.e. Dietary shift in rest of the world)	Possible shift towards a "western diet" and respective demand for resources	Changing demand for food	X					X	X	X	X	Positive: growing demand leads to growing market opportunities, which in turn leads to growth motivation Negative: various changes in food demand can also – e.g. due to uncertainties – lead in the opposite direction

Short name of driver	Brief description of driver, which impacts farmers/farms and their role in the EU	Main type of driver	Group of drivers					Type of impact				Short commentary on the choice
			S	T	EV	EC	P	Direct	Indirect	+	-	
Values placed on rural areas, tradition and culture	Attitudes towards landscapes as public goods and multi-functionality of farming, diversification of farming – leisure, tourism, and counter-urbanisation (in-migration), openness to innovation	Shifting values of EU society	X						X		X	Negative: curbing trends in large-scale agriculture; values are in conflict with new values; may motivate producers to change their production orientation and/or marketing strategies, but it is quite unlikely that this factor will influence decisions to abandon or expand farms
Importance given to sustainability and ethical aspects	Diversification of lifestyles and diets, change of diets towards flexitarian, less consumption of animal proteins, vegetarian, vegan diets, animal welfare, conversation farming	Shifting values of EU society	X						X	(x)	(x)	Depends on the time scale and the regions observed; same effects as above
Work-related aspiration	Other priorities than high income, appreciation of free time, implications for farmers and farm employment	Shifting values of EU society	X						X			neither positive nor negative: this driver has low (if any) relevance on this farming type, only indirect impacts could derive from other competing farming types
Social cohesion	Influence on community values and activities, and implications on attitudes and lifestyle	Inequality & trust	X						X			Driver has low (if any) relevance on this farming type
Consumer trust	Influences food choice, consumer engagement in the food chain	Inequality & trust	X						X		(x)	Driver has low (if any) relevance on this farming type; only if transparency is required, otherwise hardly an effect
Precision agriculture (Internet of Things IoT)	Affects efficiency of agriculture, implications for skill needs and farmer role (farm technician), inequality in technology access and adoption	Digitalisation		X				X		X		positive: Adopting innovation improves efficiency, motivation to grow; largely decisive on scale and location, with regard to productivity options

Short name of driver	Brief description of driver, which impacts farmers/farms and their role in the EU	Main type of driver	Group of drivers					Type of impact				Short commentary on the choice
			S	T	EV	EC	P	Direct	Indirect	+	-	
Automation & robots	Reduced farm labour needs, less manual labour, 24/7 operations, potentially less/changed non-farm labour, changed skills needs, implications for attractiveness of rural areas (commuting – driverless cars)	Digitalisation		X				X		X		positive: high interest in making use of automation (same impacts as above)
Connectivity	Facilitates living in rural areas, tele-working, gig-economy activities*	Digitalisation		X					X	X		no big changes expected for this group, however, connectivity improves living and working conditions for people working in this farm type
Virtual services	Potentially facilitates access in rural areas to e.g. education, healthcare, online platform	Digitalisation		X					X	X		positive: also important for large enterprises, improves living and working conditions
New breeding technologies/ synthetic biology	New varieties and products, potentially improve efficiency	Biotechnology		X				X	X	X		positive: interested enterprises to make use of technologies; likely to adopt new technologies soon; further competitiveness gains
Alternative protein sources	Artificial/synthetic meat, algae, insects	Biotechnology		X				X	X	(x)	X	positive: for some "innovative" enterprises negative: substitutes for animal products increase competitive pressure, which is likely to be felt most strongly in this group of farms
Food design	E.g. tailored/personalised food products, might imply diversification of agricultural product demands by food industry	Biotechnology		X				X	X	(x)	(x)	positive: for some "innovative" enterprises negative: too labour intensive, and potentially risky for this farm type

Short name of driver	Brief description of driver, which impacts farmers/farms and their role in the EU	Main type of driver	Group of drivers					Type of impact				Short commentary on the choice
			S	T	EV	EC	P	Direct	Indirect	+	-	
Biorefinery & bio-fuels	Implications for rural economy, opportunity for diversification of products – bioeconomy, biomass production	Biotechnology		X				X		X		Positive: Rising demand, rising revenues, motivation of farms to grow (but dependent on business strategies).
Climate change	Volatile, harsher weather conditions, changing transboundary pests and diseases	Climate Change			X			X	X		X	negative: impacts go in the same direction as for medium farms, only the impacts may be weaker, as large farms have more possibilities to manage production risks (depending on area, type of farming, strategies, etc.)
Availability of natural resources	Expected increasing scarcity and competition for access (water, land, soil, minerals, fertiliser, etc.), environmental degradation such as air and water pollution, habitat loss, decline of biodiversity, soil quality etc. affects agriculture, necessary sustainable transition might disrupt labour markets, create new jobs with implications for farming	Natural resources			X			X	X		X	negative: impacts go in the same direction as for medium farms, only the impacts may be weaker, as large farms have more possibilities to manage production risks (depending on area, type of farming, strategies, etc.)
Economic growth	EU and worldwide – sets framework conditions for policy, public budget	Economic growth and globalisation				X		X	X	X		positive: Policy support motivates farms to grow (esp. payments/ha; partly controlled by modulation)
Structure of the agro-food sector	Power distribution within the sector, structural change of farm holdings, relative importance of agriculture in rural economies & diversification	Structure of the agro-food sector				X		X	X	X	X	positive: crowding-out process of smaller structures prolonged negative: Also affected by weak position in value chain, but more resilient (economies of scale)

Short name of driver	Brief description of driver, which impacts farmers/farms and their role in the EU	Main type of driver	Group of drivers					Type of impact				Short commentary on the choice
			S	T	EV	EC	P	Direct	Indirect	+	-	
Globalisation	Trade liberalisation, implications for supply chain complexity and agricultural trade	Economic growth and globalisation				X			X		X	negative: supportive environment for large-scale structure; however, the driver pushes down the revenues from primary agricultural production
Financial investments	Access to finance, interest rates, have implications for farm investments, available of new forms of finance (crowed-funding), stability of markets for land assets, global investments/speculation in agricultural land affect competition for and access to land	Economic growth and globalisation				X		X	X	X		positive: process towards amalgamation of farm land, better access to finance, (urbanisation pressures on large plots of agricultural land are more an exception than a rule)
Rise of emerging economies	Implications for power and influence of EU worldwide, agricultural trade	Economic growth and globalisation				X		(x)	X	X	X	positive: depending on market strength of enterprises negative: increased competitive pressures motivate farm exit
Geopolitical situation/international collaboration	Conflicts & crises, competition, access to energy and other resources etc., implications for standard setting, trade, sanitary measures	International situation					X		X	X		dependent on type of crisis, and implications experienced positive: less competition from international trade partners, increased driver on domestic markets, motivates farm survival and growth
Rural development policies	Implications for urban-rural relationship, neglect of rural areas, distance to agricultural and social infrastructure, alternative employment opportunities	Policies & regulatory frameworks					X	X	X	X	X	positive: RD policies improve general living & working conditions in rural areas; more importantly, positive impacts of RD measures targeted at increased competitiveness of farming, and A-E measures. negative: no direct reference to large scale agriculture
CAP	Sets framework conditions for farming in the EU	Policies & regulatory frameworks					X	X		X		positive: overall beneficial to structural adjustment, and large scale structure; CAP payments (DP, LFA/ANC, Agri-environment) motivate farm survival

Short name of driver	Brief description of driver, which impacts farmers/farms and their role in the EU	Main type of driver	Group of drivers					Type of impact				Short commentary on the choice
			S	T	EV	EC	P	Direct	Indirect	+	-	
Food policies	Sets framework for food production in the EU and elsewhere	Policies & regulatory frameworks					X	X	X	X	X	Driver can act either way; positive: food policies can improve agricultural producers' position in domestic markets; or, as long as no substantial changes, indirectly supporting large structures negative: tightening of hygienic sanitary conditions → need to invest → farm exit
Renewable energy policies	Implications for biomass growth and use for energy (in EU and elsewhere)	Policies & regulatory frameworks					X	X	X	X		positive: professional use renewable energy potential by parts of this group; driver may increase agricultural biomass production within this farm type, incl. side streams, potentials to improve farm revenues
Major health crises	e.g. Covid-19 Pandemic	Major health crisis							X	X	X	positive: due to unsecure about impact trend towards closer linkages and not so large structures; evolution on valuing remoteness negative: Increased instability of business environment, possible frictions on factor markets (e.g. seasonal labour)

* gig-workers are independent contractors, on-call and temporary workers

A.5 Case Study Reports

A.5.1 Case study Slovenia

Country	Slovenia
Selected region (NUTS3)	SI014 – Savinjska (SI03 – Eastern Slovenia)
Case study author	Ilona Rac, Luka Juvančič

A.5.1.1 General context information: farm decline and regional farming model

Description of the region

The Cohesion Region of Eastern Slovenia covers 12,432 km^2, which represents 61.3% of the country. It consists of eight statistical regions (Pomurska, Podravska, Koroška, Savinjska, Zasavska, Posavska, Jugovzhodna Slovenija and Primorsko-Notranjska) or 148 municipalities. There are about 1,100,000 inhabitants in Eastern Slovenia, which equals 52.5% of the total population of Slovenia (MKGP, 2021). Regional GDP per capita was 73% of the Slovenian average in 2019 (UMAR, 2021). Labour activity was 53.9% in 2020 (SORS, 2021a), with the largest percentage (28.7%) of people employed in processing activities; farming, hunting, forestry and fisheries together employed 5.6% of people (SORS, 2021a). All statistical regions are classified as predominantly rural regions (MKGP, 2020).

The Cohesion Region of Eastern Slovenia lies at the crossroads of the Alps, the Pannonian Plain and the Dinaric Alps. The landscape is thus very diverse: the northwestern Alpine part descends to the east into the wine-growing hills on the edge of the Pannonian Plain, and to the south into the Karst Dinaric Alps. Due to sparsely populated border areas and larger forested areas (Razvojni svet kohezijske regije Vzhodna Slovenija, 2021), the population density here is below the national average – 89 persons/km^2 in 2020 (SORS, 2020a). The largest city by population in this region is Maribor (~113,000), followed by Celje (~50,000) and Novo mesto (~38,000) (SORS, 2020b).

Table A.1: Characteristics and dynamics of farm decline at NUTS2 level – SI03 Eastern Slovenia (Vzhodna Slovenija)

	Share primary sector 2018	Change in farms (05-16), %	Share of farms small farms 2016	Change in small farms (05-16), %	Average UAA per farm unit (05-16), %	Change in average UAA per farm (05-16), %	SO per farm 2016, EUR	Change in labour (05-13), %
SI03 Eastern Slovenia (Vzhodna Slovenija)	3,26	-9,94	59,92	-0,03	11,22	0,16	16757,22	-11,79

Source: Project team, 2021, based on Eurostat and DG AGRI data

Agricultural situation

Available provisional data of the agricultural census (SORS, 2021b) for 2020 show that 70% of Slovenian agricultural holdings (approx. 47,500) and 72% of agricultural land (utilized agricultural area, UAA) are

in this region, their number having fallen by 11% since 2010, while total UAA remained roughly the same. 69.6% (31,600) of the holdings have livestock; the number has dropped by 23.5% (11.3 percentage points if calculated as a share of all holdings) since 2010. Stocking density is 0,86 LU/ha, which is the same as the national rate, and has remained roughly the same in the last 10 years. The share of arable land is about 43.2% (37.1% nationally; 83.5 of all Slovenian arable land lies in this NUTS 2 region and it is considered to be the most favourable for farming, as it is characterized by relatively large expanses of flatlands), having increased slightly (+3.9%) since 2010, but not in all NUTS 3 regions. In 2016, 69.2% of UAA was classified as Less favoured areas (LFA).

The NUTS3 region selected for this case study is the Savinjska statistical region, which is in itself geographically (spanning the Alpine and Pannonian macro-regions) and socio-economically diverse and thus in the opinion of the authors adequately represents the high level of diversity (VKR, 2019) that can be found at the NUTS2 level. At the same time, the structural trends in agriculture follow the same pattern: decreasing number of small farms and increasing number of large ones, concentration and slight intensification of production. The region is characterised by a high percentage of LFA areas (85.4% in 2016) and a farm size slightly below the national and regional average (provisional data for 2020: 6.4 ha UAA/farm; SORS, 2021b), though highly variable, with some of the largest farms in the country situated here.

In 2019, 12% of the population of Slovenia lived in the Savinjska statistical region. The average age of the population of the region was equal to the Slovenian average: 43.4 years, though with the lowest share of people aged 80 or over (4.9%). Natural increase in this region (as in most others) was negative (-0.5 per 1000 population), while net migration was positive (6.4 per 1000 population). 21% of the population (25-64 years) had a tertiary or higher education (Slovenian average=24%). The at-risk-of-poverty rate was the fifth highest (13.5%). 24% of households lived in poor conditions, the third highest share among the regions. The level of employment in the Savinjska region was slightly above the Slovenian average; and more than 10 percentage points higher among men (71.5%) than among women (61.4%). The percentage of people who went to work in another region was one of the lowest in this region (18.7%). Just over 22,300 companies operated here, each employing an average of 4.7 people. The average monthly net salary in the Savinjska region in 2019 amounted to EUR 1,043, which was approximately EUR 90 less than the average in Slovenia as a whole. This region generated just over 11% of national GDP (ranking 3rd among statistical regions). 44% of regional gross value added was generated in industry (SORS, 2021c). Labour activity was 55% in 2020 (SORS, 2021).

Agricultural activities in the region are dominated by livestock, milk production, viticulture and fruit growing, and forestry. A special feature of the region is the production of hops, which is especially characteristic of the Lower Savinja Valley, where it is one of the most recognizable landscape features and traditional activities. Intensive agriculture predominates in the flat parts of the Savinja Valley, while more hilly and less accessible areas are mostly covered with forest or overgrown. Agricultural activity represents 3.9% of the regional GDP, while the share of employees in agriculture is 5% (RASR, 2021). Celjske Mesnine and Mlekarna Celeia the largest regional purchasing and processing agricultural companies with an established brand (for meat and milk, respectively); the largest wine-growing companies are Klet Imeno and Zlati grič. There are 12 agricultural cooperatives in the region, with 2,750 members (ibid.).

Structural development in the region from the interviewees' perspective

Both interviewees indicated that in the Savinjska region, the decline in the farming structure is currently not as adverse as in some other region, but is likely to be expected in the future. The number of applications for farm subsidies is not formally declining, but it is common for owners to rent their land to others and collect the subsidies themselves (seen as "couch farms"); the relatively high prices for agricultural land, which is also under pressure from other developmental tendencies, are resulting in the reluctance of most owners to formally sell their land. On the other hand, what land does get sold is often bought speculatively. There has been some recent activity by the Farmland and forest fund, which has been buying off land at a good price, prompting a few more owners to sell their land.

Interviewees expect that more prominent abandonment of farming is likely to manifest in the near future, especially on farms in LFA areas and those whose owner is elderly but without an heir (and where the younger generation has acquired an education outside of farming; in some cases, they still offer help on the farm, but will not remain in the sector after inheriting). There is an increasing amount of pluriactivity, with difference between the higher-lying and low-lying farms in terms of strategies adopted due to the availability of off-farm work (see below). Generally, intensification and specialisation (where feasible) are the strongest trends, especially in hops farming, curbed mainly by the lack of available land.

A.5.1.2 Drivers of farm decline, micro-economic pathways and consequences

Drivers of farm decline

General socio-economic context

The possibility of achieving adequate income on the farm (and, conversely, the availability of employment opportunities) is certainly a very strong, if not the strongest, factor affecting farmers' decision to stay in the sector. Younger generations, especially those who have acquired a non-farming education, no longer feel compelled to stay on the farm for emotional reasons – if off-farm income offers a better outlook, they will likely seek better opportunities; financial aspects will also most strongly affect the production decisions of those who do remain (e.g. the decision to shift from conventional to organic). For those wishing to expand or intensify their production, or even to switch to organic (which requires more land due to lower intensity and fewer external inputs), the (physical) unavailability of adequate land, related to the geographic characteristics, is a limiting factor.

Potentially, the (perceived) negative societal image (see e.g. Černič Istenič, 2011) of farmers may play a role in the profession's unattractiveness, including the nature of the work, which is generally seen as arduous and not allowing for much free time.

Sector-specific drivers

Inadequate prices for produce imposed by the overpowering retailing sector are seen as a strong factor driving intensification; small and medium-sized farms cannot continue producing basic commodities for mainstream markets, so they are expected to be pushed out of the sector unless they adapt – increase intensity, diversify or achieve better value-added (including better prices through direct sales). The high level of land fragmentation typical of Slovenia was also mentioned as an obstacle to better productivity.

In relation to the agri-food chain, it was mentioned that the suppliers of produce are currently too dispersed and disconnected. Especially in light of green public procurement, there is a need to better

organise producers, which necessitates a stronger role of the cooperative system (which is traditionally strong in Slovenia but has witnessed some decline after independence and numerous anomalies during the privatisation process; see Lorenčič, 2016). There are some cooperatives already moving in this direction and the Advisory service has also managed to link some producers, including through a collective brand; on the other hand, experience with LAGs in this area is not particularly good (from a farming perspective), as they were "exploited" by some mayors for local infrastructural projects.

Growing prices of energy and other inputs on world markets, especially combined with low purchasing prices for produce, are also very likely to squeeze numerous uncompetitive or marginal farmers out of the sector; perhaps this will drive extensification in an attempt to bring costs down, but it will mean the same amount of food is produced on more land. On the other hand, this factor may prompt some farmers to bring less productive land back into production.

There are marked differences between different sectors which are also related to the vicinity of large cities. For example, much of produce (e.g. vegetables, meat, eggs) can be sold on the farm or in its vicinity, while milk (which is abundant) can be sold at a premium in larger cities, but not locally. The regionally relevant group of hops producers is seen as very flexible; when their production became particularly lucrative (coinciding with the upswing in the craft beer market), they expanded relatively quickly, but also changed production (to e.g. cattle fattening) when conditions changed. The most flexible farmers will likely also not stay in the sector indefinitely (i.e. after retirement age) and are quite likely to diversify into other sectors (such as shipping).

Poorly coordinated spatial policies at different levels are a problem, especially due to the ensuing losses of "the best agricultural land". Development planning is often at the expense of farmland; here, some landowners prefer to sell their land at a good price and leave the sector rather than struggle with a small farm in an uncertain setting, especially if they have a viable education.

Public interventions

Area-based payments (direct payments and LFA payments, possibly also AECM and organic payments) are certainly a factor. On the one hand, they are slowing down structural change by motivating farmers against selling land, but they are also prompting behaviour such as the above-mentioned "couch farmers", which are actually seen as negative by more active farmers, as they inhibit growth and consolidation while contributing little to food security. It is also driving land prices up, making purchases prohibitively expensive for many and causing speculative land purchases. Here, state intervention such as the recent purchases by the Land fund, can play a positive role in allocating land to "real" farmers. Furthermore, the current level of taxation may be too low – it might be conducive to better land mobility if higher taxes were imposed on owners who do not work the land themselves.

In areas where farming is very disadvantaged, more effective LFA payments are seen as a crucial tool to retain farmers performing a multi-functional role. They keep the production potential where it is not economically interesting and provide some level of food security that might become even more relevant in case of disruptions of global value chains. Certain national policy decisions, such as the large-scale introduction of various registries and limitation of on-farm slaughter, have contributed to the decline of small farms; while this might be seen as a step backwards, it might be necessary to relax these conditions for small farms again, if they are to be retained.

Agricultural policy in the future must contribute towards actual progress in the future, rather than stimulating unnecessary investment in e.g. oversized machinery. Furthermore, general rural development policy measures, including infrastructural investment, would help to improve the quality of life and thus contribute to the better attractiveness of rural areas as a place of living.

A.5.1.3 Overview and analysis of micro-economic pathways implemented by farmers in the region, and corresponding consequences of farm structures

The following table highlights different micro-economic pathways implemented in the case study region, as well as their intensity of occurrence. For each of the listed micro-economic pathways the most often represented type of farms are described in more detail.

Table A.2: Micro-economic pathways implemented by farmers in the region of Savinjska

Microeconomic pathways	Intensity of occurrence* (interviewee 1)	Intensity of occurrence* (interviewee 2)	Most represented farm types**
Intensification, specialisation, economy of scale	1	1 (about a third of the Celje region, 10-15% of subsidy applications)	Hop growers and those who have the and interest in increasing, investment, land acquisition and production intensity
Adding value to agricultural production (e.g. Quality schemes)	3	4 (perhaps 3%, excluding forestry)	Everyone, including larger market-oriented farms wishing to be independent of dairies; some medium-sized farms, organic farms and fruit growers (meadow orchards) processing their produce;
Ecologisation of farming (organic, local)	4	3	Numbers slightly increasing (some who had entered also leaving the sector); only a few cases in dairy but practically everyone above 700 m; at the moment there is practically no market production except those who have their own processing or tourist activity, but some are moving towards a stronger market orientation
Off-farm employment (pluriactivity)	2	2 (increasing)	There is abandonment of milk production, especially in the generational change, and the transition to suckler cows, which is less labour-intensive.
Policy optimisation (adapting agricultural production to agricultural policy measures (e.g. Agri—environmental payments, organic livestock, LFA/ANC)	6	6	At the moment there is not much of this, because at the moment land is scarce. Examples and situations are different, sometimes it is some mountain farms that would not otherwise be cultivated. In some cases, farmers from higher-lying areas rent land in the valley to grow feed, while only grazing in the hills and collecting subsidies.
Abandonment of farming	5	5	Smaller farms and those undergoing generational change. The abandonment of the steepest areas is more problematic, not so much in number as in hectares.

** please rank, the most intensively occurring pathway (i.e. the most numerous in terms of no. of farms affected) denoted by 1)*
*** please briefly outline: size, production orientation, socio-demographic characteristics*

Intensification: As stated above, this is mainly seen as driven by price pressure and the availability of alternative sources of income, related to location (proximity of off-farm labour), education and available capital (for land purchase)

Pluriactivity: For now, there are numerous small farms in the hilly parts of the region, where the farm offers enough income for one person, so that here it is common for the wife to stay at home (usually tending a small herd of suckler cows) while the husband seeks employment in the valley's industries or in the forests (offering felling services); on lower-lying farms the roles are usually reversed. In rare cases, both partners have jobs and do the majority of farm work during weekends.

Farm abandonment: This is not a major problem as of yet, but is expected to occur at a significant scale in the near future, especially older farms and farms in steep and otherwise (infrastructure-wise) disadvantaged areas.

Table A.3: Environmental, social and economic consequences of micro-economic pathways occurring in the region (from +3 (very positive), 0 (neutral) to -3 (very negative))

	Intensification, specialisation, economy of scale	Adding value to agri. production	Ecologisation of farming (organic)	Off-farm employment (pluriactivity)	Policy optimisation (agri-envmt.)	Abandonment of farming
Environmental consequences			0	+1	+1/0	-3/-2
Social consequences	+3/+3	+3/+1		+3/+1	-1	-2
Economic consequences	+3/+3	+2/+1	-1	+1	-1	-1

(Note: Red = interviewee 1, purple = Interviewee 2)

- Neither interviewee expressed concern regarding potential negative environmental consequences of **intensification;** while interviewee 1 indicated that at the regional Chamber level, they do not stimulate over-intensification, interviewee 2 did feel that the current policy framework and the future policy direction towards organic farming are too constraining and perhaps unrealistic considering our capacities. They both perceived a certain level (though not at all costs) of intensification as economically and socially beneficial.
- **Adding value** to production is too diverse a category to have uniform environmental effects, but should at any rate have some beneficial social and economic effects in terms of improving independence from retailers and better incomes.
- **"Ecologisation"** of farming was not seen by either interviewee as necessarily environmentally beneficial, at least not in the regional setting, where intensification is already limited. Especially for interviewee 2, it is juxtaposed against food security and farm incomes; interviewee 1, on the other hand, welcomed the increasing market orientation of this group of farmers.
- **Pluriactivity,** especially where helping to preserve agricultural land in otherwise marginal areas, was seen as environmentally positive (here, environmentally positive consequences seemed to be conflated with preserving production potential, but likely the underlying implicit logic is the

conservation of habitats, as well); if helping to prevent full abandonment of rural areas and improving economic situations, this strategy was seen as moderately positive.

- **Policy optimisation** did not appear to any notable extent, except with regards to speculative buying of land, which was seen as negative, and in terms of LFA payments preserving farms, which was seen as positive.
- Farm **abandonment** was seen as negative, especially from an environmental (and production potential) point of view.

A.5.1.4 Changes to the farming model

(1) **Adaptive-diversified farmers:** This is seen as the future of farming. They are already present, young entrepreneurial farmers taking over the farm who look to the future and will be either diversified or intensive. Such a farmer will assess the economics of the farm and adjust the form of farming to achieve a good result.

(2) **Intensive – specialised farmers:** This is the alternative to the diversified farmer above, but generally belonging to the same mental profile; large-scale intensification will also depend on the policy framework, which has heretofore sometimes stimulated farmers to make investments based on unrealistic assumptions.

(3) **Patrimonial farmers:** these exist but will likely disappear in the future, as the younger generation does not decide based on emotional attachment anymore.

(4) **Semi-subsistence farmers:** these farmers are present, but their existence is largely dependent on the economic situation, as farms serve as a social buffer, and on the policy setting, with agricultural policy (again as social buffer) serving more as a social policy in rural areas.

The other farmer profiles as defined by JRC are not too strongly present at the moment, appearing only here and there, but might appear to a larger extent in the future, especially social farms offering services to the elderly, lifestyle and regenerative farmers (though none of them, with the possible exception of organic farmers, are expected to contribute significantly to food security). There is some controlled environment farming, but not too intensive; this might become relevant if the loss of agricultural land continues at the present rate. The urban centre (Celje) is too small and possibly too close to rural areas to be interesting for urban farming as of yet.

A.5.1.5 Recommendations

Interviewee 1 emphasised the importance of continued LFA payments if the small, marginal farms with their multifunctional role are to be preserved in the future. Less stringent or simplified obligations in terms of e.g. conditions for on-farm slaughter should also be considered. On the other hand, from a food production and economic perspective, both interviewees indicated that the current policy framework is inhibiting structural change, which is to some extent desirable. This includes changing taxation and conditions for subsidies to prevent speculative buying, improving the coordination between different levels of spatial decision-making, and providing better stimulation for the consolidation of spatially dispersed (fragmented) agricultural land. In Slovenia, there is a role here to be played by the Land fund, which should regulate land markets and direct land towards real farmers rather than speculative buyers. From the point of view of efficient public spending, investment support should be oriented towards development rather than supporting excessive investment into agricultural machinery; similarly, over-investment into production capacities based on unrealistic assumptions should be curbed, as it can bring down otherwise developmentally able farms.

Both interviewees strongly emphasised the importance of improving and upgrading the Advisory service, which is currently mainly engaged in administrative support for acquiring subsidies, rather than providing material knowledge on agricultural production, including advice on farm economics. In their view, the Service is in dire need of new blood and should be rejuvenated, its knowledge updated and the administrative service redirected towards a different service (perhaps administrative aid might even be left to the market).

At the value chain level, there are two aspects to be tackled, both related to market power; while interviewee 1 emphasised the importance of coordinating producers and concentrating their supply, including with the help of the cooperative union, interviewee 2 highlighted the low prices imposed by powerful retailers, which drive intensification. Both interviewees think that the role of cooperatives here is big; Interviewee 1 elaborated that an issue is in the relations between farmers and cooperatives, where it is common for members to strategize – try to sell via the cooperative when prices are low, and "play solo" when they are high; thus, improving contractual relations, as well as reviving the cooperative culture, is necessary.

As for the various new options offered by e.g. EIP projects and demonstration farms, both interviewees think that they are planned very much in a top-down manner. While there is a great deal of practical knowledge on farms that could be dispersed, the question is who such projects are for; at the moment, these new projects are stimulating short-term project cooperation for funding's sake, rather than stimulating cooperation between different knowledge institutions.

To sum up, some structural change is likely inevitable, but the more dynamic new farms should be supported if they have a good future outlook that does not entail too much intensification, while farms in LFA areas, if their multifunctional role is to be preserved, must be supported by an adequate LFA policy, while also stimulating generational renewal, knowledge on technologies, farm economics and marketing, and realigning the support institutions such as the Cooperatives union and Advisory service.

A.5.1.6 References and list of interviewees

Table A.4: Interviewed experts

	Name	Institution	Date
Regional	Stanko Jamnik	Agricultural chamber	17.12.2021
Local	Franci Zagožen	Farmer, head of cooperative Dreta	17.12.2021

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A.5.2 Case study Greece

Country	Greece
Selected region (NUTS3)	EL611 – Karditsa (EL61 – Thessalia)
Case study author	Luka Juvančič, Victoria Chorafa

A.5.2.1 General context information: farm decline and regional farming model

Description of the region[24]

Thessaly is located at the centre of the eastern part of the Greek peninsula, between the two main urban agglomerations of Attica and Thessaloniki. The plain of Thessaly, the largest in Greece, is completely surrounded by the Olympus, Antihassia, Pindus, Orthrys, Pelion and Ossa mountains. The city of Larissa with a population of 144,651 inhabitants is the capital of the Regional Administration of Thessaly. The other major cities in the region are: Volos (144,449 inhabitants), Trikala (61,653) and Karditsa (38,554), which are the centres of the respective regional units.

Thessaly is the third most populated region of Greece hosting 722,065 inhabitants in 2018 (6.7% of the national population), with a density of 52.06 people per km^2. The urbanization rate (67.5%) is close to the national average, with the higher concentration in the eastern part of the region with Larissa (administrative and commercial centre of the region) and Volos (a major port city).

The region has experienced a slight population decline in the post-2008 period and a corresponding decreasing trend in its population density. Ageing in Thessaly is an important issue as the share of population over 70 years old is significantly higher compared to the national average and has also increased significantly (3.4%) during the crisis. The case of Thessaly, in such a national context, is relevant, since the region with almost 40% holds the third highest elderly ratio in the country and still increasing over the time. Finally, the rate of net migration for the region of Thessaly is negative, albeit slightly, reflecting the decrease in the population generated by emigration in the area.

General socio-economic patterns and trends[25]

Thessaly is generating 5.2% of the National GDP being the third largest regional economy in Greece, after Attica and Central Macedonia. However, its GDP per capita is 77% the national average. Both GDP and GDP per capita have declined during the last decade by -3.1% and -2.8% respectively, experiencing one of the highest drops (4th place) among the Greek regions. The productivity level in Thessaly is 80% the national and 53% the EU average. It has declined in the post-2008 period by -1.1%, which is one of the lowest drops among regions. Thessaly is facing acute social problems. Thessaly is facing a high unemployment rate (18.3%) that is close to the national average. Unemployment has increased on average by 8.2% per year during the last decade, while the employment ratio has declined by 1.5%. About 71% of jobless people are long-term unemployed, 16% of the young people in the age group 15-24 are excluded from education or the labour market, while the share of population in danger of poverty and social exclusion is above 33%.

[24] The information is summed up from OECD (2020).
[25] The information is summed up from OECD (2020).

The productive structure of the region counts on the presence of a strong primary sector displaying the highest GDP share in the country (11.8%, which is about 3 times the national average). Although the relative productivity of the primary sector in Thessaly is lower when compared to industry and services, it is 1.5 times higher than the national average. The region also has a significant secondary sector, which shows a share of GDP and relative productivity above the national average. The industrial activity includes significant sectors such as food, textiles, cement and metals. However, deindustrialization has significantly affected the region since the 1990s. As for the tertiary sector, this is the largest sector in the region, although its share of GDP and relative productivity are low compared to other Greece's regions. Although Thessaly has some important tourism destinations, the region does not show a high specialization in tourism like other Greece's regional economies.

Agriculture

Key characteristics and structural indicators

Thessaly is located in central Greece. The region's large plain region is stretching to the coast of the Aegean Sea on the West, and surrounded from other sides by mountain chains (Olympus, Kisavos, Pelion, Pindus, Othrys), the highest elevating to 2,800 m. Thessaly covers a total area of about 13,700 km^2. Thessaly plain is the most productive agricultural region of Greece with an area of about 4,000 km^2 and it is part of the Pinios River and Lake Karla basins, the two major hydrological basins of Thessaly. The landscape is characterized by the intensive agriculture in the plain, where crop production (fodder crops, durum wheat, cotton) largely prevails. In more elevated areas, farmers are dealing predominantly with various types of livestock production.

Key structural characteristics of agriculture for the NUTS-2 region of Thessaly (EL-61) and its NUTS-3 regions Karditsa (EL611), Larisa (EL612) and Magnisia (EL613) are presented in Table A.5. Thessaly's leading position in Greek agriculture is reflected by considerably larger agricultural holdings (both, in terms of farm size and livestock status), and lower percentage of small farms. In comparison with the EU counterparts (Spain, Italy, Portugal) Thessaly shares the same structural drawbacks than the rest of the country. Kasimis and Papadopoulos relate these drawbacks with fragmented small-sized farms, high cost of production, weak bargaining power of non-consolidated primary producers towards their purchasers, input and service providers (eg. insurance). Unfavourable age and education structure of farm holders, and weak knowledge transfer (non-existing public extension service) additionally contributed to the structural lag of Greek (and region's) agriculture.

In addition to the above listed structural problems, agriculture in the region of Thessaly faces significant environmental challenges in terms of water shortage, which exert pressure on the existing model of production.

Table A.5: Comparison of key farm structure indicators for Greece and Thessaly

	Greece	EL61 – Thessalia	EL611 – Karditsa, Trikala	EL612 – Larisa	EL613 – Magnisia
Number of farms	678,702	59,208	22,900	23,256	13,051
Utilised agricultural area (ha)	4,553,830	542,476	187,177	260,759	94,540
Hectares UA/farm	6.71	9.16	8.17	11.21	7.24

	Greece	EL61 – Thessalia	EL611 – Karditsa, Trikala	EL612 – Larisa	EL613 – Magnisia
Share of small farms (under 5 ha)	77.1%	63.6%			
% of farms engaged in animal production	34.5%	40.7%			
Livestock status (LU/farm)	8.98	11.13			

Source: FSS, 2016

The prevailing production orientation is milk production, originating from sheep (42%), dairy cow (25%) and goat (12%) breeding. Comparison with the national average reveals that the average sheep and cow herd size in Thessaly are higher than the national average. To a large extent, the region's milk is purchased by a relatively consolidated local dairy sector (operating internationally, particularly with its spearhead PDO product Feta cheese and Greek Yoghurt).

With respect to the commercial production of crops, the cultivation of cotton sought its peak in 1990s and early 2000s (partly due to favourable prices, but also because of strong production subsidies), while after a (gradual) introduction of decoupled payments since 2003, it gave way to cereal production, in particular durum wheat, whose economic viability resonates with favourable demand trends on international pasta and semolina markets.

Latest structural developments and explanation from the interviewees' perspective

Table A.6 presents structural characteristics of the region's agriculture in a more dynamic setting (recent evolution of farm structures, 2005-2016) and, where feasible, also at a lower territorial level (NUTS-3).

Table A.6: Characteristics and dynamics of farm decline at NUTS2 level – EL61 Thessaly (Greece)

	Share primary sector 2017	Change in farms (05-16), %	Share of farms small farms 2005	Change in share of small farms as a percentage of all farms (05-16), %	Change in average UAA per farm (05-16), %	Change in UAA in the region (05-16), %	SO per farm 2016, EUR	Change in labour (05-13), %
EL – Greece	4.24%	-17.84%	77.1%	-3,60%			11,160	-21,70%
EL61 – Thessalia	12.17%	-24,75%	63.60%	-26,06%			13,158	-28,25%
EL611 – Karditsa, Trikala	11.87%	-32,15%	-	-	-	-	-	-36,03%
EL612 – Larisa	16.62%	-16,79%	-	-	-	-	-	-22,08%
EL613 – Magnisia	5.50%	-23,30%	-	-	-	-	-	-22,77%

Source: national statistics

As a general observation, agriculture in Thessaly accounts for a much stronger share of the regional GVA (12.2%) as the national average (4.2%). On average, the economic size of the region's farms is 17.9% above the national average.

With respect to the trends, Thessaly shares similar, yet more pronounced trends as the national average. According to the data presented in Table A.6, Thessaly sought a 24.8% decrease of aggregate number of farms, which is well above the national average (by 7 percentage points). Even more expressed was the reduction of agricultural labour input (28.3%)[26]. Although the data is in line with the general trends of Greek, and indeed, EU agriculture, the outcome was rather surprising as, according to our cluster analysis, the region exhibits only a moderate decline, while agriculture sought marked increase of economic output (GVA). Additional query with regional experts provided an explanation to this intriguing situation. It appears that following the 2003 CAP reform[27] several livestock farms decided to optimise their CAP direct payments status by dividing themselves into a larger number of smaller farm units, which resulted in an inflated number of farms in statistical registers.

In our case study, the territorial focus to a more in-depth review is given to the Karditsa NUTS-3 region. The Regional Unit of Karditsa is part of the Thessaly region. Located in south-western Thessaly in central Greece, it is primarily an agricultural area. It is a rural region and the economic development is affiliated with the primary sector. The western and southern parts of the regional unit are mountainous and livestock development is the main characteristic of the area. The western part of Karditsa, which belongs to the catchment of Achellos river, is mostly known for the artificial lake Plastira while the eastern part, which belongs to the river basin of Pinios, constitutes a very important irrigating area of the Thessaly Plain.

The main agricultural activity in the region is sheep breeding (intensive in the plain) and milk production due to the increased demand from dairies for the production of feta cheese. Large sheep farms (400 sheep and more) are increasing in number, although the majority of producers (75%) have up to 230 animals. Intensive sheep farming leads to increased demand for animal feed (increasing pressure on fodder production in the lowland part of the region). On the other hand, the cotton production has a significant decline in the last two decades, but it remains predominant, followed by cereals (durum wheat), maize and industrial tomato.

According to the interviews, agricultural structural adjustment in the region of Karditsa has accelerated in the last decade, exhibiting two distinctive characteristics: (i) reduction of the number of agricultural holdings and enlargement of their size, and (ii) increase in farmland rental rather than purchase. Owing to the fact that the historical entitlements for direct payments in the region are nation's highest (legacy of heavily subsidised cotton production in early 2000s), internal convergence of direct payments may accelerate the above described structural trends of in the forthcoming years.

Interviewees confirm that small-scale farming still plays a considerable role in the region. The regional expert distinguishes between three types of small-scale farms: (i) Holdings belonging to elderly farmers which are in the process of decline; (ii) Pluriactive agricultural holdings where farming is a supplementary income, and (iii) Young farmers and new entrants who are seeking to increase their operations and develop into larger, full-time operating units.

[26] According to Kasimis and Papadopoulos, the overall figures are hiding intensive internal restructuring of farm labour. Before the economic crisis, labour demand of the expanding sectors (tourism, construction) resulted in off-farm employment, which was compensated by higher labour input of other farm members (most frequently, wifes), and engagement of hired labour (international migrants).

[27] CAP reform in 2003 brought a major change to the implementation of the major instrument of CAP Pillar I, direct payments. Direct payments were decoupled from production with the introduction of the Single payment scheme, while additional payments for livestock were limited with individual ceilings on premium entitlements.

A.5.2.2 Drivers of farm decline, micro-economic pathways and consequences

Drivers of farm decline

General socio-economic context

With respect to the general socio-economic context, interview with the regional expert points out the problem of ageing population in the region, which reflect *inter alia* in unfavourable age and education structure of farm holders. This resonates to the observed general trend of transformation of rural areas and family farming in Greece (Kasimis, Papadopoulos, 2013). The processes of "de-agriculturalization" and rural restructuring in the early 1990s have been accompanied by "rurbanization" and socioeconomic integration of rural populations. These interrelated processes have internally transformed the rural areas, thus forming a "new rurality" characterized by contraction of agriculture, expansion of tourism and construction, increased pluriactivity, increased employment of international migrant labour and the reorganization of farm family labour and operation.

However, in the environment of economic crisis characterised by falling incomes, job losses and contracting public services, "reverse mobility" to farming can be observed; partly this is on the account of previously pluriactive farmers now operating again on a full-time basis, and partly on the account of new entrants to farming.

Sector-specific drivers

The sector-specific drivers affecting the structural adjustment of the region's farming sector can be for classified in three distinctive groups.

The first group of factors relates to the aggravated environmental conditions. Problems linked to water supply (irrigation) have been recognised as the most pronounced in this respect. The interviews highlight several dimensions associated with this problem: (i) lack of water resources inside the basin of Pinios River; (ii) lack of infrastructure for water storage in winter and use in summer; (iii) lack of water transmission networks with small losses; (iv) use of non-renewable groundwater for irrigation; (v) Deficit of underground aquifers from over-pumping; (vi) high water costs that make irrigated crops unprofitable and (vii) changing crop structure (drought-resistant crops) with reduced turnover. Especially in the mountainous areas and areas with natural constraints, problems related with water supply lead to the abandonment of agricultural land.

Another environmental weaknesses derives from the prevailing cultivation practices that are environmentally unsustainable (continuous plowing, burning or removal of crop residues, no use of crop rotation, no use of cover crops or green manure) that lead to soil erosion and degradation.

The second group of factors is associated to agricultural market conditions. The interviews point out the cost-price ratio, which has currently aggravated primarily with accelerating input prices (fuel, fertilisers, feeding stuffs, irrigation), accompanied with increasing cost of services (eg. rental costs of machinery) and capital costs (interest rates).

According to the interviewees, prices of agricultural products do not compensate for increasing costs. Although the price of milk in Thessaly is one of the highest in Greece, milk producers share the view that it is not satisfactory. Taking into account the structure of the dairy supply chain in the region (small-scale primary producers on one side, and consolidated firms in the processing and retail sector), and the prevailing practice of sales of raw milk through individual arrangements of farmers with processors, the problem is barely surprising. All small farmers make verbal agreements, while some big farms may pursue a formal agreement. Co-operative and large dairy industries' prices to farmers are somewhat

higher; however, they are paying a single flat price to all farmers, regardless of specific product characteristics. Farmers cooperating with large dairies do not receive the same personal relationship they have with the small dairies and the advantages stemming from this close relationship i.e. positive price differentiation according to milk quality, technical and financial assistance and advice.

Another important element is the mistrust towards cooperatives in general, due to the long history of mismanagement and ineffectiveness which appears an obstacle difficult to overcome. On the other side, young people seem to be more prepared and willing to be actively involved in a collective process but, still, it requires an effort by experts to motivate and get them engaged in the long run.

Another set of challenges is associated also with factor markets. Purchases and sales of farmland are barely existing, as the land purchase marked is not liquid. Currently, enlargement of the farm size can be achieved only with farmland rental. However, also the conditions on land rental market are aggravating due to competition with other land uses (e.g. installation of photovoltaics).

Public interventions

Description of the general context of agriculture in the region of Thessaly (section A.5.2.1, agriculture) already illustrated the importance of CAP instruments like Pillar 1 direct payments, LFA/ANC payments, interventions for environmental, climate and other management commitments, investment support.

Similar to the rest of the region, the region has undergone a significant restructuring in crop production following the reform of CAP Pillar I direct payments in early 2000s. The decoupling of direct payments from production, which coincided with the price slump, the production of cotton has significantly reduced. Similarly to the rest of the region, early 2000s also sought an unusual increase of the number of farms due to the fragmentation of farm units engaged in livestock production (stimulated by individual ceilings on premium entitlements). The expected drop of the historical entitlements for direct payments after 2023 (see section A.5.2.1) may accelerate farm exit, especially in the most affected areas (farm units) previously engaging in cotton production.

A.5.2.3 Overview and analysis of micro-economic pathways implemented by farmers in the region, and corresponding consequences of farm structures

As a consequence of several factors affecting farm production and organisation of agricultural markets, farmers in the Karditsa region opted for various micro-economic pathways. For the sake of consistency with the overall study, the analysis is using a generic set of micro-economic pathways as a basis. Based on literature review, interview results and expert judgements, validity and relevance of generic micro-economic pathways has been assessed for Karditsa region. Results are presented in Table A.7.

Table A.7: Micro-economic pathways implemented by farmers in the region of Thessaly

Microeconomic pathways	Intensity of occurrence*	Most represented farm types**
Intensification, specialisation, economy of scale	1	Sheep breeding farms
Adding value to agricultural production (e.g. Quality schemes)	3	Arable land farms linked to contract farming (e.g. durum wheat) Sheep breeding. The production of feta cheese is linked to specific quality of milk requested by the dairies.

Microeconomic pathways	Intensity of occurrence*	Most represented farm types**
Ecologisation of farming (organic, local)	6	New entrants to farming, niche farm production (eg. horticulture, herbs), direct sales
Off-farm employment (pluriactivity)	4 to a large extent (not in sheep breeding)	Arable land farms
Policy optimisation (adapting agricultural production to agricultural policy measures (e.g. Agri—environmental payments, organic livestock, LFA/ANC)	5	Nitrate pollution (specific standards for cotton production)
Abandonment of farming	2	In mountainous and less-favoured areas and areas with natural constraints (LFA/ANC)
Other		

The type of farms that is growing the most is sheep breeding due to the increased demand for milk from cheese dairies and farms (arable crops) operating under the model of contract farming. Small farms tend to disappear progressively (mostly extensive farms of elderly farmers) on the account of the growing larger, specialised production units. Abandonment of farming is either with farm succession (farm successors deciding to close the operations), and with aggravated environmental conditions (in particular associated with water shortage). This may lead to permanent abandonment of farming on areas with natural constraints (LFA/ANC).

As a consequence of the general economic situation and corresponding poor perspectives for off-farm employment, the widespread occurrence of pluriactive farming has stalled, which holds especially for more labour-intensive sheep farming. Pluriactivity is more widely applied in farms, engaging in more extensive crop production.

As described in sections A.5.2.1 and A.5.2.2, changes in the public interventions (CAP reforms, in particular) alter farmers production decisions, as well as their organisation of production. Previous decade was relatively stable in this respect, but envisaged changes in the CAP Pillar I payments after 2023 may accelerate pressures for farm abandonment in the case of farms with the highest historical entitlements.

The emergence of organic farming and direct sales of local produce is to a large extent associated with the "reverse migration" trend of new farm operators. However, this strategy has been so far detected only on a limited number of cases; this may be owing to the fact that in general, the conditions for agricultural production in Karditsa region are favourable, which consequently leads to a competitive land rental and highly illiquid land purchase market.

Table A.8: Environmental, social and economic consequences of micro-economic pathways occurring in the region (from +3 (very positive), 0 (neutral) to -3 (very negative))

	Intensification, specialisation, economy of scale	Adding value to agri. production	Ecologisation of farming (organic)	Off-farm employment (pluriactivity)	Policy optimisation (agri-envmt.)	Abandonment of farming
Environmental consequences	-1	+1	+2	0	+2	-2
Social consequences	+1	+1	0	+1	0	-3
Economic consequences	+2	+2	0	+1	+2	-2

Interview outcomes suggest that the currently pronounced trend of intensification in livestock production moderately increases the pressure to the environment due to increasing (already high) production intensity. In line with expectations, intensification/specialisation of agriculture is expected to bring significant economic and moderate social benefits.

Similar expectations about economic and social benefits are shared with farm-level strategies related to value-adding to primary production (such as e.g. PDI/PGO products). These strategies are usually linked with certified local (and often also organic) production, thus expected positive environmental impacts.

Transition to organic farming as next farm-level strategy is expected to bring even more beneficial environmental impacts; on the other hand, neutral scores for social and economic impacts suggest that more needs to be done in the market valorisation of organic production.

Moderately positive scores for social and economic impacts of pluriactive farms underline their primary task, while their environmental impacts are regarded as neutral.

Interestingly, policy optimisation as a farm level strategy is expected to yield in positive environmental impacts. This are is most likely due to the interviewee's focus to the specific standards for cotton production (see Table A.7), controlling for limiting nitrate pollution. Expectedly, positive economic impacts are associated with this strategy.

Abandonment of farming is regarded as the least favourable farm-level strategy in all respects. Negative environmental impacts are associated primarily with the irreversible abandonment of agricultural land use in marginal areas. Highly negative scores for economic and social impacts suggest that abandonment of farming is often associated with deteriorated economic and social resilience livelihoods in affected rural communities.

A.5.2.4 Changes to the farming model

On the long-run, adaptive and diversified farms are probably best suited for the increasingly unstable environmental, market and institutional conditions in which agricultural production will operate in the future. As farm-level strategies are suited to the specific conditions, this farming type represents the most heterogeneous, but also versatile group of farms. As suggested from the interview outcomes, this group is currently only emerging in Karditsa, and is represented mostly by young entrants farming.

Currently, intensive, specialised farmers represent the backbone of the regional farm model in Karditsa. The prevailing production orientation of this farming profile is intensive livestock; this is owing to the favourable demand trends for local dairy produce (both, nationally and internationally) and the presence of relatively consolidated and competitive processing sector capable of meeting the demand trends. This farming type is less adaptive to the changes that can occur in the production characteristics, or market environment, the representation of this farming type in the future is expected to decrease.

Another group of farms that is strongly represented in the structure of farms in Karditsa region today, patrimonial farmers, is declining with the generational renewal of the farms. In the future, this farming type is likely to transform either to adaptive, diversified farms, regenerative farms oriented primarily to environmentally sustainable practices, or will abandon agricultural production.

As suggested by the interview outcomes, corporate farms operating as enterprises are already present in a subset of farm structures in Karditsa and are likely to continue in the near future. Their comparative advantages (mainly deriving from economy of scale) are expected to outweigh the risks.

Other farming types, suggested in the JRC foresight study have not been identified as relevant in the case of Karditsa region.

According to the interview with the regional expert, the main features of the changing European Farming Model in Karditsa region are the enlargement of the farm size, the reduction of agricultural holdings owned by elderly farmers, the implementation of a more environmental-friendly agriculture and the increased trend for contract farming (also applying to the livestock farms).

With respect to the environmental dimension of the European Farming Model in Karditsa region, the interview results emphasize the importance of the implementation of the CAP, in particular:

(i) cross-compliance standards that link financial support to EU rules on the environment, as well as human, plant and animal health;
(ii) green direct payments (future CAP: ecoschemes) that put in place mandatory actions (maintaining permanent grassland, crop diversity and ecological focus areas;
(iii) rural development policy through supporting investments and farming activities that contribute to climate action and the sustainable management of natural resources (organic farming, reduction of pesticides and fertilizers, etc).

As regards the economic and social importance of the European Farming Model in Karditsa and the role of the CAP, local experts point out that the implementation of CAP instruments and Pillar 2 measures have contributed to safeguarding the socio-economic stability of the countryside and decelerating if not stopping its depopulation. It is estimated that currently, about 57% of the agricultural income in the region retrieves from various CAP payments. In the CS area, regional expert estimates that without the CAP out of the 25,000 holdings only 1,000-2,000 would remain active in agriculture.

In essence, local experts opine that family farming is likely to continue to be predominant in the foreseeable future. However, the agricultural structural adjustment combined with the continuing gap between agricultural and non-agricultural incomes, there is likely to be a further trend to fewer, larger family farms and also a trend to non-family types of organisation of agricultural production. Also, continued development of pluriactivity and diversification can contribute to the viability of family farms.

A.5.2.5 Recommendations

One of the most pressing challenges pertaining the future of farming and rural well-being in Karditsa is associated with the generational renewal of farming sector in the region, together with the modernization of farms, improvement of knowledge transfer and cooperation along food value chains, both horizontally, as well as improving the farmers' ability to cope with (production- and market-linked) risks and to improve the farms' water efficiency and other aspects of improved environmental sustainability.

Meeting the above challenges requires technical and organisational advancement of agricultural holdings, enabled through the digitisation and implementation of precision agriculture. In crop production, and horticulture (smart greenhouses), this is associated with input reduction/production mapping, traceability and food safety. In livestock sector, in addition to the previously listed, additional elements are precision feeding, early disease warning systems, housing systems/environmental control and lameness detection.

One of the pressing challenges to efficiently address these goals lies in the implementation of publicly available farm advisory system, which is currently inexistent. This holds especially for young farmers and/or new entrants who are, in general, better educated but not trained in new technologies and approaches related to farm production and management.

Apart from the innovation transfer, access to new technologies is inevitably linked to the farms' investment capacities. The small size of the agricultural holdings and the amount of the required investment are inhibiting factors for the development of precision agriculture in Greece. However, the reduction of investment costs for the adoption of new technologies and the renewal of human resources could give strong potential to its development.

Another challenge that needs to be addressed in order to improve the farmers' position in the market, relates to their participation in collective schemes (producer groups, producer organisations). Local experts point out that, despite the subordinate current role of farmers and tangible benefits of their coordinated market presence, the prospects for the achieving the desired result on the short-run are low. This is a strong case for intensified policy action.

A possible waypoint on the way to the goal of equal treatment of farmers in market relations is with the introduction of contract farming. Especially the dairy sector, which is facing favourable demand trends, and is vitally interested in a constant supply of quality raw materials could play a strong role in this respect.

A.5.2.6 References and list of interviewees

Table A.9: Interviewed experts

	Name	Institution	Date
Regional	Prof. Konstantinos Tsiboukas	Agricultural University of Athens, Laboratory of Agribusiness Management, Department of Agricultural Economics and Rural Development	17/12/2021

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A.5.3 Case study Poland

Country	PL
Selected region (NUTS3)	PL822 – Przemyski (PL82 Podkarpackie)
Case study author	Kinga Hat

A.5.3.1 General context information: farm decline and regional farming model

Description of the region

The NUTS2 region Podkarpackie is one of 16 Voivodeships in Poland. The total population of the area is 2,115,578 (30.06.2021). The population figures for the whole region are stagnating. The unemployment rate is 8.1% (Urząd statystyczny w Rzeszowie, 2021). The employment is dominated by agricultural sector: 35% of economically active residents work in this sector. 26% work in industry and construction and 18% in service sector.

The capital of the Podkarpackie Voivodeship is Rzeszów. It is a growing city with 198,476 inhabitants. Other couple of cities in the region have appr. 45,000 to 60,000 inhabitants (Mielec, Przemyśl, Stalowa Wola, Tarnobrzeg, Krosno, Dębica) (GUS, 2021). Apart from that it is a rural region with mountainous landscape (Bieszczady, Beskid Niski) in the southern half. It is also a border region: the southern border is national internal EU-border with Slovakia and the eastern border is the EU-external border with Ukraine.

Role of Agriculture

The agriculture is dominated by production-oriented farms with the average size of 50 ha. There are also smaller farms but they are often inactive and are not the driving force of the region. There is the Regional Chamber of Agriculture representing the interests of all farms in the Podkarpackie province. The representatives of the chamber are active in politics. During the meetings of the delegates various problems, challenges and solutions are discussed and managed.

Table A.10: Characteristics and dynamics of farm decline at NUTS2 level – PL82 (South Poland)

	Share primary sector 2018	Change in farms (05-16), %	Share of farms small farms 2005	Change in share of small farms as a percentage of all farms (05-16), %	Change in average UAA per farm (05-16), %	Change in UAA in the region (05-16), %	SO per farm 2016, EUR	Change in labour (05-13), %
PL82 – Podkarpackie	1.80	-51.49	89.94	-7.96	82.33	-11.55	5,360,465	-30.67

Source: Project team, 2021, based on Eurostat and DG AGRI data

In the Podkarpackie province there are 4 NUTS3 regions: krośnieński PL821, przemyski PL822, rzeszowski PL823, tarnobrzeski PL824. With regard to agriculture and farming structures they can be shortly characterized as follows:

- krośnieński PL821: the whole region has a mountainous characteristic, because of the Bieszczady and Besid Niski mountains. The conditions for farming are difficult due to mountainous terrain, difficulties in cultivation, short vegetation period. The region is rather dominated by forestry.
- przemyski PL822: the region offers good conditions to farming. The arable land is available and the soil is well suited for agriculture. The farms are able to reach high productivity levels. In the socialist time there was a lot of state farms in the region (PGR). They were relatively not as big as in the others parts of Poland. The restructuring process went well, the farms got privatized. The environment, also thanks to relatively small sizes of the previous state farms, is in a very good condition (no contamination, no overfarming). An average well prospering farm has a size of round 50 ha in the region. The farmers can afford their living based only on the agricultural production.
- rzeszowski PL823: outside of the city of Rzeszów the region is largely suburban in character. The construction of housing and infrastructure consumed a lot of agricultural land. There are smaller and bigger farms, but it is not the most important sector of economy in the area. Many farmers are running agrotourism. The guests are mainly the construction workers (they come from outside the region and work on the construction sites nearby Rzeszów). The business model works very well as the owners of the accommodation can approach 90% occupancy almost throughout the year.
- tarnobrzeski PL824: the region has predominantly poor soil quality. The industry is well developed in the region and it is the dominating source of the income in the region. There are several middle size cities, where the manufacturing and production is concentrated. There are small farms (2-4 ha) of land. The farmers are mostly multiprofessional and they earn their living elsewhere. Farming is rather focused on self-supply.

Figure A.1: NUTS3 regions in the Podkarpackie province

Source: Periwinklewrinkles, based on work by Aotearoa, adapted by OIR 2021

There is no quantitative data available on the lower level than NUTS2. Therefore, the choice of the CS region was based on the provided short descriptions of the regions and the recommendation of the interview partner. Region przemyski (PL 822) was selected for the further detailed analysis. It is the most interesting and dynamic considering the agricultural development in the province.

A.5.3.2 Drivers of farm decline, micro-economic pathways and consequences

Drivers of farm decline

General socio-economic context

Generally, it needs to be underlined that there is a significant number of small farms in the statistics of the whole province, but the owners are not involved into agriculture. They own the agricultural land, but the land (1) is leased to other (bigger) farmers or (2) is getting overgrown due to lack of cultivation. There are many reasons for keeping the possession of the land: it is a good and secure deposit of capital and gives opportunities for possible future development, the owners benefit from subsidies, they can profit from more favourable conditions of social insurance, they want to keep their parental property, etc.

Furthermore, small farmers often spent their means on the education of the children. They are now having other professions and well-paid jobs in the city and are not interested in taking over a small farm.

Sector-specific drivers

One of the main problems for the small farms is the lack of differentiated small-size processing and food production enterprises. Small farms may only be rentable, if the production is organic. In the region there is almost no possibility to sell the organic crops to the food production. If there is no demand, the production cannot be planed.

There is also a lot of administrative work related to the farming, which has to be done digitally. It is often a barrier for older farmers who do not have necessary computer skills.

There is no financial motivation. A small farm demands a lot of work and investment but the profits are not sufficient.

Public interventions

All farms need, profit from and rely on the subsidies. The subsidies go mainly to support the family and education. It is currently not thinkable to run a farm without the subsidies. It considers only parts of the considered NUTS3 region, but there used to be a mountain subsidy in some regions. It was cancelled 4-5 years ago. There are difficult areas and according to the interview partners, they should get granted additional payments (e.g., More fuel is needed, machines break down).

A.5.3.3 Overview and analysis of micro-economic pathways implemented by farmers in the region, and corresponding consequences of farm structures

The following table highlights different micro-economic pathways implemented in the case study region, as well as their intensity of occurrence. For each of the listed micro-economic pathways the most often represented type of farms are described in more detail.

Table A.11: Micro-economic pathways implemented by farmers in the region of przemyski

Microeconomic pathways	Intensity of occurrence*	Most represented farm types**
Intensification, specialisation, economy of scale	1	Round 50 ha, but all farmers that depend and rely on agriculture are trying to achieve a proper size of the farm. It is the dominating strategy for famers: to get more and more for cultivating
Adding value to agricultural production (e.g. Quality schemes)	2	All farmers aim at production of high quality crops and implement some adaptations on demand
Ecologisation of farming (organic, local)	3	There is a great potential for organic farming, but as already mentioned: processing (buying) enterprises are missing
Off-farm employment (pluriactivity)	3	Differentiated
Policy optimisation (adapting agricultural production to agricultural policy measures (e.g. Agri-environmental payments, organic livestock, LFA/ANC)	Not really relevant	
Abandonment of farming	4	Older farmers not having anybody to take over the farm

The most common micro-economic pathway is the specialisation and upscaling of the farming activity. Off-farm employment is common only if the farm itself is not enough to maintain the family. Small farms without switching to organic production have scarcely chances to provide sufficient means for the whole family. Organic production on a smaller scale is difficult as there are very little options to sell the crops. The small organic and high-quality processing and production enterprises are missing. Independently from the size a farm needs secure, predictable market conditions which are not given yet.

Well prospering farms run by dedicated farmers are growing the most. If there is not enough land, lacking motivation and perspectives or no market for the crops (e.g. for organic crops) the farm cannot be developed.

Table A.12: Environmental, social and economic consequences of micro-economic pathways occurring in the region (from +3 (very positive), 0 (neutral) to -3 (very negative))

	Intensification, specialisation, economy of scale	Adding value to agri. production	Ecologisation of farming (organic)	Off-farm employment (pluriactivity)	Policy optimisation (agri-envmt.)	Abandonment of farming	Other
Environmental consequences	0	2	3	0	1	0	0
Social consequences	1	1	1	1	1	1	1
Economic consequences	3	1	2	2	2	0	1

The environmental consequences of different micro-economic pathways can be rated as neutral in case of growing sizes of the farms. The cultivation and land use does not undergo significant changes in this case. Off-farm employment as well as abandonment of farming help the other farms to grow as the land becomes available for them. The ecologisation of farming can have very positive impact on the environment.

The social consequences for the whole region are rated with 1 in all cases, as they depend on the situation of the single farm.

The economic consequences are also not negative. If a farmer cannot make up for living based on the agricultural activity, then it is better he/she finds additional employment or gives up. If the farmers are interested into expansion and development (in the region mainly in terms of size growth) and manage to get further areas to their farm it is very profitable. In case of ecologisation, there is still a significant risk of not finding the purchasers of the crops. It is not possible to do both: agriculture production and processing, there would be too much investment needed.

The following table gives an overview of potential farm profiles that are already relevant or will emerge as a result of dynamic processes.

Table A.13: Farm profiles that emerge as a result of dynamic processes in the region

Farmers profile*		Farm profiles that are already relevant or will emerge in the near future in the region	
		Already relevant	Will emerge in the near future
Current established farmer profiles	Adaptive-diversified farmers	occasionally	yes
	Intensive – specialised farmers	yes	yes
	Patrimonial farmers	yes	
	Recreational, non-profit farmers	yes	Yes, but only if expanding
	Semi-subsistence farmers	yes	
	Corporate farmers	Not really	Rather not
Current emerging farmer profiles	Regenerative farmers		No, it is not necessary or needed in the region, the ecosystem and soil conditions are very good
	Social famers	no	no
	Lifestyle – neo-rural farmers	The land is expensive, the investment does not pay for itself so easily. The land is not as traded in the region and not available	Not really. People having that much money do not know and do not do agriculture
	Urban micro-farmers	no	It is not relevant for the region

Farmers profile*		Farm profiles that are already relevant or will emerge in the near future in the region	
		Already relevant	Will emerge in the near future
	Indoor – controlled environment agriculture farmers	no	no
	Biotech start-up farmers		No. That's a long way off. According to the interview partners it would be important to consider what is really better for the environment.

* These profiles derive from the JRC study "Farmers of the Future"

A.5.3.4 Changes to the farming model

Moving away from very small farms does not necessarily mean giving up the EFM. The middle size farms still stand for diversified agriculture. In the region, to be viable it is necessary to run a larger farm. The implications for the structural changes are primary based on the market conditions. There are not yet new environmental issues due to e.g. climate change in the region. The environmental state in the region is very good. Ver small farms do not really have a significant contribution to coping with rural poverty. The self-sufficiency farms are mainly an add-on to other economic activities.

The small farms dominate the statistics, but if they really pursue agricultural activities is not given in the statistics. Sometimes it is better they give up also formally (change in the statistics) as it enables other active farmers to take over the land and develop the agriculture.

The basis for a successful and fruitful development of small size farms is the partnership between farmers and processing and production companies. The farmers need a "cultivation" contract, to get ensured that they will sell the crops at agreed prices and conditions. The companies can rely on the crops quality and timely delivery.

A.5.3.5 Recommendations

CAP is one of the things that farmers take for granted that there are subsidies, so they should be continued.

There is a need to support the establishment of small, high-quality production facilities. Then small farms can become profitable again. Organic farming will also make sense if there is a market for it. Long-term planning should also be promoted and supported by all levels of governance.

Farmers with perennial agro-fruit crops have problems selling their crops. The existing companies are monopolized, there are too few of them and they do not offer good long-term contracts to farmers. Supporting the differentiated and small-to medium size structure agro-processing industry can change a lot in the region. There are huge opportunities in the region for organic farming. It just needs to be processed.

The CAP and/or other EU policies shall focus on market development, awareness and demand creation in order to shape the current and future structural change and to reinforce the resilience of the regional European family farming. If there are customers, the demand will be met.

Aid funds should be directed towards rebuilding processing capacity. Especially when it comes to potential of organic farming. The interview partner meant that, it is thinkable to reduce the funds even somewhere else to achieve this change. In the 70s/80s/90s in each of the 49 provinces in the country, there were several plants where crops could be sold. Now there is 1 per province and there are 16 provinces since more than 20 years.

Farmers are not able to build a processing company with their own money. The basis for starting the economy is processing companies, which would offer several-year contracts. There are factories nowadays, but not many of them give contractual agreements (when the date of delivery and the price are fixed).

"The green deal will do nothing, if there is no one to process the products from ecological farms."

The problem lays deeper, as there is still no real demand. Therefore, awareness-raising in order to create demand is crucial. Most of the agricultural products have to go to processing. A farmer cannot invest in everything, if he/she already has credit for farming machines, she/he will not invest in a production/processing plant.

Further crucial issue for all farmers are the insurances. One of the biggest drawbacks are the not insured crops. There are still more and more extreme weather events expected. Nowadays, only emergency relief is being activated in case of a crop failure, which is not enough.

Farmers often cannot afford additional investment in form of insurance.

E.g. Covid issues are not influencing the agriculture in the region. The remote border region of przemyski NUTS3 is far away from cities, it is not a tourism region. The demand and the attitude to the rural areas did not change due to covid. There is another burning issue: ASF (African swine fever) for the farmers who invested in the piggeries. Before many farmers have taken loans, not having troubles, as whole piggeries are staying empty.

A.5.3.6 References and list of interviewees

Table A.14: Interviewed experts

	Name	Institution	Date
Regional	Stanisław Bartman	Podkarpacka Izba Rolnicza (Podkarpackie Chamber of Agriculture)	10.12.2021
Regional	Wiesław Lada	Podkarpacka Izba Rolnicza (Podkarpackie Chamber of Agriculture)	10.12.2021

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Urząd statystyczny w Rzeszowie (2021): Accessed from: https://rzeszow.stat.gov.pl/ (December 2021)

A.5.4 Case study Germany

Country	Germany
Selected region (NUTS3)	DE40F – Prignitz (DE40 – Brandenburg)
Case study author	Manon Badouix

A.5.4.1 General context information: farm decline and regional farming model

Description of the region – General socio-economic patterns and trends

Brandenburg had 2,531,071 habitants in 2020 of which approximately 75% are working in the tertiary sector, around 22% work in secondary sector and 3% in the primary sector (MLUK, 2021 & BLPB, 2020). Brandenburg's population is mostly concentrated in the direct surroundings of the capital Berlin with Brandenburg's capital city Potsdam (958 inhabitants per sqm in 2019) as the main concentration point (Statistische Ämter des Bundes und der Länder, 2021e). Other major cities are Cottbus, Brandenburg an der Havel and Frankfurt an der Oder. The state Brandenburg had a GDP of EUR 73,931,000 in 2020 (Statistische Ämter des Bundes und der Länder, 2021b). The primary sector generates 1,98% of Brandenburg gross added value (see table below). Brandenburg's unemployment rate was at 6.5% in 2019, which is slightly more than the German unemployment rate (5.4%) (Statistische Ämter des Bundes und der Länder, 2021a). Brandenburgs unemployment rate is however decreasing at slightly faster than on national level. As other states in Germany and in the EU, Brandenburg has an ageing population with 31% of over 65 years old expected in 2030. The ageing and decrease of the natural population is expected to further compensated by immigration influx from Berlin and foreign countries (LBV & Statistik Berlin Brandenburg, 2018).

Geographically, the state of Brandenburg is characterised by its flat landscape, its numerous lakes and waterways and its border to Poland at the East. Approximately one third of the state's surface is covered by protected areas and natural parks.

Agriculture

Brandenburg's farmers cultivate around 1.3 million hectares (ha) of utilised agricultural area (UAA), making it the 5th German region in terms of agricultural surface. The 5,413 farms have an average size of 242 hectares, which is far above the national average of 63 hectares. Only Mercklenburg-Vorpommern and Sachsen-Anhalt have farms with an higher average sizes (respectively 281 ha and 268 ha). This can be explained by the historical branch evolution and by the nature of the soil in Brandenburg. Indeed, being part of East Germany, the farmers were generally members of farm cooperatives (Landwirtschaftlichen Produktionsgenossenschaft, LPG) and were left the possibility to stay in these cooperatives after Germany's reunification (BLPB, 2020). In 2020, 1,579 out of 3,691 farms in Brandenburg operated as sole proprietorships – the classic family farm – as their main occupation (43 percent), a number in decrease compared to 2016 were classic family farms represented 47%. Furthermore, the soil's fertility being relatively low it is particularly relevant to have large production surfaces (MLUK, 2021). Brandenburg is the 2nd region in terms of biological agricultural surface (DESTATIS, 2021). It is also has a rather high proportion of women entrepreneur in the primary sector with 20% of its farms being run by a woman (MLUK, 2021).

Table A.15: Characteristics and dynamics of farm decline at NUTS2 level – DE40 Brandenburg (Germany)

	Share primary sector 2018	Change in farms (05-16), %	Share of farms small farms 2005	Change in share of small farms as a percentage of all farms (05-16), %	Change in average UAA per farm (05-16), %	Change in UAA in the region (05-16), %	SO per farm 2016, EUR	Change in labour (05-13), %
DE40 Brandenburg	1.98	-18.52	20.78	-79.54	20.10	-2.15	411349.96	NA

Source: Project team, 2021, based on Eurostat and DG AGRI data

Prignitz is Brandenburg's NUTS 3 region with the highest farmer number (531) and the second highest UAA surface (137,037 ha) in 2020 (MLUK). As for the other new German states, the agricultural enterprises were marked by the communist regime's structure and its dismantling. The LPG were transformed mostly in cooperatives but also in GmbH, or were liquidated, allowing new farmers to settle there. However, the number of cooperatives is also declining in Prignitz as the demographic change is not happening in all cooperatives and those not finding new farmers have to sell to investors or other farming enterprises. An enlargement of the UAA for family farms can also be observed in Prignitz as stated during the interview. This is rather not the case for cooperatives due to their loss of members whom they must pay their part. The history of the interviewee's cooperative can be used as an example for the evolution of this model. At the end of the GDR regime in the 1990s the cooperative counted more than 200 members, today only 13 remains, mostly because the retiring farmers, withdraw from the structure and the ones keeping their parts, even after retirement are dying and their heir usually opt out of the structure. This has for consequence the diminishing of the utilisable agricultural area, as the cooperative has to sell land to pay their parts back. However, the interviewee explained that this demographic change is reaching its end as only two retired farmers remain. The cooperative also gained three new members in the last years (2015,2016, 2017) as its form enables farmers to enter the parts with an investment of EUR 250,000. For comparisons sakes, in the same region a retiring private farmer sold his farm for EUR 500,000 to an already well-established farmer from West Germany. No Prignitz' farmer could have bought the whole farm on their own.

At a political level, the farmers of Prignitz are well represented, even if their number is decreasing. Organised in a political fraction, they have 5 out of 46 representants – "Mitglied des Kreistages".

A.5.4.2 Drivers of farm decline, micro-economic pathways and consequences

Drivers of farm decline

The main external trends affecting the region are both a demographic change and a rural exodus. The proximity with the state's capital Berlin and other important cities attracts young people, making it more difficult to find qualified workforce in the agriculture but also in other sectors such as banks and administrations. The interviewee notes however that this difficulty is especially hitting livestock farming where the working conditions are more difficult as it isa physical work with constraining work schedules. In these farms, around half of the employees are coming from Poland.

Similarly, to other European regions, the agricultural sector of Prignitz is concerned by increasing land prices which put them in higher concurrence with investors, especially in the context of complicated

inheritance of farms where the heirs tend to prioritise direct benefits over maintaining local farming enterprises.

Another external important influence on the day-to-day work of Prignitz' farmers are the rapidly changing norms and laws which can be contradicting (e.g. of the glyphosate) and with clashing temporalities. This is especially true for livestock farming, as the animal welfare norms change so rapidly that farms can hardly keep up with investments and renovation, especially when applying for the subventions associated.

The legal and administrative work associated in the running of a farm also takes a greater amount of time representing around 40% of the time of a full-time employee according to the interviewee.

The influence of climate change, in terms of extreme weather events, was not seen as a major driver of farm decline or need for structural change. The adaptations undertaken by the interview's cooperatives here rather concerned the sort of cereals to produce. The interviewee saw however, a greater role for farmers to the production of green energy in terms of biogas but also windmill and solar energy. Indeed, the leasing prices for a hectare of land dedicated to windmills or solar panel increased during the last years (e.g. the lease for 1 hectare of land for photovoltaic panel doubled from EUR 2,000 to EUR 4,000 in the last 2 to 3 years). This increase is now directly competing with yields made with agriculture on the same surface.

These drivers have influenced the structure of the agricultural sector in Prignitz as well as the structure of the farms. Firstly, the livestock farms seem to have either enlarge or closed the example of the interviewee is showing. The cooperative had a herd of 150 cows and veal for milk production until end of 2016 but the combination of the renovation costs, lack of milkers (a resignation for health reasons and retirements) made its maintaining to risky. The herd was sold to the neighbouring farmer who was already specialised in milk production and the stables and infrastructure owned by the cooperative are leased to the milker. The herd of this farmer went from 500 cows and veal in 2016 to 800 nowadays. Cows are still presents on the cooperative's site and a further agreement was made between them concerning the manure. The interviewee stated to be satisfied about this cooperation. This example is not isolated as the interviewee stated that around half of the livestock farms had to close in the last years.

The cooperative produces cereals and potatoes for Brandenburg and Berlin and can still benefit good prices thanks to a high demand at world level for the time being. This participated to the capacity of the cooperative to invest in technologically advanced material such as GPS-led tractors which are highly improving the farmers working conditions.

For the interviewee CAP subventions represented only a small part of the revenue (EUR 320,000 compared to EUR 1,600,000 generated by the production) but was still deemed as important for the viability of the cooperative. The evolution of the CAP reform is followed with high interest. These changes in policies are facilitated by the work of the farmer's association which is represented at all levels of the German governance (national, Länder and regional).

A.5.4.3 Overview and analysis of micro-economic pathways implemented by farmers in the region, and corresponding consequences of farm structures

The following table highlights different micro-economic pathways implemented in the case study region, as well as their intensity of occurrence. For each of the listed micro-economic pathways the most often represented type of farms are described in more detail.

Table A.16: Micro-economic pathways implemented by farmers in the region of Prignitz

Microeconomic pathways	Intensity of occurrence*	Most represented farm types**
Intensification, specialisation, economy of scale	3	The intensification level seems to have been stable over the last 10 years. A certain specialisation was observed. A certain economy of scale can be observed when comparing cooperatives with family farms in terms of administrative work and work repartition (less hours per person, autonomous machines). On the other hand, cooperatives might suffer from their material investments if the hectares decline due to a loss of members. In this case, a 100-hectare threshold per machine is deciding.
Adding value to agricultural production (e.g. Quality schemes)	4	The cooperative did not invest in the transformation of their product. Another farm of the region producing similar products developed a feed line. A livestock farm of the region also developed the transformation of their products and sale them on site. However, such on site transformation and sale were not deemed as sustainable for all farmers neither for all sectors. During a milk price crisis, the direct sale of milk was considered but the production was to high for the regional market and therefore never implemented.
Ecologisation of farming (organic, local)	5	The demand for organic products is too low and the costs of conversion too high, it would generate losses.
Off-farm employment (pluriactivity)	6	The cooperative manager estimated to sell around 1% of external services in a year and stated no interest for the cooperative to increase this part of the business. No farmer of the cooperative requires a second job to make a living.
Policy optimisation (adapting agricultural production to agricultural policy measures (e.g. Agri—environmental payments, organic livestock, LFA/ANC)	1	Policy optimisation seems t be completely integrated to a farmer's job. In the cooperative it represents around 40% of a full-time job, other farmers have to outsource this administrative work. The legal council is mostly done by the farmers' association
Abandonment of farming	6	The farm decline in Prignitz seems to be first and foremost the consequence of a lack of takeover rather than an abandonment by active farmers. However, this might be different for livestock farming which was deemed to face more difficulties keeping up with norms.
Other		

It seems that most farmers in Prignitz used several micro-economic pathways to evolve and survive in the agricultural sector. First and foremost, a policy optimisation to get a maximum amount of subvention, especially from the first pillar of the CAP is done. The subvention potential of the second pillar was deemed as less interesting for the cooperative, even if its benefits at local level are recognised. Secondly, depending of the production (milk, meat, cereal…), farmers of the region developed second branches

to their business in the form of direct sale or product transformation on site. The interviewed cooperative manager did not choose this kind of second income. A growing interest in producing and selling green energy can however be noted. The cooperative itself already installed photovoltaic panels on the roofs and might consider leasing land if the generated income allows to buy more land. The interviewee also gave the example of a milk producer also producing biogas with the cows' manure. Thirdly and happening while this slow diversification of incomes, a specialisation in products happens. Cereal producers concentrate more on cereal products and livestock farms tend to grow their herds or close.

Table A.17: Environmental, social and economic consequences of micro-economic pathways occurring in the region (from +3 (very positive), 0 (neutral) to -3 (very negative))

	Intensification, specialisation, economy of scale	Adding value to agri. production	Ecologisation of farming (organic)	Off-farm employment (pluriactivity)	Policy optimisation (agri-envmt.)	Abandonment of farming
Environmental consequences	0	1	1	Not relevant	-1	0
Social consequences	3	0	0	Not relevant	0	3
Economic consequences	2	2	-3	Not relevant	0	-3

The interviewee found the agricultural activity as actually run to have a rather positive impact on the environment stating that the landscape and biodiversity of the region were shaped by agricultural work since long times and that without such cultures, some species of plant or animals would take the over hand causing a loss of biodiversity. Generally, a lack of knowledge and understanding of agricultural production from the side of environment advocates was regretted. Therefore, the environmental consequences of a farm decline were seen rather negatively.

The social consequences of farm decline, especially of cooperative farms were also seen as highly negative. Indeed, cooperatives, mostly benefitting from economy of scale and better working conditions thanks to investment in automatization machines (GPS-led tractors for example), leave more time and energy to their employers to engage in associations important for the local population. The different engagements of the interviewee is a direct proof of it and most of farmers of the cooperative have similar engagement maintaining local activities such as the local firemen corps thanks to their voluntary work.

The economic consequences of a farm decline were also assessed as negative. Even if declining, the number of farmers still is important and would generate direct and indirect job losses, thus contributing to the rural exodus already taking place. An ecologisation of the production was not deemed as an economically positive transformation, as the demand and prices are too low compared to the costs of such a conversion. The on-site creation of added value to the products was deemed as an interesting way to generate income, however not a universal solution and not especially job-creating (usually implemented to complete work schedules more than employ additional workforce).

Off-farm employment were deemed as not relevant by the interviewee as not experienced by the cooperative and known farmers' situations.

A.5.4.4 Changes to the farming model

The changes in farming structure in the Prignitz region seem to go rather in direction of a convergence of farming sizes with on one hand smaller family farms growing or closing and on the other hand co-operatives with declining surfaces and members. A specialisation around a product (being cereal, milk, meat…) and an integration of the value chain seems to happen but not in all branches of the primary sector. However, there is a growing interest for green energy production for farmers being with the production of biogas as a by-product coming from livestock or in form of land leasing for photovoltaic panels or windmills.

Here the form of farm cooperatives could be more advantageous than a familial model, as they allow for more economy of scale and economical resilience. It allows for an easier entry in the primary sector for young farmers thanks to smaller initial investments, allows for better working conditions thanks to investments in high-technology material (GPS-led tractors) and also might benefit from a greater pool of punctual workforce through the employees' families.

When presented to the interviewee, the new farming profiles of the JRC were not deemed as particularly relevant or on-going in the region of Prignitz.

A.5.4.5 Recommendations

The interviewee stated several times during the interview that there was a broad lack of knowledge and understanding of the current work methods of farmers and agricultural production, leading to policies complicating the production and the working conditions of farmers. This was deemed as a major obstacle for the relevance future agricultural policies according to current farming practices. However, the interviewee deemed the current framework to be sustainable and was confident that the cooperative structure had found a stable form and would be able to sustain like that at least for the next ten years. The interviewee noted also that the farming structures in Germany were highly diverse (smaller more productive farms in South-West Germany for example) and had therefore diverging interests and assessments of the situation. The interviewee also wished for more equity in the repartition of CAP subvention as well as more funds for research and development to help anticipate climate change.

A.5.4.6 References and list of interviewees

Table A.18: Interviewed experts

	Name	Institution	Date
Local	Andreas Kiekback	AG eG Mesendorf (Chairman), also active as volunteer as: – Chairman for the Kreisbauernverband Prignitz – Member of the voluntary Firemen Corps of Mesendorf – Elected member of the district council representing the farmers	21.12.21

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A.5.5 Case study Spain

Country	Spain
Selected region (NUTS3)	ES522 – Castellón (ES52 – Valencian Community)
Case study author	Karin Schroll, Thomas Dax, Ingrid Machold

A.5.5.1 General context information: farm decline and regional farming model

The Communitat Valencia has been selected as case study for the study "The future of the European farming model" commissioned by the AGRI Committee of the European Parliament. It is located on the southeast of the Iberian Peninsula on the Mediterranean coast and covers an area of 23,259 km^2. About 5,000,000 inhabitants are living in the region (EUROSTAT 2021a), mainly concentrated in the coastal areas, where also the urban centers are located. In perspective of the socio-economic patterns there is a strong duality between the coastal areas and the more mountainous inland. Agricultural production in the coastal plains tends to be intensive with a high share of irrigated areas. On the other hand, agriculture in the inland tends to be more extensive and crop cultures more likely rainfed. Like in all Spain (González-Leonardo et al., 2019), also in this region there are pockets with a strong trend of rural depopulation (Comité Econoòmic i Social, 2020; Arnalte-Mur et al., 2019).

The Valencia Province represents a typical area of the western Mediterranean. Its land use depicts elements of coastal intensive and inland hilly and mountainous characteristics. About half of the land area (50.9%) is forestry land, while more than a third (35.3%) is used for agricultural land use (data from census 2016). The share of the primary sector has decreased as elsewhere in Spain and currently is as low as 2.34% (2016). About 80% of agricultural land is cropland, the remaining land (20%) being used as meadows and pasture areas. More than 470,000 ha and 70% of cropland are wooded crops and mainly covered with trees of almond, olive, tangerine, sweet orange, wine grape, carob, khaki and lemon. Citrus fruits and almonds are in terms of area and production value of outmost importance in the region (Consellaria de Agricultura, Desarrollo Rural, Emergencia Climática y Transición Ecológica, 2021). Despite this high production level, the Valencian citrus-growing system is experiencing structural problems since some time (Noguera Tur, 2010). The historically small citrus farms have an average size of less than one hectare with high internal fragmentation (on average 4 plots per farm). This leads to difficulties for mechanisation and consequently low efficiency and farm profitability. Regarding the fact of stagnating selling prices for citrus fruits, the rising costs of production (labour costs, fertilisers, …) put increasing pressure on the farms. Difficulties in rationalising the ownership structure and increasing the average farm size and structural water deficit due to low precipitation (450-600 mm in some parts) and dependence on irrigation are particular regional problems (Noguera Tur, 2010). With regard to potential impacts of climate change, Hidalgo et al. (2001) analysed daily rainfall amounts in time and spatial patterns between 1961-1990 and found a significant decrease in rainfall amount associated to an increment in their variability.

The Valencian region's agricultural areas are highly small structured. With an average area of 5.5 ha per farm, Valencia is the region with the second smallest farm structure in Spain, the national average farm size being 25.1 ha (INE, 2021b), with the EU28 average of 16.9 ha. While the total UAA in the region decreased by 12% (period 2005-2016) due to change of use, the average UAA per farm increased only slightly from 4.9 ha in 2005 to 5.5 ha in 2016 (EUROSTAT, 2021c). This leads to the on-going predominance of small farms within the Valencian Community with more than 75% of farms of an area of less

than 5 ha, whereas Spain shows a share of 51.6% for this size group (EUROSTAT, 2021b). Yet, structural adjustment is on-going and the number of farms decreased by 21.88% from 2005 to 2016.

The average Standard Output (SO) per farm in the province was EUR 21,135 in 2016, whereas in Spain it achieved almost the double value (EUR 40,597), and also on average for all the EU28 Countries it was with a value of EUR 34,785 much higher than in this area (EUROSTAT, 2021c).

Table A.19: Characteristics and dynamics of farm decline at NUTS2 level – ES 52 Valencian Community

	Share primary sector 2018	Change in farms (05-16), %	Share of farms small farms 2005	Change in share of small farms % (05-16)	Change in average UAA (05-16), %	Change in UAA in the region (05-16), %	SO per farm 2016, EUR	Change in labour (05-13), %
ES52 Valencian Community	2.34	-21.88	79.38	-2.52	12.66	-11.99	21,153.38	-10.67

Source: Project team, 2021, based on Eurostat and DG AGRI data

In the Communidad of Valencia (NUTS2) there are three Provinces (NUTS3), the most southern is Alicante, Valencia in the center and the northern Province is Castellón. For more detailed information this report will focus on the province of Castellón whenever needed. As the agricultural census provides detailed information on the level of NUTS3-regions that source will be used for descriptions on province level. However, the census data of 2020 will only be published (earliest in March 2022), so the last available reference period is the data from 1999 to 2009. Within this period 47.2% of farms in the region have given up farming. The average UAA per farm increased from 3.3 ha to 5.5 ha or 68%.

As the following table shows the province Castellón both disposes of the smallest structure and shows slowest change in structural adjustment. This emphasizes the strong position and role of small-scale farming types, and its potential on-going relevance for land management in the area.

Table A.20: Characteristics and dynamics of farm decline at NUTS3 level

Region	Number of farms 2009	Change in number of farms (1999-2009), %	Share of small farms (< 5 ha) 2009, %	Change share of small farms (1999-2009), %	UAA 2009, ha	UAA change (1999-2009), %	UAA per farm (2009), ha	UAA change per farm (1999-2009), %
Communidad Valencia NUTS 2	119,659 (1,124 organic)	-47.2	79.2	-4.9	657,471 (16,429 organic)	-11.9	5.5	66.8
Provincia Alicante NUTS 3	25,878	-50.5	77.5	-6.2	159,935	-14.6	6.2	72.6
Provincia Valencia NUTS 3	67,793	-47.0	81.5	-5.1	309,172	-14	4.6	62.4
Provincia Castellón NUTS 3	25,988	-44.1	75.0	-2.8	188,364	-5.8	7.2	68.3

Source: INE, 2021a

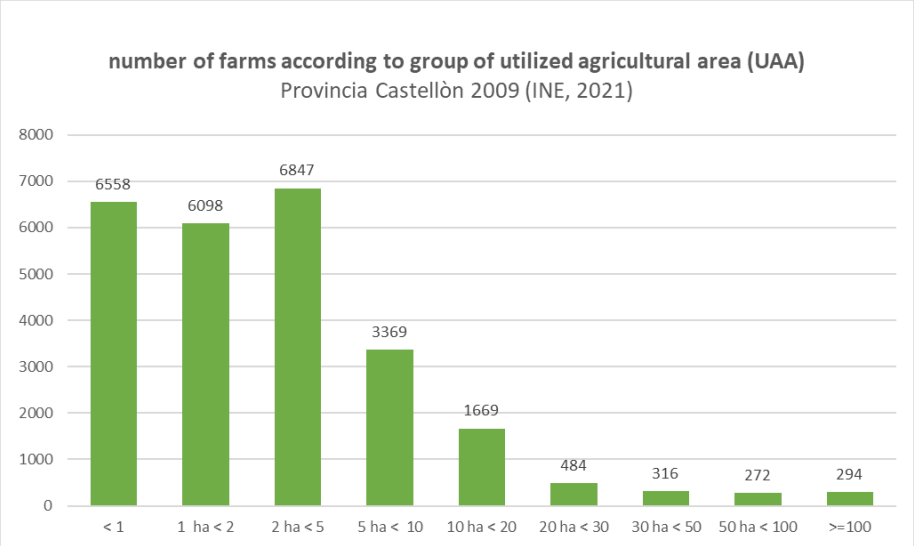
This small-scale structure was one of the main criteria for selecting that province for more detailed focus. The relevance of the sector is also highlighted by the fact that the share of agricultural employment is higher in Castellón (4.0%) than for the whole Communidad de Valancia (2.7%) and shows a similar value to the Spanish average (4.5%). Whereas the share of employees in the agricultural sector is 4.5% in total Spain, the Community of Valencia has only a share of 2.7%. The highest share is in Castellón, where 4.0% and about 10,600 (from total of 267,900 active) people are employed in the agricultural sector.

Table A.21: Population, density and employment at NUTS 3 level

Region	Population (people)	Density (people/km2)	Share of employees in agricultural sector
Communidad Valencia NUTS 2	4,959,968	213	2.7
Provincia Alicante NUTS 3	1,836,459	316	2.2
Provincia Valencia NUTS 3	2,544,264	235	2.8
Provincia Castellón NUTS 3	579,245	87	4.0

Source: Consellaria de Agricultura, Desarrollo Rural, Emergencia Climática y Transición Ecológica, 2021, data of 2016

Figure A.2: Farm structure in province Castellón



Source: INE, 2021

According to Arnalte-Mur et al. (2019) the agricultural activities in the low-land strip along the coast is mostly irrigated and dominated by citrus crops with some horticulture in the northern part of the region. The agriculture in the mountainous inland is mostly rainfed and dominated by permanent crops of almond and olive trees, which are often part of mixed farms. Depending on the area they combine with crops as cereals, pastures and other tree crops or animals (mainly intensive pigs or poultry, semi-extensive cattle and sheep).

Table A.22: Agricultural labour input by farm size in province Castellón, 2009

Farm size classes	Annual work size units (AWU)	Total family labour (in AWU)
Without UAA	347	165
0-5 ha	7,440	6 748
5-20 ha	4,164	3 473
21-50 ha	1,177	670
More than 50 ha	902	524
total	14,030	11 580

Source: INE, 2021a

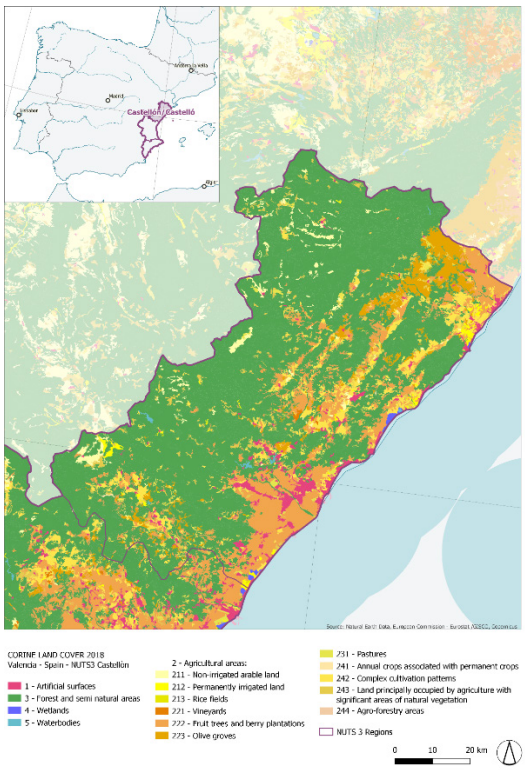
In recent years structural changes also became visible through a stronger dependence on non-family labour, leading to a situation where about one quarter of the labour force is external labour. This is particularly important for the production sector of citrus fruits. Land use in general of the province indicates a stronger divergence of uses, by showing a higher share of forest areas (about 57%), the important share of cropland within agricultural land (66%), and a high concentration on wooded crops (about 84% or more than 120,000 ha) of which more than a third is irrigated land. The intensity of land use is also underpinned by the total share of irrigated land within cropland (39.3%).

Table A.23: Main crop groups by area in Castellón 2016

Group of crops	hectares	irrigated area %	main cultures
grain cereals	6,865	5.6	wheat, barley
fodder crops	1,082	18.7	
vegetables	4,419	93.6	artichoke, lettuce, tomato, watermelon, melon
citrus fruit	36,718	100.0	mainly clementine, sweet orange
non citrus fruit trees	41,133	7.3	almond
olive trees	32,730	5.4	
other woody crops	7,757	0.0	carob (locust bean)
nurseries	1,033	100.0	

Source: Consellaria de Agricultura, Desarrollo Rural, Emergencia Climática y Transición Ecológica, 2021

Figure A.3: Land cover in the province Castellón



Source: CORINE LAND COVER, 2018

Table A.24: Livestock in Castellón 2016

	Livestock (LSU) per type	Livestock (LSU) of farms with less than 5 ha per type	Sales of livestock for slaughter [total heads]
Cattle	15,949	2,122	7,760
Pigs	165,817	71,381	1,343,791
Sheep	12,971	2,858	119,519
Goats	2,224	735	9,079
Horses	1,647	462	1,781
Poultry	89,529	56,192	14,174,003
Rabbits	1,197	786	45,635

Source: Consellaria de Agricultura, Desarrollo Rural, Emergencia Climática y Transición Ecológica, 2021, SALSA project Del 3.1

Land Use Changes analysed from 1990 to 2012 with Corine Landcover Data (Fernández-Nogueira and Corbelle-Rico, 2018) identified the main land cover transition within the regions. In Castellón the southern coastal area is dominantly affected by artificialization, the northern coastal part by artificialization and intensification. The central part of Castellón (also in the coastal areas) is mainly affected by afforestation, agricultural conversion or abandonment. The most inland and mountainous areas were in some parts predominantly affected by deforestation, in other parts by afforestation or change in forest composition.

These changes in land use were, in general, confirmed by the interviews with regional experts who highlight the structural and farming differences between coastal plains with highly intensive agriculture (often irrigated) and the mountain areas with more extensive agriculture (mainly rainfed). The historically typical small farm structures with a high share in off farm employment decreased at first very slow in numbers, because the off-farm employment within the region stabilized the farms. However, the decline of farms has accelerated in recent decades. There is a strong abandonment of small-scale farms and land particularly in the mountain area, but to some extent also in the coastal areas. Those changes lead to and are fuelled by the ongoing concentration process. Abandoned land drops out of use or is purchased or rented by other farmers to enlarge their area. In coastal areas, there is also a strong pressure on agricultural structures due to urbanization. Small-scale farming in the coastal areas is dominated by citrus (historically with off farm income) and in some parts also horticulture. The interviewed experts perceive a big problem in lack of generational renewal. Due to the large share of old farmers and a poor rentability of these small structures, the sector misses swift and useful generational change, particularly due to hesitation of young people to take over.

Decline of farms in inland areas is occurring gradually and often leads to abandonment with social consequences and an emerging trend for depopulation in parts of the area (Ortega-Reig et al. 2020). New strategies and changed management schemes are visible through shifts towards organic farming (by small farmers in mountains), and this turns out to become even a larger strategy for the whole region. However, with a missing national market, the prime strategy is focused (still) on export. Other little coops show little progress in professionalisation and experience difficulties, which tends to contribute to their (gradual) disappearance from the market. An economic problem for farmers is the tightening cost-benefit relationship. While costs for inputs (fertilizers, etc.) increase, prices are "squeezed". Economies of scale get more important, but only few farmers can profit because of capacity to adopt new techniques. Especially small farms in the region are highly dependent on integration into cooperatives. Cooperatives are in charge of trading agricultural products and allow the farmers to focus on farming itself (especially important for historically small farms with off farm employment). Particularly small cooperatives lack professionalisation. They have a problem to be competitive and are losing linkages to farmers and markets. When cooperatives disappear, also farmers probably are losing connection to the market. There is a need of change with regard to the field of activity of cooperation (see recommendation). Another factor of change is the entrance of new capital. There is an increased activity of investment funds/traders/retailers, that are now also engaging in agricultural production itself. As they show interest in intensive farming (also investing in "integrated" production) they are capable of applying new citrus variants, disposing of specific property rights, and also respond to new demands and options for crops like avocados in recent years, again accelerating the trend towards more intensive farming systems

A.5.5.2 Drivers of farm decline, micro-economic pathways and consequences

Drivers of farm decline

While the case study represents an example of a traditional agricultural area with high labour input and farming intensity for citrus and horticulture production, the socio-economic changes of last decades had an important impact on structural change. This can be seen in a long historical trend of urbanisation and industrialisation of cities and towns at the coast, but also in inner areas of the region. It implies a host of economic, social and cultural changes that impact on the expectations and plans of current and next generation farming population. These effects are experienced in spatially very uneven ways and their influence is pertinent ubiquitous or at quite different time periods across the different local

areas of the region. Therefore, spatial diversity has to be addressed as a crucial element in translating large-scale, national or even global trends into structural response. While in coastal areas this tendency just alleviates or accelerates structural adjustment, thus explaining at least partially the pace of structural change, this effect is more wide ranging in the inner areas of the mountains of the region. As the experts argue structural change is not limited there to a primarily sector phenomenon, but links strongly to regional demographic and socio-cultural processes. Above all, land abandonment and ensuing decrease in attractiveness of local places enhances trends of out-migration and leads to continued depopulation of remote areas. Idle land might be kept in possession of farm households for quite some time, as with rising land prices and expectations for urbanisation and settlement extension farmland might turn to construction area. Price expectations for selling agricultural land is therefore often based on such future forecasts of settlement extension and prices that are manifold higher than actual land prices. These urbanisation outlooks add to previously mentioned detrimental ecological effects. The difference is that negative land management continuity and depopulation process is mainly limited to more remote places, a small number of villages and few people are affected in this region (in contrast to many other parts of Spain). Nevertheless, the occurring changes substantially affect those communities, but also economic capacity for cooperatives, marketing of products and thus also farming structure. Finally, this might weaken still existing local economic ties and contribute to the situation of a "downward spiralling" effect and feelings of negligence of local population.

With regard to sector specific drivers, the farming population is under great pressure. This is not just argued as a gradual structural adjustment due to small farm size of many farm units but increasingly also to technological changes, the rapid expansion and dependence on digitalization, demands for adaptation in management methods and increasing challenges for traditional, less competitive cooperatives. Also emerging demands for ecological production schemes, climate change effects, with starting concern about puzzling observations on weather events, hazards and vulnerability to risks add to the problems experienced particularly by less professional and small-scale farmers. Despite the fact that structural change is quite slow in the region the bundle of influencing factors is jeopardizing the existing production model (Arnalte-Mur et al., 2020). Drivers are conceived to impact at different rates, particularly due to ability of achieve professional knowledge and adaptation information as well as integration in cooperation and value chains. This integration is assessed as decisive for farmers but also for cooperatives themselves. Many small, traditional cooperatives are not prepared to ecological, quality and market requirements that are becoming visible for different production schemes. Some of these changes seem somewhat looming and might materialize due to changes of export relationships, technological adaptations, new regulations on environmental standards, and social demands in regeneration of the sector. The different effects must also be differentiated for different agricultural products which are characterized by very specific market options and (regional) trends. For example, concentration trends at the coast would continue under these circumstances (but for many products would allow a slow adaptation process). On the other hand, livestock in inner areas might lead to bigger units with ecological consequences and challenges in value chains and cooperatives.

Climate changes and the accompanying higher temperatures are slowly leading to necessary changes in traditionally cultivated crops in the region. In the south of the Valencia region (Alicante), viticulture is becoming more difficult. Traditionally cultivated stone fruits, such as peaches, which need frost in winter, are increasingly failing in more southern regions.

Discussions on sustainable land management systems are not very strong at the moment. However, this might change in the future. At present, experts acknowledge a strong increase of organic farming which is, however, mainly oriented at expert production as regional and national markets are not yet interested with these products. Similarly, production on irrigated and intensively used areas for many

of the products should be analysed on achieving sustainable development goals. So far, this is not a major issue in the region, even if some starting considerations to avoid ecological harmful methods are beginning to be conceived. Again, here small-scale farming shows difficulties in adopting such demanding new regulations and technological systems.

Public interventions might also impact on management decisions and structural development. Experts explained that overall impact of CAP remains rather limited, both for Pillar 1 and Pillar 2 instruments. For Pillar 1 a limited eligibility, respectively relevance of measures is assessed for the large share of small farm units which is, if eligible at all, marginal, and not influential on major farm management decisions. In general, relevant instruments relate to products like almonds, nuts and livestock (in inland areas); as for many fruit and horticulture products CAP support is not available at all or very limited. Policy support has been particularly relevant for shifting towards organic farming, but less so for diversification towards new activities or processing of produce etc. The main use of CAP policy support is through investment measures which are often also not tailored or apt for small-scale farming or less accessible for small cooperatives. In view of regional structural development, it appears that national schemes are more important, operated primarily by the responsible administration of the Communidad Valenciana, still favouring a production-oriented support regime. On the other hand, the influence of other non-agricultural policies should not be neglected, as health provision, environmental policies, infrastructural development, education and skill support as well as cultural development are pivotal for assessing local conditions by farmers' households, next generation and young and new entrants to farming.

A.5.5.3 Overview and analysis of micro-economic pathways implemented by farmers in the region, and corresponding consequences of farm structures

Strategies of "micro-economic pathways" are implemented by farmers to adapt, or react, to the challenges posed by changes in (i) general socio-economic context, (ii) agricultural and other relevant economic policies, or (iii) sector-specific drivers of structural change. The interviews with regional experts explored the specific adaptation strategies visible in the area or expected for future decisions. Moreover, the case study analysis can refer to summary reports on this topic, published recently as a result of the EU-project SALSA ("Small Farms, Small Food Businesses and Sustainable Food Security") analysis within a regional case study in this area (Arnalte-Mur et al., 2019; Ortiz-Miranda et al., 2020) to which our experts also contributed as workpackage leaders.

The assessment on the various micro-economic pathways is summarized in the following table. It emphasizes the pertinence of intensification processes as lasting drivers and strategies chosen by professional farmers. The other development strategies highlighted there (diversification and quality focus; ecologisation; engaging stronger in off-farm employment; or adapting stronger to policy framework conditions or abandoning farm management) were of less concern. However, for small groups of farm households these might attain significance, particularly in specific periods and local conditions. As an be seen from the column on types of farms affected by these pathways, the experts mentioned a string reliance on the farm type, e.g. some options for diversification and quality development for specific products (like horticulture, new emerging products, wine production; new varieties of citrus production etc.). It also appears that the choice for different pathways is higher for medium and larger farm groups, as small farm groups do not dispose of the background conditions (including professional skills, access and availability of information and collaboration) to select specific development pathways. The assessment also traces those arguments which point to a gradual decline of small farming, albeit specific niche strategies and case by case positive future outcomes are assessed as possible even within very small farms.

Table A.25: Micro-economic pathways implemented by farmers in the region of Castellón

Microeconomic pathways	Intensity of occurrence*	Most represented farm types**
Intensification, specialisation, economy of scale	Most important, also in the future (with problems for environment)	Concentrated in medium and large farms.
Adding value to agricultural production (e.g. Quality schemes)	Stabilized quality development in the last years, market is saturated with different types of labels	Particularly in wine production, specific permanent crops (oranges, etc.)
Ecologisation of farming (organic, local)	Is growing. Ambitious plans to increase organic production in the regions (up to 20% by 2030). They reach milestones quickly (farm to fork strategy)	Medium and large farms. For small farmers more obstacles to achieve certification, with adverse effects from neighbour contexts to keep to rules
Off-farm employment (pluriactivity)	High, it is traditional in this area. Many possibilities, also in cooperatives	Small scale farms enabling high intensity of pluriactivity
Policy optimisation (adapting agricultural production to agricultural policy measures (e.g. AEMs, organic livestock, LFA/ANC)	Personal impression of expert, it is the other way around: policy design is looking to feed the existing practices. It is not designed to change the existing production methods/rationale.	AEM policy is a given policy; some extensive farming, and slow emergence of discourse.
Abandonment of farming	High, particularly in specific small plots, but adding up to larger areas (by and by)	Small farms decline in marginal areas. Small plots in industrial areas, larger plots in mountain areas with extensive farming
Other	No other pathways seen	

Experts also tried to answer the table on the environmental, social and economic consequences of structural change and their specific adaptation strategies. On a range from very positive (+3) to very negative (-3) effects, strongest implications are reported for intensification and abandonment processes, the two extreme developments. All other strategies appear as intermediate to them and particularly related to individual household conditions, local contexts and management adaptability of farm operators and their households. Following a classical, wide-spread argument ecologization is approved with high positive outcomes, implying a provision of benefits of public goods linked to such a shift in land management systems.

Table A.26: Environmental, social and economic consequences of micro-economic pathways occurring in the region (from +3 (very positive), 0 (neutral) to -3 (very negative))

	Intensification, specialisation, economy of scale	Adding value to agric. prod.	Ecologisation of farming (organic)	Off-farm employment (pluriactivity)	Policy optimisation (agri-envmt.)	Abandonment of farming
Environmental consequences	-3 Ground water poll., biodiv. loss, independent of farm size	1	3	0	1	-2 (worsening env. Risk)?
Social consequences	-2 needs minor labour	1	2	2	0	-3
Economic consequences	-1 Organization not resilient	2	2	3	1	-1

Following from these assessments, experts notice that current farm profiles will remain relevant, at least for the immediate future to come. Strongest approval is for "adaptive-diversified farmers", "intensive-specialized farmers" and "corporate farmers". It is argued that intensification is an on-going and largely impacting issue for farmers' decisions, however in the long run specialization might reach a peak as limitations due to ecological constraints might increase. Even if the other types are not so prominent all of them might have a role for specific farmers, except for semi-subsistence farmers who are deemed not so relevant in this region. For example, some traditional patterns, like some patrimonial farmers would be still relevant at the moment but would decrease in the future.

As to the emerging farm types, these are seen to have potential in the case of biotech start-up farmers and for the case of regenerative farmers, but to a lesser extent. It is stressed that those types largely depend on information, education and skills, as well as cooperation and technological access, factors that are altogether less developed within the group of small farmers.

The foresight analysis of the SALSA project on future farm types development presents for different scenarios, termed as "Lost in liberalisation", "Bye bye globalisation", "Resurging of agroruralization" and "Apocalypse". As it exposes to some extent extremes of structural change, outcomes of expert engagement in a discussion process on these future developments reveals that a strong re-orientation towards functions and positive benefits due to inherent rural values might lead to most feasible adaptations. Liberalization and the contrasting view on de-globalization or national protection strategies might be less convincing developments (Ortiz-Miranda et al., 2020). Even if that is a result that would appear in many regions it seems important that also within a highly intensive production area these values and the need for reorientation score high up in the regional agenda of structural adjustment.

A.5.5.4 Changes to the farming model

The discussion on "Changes to the farming model" implies that there is a common model that is approved as a guiding principle throughout Europe and the EU countries. The experts expressed their

view that the common denominator of the EFM is primarily the outmost diversity of European agriculture and its linkage to rural contexts. The provision of multifunctional tasks, of ecosystem services and public goods was seen as core in this regard.

It appears that the high share of small-scale farming supports a continuous relevance of the EFM, even if the share is gradually decreasing and the economic value of small sale farming loses on economic influence also in this region. Nevertheless, still in the short and medium-term future there is no sign of a sharp decrease or end of small-scale farming. As such it seems particularly relevant to consider how multifunctionality can be achieved by small and medium sized farmers in the region. They are mainly assessed as keeping a strong function for populating rural regions, both in terms of conserving actual population members, preserving land management and linked functions of landscape shaping and ecological functions related to that, and also in terms of mitigating trend for shrinking rural areas. As shrinking rural regions is a hot political issue in Spain (see ESCAPE project and national strategy to cope with depopulation in large portions of the Spanish territory: Ministerio de Politica Territorial y Funcion Pública, 2017).

Structural change is not only an issue of farms and farm management, but increasingly an aspect how these are integrated in regional socio-economic processes, and regional (and larger) value-chains, and how they adapt to global influences and technological developments. There is mixed awareness on these issues, but their impact is esteemed as particularly important. The aspect is not just an issue of professionalisation and of linking medium and large-scale farms to processing and marketing networks and global outlets but it seems a crucial aspect how small-scale farming can address and link to needs and possibilities of collaboration in the whole value chain. In particular, its effects on the social dimension of rural society have to be taken into account. In the case study, and in Spain in general, there is an increased awareness on these societal interlinkages and the inherent effects towards local development issues (Arnalte Alegre et al., 2013).

Moreover, linkages to consumers and taking up changes and main trends of consumer habitats are pivotal. There seems no feasible future development for sustainable farm management systems and beneficial farming organisation if also consumers do not change in their food perspectives. This includes visions on demand for regional food produce, direct marketing sales, new quality developments etc. Although this was no focus in the interview the high relevance of the aspects was underlined by the experts. In particular, current market power structures favour existing networks and food provision with limited options for change, except for niches to cover emerging consumer complaints. This high dependence on the trade sector and structures, including export orientation of the citrus and horticulture sector, should not be overlooked when arguing on the future of agricultural structural change.

A.5.5.5 Recommendations

The future of the diverse features of the farming sector in the region is largely dependent on interlinkages to processing, marketing and international trade (exports), and integration of various types of farm households into local and regional economy. As a gradual abandonment of small-scale farming units is traceable through statistics and long-term adaptation trends, structural adaptations seem necessary to adjust for the persistent challenges of specific regional agricultural production.

It is therefore recommended by regional experts that concern for small-scale farmers future is kept and their participation in collective action in a more innovative way is enhanced. This increased concern for cooperation addresses both small farm units and small- and medium sized cooperatives with similar challenges due to limitations in adaptation strategies so far. In order to achieve beneficial outcomes

and market impact, cooperatives need to become more responsible in their adaptation strategies and action, i.e. they should not only be active in improving trade processes and relationships on products they collect from producers but should aim at influencing production scope and qualities more substantially, thereby gearing local producers towards shifting market and societal demands (SALSA, 2020). This includes a strong focus on enhancing adaptive strategies of local farmers' capacity to integrate in cooperative action and understand and access options for ecologization of specific production (of citrus and horticulture) to reflect new demands and regulation for improved ecological quality production. Above all, such a shift in behaviour is deemed feasible only of small and medium cooperatives elaborate appropriate development plans, strategies and action profiles (which are largely missing at the moment).

At present, there seems an important lack in current policy orientation towards these aspects, with CAP and national implementation (through the responsible provincial framework) revealing very low impact on these structures, but more or less providing means and support for continued concentration and investment of already potential producers. Moreover, there is limited awareness on effects of current policy measures on structural adjustment. As such hidden effects of the policy frameworks is not helpful to orientate towards societal objectives and shift fragmented small-scale structures to more effective provision of high-quality products responding to consumer demands and export potential.

This lack of policy orientation in contents also leads to an important communication aspect: There is a need to address explicitly the challenges and opportunities of small-scale farming structure in the region, highlighting realistic chances for the future (and not just implicitly accepting incremental adjustment and steady concentration processes). Visibility of small farms in politics would be an important argument in elaborating CAP programmes and national implementation, as well as national and regional strategies for diverse sectors and product branches. These specific needs for product development should include the adaptation requirements and options for different farm structures and be tailored to organisation structures and processes that would enable inclusion of various size structures.

A further aspect, increasing very swiftly over recent years is the integration into a number of issues of digitalisation. Again, the rising options are hardly oriented at small-scale farming and it is assessed that this aspect would need specific concern in order not to lose the inherent potential. Also research and support for shifts in practical solution seeking innovative ways of adaptation and application of digital potential seems necessary to make use of new technologies for existing structures. Without that support a large share of farm households might fail to see any future feasible adaptation of their agricultural production. In particular, due to uneven spatial distribution of such effects, such abandonment of agricultural activities might lead to macro-economic losses, regional weakening of structures, ecological pressures and under-production of valued public goods. These recommendations seem important not just for the case study, but for larger parts of Southern Europe farming systems (SALSA, 2020b) to address farm systems for sustainable food security.

A.5.5.6 References and list of interviewees

Table A.27: Interviewed experts

	Name	Institution	Date
Regional	Dionisio Ortiz Miranda	Universitat Politècnica de València	16/12/2021
Regional	Laura Arnalte Mur	Universitat Politècnica de València	21/12/2021
Local	Egon Cervera and Vicent Insa	Valencian Federation of Agrifood Cooperatives	17/01/2022

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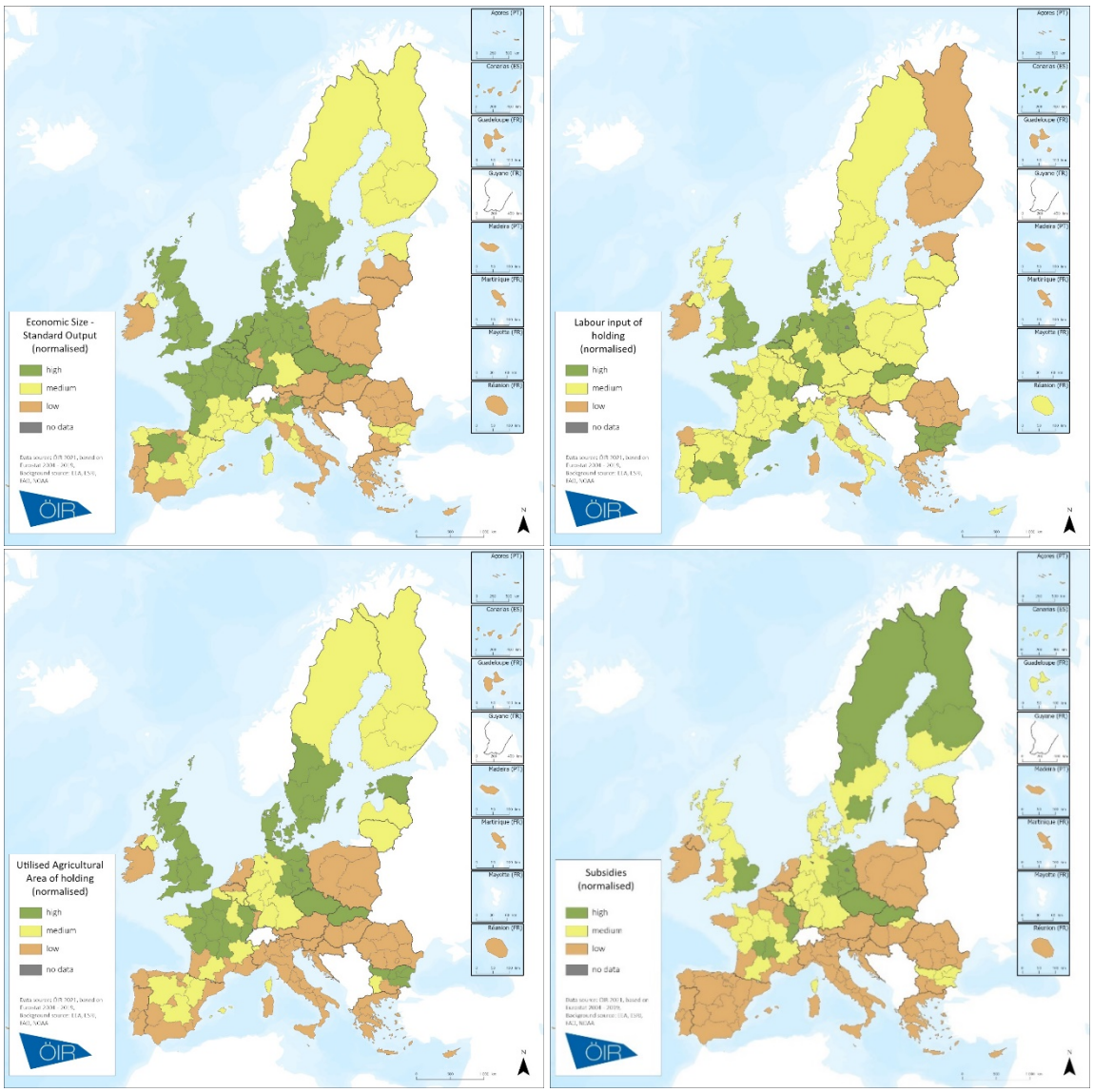
A.6 Maps of potential economic resilience in 2040

The following normalisation rule was applied on regional level:

$X_r' = \frac{X_r - X_{min}}{X_{max} - X_{min}}$	Where X_r is the normalised value of a region r for sub indicator X; Where X_r is the original value of a region r for sub indicator X; Where X_{max} is the maximum value of all regions for sub indicator X; Where X_{min} is the minimum value of all regions for sub indicator X.

Maps were created by dividing the composite indicators into 3 categories based on the European average: high, medium, low.

The following four maps show the forecasted and normalized results of the four FADN indicators: (a) economic size of holdings expressed in 1000 euro of standard output, (b) total labour input of holding expressed in annual work units, (c) total utilised agricultural area of holding, and (d) total subsidies linked to production.



A.7 Measure Fiche

(1) Direct payments

Measures	Legal basis	Further information	Data on planned/ implemented expenditure
2014-2020			
Basic payment scheme and SAPS	Reg. 1307/2013 Title III, Chapter 1	https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/income-support/basic-payment_en	https://agridata.ec.europa.eu/extensions/DashboardIndicators/Financing.html?select=EU27_FLAG,1
Redistributive payments	Reg. 1307/2013 Title III, Chapter 2	https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/income-support/additional-optional-schemes/redistributive-payment_en	
Payment for agricultural practices beneficial for the climate and the environment (Greening)	Reg. 1307/2013 Title III, Chapter 3	https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/income-support/greening_en	
Payments for areas with specific natural constraints	Reg. 1307/2013 Title III, Chapter 4	https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/income-support/additional-optional-schemes/anc_en	
Payment for young farmers	Reg. 1307/2013 Title III, Chapter 5	https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/income-support/young-farmers_en#supportforyoungfarmers	
Voluntary coupled support	Reg. 1307/2013 Title IV, Chapter 1	https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/income-support/additional-optional-schemes/voluntary-coupled-support_en	
Crop-specific payment for cotton	Reg. 1307/2013 Title IV, Chapter 2	https://ec.europa.eu/info/food-farming-fisheries/plants-and-plant-products/plant-products/cotton_en	

Measures	Legal basis	Further information	Data on planned/ implemented expenditure
Small farmers scheme	Reg. 1307/2013 Title V	https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/income-support/additional-optional-schemes/small-farmers-scheme_en	
Cross compliance	Reg. 1306/2013 Title IV	https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/income-support/cross-compliance_en	
2021-2027			
Basic income support for sustainability	Reg. 2021/2115 Title III Chapter II Section 2 Subsection 2	https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/new-cap-2023-27/key-reforms-new-cap_en#agreenerpolicy; https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/cap-strategic-plans_en; https://ec.europa.eu/info/sites/default/files/food-farming-fisheries/key_policies/documents/factsheet-agri-practices-under-ecoscheme_en.pdf;	
Complementary redistributive income support for sustainability	Reg. 2021/2115 Art. 29		
Complementary income support for young farmers	Reg. 2021/2115 Art. 30		
Schemes for the climate, the environment and animal welfare	Reg. 2021/2115 Title III Chapter II Section 2 Subsection 4		
Coupled income support	Reg. 2021/2115 Title III Chapter II Section 3 Subsection 1		
Crop-specific payment for cotton	Reg. 2021/2115 Title III Chapter II Section 3 Subsection 2		
Payments for small farmers	Reg. 2021/2115 Art. 28		
Conditionality	Reg. 2021/2115 Title III Chapter I Section 2		
Social conditionality	Reg. 2021/2115 Title III Chapter I Section 3		

(2) Market support

Measures	Legal basis	Further information	Data on planned/ implemented expenditure
2014-2020			
Public intervention	Reg. 1308/2013 Part II Title I Chapter I Section 1	https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/market-measures/market-measures-explained_en#publicintervention	https://agridata.ec.europa.eu/extensions/DashboardIndicators/Financing.html?select=EU27_FLAG,1
Aid for private storage	Reg. 1308/2013 Part II Title I Chapter I Section 2	https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/market-measures/market-measures-explained_en#storageofproducts	
Aid for the supply of fruit and vegetables and of milk and milk products in educational establishments	Reg. 1308/2013 Part II Title I Chapter II Section 1	https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/market-measures/school-fruit-vegetables-and-milk-scheme/school-scheme-explained_en	
Aid in the olive oil and table olives sector	Reg. 1308/2013 Part II Title I Chapter II Section 2	https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/market-measures/market-measures-explained_en#sectorspecificaidschemes	
Aid in the fruit and vegetables sector	Reg. 1308/2013 Part II Title I Chapter II Section 3		
Support programmes in the wine sector	Reg. 1308/2013 Part II Title I Chapter II Section 4		
Aid in the apiculture sector	Reg. 1308/2013 Part II Title I Chapter II Section 5		
Aid in the hops sector	Reg. 1308/2013 Part II Title I Chapter II Section 6		
Export refunds	Reg. 1308/2013 Part III Title I Chapter VI	https://trade.ec.europa.eu/doclib/press/index.cfm?id=1738; https://www.wto.org/english/news_e/news17_e/agcom_17oct17_e.htm; https://ec.europa.eu/growth/sectors/food-and-drink-	

Measures	Legal basis	Further information	Data on planned/ implemented expenditure
		industry/trade-processed-agricultural-products/export-refunds_en	
Exceptional market support measures	Reg. 1308/2013 Part V Chapter I	https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/market-measures/market-measures-explained_en#exceptionalmeasures	
Reserve fund (from financial discipline)	Reg. 1308/2013 Part V Chapter III; Reg. 1306/2013 Art. 25	https://www.europarl.europa.eu/ftu/pdf/en/FTU_3.2.4.pdf	
POSEI (measures for agriculture in the outermost regions of the Union)	Reg. No 228/2013, Chapter IV	https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/market-measures/outermost-regions-and-small-aegean-islands/posei_en	
2021-2027			
Measures largely unchanged, but: – extension of possibility to initiate sectorial – interventions to other agricultural sectors – amendments to rules on geographical indications – provisions on export refunds deleted	1308/2013 as amended by Reg. 2020/2220 Art. 10 and Reg. 2021/2117; Reg. 2021/2115 Title III Chapter III	https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI(2019)642234	

(3) Agri-environment and climate payments

Measures	Legal basis	Further information	Data on planned/ implemented expenditure
2014-2020			
AECM	Reg. 1305/2013, Art. 28	https://enrd.ec.europa.eu/sites/default/files/rdp_analysis_m10-1.pdf	https://cohesiondata.ec.europa.eu/2014-2020/ESIF-2014-2020-FINANCES-PLANNED-DETAILS/e4v6-qrrq
Animal welfare	Reg. 1305/2013, Art. 34	https://enrd.ec.europa.eu/sites/default/files/enrd_publications/animal_welfare_in_the_rural_development_programme_for_the_2014_2020_period_in_the_eu.pdf	
Forest-environmental and climate services and forest conservation	Reg. 1305/2013, Art. 34	https://ec.europa.eu/info/food-farming-fisheries/forestry/forestry-explained_en#financialsupport	
2021-2027			
Environmental, climate-related and other management commitments	Reg. 2021/2115 Art. 70	https://enrd.ec.europa.eu/sites/default/files/p1ws_intervention-strategies_developing-interventions_falter-sulima_0.pdf	

(4) Support for organic farming

Measures	Legal basis	Further information	Data on planned/ implemented expenditure
2014-2020			
Conversion or maintenance of organic farming	Reg. 1305/2013, Art. 29	https://enrd.ec.europa.eu/sites/default/files/rdp_analysis_m11.pdf	https://cohesiondata.ec.europa.eu/2014-2020/ESIF-2014-2020-FINANCES-PLANNED-DETAILS/e4v6-qrrq
2021-2027			
Environmental, climate-related and other management commitments	Reg. 2021/2115 Art. 70		

(5) Support for areas facing constraints

Measures	Legal basis	Further information	Data on planned/ implemented expenditure
2014-2020			
Natura 2000 and Water Framework Directive payments	Reg. 1305/2013, Art. 30	https://enrd.ec.europa.eu/sites/default/files/rdp_analysis_m12.pdf	https://cohesiondata.ec.europa.eu/2014-2020/ESIF-2014-2020-FINANCES-PLANNED-DETAILS/e4v6-qrrq
Payments to areas facing natural or other specific constraints	Reg. 1305/2013, Art. 31 & 32	https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/income-support/additional-optional-schemes/anc_en; https://enrd.ec.europa.eu/sites/default/files/w11_anc_faqs.pdf	
2021-2027			
Natural or other area-specific constraints	Reg. 2021/2115 Art. 71		
Area-specific disadvantages resulting from certain mandatory requirements (N2K, WFD)	Reg. 2021/2115 Art. 72		

(6) Investment in physical assets

Measures	Legal basis	Further information	Data on planned/ implemented expenditure
2014-2020			
Investments in physical assets	Reg. 1305/2013, Art. 17	https://enrd.ec.europa.eu/sites/default/files/rdp_analysis_m04.pdf	https://cohesiondata.ec.europa.eu/2014-2020/ESIF-2014-2020-FINANCES-PLANNED-DETAILS/e4v6-qrrq
2021-2027			
Investments	Reg. 2021/2115 Art. 73		

(7) Cooperation

Measures	Legal basis	Further information	Data on planned/ implemented expenditure
2014-2020			
Setting-up of producer groups and organisations	Reg. 1305/2013, Art. 27	https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/market-measures/agri-food-supply-chain/producer-and-interbranch-organisations_en#producerorganisations	https://cohesiondata.ec.europa.eu/2014-2020/ESIF-2014-2020-FINANCES-PLANNED-DETAILS/e4v6-qrrq
Quality schemes for agricultural products, and foodstuffs	Reg. 1305/2013, Art. 16	https://ec.europa.eu/info/food-farming-fisheries/food-safety-and-quality/certification/quality-labels/quality-schemes-explained_en	
Co-operation approaches among different actors in the Union agriculture sector	Reg. 1305/2013, Art. 35 1. (a)	https://ec.europa.eu/eip/agriculture/sites/default/files/16_measure_fiche_art_35_co-operation.pdf	
The creation of clusters and networks	Reg. 1305/2013, Art. 35 1. (b)	https://ec.europa.eu/eip/agriculture/sites/default/files/16_measure_fiche_art_35_co-operation.pdf	
The establishment and operation of operational groups of the EIP for agricultural productivity and sustainability	Reg. 1305/2013, Art. 35 1. (c) & 56	https://ec.europa.eu/eip/agriculture/sites/default/files/16_measure_fiche_art_35_co-operation.pdf ; https://ec.europa.eu/eip/agriculture/; https://enrd.ec.europa.eu/sites/default/files/rdp_analysis_m16-1.pdf	
Risk management	Reg. 1305/2013, Art. 36-39	https://op.europa.eu/en/publication-detail/-/publication/5a935010-af78-11e8-99ee-01aa75ed71a1; https://www.europarl.europa.eu/RegData/etudes/STUD/2016/573415/IPOL_STU(2016)573415_EN.pdf	
2021-2027			
EIP operational groups	Reg. 2021/2115 Art. 77 (a)		

Measures	Legal basis	Further information	Data on planned/ implemented expenditure
LEADER	Reg. 2021/2115 Art. 77 (b)		
Quality schemes	Reg. 2021/2115 Art. 77 (c)		
Producer groups, producer organisations or interbranch organisations	Reg. 2021/2115 Art. 77 (d)		
Smart-village strategies	Reg. 2021/2115 Art. 77 (e)		

(8) Knowledge transfer

Measures	Legal basis	Further information	Data on planned/ implemented expenditure
2014-2020			
Knowledge transfer and information actions	Reg. 1305/2013, Art. 14	https://enrd.ec.europa.eu/sites/default/files/rdp_analysis_m01-02.pdf	https://cohesiondata.ec.europa.eu/2014-2020/ESIF-2014-2020-FINANCES-PLANNED-DETAILS/e4v6-qrrq
Advisory services, farm management and farm relief services	Reg. 1305/2013, Art. 15		
2021-2027			
Knowledge exchange and dissemination of information	Reg. 2021/2115 Art. 15 & 78		

(9) Business start-up aid

Measures	Legal basis	Further information	Data on planned/ implemented expenditure
2014-2020			
Business start-up aid for young farmers	Reg. 1305/2013, Art. 19 (a)(i)	http://agricoltura.regione.campania.it/PSR_2014_2020/pdf/Art19.pdf	https://cohesiondata.ec.europa.eu/2014-2020/ESIF-2014-2020-FINANCES-PLANNED-DETAILS/e4v6-qrrq
Business start-up aid for non-agricultural activities in rural areas	Reg. 1305/2013, Art. 19 (a)(ii)		

Measures	Legal basis	Further information	Data on planned/ implemented expenditure
Business start-up aid for the development of small farms	Reg. 1305/2013, Art. 19 (a)(iii)		
2021-2027			
Setting-up of young farmers and new farmers and rural business start-up	Reg. 2021/2115 Art. 75		

(10) LEADER and basic services

Measures	Legal basis	Further information	Data on planned/ implemented expenditure
2014-2020			
Basic services and village renewal in rural areas	Reg. 1305/2013, Art. 42-44	https://www.madr.ro/docs/dezvoltare-rurala/Axa_LEADER/2014-2020/2019/fise-template/Art-20-Servicii-de-baza-reinnoirea-satelor-in-zonele-rurale.pdf	https://cohesiondata.ec.europa.eu/2014-2020/ESIF-2014-2020-FINANCES-PLANNED-DETAILS/e4v6-qrrq
LEADER	Reg. 1305/2013, Art. 21	https://enrd.ec.europa.eu/leader-clld_en	
2021-2027			
LEADER	Reg. 2021/2115 Art. 77 (b)	http://elard.eu/wp-content/uploads/2020/04/S1-3-FutureDirectionsRuralDevelopment_EZhivkova.pdf; https://enrd.ec.europa.eu/sites/default/files/leader_sub-group-6_cap-post-2020_castellano-jasinska.pdf	

The current allocations (not broken down per measure) for the 2021-2027 Multiannual financial framework can be found here: EAGF, EAFRD. For information on the new measures, we suggest the reader consults the relevant legislation, as there are very few reliable explanatory sources available at the time of publication.

A.8 Results of expert workshop

After the synthesis of main findings of this study, an online workshop was organised by bringing together different agricultural experts across Europe. Given the importance of the research topic, various international academic experts had already expressed in advance their interest in participating in a workshop. During the workshop itself, representatives from Poland, Netherlands, Greece, Cyprus, Germany, Romania, Spain, Italy, Lithuania, Portugal, Slovenia and Austria were actively involved. The online-workshop took place on January, 17th and lasted for approximately 3 hours. In terms of technical implementation, a combination of MS Teams for the videoconferencing and Conceptboard for the interactive workshop moderating part was used. The Workshop started by presenting the background and aim of the project, followed by main results of different working steps, and concluded with two interactive workshop sessions. For additional information, the input presentation can be found in annex **Error! Reference source not found.**. The first component of the workshop concentrated on the three main questions specified in the Terms of Reference. Within three parallel breakout sessions, these three questions were intensely discussed with the expert participants.

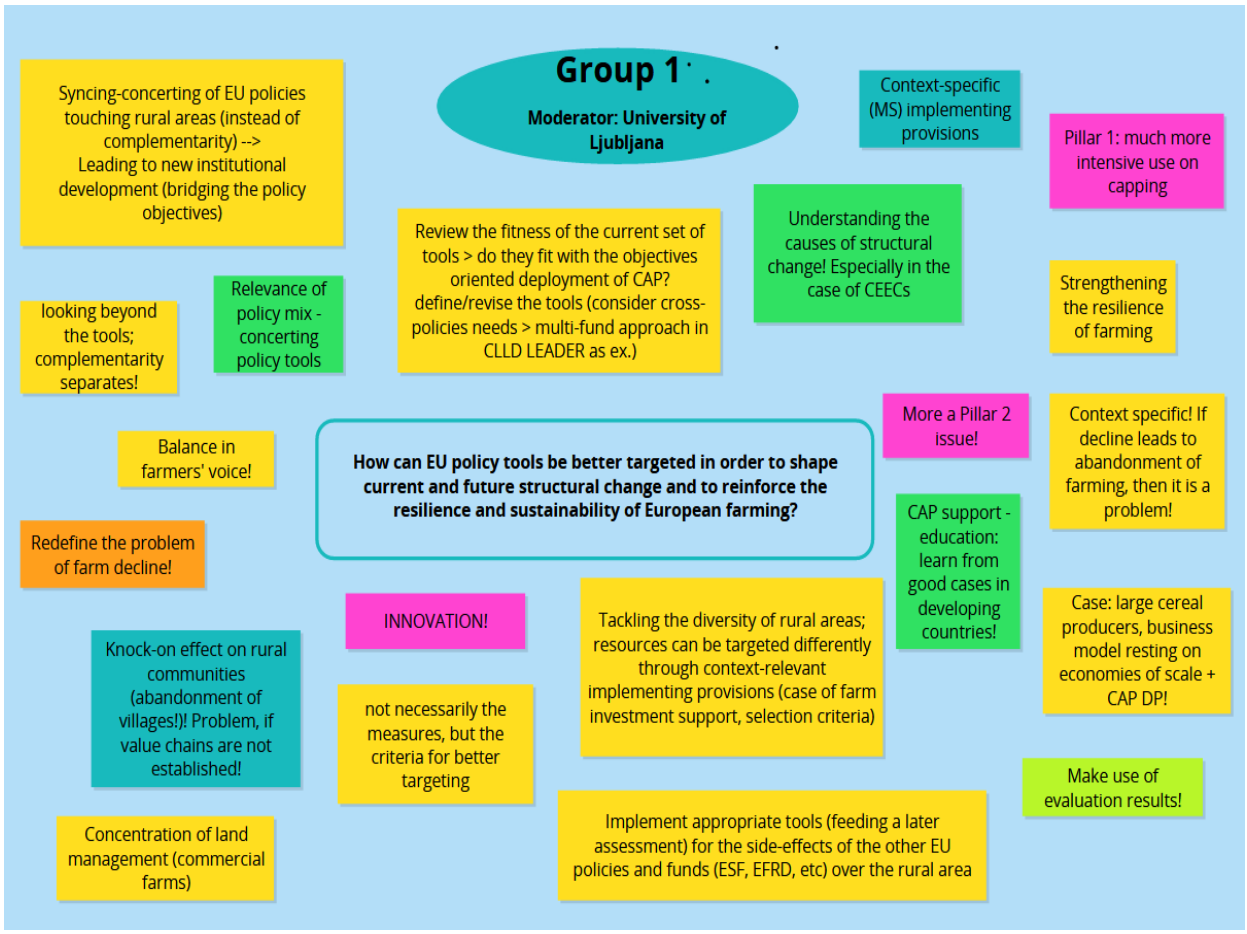
Group 1 concentrated their discussion on the question *"How EU policy tools can be better targeted in order to shape current and future structural change and to reinforce the resilience and sustainability of European farming?"* Participants were further introduced to this question by the following information and sub-questions: CAP, with its measures, has difficulty affecting structural change, which happens by inertia; the policy may affect the trends slightly. Do we need specific structural objectives for the policy? If yes, what kind of objectives and what kind of information would be needed to define these objectives properly? What institutional conditions would be needed to be more targeted. Do we need policy innovations?

Through the discussions in Group 1, the ***Romanian expert*** emphasised that concerning rural and regional development, a variety of different policies and tools, ones also deriving from other sectors, have had an effect on rural areas. According ot the expert, the EU has been complementing policies rather than coordinating them. Policy concertation, which not only has beneficial effects on farming and rural areas, needs to be facilitated horizontally. Concerting EU policy interventions will require appropriate tools and institutional support. This focus, however, must go beyond the tools presently available. He further points out that different tools are not working properly in Romania. In order to address sustainability and resilience, it is of utmost importance to have educated and motivated people that are willing to stay in the region. So, the first step needed is the provision of proper educational services. With regard to this, a revision of tools might be necessary including an evaluation whether they still fit the intended purpose. As the new programming period seems to be more objective-oriented, present tools might be outdated. Providing examples, he mentions LAGs, grasslands in mountain areas, or changing ecosystems that are struggling in a very rigid framework.

In terms of objectives, the ***Italian expert*** emphasised the need to redefine the problem of declining farm structure. The expert is not in favour of the idea that a decline can be seen as positive, however, reported that it still depends on the situation and the context. In Italy and other Mediterranean countries, the decline was very striking, and as a policymaker he would consider it necessary to stop the decline, as it often means abandonment in mountain and marginal areas. As another policy objective he emphasised strengthening capacity and resilience of farm structure in general. With regard to CAP instruments, he deemed it necessary to distinguish between Pillar I and Pillar II. Targeting for Pillar I is more difficult than Pillar II – in political and social terms. Pillar I in general is considered as an income support tool, a mindset which is very difficult to change. Therefore, it is very crucial to implement capping as the most important instrument to avoid bias in favour of large farms. He recommended a more

widespread use of capping in every Member State. On the other side, the discussion on Pillar II seems to be more complex as it comprises more measures than the instruments from Pillar I. The RDP seems to be better for targeting, as it is able to differentiate better between different rural areas. The same applies for different options available to manage measures for rural development, especially for investment and for the selection criteria for beneficiaries or allocation methods – like concerning marginal areas or smallest farms. There are also interesting innovations in some regions which are useful in allocating funds to those more in need rather than distributing them indiscriminately. He further emphasised that measures must be evaluated to give insight on the impact of choices and that these findings have to be used at the next stages of policy implementation.

Figure A.4: Expert Workshop – Group 1



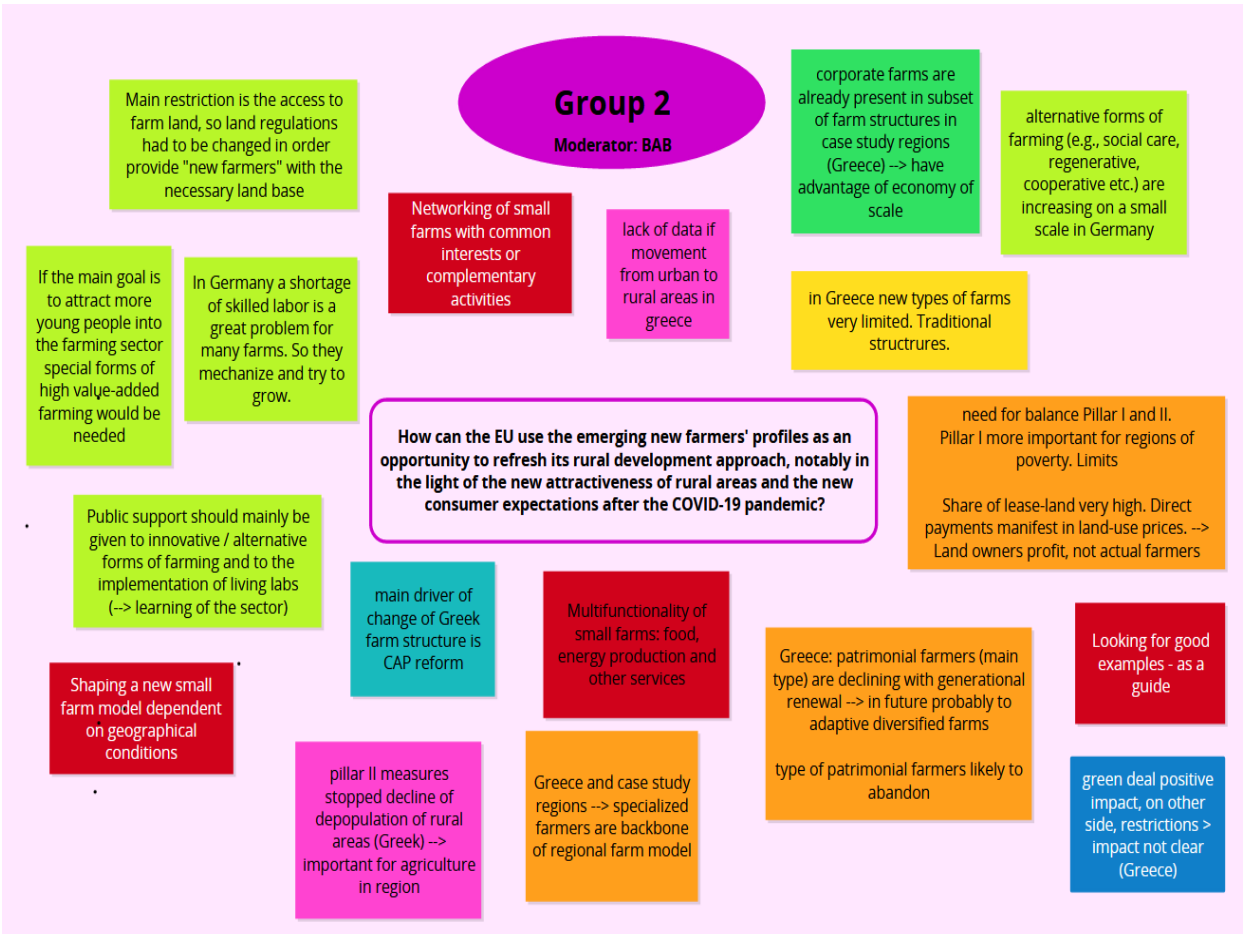
Source: Project team, 2022

The participating ***Lithuanian expert*** provided some background information for Eastern countries. Some causes and processes of structural change are natural and depend on historical developments and can thus be neither described as being positive or negative. In Lithuania, Latvia and Slovakia, abandonment takes place. Land owned by family farms is declining rapidly, whereas large commercial farms are growing very quickly. It can therefore not be said that there is land abandonment of arable land, but rather abandonment of rural areas. Commercial farms have a big interest in farming. Nowadays, farming is not popular among young people. They are leaving the countryside and will not return. Specialisation practices are observable leading to large growth in exports of low value-added grains. As a major issue, the expert describes the definition of objectives which are the same across the EU. Differ-

ent Member States and regions have different situations. Small farmers can have different characteristics in different regions. Policy measures should therefore be adapted to local conditions. Even if we agree on sustainable development in a broader sense, we still need to keep in mind that farmers need to survive economically. A farmer with 10-20 ha is not able to gain enough revenue from agriculture alone – they have to become pluriactive. Policymakers have introduced a policy goal of advocating medium farms (20-50 ha) – a goal with which large farms are quite unhappy. Since large farms have a stronger participation in the market, as well as a stronger stakeholder voice, it is necessary to ensure that their opinions are equitably weighted and do not overtake the discourse. Further the expert emphasises that products with a low value added are not favourable to the country. For this reason smart farming and different types of innovation are needed. Many different suggestions exist for specific measures; however, presently they face a lot of opposition and protest.

Group 2 addressed and discussed in more detail the question "How can the EU use the emerging new farmers' profiles as an opportunity to refresh its rural development approach, notably in the light of the new attractiveness of rural areas and the new consumer expectations after the COVID-19 pandemic?". This question was seen as linking many influential aspects for structural change and therefore seems quite difficult to grasp in the brief expert discussion. Nevertheless, experts confirmed the orientation of EFM considerations to emphasise the various tasks of agriculture, going beyond agricultural production. This perspective puts multifunctionality of small farms, networking of farms and learning processes at the centre of policy considerations.

Figure A.5: Expert Workshop – Group 2



Source: Project team, 2022

Experience and insight into this issue is highly dependent on regional context; in this group views from Southern Europe ***(Greece),*** Eastern Europe ***(Poland)*** and Central Europe ***(Germany)*** were shared and underlined quite different farm change and farm type development trajectories. While ***Greece*** was described by its national ***expert*** as still largely characterised by traditional farming types and a slow diversion toward contract and corporate farm types, in ***Germany*** there is a vivid discussion on niches, new farming, and new entrants into farming. However, these new types of farming often find substantial obstacles due to restricting regulations of farm land access and limited orientation towards farm entrants in CAP implementation. In ***Poland,*** there is the legacy of dramatic past structural changes over last decades depicting the great difference between developments in old and new MS.

Changes in farm structures are underway everywhere, but the contribution of the CAP or other policies is restricted and might even be quite mixed (both positive and negative) depending on implementation priorities and decisions, the institutional framework and the national public discourse on structural change, spatial divergences due to physical differences, socio-cultural backgrounds, and market relevance and integration.

Notable developments from experts point to an increasing role of "contract farming" also in very traditional contexts, the need to view young farmers livelihoods, the development of shortages on skilled labour forces. Other innovative approaches are appearing as niches, but there is no particular priority allocated to them, even if Pillar II and the new Green Deal would offer sufficient scope to integrate such strategies.

Quite adverse effects of the CAP were also addressed. For example, in ***Germany*** access to farm land was assessed as the strongest limitation. This links also to long-term trends of rising prices for agricultural land as a consequence to CAP direct payments.

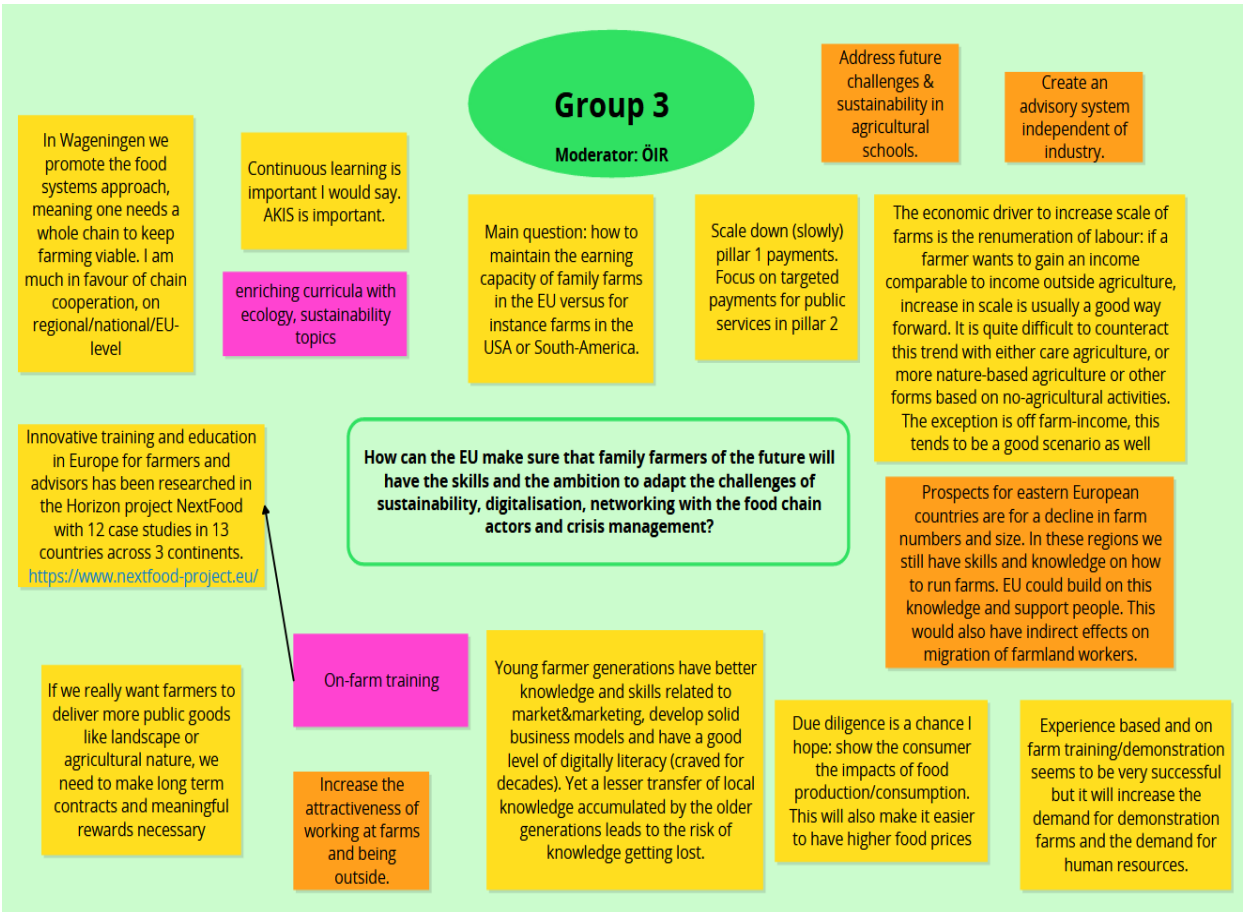
On the other hand, in ***Greece,*** implementation of the CAP (with a particular focus on Pillar II) could contribute to sustaining economic opportunities and, in several marginal areas, to stopping population decline, thus showing positive effects on general regional outcomes.

To strengthen regional development outcomes, future policies, particularly the CAP need to realise their current effects which are often either inefficient, or show mixed results. In particular, Pillar I is described as rather inefficient to secure beneficial outcomes linked to EFM characteristics and societal tasks whereas the current framework for Pillar II seems rather rich and sufficient. It is mainly an issue of achieving a common understanding among diverse social groups and sectors and policy priorities that reflect these demands correctly. This would enable a more targeted selection from the wide scope of available instruments and an increase in the intended socio-ecological effects.

Group 3 focused in their discussion on the question *"How can the EU make sure that family farmers of the future will have the skills and the ambition to adapt to the challenges of sustain-ability, digitalisation, networking with the food chain actors and crisis management?"* This group comprised ***experts*** from the ***Netherlands, Austria*** and ***Greece.*** Within this context, aspects on how to motivate farmers, especially young farmers, to stay in agriculture as well as how to enhance their competitive strength in the future, were discussed. The latter was further linked to a main question of one of the experts, namely *"How can family farms in the EU maintain their earning capacity in contrast to farms in the USA, South-America or other regions of the world?"* These questions were addressed sequentially by the participants. The first segment of the discussion focused on needed skills and alternative orientation options within agriculture. The experts emphasised on several occasion the importance of experienced based skills and on-farm training. This, however, will lead to an increased demand for demonstration farms as well as for

human resources. Relevant in this context is for instance the project NextFood[28] funded by the Horizon 2020 programme, which developed a toolbox for teaching practitioners. It aims at helping educate the next generation of professionals in the agrifood system, as well as enhancing the co-creation of innovation and knowledge. Since the young farmer generation is often characterised as having better knowledge and skills in terms of marketing, developing solid business models or digitally literacy, they can more easily adapt to new demand models. According to one of the ***Austrian experts,*** diversity is a key for becoming more resilient in the future. If new farmer businesses are holding up for 5 years then they have established a sustainable place in the markets. One possibility could be different niche markets. Such a potential is also seen by the other ***Austrian expert.*** Since so-called atypical farmers do not receive the same support from the public sector compared to traditional farmers, they need to be more innovative, connected with other actors from the supply chain, as well as having good PR skills. For this reason, additional training – also at universities – is needed to foster an economic and ecological background among young farmers. In addition to increasing on-farm training, the adaptation of existing curricula would also be necessary. Nevertheless, it is expected by the ***expert*** from the ***Netherlands,*** that these types of farmers will only account for a maximum share of 5-10% of the agricultural sector. She also emphasizes that we should get away from the idea that small farms are always better in terms of sustainability, as small does not always necessarily mean beautiful.

Figure A.6: Expert Workshop – Group 3



Source: Project team, 2022

[28] https://www.nextfood-project.eu/

One of the ***Austrian experts*** also emphasised that – especially for eastern European countries– a mix of small and bigger farms will be needed also in the near future. Due to the decline in the number of farms agricultural knowledge is being lost in many regions. The experts stressed that it is important to preserve this knowledge. The EU could build on this knowledge and support young farmers, according to participants. This would also have indirect positive effects on migration of farmland worker.

If a farmer wants to earn an income comparable to off-farm income, increasing the size of farm is most often the strategy of choice. An alternative solution could be an additional off-farm income.

If we expect farmers to continue to deliver or maintain public services in the future, it is necessary to agree on long-term contracts and meaningful rewards. Furthermore, farmers' crisis management should be supported. The framework for appropriate insurance schemes is already needed at European level, with appropriate implementation methods at national and regional levels. General recognition of farmers' work also needs to be further promoted, as does public awareness of food production. This will make it easier to obtain an honest price for agricultural products on the market, which in turn will promote farmers' survival and their interest in staying in the sector.

After the three parallel breakout groups, the participants switched over to the overall workshop.

The second component of the workshop focused on the results of chapter 4 and pursued the goal of obtaining feedback and validating the results. The comprehensive feedback concerning the analysis was taken up by the project team and integrated into the revision of the research results.

The project team would like to thank all participants for their very valuable feedback.

This study provides an overview of the effect of the decline in the number of farms across the EU on the European farming model (EFM), which is built around the notion of multifunctionality and provision of public goods by agriculture. It concludes that in order to foster sustainability and resilience, the EFM and policy must embrace the emerging diversity of farmer profiles and stimulate socially desirable adaptive strategies that preserve the multifunctionality of farming.

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