Project acronym: SURE-Farm
Project no.: 727520

Start date of project: June 2017
Duration: 4 years

D2.1. Report on farmers' perceptions of risk and resilience capacities – a comparison across EU farmers

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Due date	31/03/2019
Version/Date	29/03/2019
Work Package	WP 2
Task	T2.1/T2.2
Task lead	WU (P1)
Dissemination level	Public

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Content

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1 Introduction

Multiple economic, ecological, institutional and societal challenges raise concern about the future functionality of agriculture and more specifically of farms in Europe, which leads to an increased need to understand and improve its resilience. We aim to provide a comprehensive overview of farmers' perception and self-assessment of resilience that would serve as a solid basis for further research on farm resilience. We explicitly opted for an explorative approach and subjective perception of challenges, objectives, resilience capacities, and available options to improve resilience for two reasons. First, farmers behave according to their perception and beliefs; and hence knowing their perceived resilience capacities and components helps explaining decisions making. Second, existing objective indicators of resilience are usually restricted to key socio-economic variables and other capitals (Jones and Tanner, 2017), while ignoring other dimensions that cannot be captured by any objective indicator in a straightforward way, e.g., motivation, willingness to take risk, involvement in networks, openness to innovation, learning capacities, etc. (Bené at al., 2016). It is important to highlight, however, that when targeting subjective resilience assessment, we assume that farmers are able to anticipate and assess their resilience capacities, resilience-enhancing attributes and other components of resilience (Jones and Tanner, 2017).

In order to achieve the aim, a farmer survey was designed based on theories of risk communication, decision theory and psychometric models (e.g., Johnson and Slovic, 1995; Slovic, 2000; Witte, 1992). The vast majority of previous empirical research on farm resilience used objective indicators that were either collected via survey or provided via statistical services (e.g., Maleksaeidi et al., 2015; Kingwell and Xayavong, 2016). Apart from focusing on subjective resilience assessment, the novelty of our research is twofold. First, the survey was designed and analysed following a framework for resilience analysis proposed by Meuwissen et al. (2018), which is introduced below. Following the framework, we do not restrict ourselves to one essential function and/or one challenge, as existing empirical studies usually do. For instance, Kingwell and Xayavong (2016) focused on financial performance (as a single essential function) of farms in the light of water scarcity (as a single environmental challenge). Instead, we distinguish between three resilience capacities (i.e., robustness, adaptability and transformability), four categories of challenges (i.e., economic, environmental, social and institutional) and multiple essential functions. Furthermore, we conducted the survey in 11 case study regions across the European Union. The selected case study regions are very heterogeneous in terms of size (from <5 ha per farm in the Romanian case study region to >1000 ha per farm in the German case study region). Also, farms with different specialisation were selected: dairy (Belgian, German and Dutch case studies), livestock (German, Dutch, Spanish and French case studies), arable (Bulgarian, German, Dutch and British case studies), fruits and vegetables (Polish case study), mixed farms (Romanian

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case study), as well as farms specialised on perennial crops (Italian case study). No previous empirical research on farm resilience included so many diverse case studies.

2 Background and analytical framework

2.1 Framework to analyse resilience

In this report, we define resilience of a farm as its ability to ensure the provision of essential functions, e.g., provision of private and public goods, in the face of increasingly complex and accumulating economic, social, environmental and institutional shocks and stresses, through capacities of robustness, adaptability and transformability. Although other actors beyond farms contribute to the provision of essential functions of agriculture and hence constitute a farming system, in this report we focus on farms, as the core of a farming system. When analysing resilience, we follow the analytical steps posed by Meuwissen et al. (2018), i.e. 'resilience of what', 'resilience to what', and 'resilience for what purpose', 'what resilience capacities', and 'what enhances resilience' (Fig. 1).

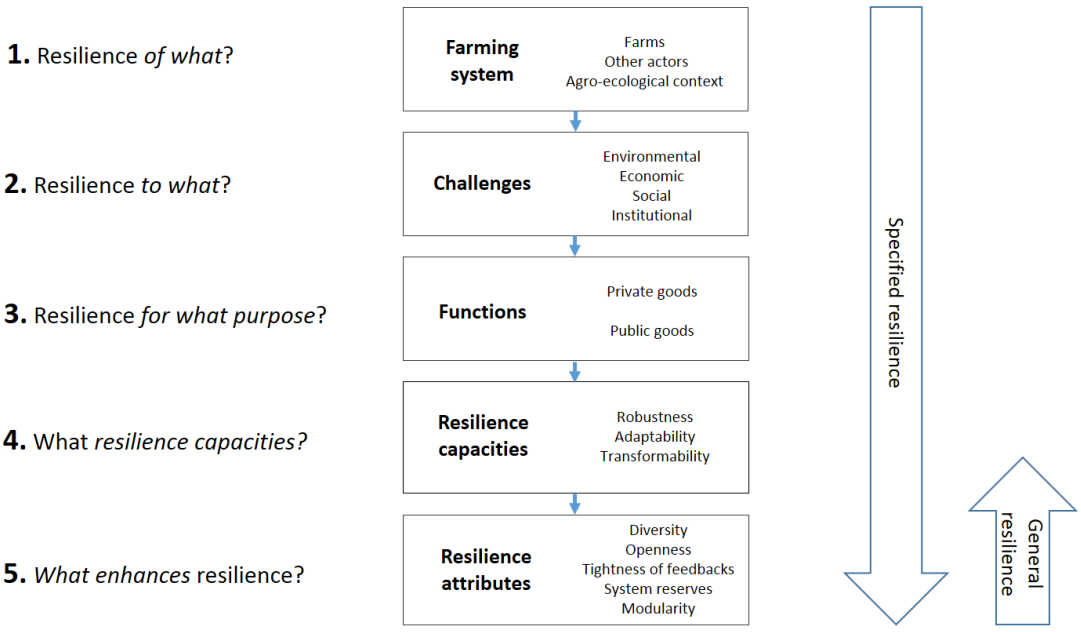

Figure 1. Framework to assess resilience capacities – robustness, adaptability, and transformability – of farming systems. Source: Meuwissen et al. (2018)

A resilience analysis should start with a definition of a farming system, which encompasses other actors beyond farms, e.g., local government, society, NGOs, or banks. This step is essential, since the other components of analysis defined at steps 2-5 might substantially differ across different farming systems. We distinguish between farms of different geographical regions across Europe.

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We hence assume that farms within one geographical region belong to the same farming system. The case study regions were selected in order to represent the variety of geographical, climatic, economic and social conditions.

Next, the key challenges and essential functions are to be identified. We distinguish between economic, environmental, institutional and social challenges. As for essential functions, we distinguish between the provision of private and public goods. Examples of private goods include marketable food products and other bio-based resources. Examples of public goods include provision of animal welfare beyond statutory requirements, contributions to attractive rural areas, and contributions to biodiversity, i.e. products for which there does not exist a market.

As for resilience capacities, we distinguish between robustness, adaptability and transformability. Robustness is the farm's capacity to withstand stresses and (un)anticipated shocks. Adaptability is the capacity to change the composition of inputs, production, marketing and risk management in response to shocks and stresses but without changing the structures and feedback mechanisms of the farm. Transformability is the capacity to significantly change the internal structure and feedback mechanisms of the farm in response to either severe shocks or enduring stress that make business as usual impossible.

Finally, we assess resilience-enhancing attributes following five generic principles of resilience as proposed by the Resilience Alliance (2010): (i) diversity; (ii) modularity; (iii) openness; (iv) tightness of feedbacks; and (v) system reserves. Diversity includes both functional diversity (Kerner and Thomas, 2014) and response diversity (Reidsma and Ewert, 2008; Carpenter et al., 2012) that generally enable greater resilience (Resilience Alliance, 2010). Modularity implies internal division of the system in independent but connected modules (Carpenter et al., 2012) with potentially different functions. Openness refers to connectivity between systems (Carpenter et al., 2012). Tightness of feedbacks means the response of one part of the system to changes in other parts of the system (Walker and Salt, 2006). System reserves mean resource stocks (i.e., natural, economic, social capital) to which a system has access when responding to a challenge (Kerner and Thomas, 2014). System reserves provide redundancy and serve as "insurance" that allows to compensate for the loss or failure of system functions (Biggs et al., 2012).

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2.2 Case study regions

Eleven case study regions were selected across Europe (Fig. 2). The ***Belgian*** case study region includes the northern Flanders region and excludes Brussels Capital Region, and the focus is dairy farms. Currently, dairy farmers are slowly recovering from the last price crisis, increasing production at a rapid rate. The average size of farms is increasing as well due to multiple exists and structural investments. The ***German*** case study region is Altmark located in the North of Saxony-Anhalt and consists of the two districts Altmarkkreis Salzwedel and Landkreis Stendal. The agricultural structure of the Altmark is typical for wide parts of eastern Germany. Different land reforms in the former German Democratic Republic resulted in large farm sizes, which mostly were continued after reunification in similar sizes. 5.3% of the farms in the Altmark have a size over 1,000 ha and cultivate close to 33% of the agricultural land (STALA 2016). Due to rather poor soils and a comparatively high proportion of grassland, dairy farming and livestock production in large units are important specialisations in the region. The ***French*** case study region is Bourbonnais (more or less the department of Allier), located in the Central part of France, and traditionally dominated by beef production. The average size of the farms is 88ha. The ***Spanish*** case study covers two specializations and regions: the extensive sheep farming in Huesca and the extensive beef farming in Sierra de Guarradama (Comunidad de Madrid). Although the number of farms has decreased between 1995 and 2015 (Gobierno de Aragón, 2016; INE,2017), the average size of farms (600 - 2,300 ewes per farm) is increasing due to lack of new generation of farmers. The ***Swedish*** case study includes the high value livestock egg and poultry sector. There are approximately 100 egg farms (Jordbruksverket, 2019a) and 100 poultry farms with more than 1,000 chicken (Jordbruksverket, 2019b) in Sweden. Most farms are located in the South of the country. The ***Bulgarian*** case study region includes the North Central and the Northeast regions. The focus were put on arable farms (mainly wheat). The ***British*** case study region covers the East of England

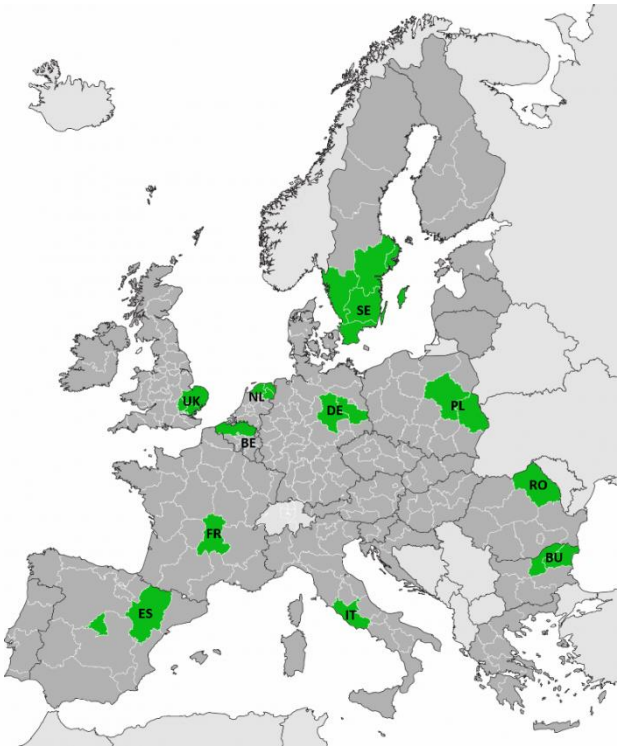

Figure 2. Selected case study regions: BE – Belgian case study region; BU – Bulgarian case study region; DE – Altmark (Germany); ES – Huesca and Sierra de Guarradama (Spain); FR – Bourbonnais (France); IT – Viterbo (Italy); NL – Drenthe, Friesland, and Groningen (Netherlands); PL – Lubelskie and Mazowieckie voivodeships (Poland); RO – Nord-Est region (Romania); SE – south of Sweden; UK – Bedfordshire, Hertfordshire, Essex, Cambridgeshire, Norfolk and Suffolk (United Kingdom).

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region, which is highly productive and contributes more to the UK's agricultural gross value added than any other UK region. Production includes a variety of crops (cereals, industrial crops, potatoes, sugar beet), with cereals (especially wheat and barley) being by far the most important crops, covering almost half of the farmed area. The majority of farms are capital intensive with an average size exceeding 100 ha. Farmers are mainly land owners and are highly market-oriented. The level of specialization and of input use is high. Labour force comes mainly from hired full- and part time employees and farmers invest heavily in seed and chemicals. The ***Polish*** case study region includes Lubelskie and Mazowieckie voivodeships. Two groups of farms were selected for the survey in Poland: (i) fruit production from trees, shrubs, bushes and (ii) production of outdoor (ground) vegetables. The ***Italian*** case region is Viterbo and the main focus here is hazelnut farms. Viterbo hosts more than 6,000 hazelnut farms, of which 86% is represented by farms under 10 hectares (ISTAT, 2010). This means that most of the farms are managed on a family and part-time basis. The quality of the product is high in comparison with the international competitors. The ***Dutch*** case study region includes three provinces in the North-East of the Netherlands: Drenthe, Friesland, and Groningen. The vast majority of farms in the region are either specialised on grazing livestock (67.5%) or on arable crops (22.9%) (CBS, 2019). The Dutch sample include farmers from the three provinces regardless of their specialisation. The ***Romanian*** case study region covers mixed farms in the Nord-Est region. The vast majority of the farms (95%) in Nord-Est region have less than 5 ha. The usual livestock on farms is bovines (42% in the region's total large livestock units (LLU), mostly dairy cows), poultry (19%), sheep (15%), pigs (12%), and equidae (9%, mainly horses for transport purposes). A more recent development in the region is the intensification of bee farming.

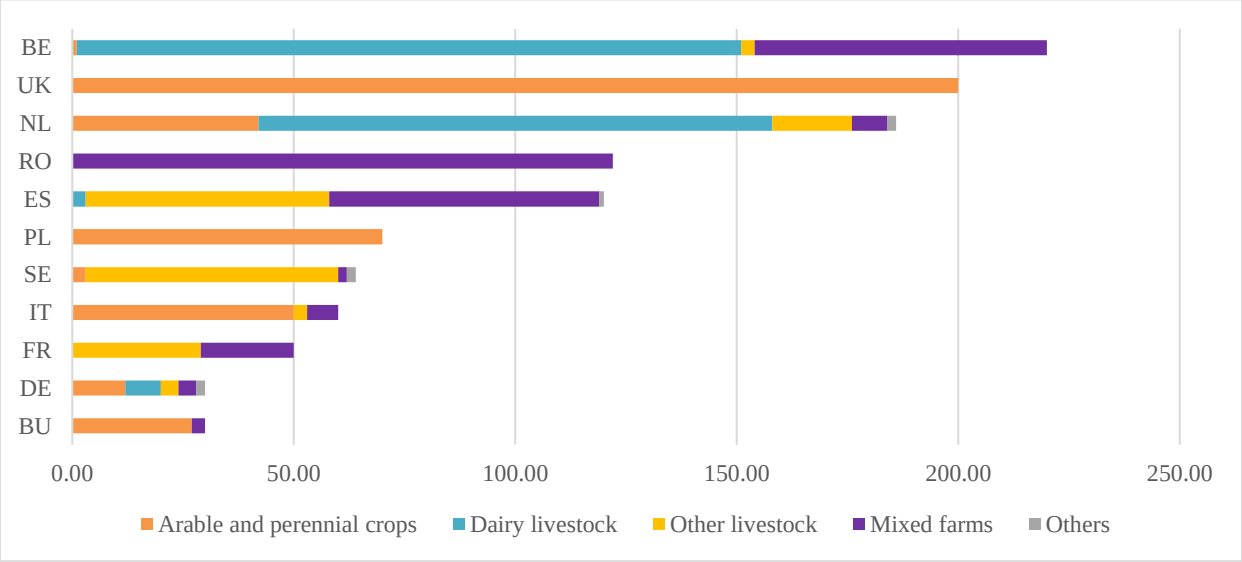

Figure 3. Number of respondents with different specialisation per case study region

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To this end, the chosen case study regions are very heterogeneous in terms of size (from <5 ha per farm in the Romanian case study region to >1000 ha per farm in the German case study region) and specialisation: we consider different types of livestock and mixed farms, as well as farms specialised on arable crops, perennials, fruits and vegetables (Fig. 3). Also, climatic conditions and political frameworks vary a lot across the case study regions.

3 Methodology

3.1 Farm survey

As mentioned above, we opt for an explorative approach and subjective perception of risk preferences, challenges, objectives and resilience capacities. Therefore, a farm survey was designed and conducted in the case study regions introduced above. Table 1 summarizes the content of the survey. The complete survey can be found in Appendix 1. Some questions include case-study-specific options; they are revealed in Appendix 4.

Table 1. Overview of the structure of the farm survey.

Farm survey's sections	Questions of respective category			
	Open answer	*Multiple choice*	*Likert-type item*	*Constant sum*
Your farm	Q1.1; Q1.3; Q1.6-Q1.12	Q1.2; Q1.4; Q1.5		
Risk management strategies		Q2.1-Q2.26		
Future challenges in agriculture and strategies to deal with these challenges	Q3a.1-Q3a.3; Q3b.1-Q3b.3			
The essential functions of your farm				Q4.1-Q4.9
Challenges in agriculture			Q5.1-Q5.20	
The resilience of your farm			Q6a.1-Q6a.4; Q6b.1-Q6b.4; Q6c.1-Q6c.4	
Network			Q7.1-Q7.6	
Innovation			Q8.1-Q8.2	

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Your ability to cope with agricultural challenges			Q9.1-Q9.8
. Handling probabilities			Q10.1-Q10.4
. Bad and good years	Q11a.1; Q11a.2; Q11b.1; Q11b.2		
. Willingness to take risks			Q12a.1; Q12b.1-Q12b.5
. Education and other personal information	Q13.1	Q13.2-Q13.5	

Online survey was expected to take 30 minutes to complete; face-to-face or phone interviews took longer. Participation in the survey was voluntary. Case study regions also differ with respect to distribution methods (Table 2).

Table 2. Overview of distribution methods and sample size across the case study regions

Case study region	Distribution method				Sample size
	Face-to-face	***Via phone***	***Via mail***	***Online***	
BE				Applied	220
BU	Applied				30
FR	Applied	Applied		Applied	50
DE				Applied	30
IT	Applied			Applied	60
NL				Applied	186
PL	Applied		Applied	Applied	70
RO	Applied				122
ES	Applied				120
SE		Applied	Applied	Applied	64

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UK	Applied	200
	Total	**1152**

3.2 Cross-country analysis

3.2.1 Risk preferences

We captured farmers' perception of their risk preferences by a Dohmen self-assessment question (Dohmen et al., 2011) formulated as a 11-point-Likert-type item and five business statements formulated as 7-point-Likert-type items. The former asked whether a farmer generally sees herself as a a person who is fully prepared to take risks or to avoid taking risks (0 – not at all willing to take risks ... 10 – very willing to take risks). The business statements asked farmers whether they are willing to take more risks than other farmers (1 – strongly disagree ... 7 – strongly agree) in terms of (i) production; (ii) marketing and prices; (iii) financial risks; (iv) innovation; and (v) farming in general. A reader should note that, in contrast to the Dohmen self-assessment question, a high point in the latter case does not mean that the farmer is risk-loving; it means that the farmer assesses herself as more risk-loving (or less risk-averse) than others. For the analysis, we calculated a mean of points assigned to each of the five business statements.

3.2.2 Step 2: Resilience to what? – Identifying key challenges

The analysis of key challenges was twofold. Firstly, an open question (Q.3a) was raised (see Appendix A.1.5), in order not to pre-influence respondents by our categorisation of challenges (i.e., economic, environmental, institutional, and social). All answers to the open question were independently analysed by three researchers; in particular, all the deviations from our categorisation were identified. Based on independently identified deviations, our categorisation was validated.

Secondly, we identified the key challenges based on the question Q.5 of the survey (see Appendix A.1.5). Farmers were asked to assess the relevance of the major challenges based on a 7-point-Likert-type item (see Table 3). We furthermore assigned each challenge to one of the four major categories, according to the framework for resilience analysis (Table 3). The total score for each challenge in each case study region was calculated as the mean of all observations.

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Table 3. Challenges included in the farm survey and their categorisation

Category of challenges	Sub-questions in the survey related to the respective class of challenges	
	Short title	*Full statement as in the survey*
Economic	LowOutputPrice	Persistently low market prices
	HighInputPrice	Persistently high input prices (e.g. fertiliser, feed, seed)
	VolatileOutputPrice	Market price fluctuations
	BargPowerProcessor	Low bargaining power towards processors and retailers
	VolatileInputPrice	Input price fluctuations (e.g., fertiliser, feed, seed)
	BargPowerSuppliers	Low bargaining power towards input suppliers (e.g., fertiliser, feed, seed suppliers)
	AccessToCredit	Limited access to loans from banks
	LatePayment	Late payments from buyers
Environmental	WeatherExtreme	Persistent extreme weather events (e.g., floods, droughts, frost)
	PestDiseaseOutbreak	Pest, weed, or disease outbreaks
	SoilQuality	Low soil quality
Institutional	DirectPayment	Reduction in direct payments of the Common Agricultural Policy (CAP)
	Regulation	Strict regulation (e.g., environmental, animal welfare, or competition)
Social	PublicDistrust	Public distrust in agriculture
	SocialAcceptance	Low societal acceptance of agriculture
	SkilledLabour	Limited availability of skilled farm workers
	SickLabour	Limited ability to work on the farm due to illness, divorce or other personal circumstances

It is worth to highlight that the challenges are not isolated from each other. Economic challenges, e.g., output price fluctuations, might be highly dependent on environmental challenges, e.g.,

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extreme weather events. Institutional challenges, e.g., strict regulation, might refer to environmental challenges, e.g., disease outbreak, and result into economic challenges, e.g., persistently high input prices.

3.2.3 Step 3: Resilience for what purpose? – Identifying desired functions of the farms

We identified the essential functions based on the question Q.4 of the survey (see Appendix A.1.4) Farmers were asked to distribute 100 points among the following functions: (i) Deliver high quality food products; (ii) Deliver bio-based resources (e.g., hemp, wood) to produce biomass and biofuels; (iii) Ensure a sufficient farm income; (iv) Provide employment and good working conditions for employees; (v) Maintain natural resources (e.g. water, air, soil) in good condition; (vi) Protect biodiversity; (vii) Ensure the attractiveness of rural areas in terms of agro-tourism and residence; (viii) Ensure animal welfare. The total score for each function in each case study region was calculated as the mean of all observations.

3.2.4 Step 4: What resilience capacities? – Assessing resilience capacities.

We assess the three resilience capacities based on question 6 of the survey (see Appendix A.1.6). Being first introduced with the definitions of resilience capacities and illustrative examples, farmers were asked to assess the relevance of some statements based on a 7-point-Likert-type item (see Table 4). Some statements are associated with a negative contribution to the resilience capacity indices (see Table 4) and hence the respective scores are first transformed, such that "1" becomes "7", "2" becomes "6", etc. The three indices of resilience capacities are derived for each farmer as the means of the scores of the respective statements.

Table 4. Statements included in the farm survey to assess the three resilience capacities

Resilience capacities and statements to be assessed by farmers *+ and - stay for positive and negative contribution to resilience capacity indices respectively*					
Robustness		**Adaptability**		**Transformability**	
After something challenging has happened, it is easy for my farm to bounce back to its current profitability.	+	If needed, my farm can adopt new activities, varieties, or technologies in response to challenging situations.	+	For me, it is easy to make decisions that result in a transformation.	+

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As a farmer, it is hard to manage my farm in such a way that it recovers quickly from shocks.	-	As a farmer, I can easily adapt myself to challenging situations.	+	I am in trouble if external circumstances would drastically change, as it is hard to reorganise my farm.	-
Personally I find it easy to get back to normal after a set back.	+	In times of change, I am good at adapting myself and facing up to agricultural challenges.	+	After facing a challenging period on my farm, I still have the ability to radically reorganise my farm.	+
A big shock will not heavily affect me, as I have enough options to deal with this shock on my farm.	+	My farm is not flexible and can hardly be adjusted to deal with a changing environment.	-	If needed, I can easily make major changes that would transform my farm.	+

3.2.5 Step 5: What enhances resilience? – Assessing resilience enhancing attributes

In the survey, we did not ask about resilience attributes explicitly. However, some insights about resilience attributes can be derived based on diverse questions. Diversity, referring to both functional diversity and response diversity, was partly captured in the questions about specialisation (Q1.2), livestock (Q1.3), land use (Q1.6-Q1.10) and risk management strategies (Q2). According to Resilience Alliance (2010), one would hypothesize that mixed specialisation, diverse livestock and land use, as well as multiple implemented risk management strategies would improve resilience. Next, openness, referring to connectivity between systems, was captured in the questions about networks (Q7.1-Q7.6) and innovations (Q8.1-Q8.2). One would hypothesize that the more a farmer is integrated into networks and the more she is open to innovation, the higher the resilience of her farm. Furthermore, system reserves, referring to resource stocks (i.e., natural, economic, social capital) that can be used when responding to a challenge, was captured in the questions about succession (Q13.3), reliance on labour (Q1.11-Q1.12). A succession agreement and low reliance on hired labour indicate reserves of social capital. Also, whether a farm is organic (Q1.4) can be interpreted as an indicator for natural capital reserves. System reserves provide redundancy and serve as "insurance"; therefore, one would hypothesize that greater natural, economic and social capital improves resilience. Finally, tightness refers to response of one part of the system to changes in other parts of the system. For an unbiased indicator of tightness, we would have needed to conduct the survey among other stakeholders beyond farmers. Also, further questions related to interdependence between different stakeholders should have been included, leading to even longer survey. We therefore opted to

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restrict the survey to farmers and farms, leaving other stakeholders out, and therefore did not assess tightness.

An advanced analysis In this report, we restrict ourselves to descriptive analysis and present only some results. In particular, we focus here on risk management strategies. The results for other questions partly capturing resilience attributes can be found in the descriptive statistics (Appendix 4).

We distinguish between on-farm risk management strategies (Q2.1-Q2.15) and risk-sharing strategies (Q2.16-Q2.26). Table 5 provides an overview of risk management strategies included into the survey. A reader should note, however, that we did not ask about any further details about implemented risk management strategies, e.g., insurance coverage.

Table 5. Risk management strategies included in the survey

Short title	*Full title as in the survey*
	On-farm risk management strategies
FinSav	Maintained financial savings for hard times
LowDebt	Had low debts or no debts at all to prevent financial risks
TechInv	Invested in technologies (e.g. irrigation or hail nets) to control environmental risks
PreventDisease	Implemented measures to prevent pests or diseases (e.g. strict hygiene rules)
WorkHarder	Worked harder to secure production in hard times
OffFarmJob	Had an off-farm job (either myself or a family member)
MarketInfo	Used market information to plan my farm activities for the next season
AgroProdDiverse	Diversified in production (e.g. mixed livestock and crop farming or a combination of several crops or animals)
OtherActDiverse	Diversified in other activities on my farm (e.g. agri-tourism, on-farm sales, nature conservation, or renewable energies)
FlexCost	Improved cost flexibility (e.g. renting land instead of buying, temporal labour contracts instead of permanent contracts)
FlexTime	Improved flexibility in the timing of my production (e.g. to deal with seasonality)
OpenUp	Opened up my farm to the public (e.g. open farm days)
	Risk-sharing strategies

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Coop	Cooperated with other farmers to secure inputs or production (e.g. buy inputs together or share machinery with other farmers)
ProdOrgMember	Member of a producer organisation, cooperative or credit union
BranchOrgMember	Member of an (inter)branch organisation (e.g. collaborate with value chain actors such as processors, retailers, and technology providers)
InputVariety	Had access to a variety of input suppliers (e.g. feed, seed, fertiliser, or finance suppliers)
LearnChallenges	Learned about challenges in agriculture (e.g. farmer group, consultant, or agricultural training)
AgroInsurance	Bought any type of agricultural insurance
Contracts	Used production or marketing contracts to sell (part of) my production
Hedge	Hedged (part of) my production with futures contracts

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4 Results

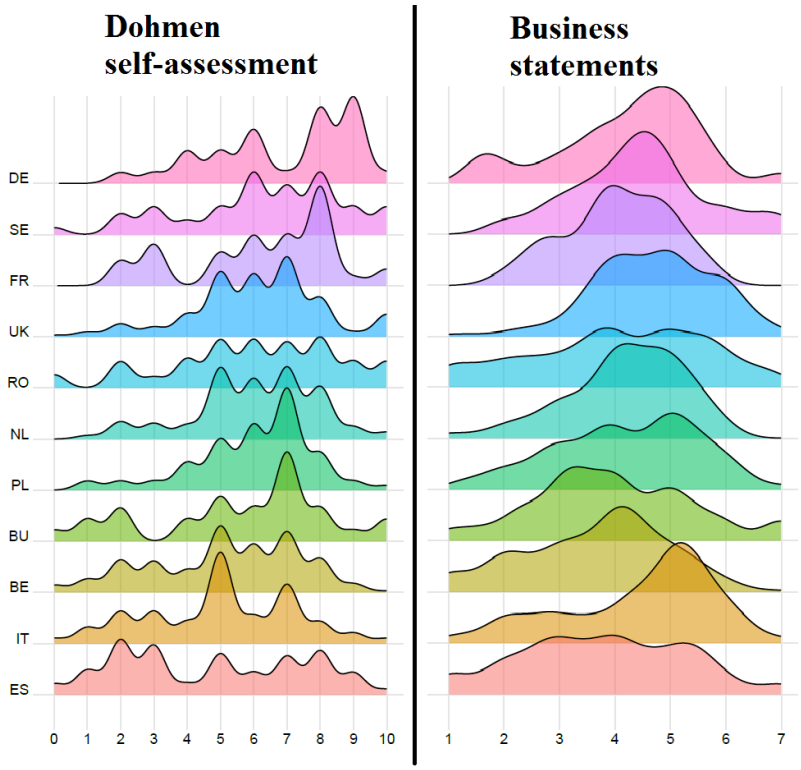

Figure 4. Self-assessed risk preferences. Note: a Dohmen self-assessment question asked whether a farmer generally sees herself as a a person who is fully prepared to take risks or to avoid taking risks (0 – not at all willing to take risks ... 10 – very willing to take risks); five business statements asked farmers whether they are willing to take more risks than other farmers (1 – strongly disagree ... 7 – strongly agree) in terms of (i) production; (ii) marketing and prices; (iii) financial risks; (iv) innovation; and (v) farming in general. Here are represented the means of points assigned to each of the five business statements.

Descriptive statistics are presented in Appendix 3.

4.1 Risk preferences

Figure 4 represents the results of self-assessment of risk preferences. Multiple heads of the distributions on the left hand side are explained by the fact that the Dohmen self-assessment was based on a single question; while the distributions on the right hand side were derived based on means of five Likert-type items. A visual analysis revealed one or several picks in the range 6-10 for Dohmen self-assessment in many case study regions (e.g., German, French, Polish and Bulgarian), which means that a large share of farmers assesses themselves as rather risk-loving. In contrast, business statements only capture the perceived difference between the respondent's risk preferences and risk preferences of other farmers. For the majority of case studies, the distributions are left-skewed, which means that more farmers perceive themselves as more risk-loving (or less risk-averse) than other farmers.

4.2 Step 2: Resilience to what?

The analysis reveals that institutional challenges are most relevant for the majority of the case study regions (Dutch, Belgian, German, French, Spanish and British). For Bulgarian, Romanian, Polish and Italian case study regions, environmental challenges are most relevant. For the Swedish case study region, economic challenges are most relevant. No case study region assessed social challenges as the most relevant. Furthermore, one can see that the probability distribution

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functions of social and institutional challenges have larger support and multiple heads, meaning that the assessments of both are rather heterogeneous (Fig.5).

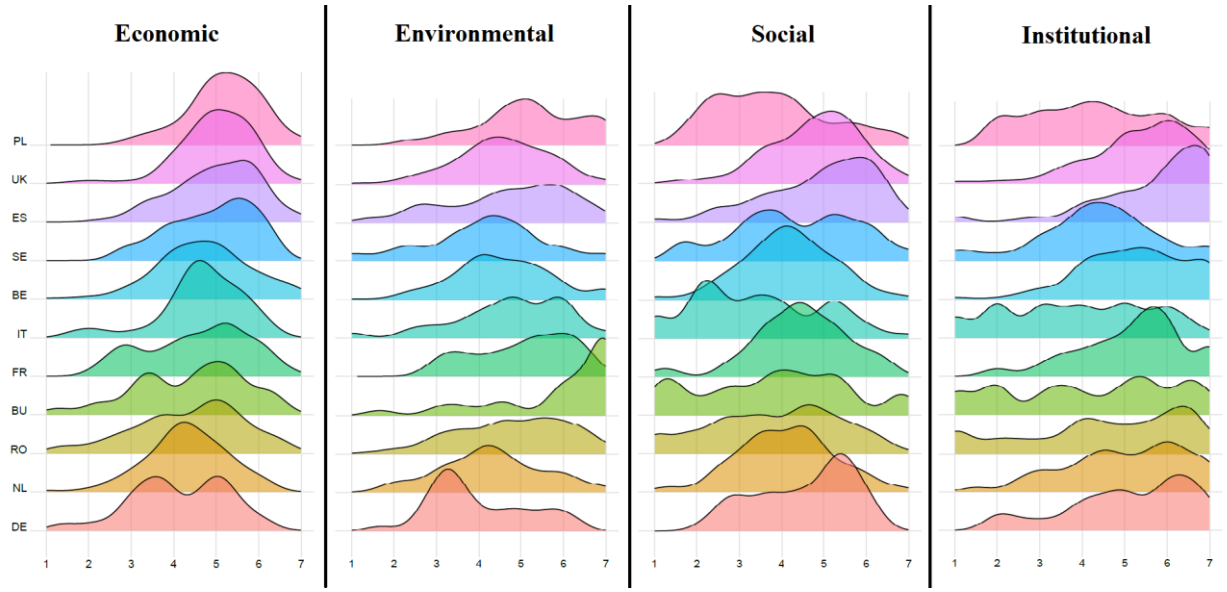

Figure 5. Distribution of perceived relevance of different categories of challenges. The relevance was assessed based on a 7-point-Likert-type item: 1 – not challenging at all for my farm ... 7 – very challenging for my farm.

The analysis of the open question on challenges (Q.3a) revealed that our categorisation should be extended with another category "innovation and information". Examples of stated challenges for this category include "digitalisation", "new technologies", "new varieties" and "influence of new research results in terms of production and ecological aspects of production".

4.3 Step 3: Resilience for what purpose?

The analysis revealed that ensuring a sufficient farm income and delivering high quality food products are the most essential functions across all case study regions (Fig. 6). In every case study region, on average, 40.5-67.6 points out of 100 were distributed to these two functions in total. In Italian, Romanian, and Swedish case study regions, delivering high quality food products is more important than ensuring a sufficient farm income.

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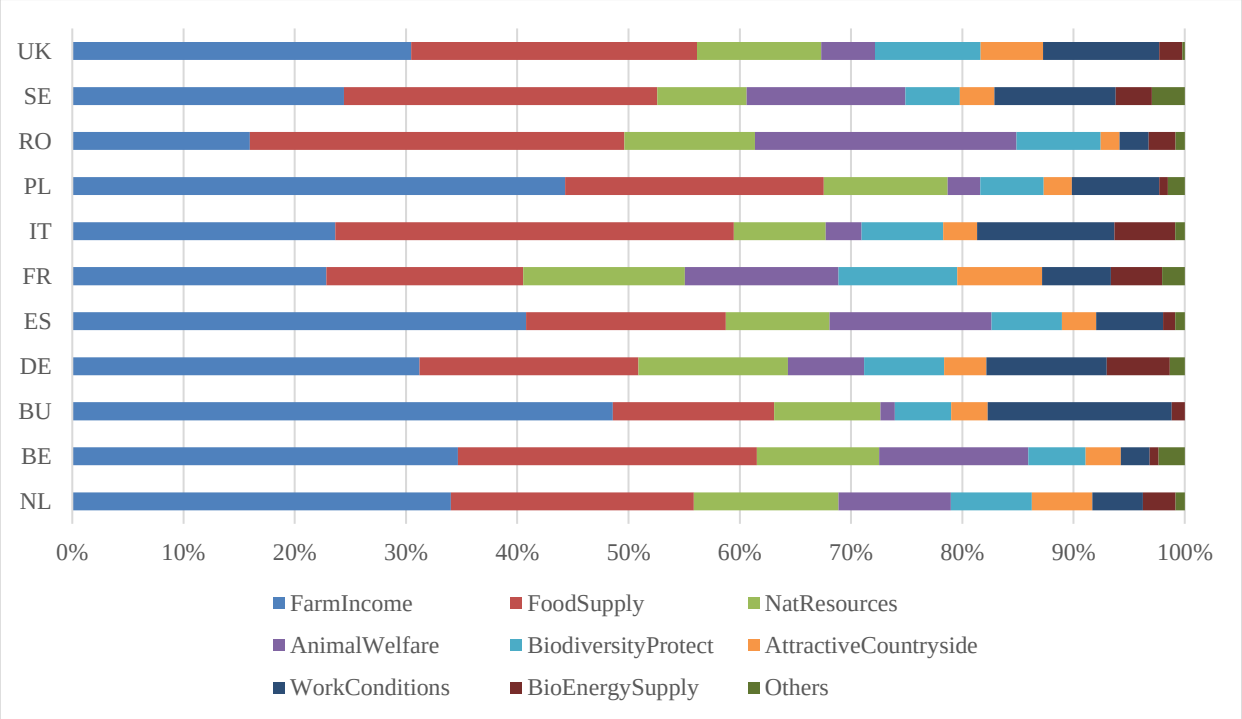

Figure 6. Essential functions across the case study regions – average distribution of 100 points among functions based on their relevance. Note: FarmIncome – ensure a sufficient farm income; FoodSupply – deliver high quality food products; NatResources – maintain natural resources (e.g. water, air, soil) in good condition; AnimalWelfare – ensure animal welfare; WorkConditions – provide employment and good working conditions for employees; BiodiversityProtect – protect biodiversity; AttractiveCountryside – ensure the attractiveness of rural areas in terms of agro-tourism and residence; BioEnergySupply – deliver bio-based resources (e.g. hemp, wood) to produce biomass and biofuels

The relevance of other functions is very heterogeneous across the case study regions. We hypothesized that relevance of other functions strongly depends on specialisation of a farm and therefore checked the assessment of functions' relevance by specialisation (Fig. 7). Indeed, one can observe that farms specialising on arable and perennial crops assess provision of employment and good working conditions for employees as much more relevant, than livestock or mixed farms do. In contrast, livestock and mixed farms assess ensuring animal welfare as much more relevant.

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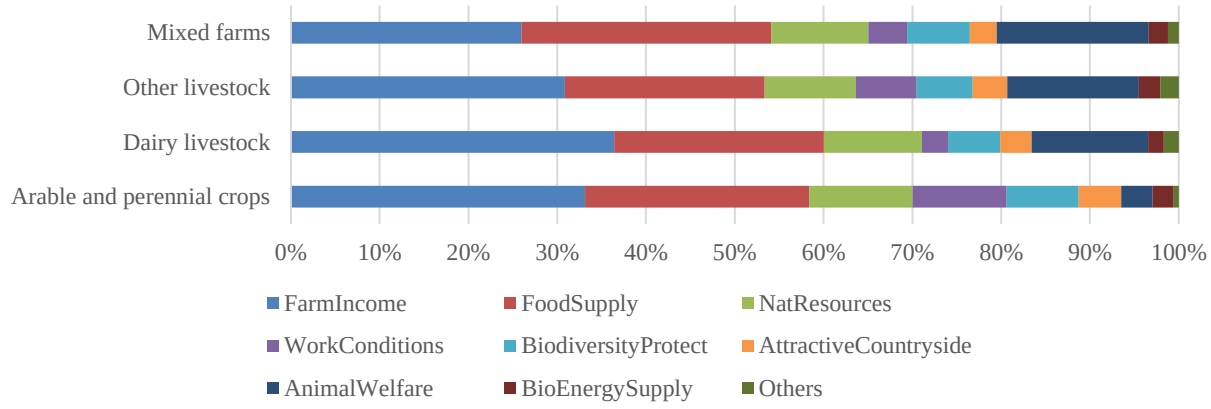

Figure 7. Essential functions across farms with different specialisation – average distribution of 100 points among functions based on their relevance. Note: FarmIncome – ensure a sufficient farm income; FoodSupply – deliver high quality food products; NatResources – maintain natural resources (e.g. water, air, soil) in good condition; AnimalWelfare – ensure animal welfare; WorkConditions – provide employment and good working conditions for employees; BiodiversityProtect – protect biodiversity; AttractiveCountryside – ensure the attractiveness of rural areas in terms of agro-tourism and residence; BioEnergySupply – deliver bio-based resources (e.g. hemp, wood) to produce biomass and biofuels

4.4 Step 4: What resilience capacities?

The data for Bulgarian and Polish case study regions are missing for robustness and adaptability. This is because a pilot-test version of the questions were used there, which was changed afterwards. Therefore data from Bulgarian and Polish case study regions cannot be compared with the others and hence was excluded from further analysis.

A visual analysis reveals that the distributions of robustness indices have smaller support and less heads than the ones of adaptability and transformability indices (Fig.8). This means that the respondents were rather like-minded in the case of robustness, than in the case of adaptability and transformability.

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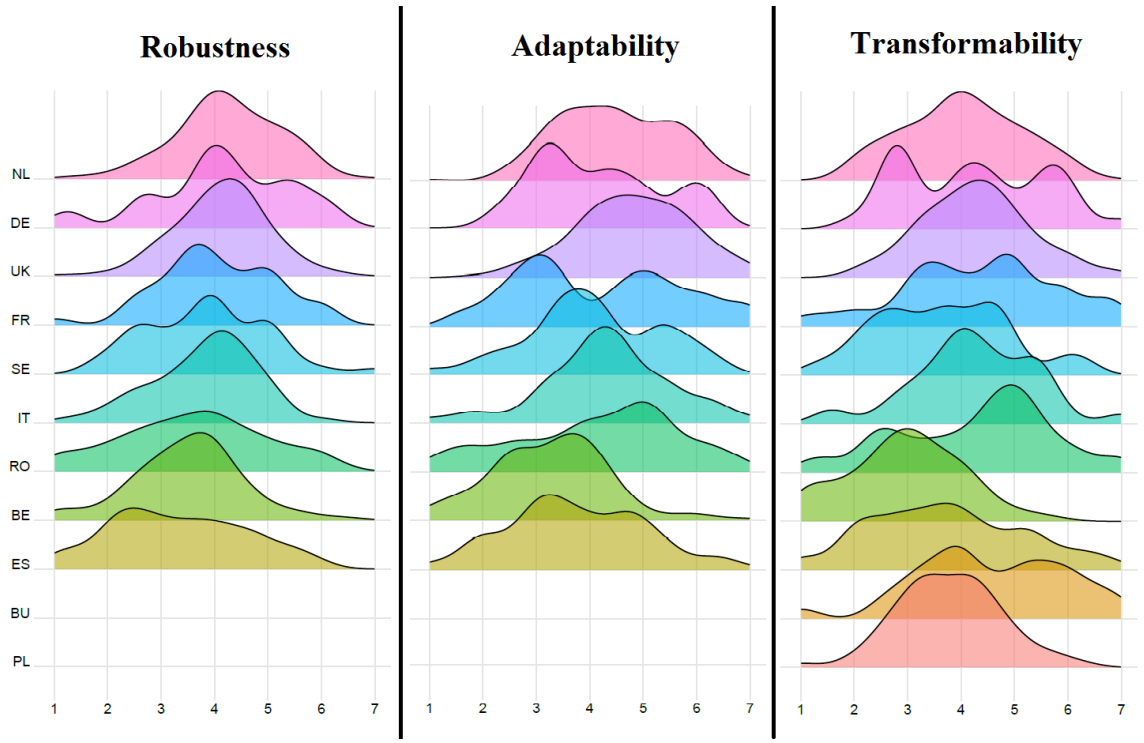

Figure 8. Resilience capacities (perceived). The index was derived based on self-assessment of statements on a 7-point-Likert-type item: 1 – strongly disagree ... 7 – strongly agree. The statements were indicating the respective resilience capacity, which means that 1 is associated with being not resilient and 7 is associated with being very resilient.

The results also reveal that arable farms perceive themselves on average as more resilient than livestock or mixed farms (Fig. 9); the difference is especially remarkable for adaptability.

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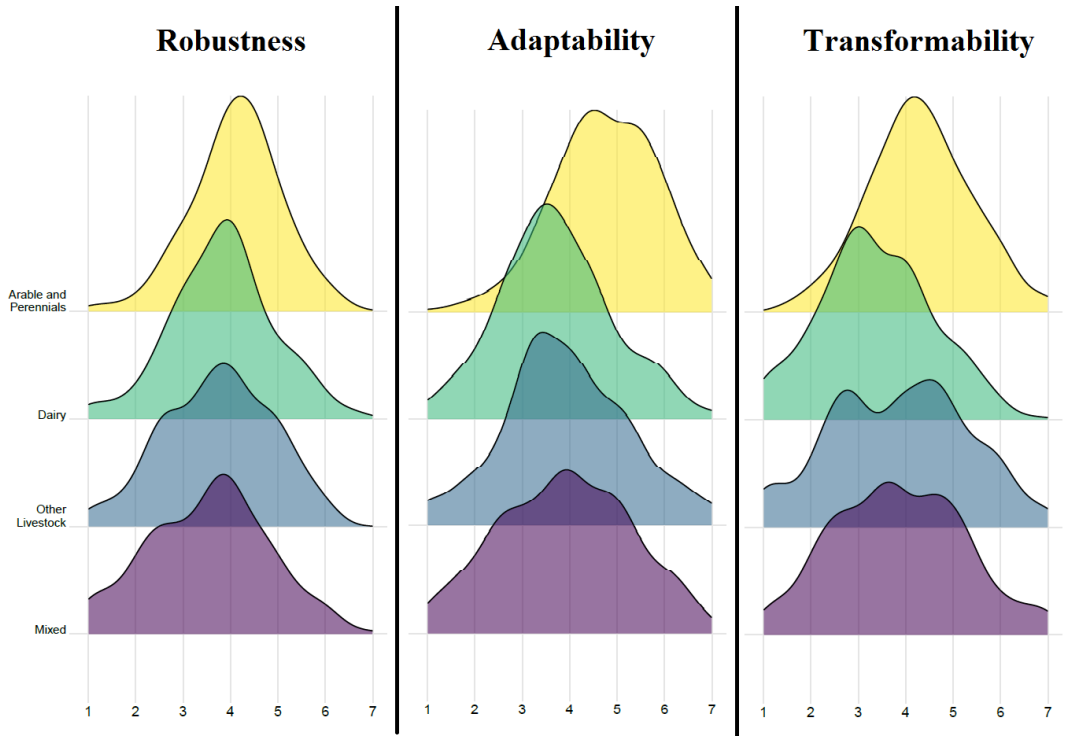

Figure 9. Resilience capacities (perceived). The index was derived based on self-assessment of statements on a 7-point-Likert-type item: 1 – strongly disagree ... 7 – strongly agree. The statements were indicating the respective resilience capacity, which means that 1 is associated with being not resilient and 7 is associated with being very resilient.

4.5 Step 5: What enhances resilience?

Our analysis revealed that use of risk management instruments depends a lot on farms' specialisations. In general, farms specialised on arable and perennial crops use more risk management instruments than livestock or mixed farms (Fig. 10 and 11). As for on-farm risk management strategies, working harder to secure production in hard times and maintaining financial savings for hard times are popular among farms with any specialisation. In contrast, using market information to plan farm activities for the next season, improving flexibility in the timing of production (e.g. to deal with seasonality) and introducing other activities on farm (e.g. agri-tourism, on-farm sales, nature conservation, or renewable energies) are rather popular only among farms specialising on arable and perennial crops. The shares of farmers implementing measures to prevent pests or diseases or having an off-farm job are remarkably low among dairy farms. Also, investments in technologies to control environmental risks and diversification in production (e.g., a combination of several animals) are not popular among livestock farms.

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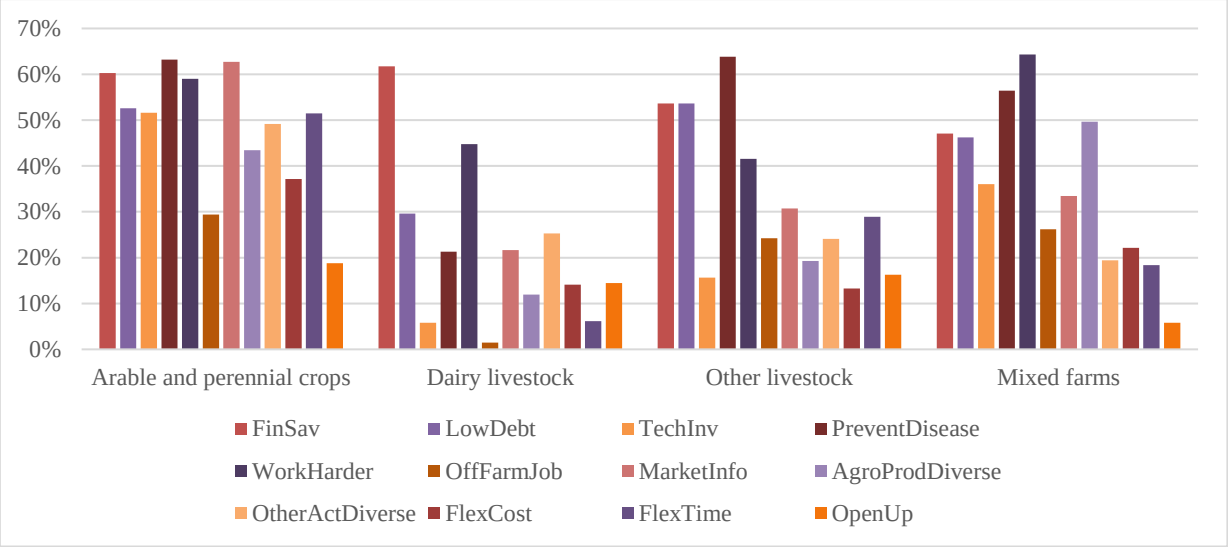

Figure 10. Share of farms with different specialisation using different on-farm risk management strategies. Note: FinSav - Maintained financial savings for hard times; LowDebt - Had low debts or no debts at all to prevent financial risks; TechInv - Invested in technologies (e.g. irrigation or hail nets) to control environmental risks; PreventDisease - Implemented measures to prevent pests or diseases (e.g. strict hygiene rules); WorkHarder - Worked harder to secure production in hard times; OffFarmJob - Had an off-farm job (either farmer herself or a family member); MarketInfo - Used market information to plan farm activities for the next season; AgroProdDiverse - Diversified in production (e.g. mixed livestock and crop farming or a combination of several crops or animals); OtherActDiverse - Diversified in other activities on farm (e.g. agri-tourism, on-farm sales, nature conservation, or renewable energies); FlexCost - Improved cost flexibility (e.g. renting land instead of buying, temporal labour contracts instead of permanent contracts); FlexTime - Improved flexibility in the timing of production (e.g. to deal with seasonality); OpenUp - Opened up farm to the public (e.g. open farm days).

As for risk-sharing strategies, the shares of farmers being members of (inter)branch organisations (e.g., collaborating with value chain actors such as processors, retailers, and technology providers) and hedging (part of) production with futures contracts are remarkably low among dairy and mixed farms. Furthermore, dairy farms make less use of agricultural insurance and production or marketing contracts to sell (part of) production; while for other livestock farms, agricultural insurance is the most popular risk-sharing strategy.

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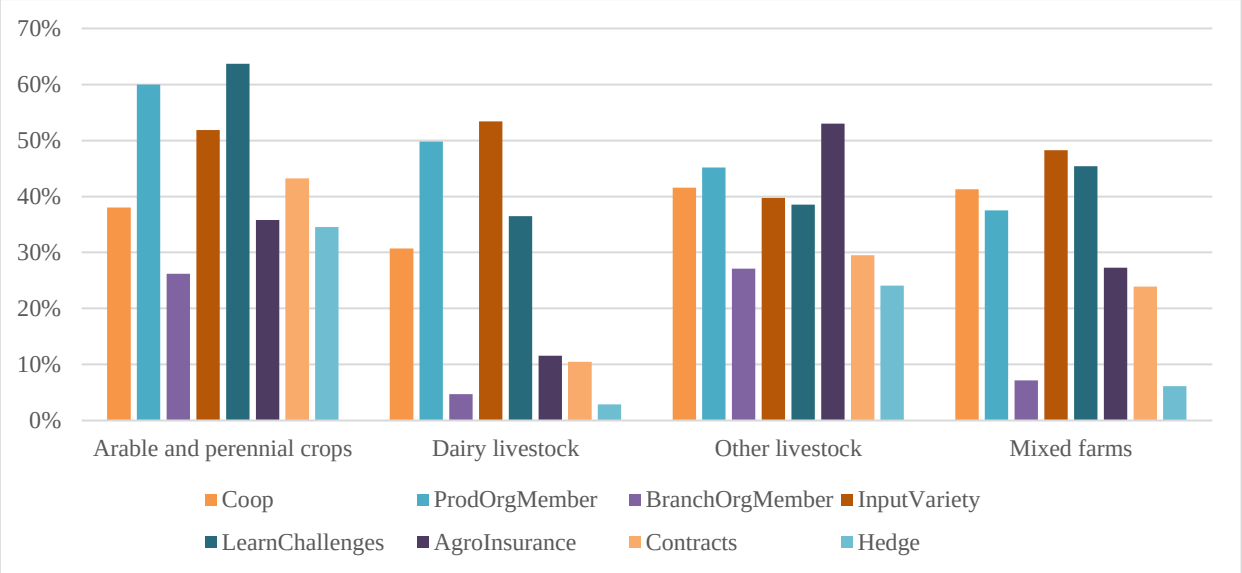

Figure 11. Share of farms with different specialisation using different risk-sharing strategies. Note: Coop - Cooperated with other farmers to secure inputs or production (e.g. buy inputs together or share machinery with other farmers); ProdOrgMember - Member of a producer organisation, cooperative or credit union; BranchOrgMember - Member of an (inter)branch organisation (e.g. collaborate with value chain actors such as processors, retailers, and technology providers); InputVariety - Had access to a variety of input suppliers (e.g. feed, seed, fertiliser, or finance suppliers); LearnChallenges - Learned about challenges in agriculture (e.g. farmer group, consultant, or agricultural training); AgroInsurance - Bought any type of agricultural insurance; Contracts - Used production or marketing contracts to sell (part of) production; Hedge - Hedged (part of) production with futures contracts.

Further analysis could focus not on single risk management instruments, but on their combinations chosen by farmers, as well as check for potential determinants of the choice and effects on perceived resilience capacities.

5 Summary and conclusion

Multiple economic, ecological, institutional and societal challenges raise concern about resilience of agriculture in Europe. Although other actors beyond farms constitute a farming system, in this report, we focus on farms, as the core of a farming system. Several resilience frameworks and related empirical studies have already been applied to farms, providing useful insights into capacities and attributes that enhance resilience. Yet, in contrast to existing literature, we aim to get a broader understanding of the perceived/subjective resilience of European farmers, not restricting ourselves to a specific challenge or essential function. Furthermore, we aim to understand farmers' perceptions and not objective indicators of challenges, objectives, resilience capacities, and their available options to increase resilience. In order to achieve the aim, a farmer survey was designed; the results of the survey were analysed following the five steps of framework

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for resilience analysis, i.e. 'resilience of what', 'resilience to what', and 'resilience for what purpose', 'what resilience capacities', and 'what enhances resilience' (Meuwissen et al., 2018).

The farm survey was conducted in eleven case study regions across the European Union using different distribution methods. The case study regions were selected in order to represent the variety of geographical, climatic, economic, institutional and social conditions. In total, 1,152 responses were obtained.

The results of the survey present a comprehensive state of art regarding farmers' perceptions of challenges, objectives, resilience capacities, and their available options to increase resilience. Despite of heterogeneity of the case study regions, some similarities were revealed. For instance, no case study region assessed social challenges as the most relevant. Next, ensuring a sufficient farm income and delivering high quality food products are the most essential functions across all the case study regions. Comparing farms with different specialisation, we revealed that crop farms assess provision of employment and good working conditions for employees as much more relevant, than livestock or mixed farms do. In contrast, livestock and mixed farms assess ensuring animal welfare as much more relevant. In general, crop farms assess themselves as more resilient in average than other farms, especially in terms of adaptability. This might be (partly) explained by the fact that crop farms use in average more risk management instruments than other farms; although more advanced analysis is required in order to draw any specific conclusion.

This report presents the results of the farm survey in a rather descriptive manner. More in-depth analyses will follow up, in order to capture and quantify determinants of resilience capacities.

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Appendix 1. Farm survey

A.1.1. Your farm

Respondent number ☐

Q1.1. For how many years have you run your own farm?	___ years
Q1.2. What is your main agricultural specialisation?	☐ Crops ☐ Horticulture ☐ Dairy ☐ Specialist pigs ☐ Specialist poultry ☐ Other grazing livestock (sheep, goats, beef, and cattle rearing and fattening) ☐ Mixed activities ☐ Other: _____
Q1.3. How much livestock do you keep on your farm for commercial usage? Please indicate the number of animals you keep on your farm. In case you do not keep any livestock on your farm, please tick the box "No livestock on my farm".	☐ No livestock on my farm _____ sows _____ fattening pigs _____ dairy cows _____ fattening calves _____ fattening bulls _____ heifers (breeding or fattening) _____ broilers _____ laying hens _____ horses _____ sheep (including ewes) _____ goats Other: _____ _____ _____ _____

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Q1.4. Is your farm conventional or organic?	□ Conventional □ Organic □ Converting from conventional to organic □ Other: _____
Q1.5. Which legal form is most applicable to your farm?	*[Relevant ownership types were inserted here for each case study]* □ □ □ □ □ □ Other: _____
Q1.6. What is the total size of your farm? This includes both rented and owned land.	_____ ha of land
Q1.7. Of which how many hectares are arable land?	_____ ha of arable land
Q1.8. Of which how many hectares are pasture?	_____ ha of pasture
Q1.9. How many hectares of land do you own?	_____ ha of owned land
Q1.10. How many hectares of land do you rent?	_____ ha of rented land
Q1.11. What is the average number of (unpaid) family members working on your farm? Please express in full time equivalents (FTE). A FTE corresponds to 8 working hours for each working day of the year.	_____ FTE of unpaid family labour

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Q1.12. What is the average number of workers you hire to work on your farm? Please express in full time equivalents (FTE). A FTE corresponds to 8 working hours for each working day of the year.	_____ FTE of hired labour

A.1.2. Risk management strategies

Which of the following have you been implementing in the last 5 years? Please tick the boxes of all the risk management strategies you have been implementing in the last 5 years.

Q2.1.-Q2.15. My on-farm strategies

☐ Maintained financial savings for hard times	☐ Used market information to plan my farm activities for the next season
☐ Had low debts or no debts at all to prevent financial risks	☐ Diversified in production (e.g. mixed livestock and crop farming or a combination of several crops or animals)
☐ Invested in technologies (e.g. irrigation or hail nets) to control environmental risks	☐ Diversified in other activities on my farm (e.g. agri-tourism, on-farm sales, nature conservation, or renewable energies)
☐ Implemented measures to prevent pests or diseases (e.g. strict hygiene rules)	☐ Improved cost flexibility (e.g. renting land instead of buying, temporal labour contracts instead of permanent contracts)
☐ Worked harder to secure production in hard times	☐ Improved flexibility in the timing of my production (e.g. to deal with seasonality)
☐ Had an off-farm job (either myself or a family member)	☐ Opened up my farm to the public (e.g. open farm days)
☐ [Up to three CS specific on-farm strategies]	

Q2.16.-Q2.26. My risk-sharing strategies with others

☐ Cooperated with other farmers to secure inputs or production (e.g. buy inputs together, share machinery, or exchange land)	☐ Learned about challenges in agriculture (e.g. farmer group, consultant, or agricultural training)
☐ Member of a producer organisation, cooperative or credit union	☐ Bought any type of agricultural insurance *[insert CS specific examples, e.g. crop, hail, yield, or livestock insurance]*

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□ Member of an (inter)branch organisation (e.g. collaborate with value chain actors such as processors, retailers, and technology providers) □ Had access to a variety of input suppliers (e.g. feed, seed, fertiliser, or finance suppliers) □ [Up to three CS specific risk sharing strategies]	□ Used production or marketing contracts to sell (part of) my production □ Hedged (part of) my production with futures contracts

A.1.3. Future challenges in agriculture and strategies to deal with these challenges

Q3a.1-Q3a.3. Considering the next 20 years, what do you expect to be the 3 most important challenges on your farm?

1.
2.
3.

Q3b.1-Q3b.3. Considering the next 20 years, what do you expect to be your 3 most important strategies to deal with challenges on your farm?

1.
2.
3.

A.1.4. The essential functions of your farm

Q4.1.-Q4.9. The following question asks you to distribute a total of 100 points between 9 potential functions of your farm. The more points you distribute to a function, the more important the function is for your farm. If a function is not important at all, then you should distribute 0 points to this function. How would you distribute 100 points among the following functions?

If you can think of an important function of your farm that is not listed below, you can add it under "Other, please specify" and distribute points to this function as well.

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	Number of points
Deliver high quality food products	
Deliver bio-based resources (e.g. hemp, wood) to produce biomass and biofuels	
Ensure a sufficient farm income	
Provide employment and good working conditions for my employees	
Maintain natural resources (e.g. water, air, soil) in good condition	
Protect biodiversity	
Ensure the attractiveness of rural areas in terms of agro-tourism and residence	
Ensure animal welfare	
Other, please specify:	

Please check carefully if the total number of points adds up to 100.

A.1.5. Challenges in agriculture

Considering the next 20 years, to what extent do you think that the following events will be challenging for your farm? Please circle your answer on a scale of 1 (not challenging at all for my farm) to 7 (very challenging for my farm).

	(1) Not challenging at all for my farm — (7) Very challenging for my farm
Price challenges	
Q5.1. Persistently high input prices (e.g. fertiliser, feed, seed)	1 - 2 - 3 - 4 - 5 - 6 - 7
Q5.2. Input price fluctuations (e.g. fertiliser, feed, seed)	1 - 2 - 3 - 4 - 5 - 6 - 7
Q5.3. Persistently low market prices	1 - 2 - 3 - 4 - 5 - 6 - 7
Q5.4. Market price fluctuations	1 - 2 - 3 - 4 - 5 - 6 - 7
Value chain challenges	
Q5.5. Low bargaining power towards processors and retailers	1 - 2 - 3 - 4 - 5 - 6 - 7
Q5.6. Low bargaining power towards input suppliers (e.g. fertiliser, feed, seed suppliers)	1 - 2 - 3 - 4 - 5 - 6 - 7
Financial challenges	

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Q5.7. Limited access to loans from banks	1 - 2 - 3 - 4 - 5 - 6 - 7
Q5.8. Late payments from buyers	1 - 2 - 3 - 4 - 5 - 6 - 7
Production challenges	
Q5.9. Persistent extreme weather events (e.g. floods, droughts, frost)	1 - 2 - 3 - 4 - 5 - 6 - 7
Q5.10. Pest, weed, or disease outbreaks	1 - 2 - 3 - 4 - 5 - 6 - 7
Q5.11. Low soil quality	1 - 2 - 3 - 4 - 5 - 6 - 7
Personal and personnel challenges	
Q5.12. Limited availability of skilled farm workers	1 - 2 - 3 - 4 - 5 - 6 - 7
Q5.13. Limited ability to work on the farm due to illness, divorce or other personal circumstances	1 - 2 - 3 - 4 - 5 - 6 - 7
Institutional challenges	
Q5.14. Strict regulations (e.g. environmental, animal welfare, or competition)	1 - 2 - 3 - 4 - 5 - 6 - 7
Q5.15. Reduction in direct payments of the Common Agricultural Policy (CAP)	1 - 2 - 3 - 4 - 5 - 6 - 7
Societal challenges	
Q5.16. Public distrust in agriculture	1 - 2 - 3 - 4 - 5 - 6 - 7
Q5.17. Low societal acceptance of agriculture	1 - 2 - 3 - 4 - 5 - 6 - 7
Country specific challenges	
Q5.18.-Q5.20. [Up to three CS specific challenges]	1 - 2 - 3 - 4 - 5 - 6 - 7

A.1.6. The resilience of your farm

To deal with agricultural challenges, it is important that your farm is resilient. We distinguish three types of resilience.

6a. The first resilience type is robustness. This explains how well your farm absorbs shocks and how likely it is that your farm recovers fast from these shocks.

Example:
A baker wants to earn a decent income. Currently he faces extremely high wheat prices. The ability to earn a decent income, even when the wheat prices are extremely high, makes the baker robust.

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To what extent do you agree or disagree with the following statements? Please circle your answer on a scale of 1 (strongly disagree) to 7 (strongly agree).

	(1) Strongly disagree	(7) Strongly agree
Q6a.1. After something challenging has happened, it is easy for my farm to bounce back to its current profitability	1 - 2 - 3 - 4 - 5 - 6 - 7	
Q6a.2. As a farmer, it is hard to manage my farm in such a way that it recovers quickly from shocks	1 - 2 - 3 - 4 - 5 - 6 - 7	
Q6a.3. Personally I find it easy to get back to normal after a set back	1 - 2 - 3 - 4 - 5 - 6 - 7	
Q6a.4. A big shock will not heavily affect me, as I have enough options to deal with this shock on my farm	1 - 2 - 3 - 4 - 5 - 6 - 7	

6b. The second resilience type is adaptability. This explains how easy you can adjust or change your farm.

Example:
To deal with extremely high wheat prices, the baker adjusts his production strategy by changing the bread composition. He uses less wheat and more cheaper grains to produce his bread. This is adaptability.

To what extent do you agree or disagree with the following statements? Please circle your answer on a scale of 1 (strongly disagree) to 7 (strongly agree).

	(1) Strongly disagree	(7) Strongly agree
Q6b.1. If needed, my farm can adopt new activities, varieties, or technologies in response to challenging situations	1 - 2 - 3 - 4 - 5 - 6 - 7	
Q6b.2. As a farmer, I can easily adapt myself to challenging situations	1 - 2 - 3 - 4 - 5 - 6 - 7	
Q6b.3. In times of change, I am good at adapting myself and facing up to agricultural challenges	1 - 2 - 3 - 4 - 5 - 6 - 7	
Q6b.4. My farm is not flexible and can hardly be adjusted to deal with a changing environment	1 - 2 - 3 - 4 - 5 - 6 - 7	

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6c. The third resilience type is transformability. This explains how easy you can and how willing you are to radically change or reorganise your farm.

> *Example:*
> *The baker thinks that it is time for a radical change. He decides to open a tearoom as part of his bakery. Next to selling bread, the baker serves coffee, tea, and cake to customers in his tearoom. This radical change shifts the business focus of his bakery. This is transformability.*

To what extent do you agree or disagree with the following statements? Please circle your answer on a scale of 1 (strongly disagree) to 7 (strongly agree).

	(1) Strongly disagree	(7) Strongly agree
Q6c.1. For me, it is easy to make decisions that result in a transformation	1 - 2 - 3 - 4 - 5 - 6 - 7	
Q6c.2. I am in trouble if external circumstances would drastically change, as it is hard to reorganise my farm	1 - 2 - 3 - 4 - 5 - 6 - 7	
Q6c.3. After facing a challenging period on my farm, I still have the ability to radically reorganise my farm	1 - 2 - 3 - 4 - 5 - 6 - 7	
Q6c.4. If needed, I can easily make major changes that would transform my farm	1 - 2 - 3 - 4 - 5 - 6 - 7	

A.1.7. Network

To what extent do the following statements apply to you? Please circle your answer on a scale of 1 (does not apply to me at all) to 7 (strongly applies to me).

	(1) Does not apply to me at all	(7) Strongly applies to me
Q7.1. I know a lot of other farmers in my region	1 - 2 - 3 - 4 - 5 - 6 - 7	
Q7.2. Concerning farming, I often interact with neighbouring farmers	1 - 2 - 3 - 4 - 5 - 6 - 7	
Q7.3. Farmers in my region tend to support each other when there is a problem	1 - 2 - 3 - 4 - 5 - 6 - 7	

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Q7.4. I know a lot of agricultural professionals, experts, or value chain actors	1 - 2 - 3 - 4 - 5 - 6 - 7
Q7.5. When I attend agricultural events and meetings, I interact a lot with professionals, experts, or value chain actors	1 - 2 - 3 - 4 - 5 - 6 - 7
Q7.6. I feel I can receive support from agricultural professionals, experts, or value chain actors in my network	1 - 2 - 3 - 4 - 5 - 6 - 7

A.1.8. Innovation

To what extent do the following statements apply to you?
Please circle your answer on a scale of 1 (does not apply to me at all) to 7 (strongly applies to me).

	(1) Does not apply to me at all	(7) Strongly applies to me
Q8.1. Compared to other farmers, I am among the first to try out a new practice on my farm	1 - 2 - 3 - 4 - 5 - 6 - 7	
Q8.2. I like to try out all kinds of new technologies or varieties	1 - 2 - 3 - 4 - 5 - 6 - 7	

A.1.9. Your ability to cope with agricultural challenges

To what extent do you agree or disagree with the following statements?
Please circle your answer on a scale of 1 (strongly disagree) to 7 (strongly agree).

	(1) Strongly disagree	(7) Strongly agree
Q9.1. If I wanted to, it would be easy for me to deal with agricultural challenges on my farm	1 - 2 - 3 - 4 - 5 - 6 - 7	
Q9.2. It is mostly up to me whether or not I can deal with the challenges on my farm	1 - 2 - 3 - 4 - 5 - 6 - 7	
Q9.3. I have a lot of control about agricultural challenges affecting my farm	1 - 2 - 3 - 4 - 5 - 6 - 7	
Q9.4. For me, it is difficult to deal with the challenges that affect my farm	1 - 2 - 3 - 4 - 5 - 6 - 7	

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Q9.5. I know a lot about agricultural challenges on my farm	1 - 2 - 3 - 4 - 5 - 6 - 7
Q9.6. If I consider the last 5 years, my farm has often experienced negative consequences of agricultural challenges	1 - 2 - 3 - 4 - 5 - 6 - 7
Q9.7. For the next 5 years, I expect my farm to be resilient to agricultural challenges	1 - 2 - 3 - 4 - 5 - 6 - 7
Q9.8. For the next 20 years, I expect my farm to be resilient to agricultural challenges	1 - 2 - 3 - 4 - 5 - 6 - 7

A.1.10. Handling probabilities

To what extent do you agree or disagree with the following statements? Please circle your answer on a scale of 1 (strongly disagree) to 7 (strongly agree).

	(1) Strongly disagree	(7) Strongly agree
Q10.1. It is often helpful to see percentages on the weather forecast (e.g. a 45% chance on rain)	1 - 2 - 3 - 4 - 5 - 6 - 7	
Q10.2. I am good in working with percentages	1 - 2 - 3 - 4 - 5 - 6 - 7	
Q10.3. Information expressed using numbers is often useful	1 - 2 - 3 - 4 - 5 - 6 - 7	
Q10.4. If the market price increases with 15%, I am good in figuring out what the new market price will be	1 - 2 - 3 - 4 - 5 - 6 - 7	

A.1.11. Bad and good years

11a. Bad years occur in farming. In a bad year, your yearly gross farm income is at least 30% lower than you expected.

Please express your answer as a percentage between 0% and 100%. The higher the percentage, the more likely it is that a bad year occurs.

Q11a.1. How likely do you think it is that next year will be a bad year for your farm? _____ %

Q11a.2. How likely do you think it is that your farm will face one or more bad year(s) in the coming 10 years? _____ %

11b. Good years also occur in farming. In a good year, your yearly gross farm income is at least 30% higher than you expected.

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Please express your answer as a percentage between 0% and 100%. The higher the percentage, the more likely it is that a good year occurs.

Q11b.1. How likely do you think it is that next year will be a good year for your farm? _____ %

Q11b.2. How likely do you think it is that your farm will face one or more good year(s) in the coming 10 years? _____ %

A.1.12. Willingness to take risks

Q12a.1. How do you see yourself: are you generally a person who is fully prepared to take risks or do you try to avoid taking risks?

Please circle your answer on a scale of 0 (not at all willing to take risks) to 10 (very willing to take risks).

(0) Not at all willing to take risks										(10) Very willing to take risks
0	1	2	3	4	5	6	7	8	9	10

Q12b.1-Q12b.5. To what extent do you agree or disagree with the following statements? Please circle your answer on a scale of 1 (strongly disagree) to 7 (strongly agree).

I am willing to take more risks than other farmers in terms of...

	(1) Strongly disagree						(7) Strongly agree
Production	1	2	3	4	5	6	7
Marketing and prices	1	2	3	4	5	6	7
Financial risks	1	2	3	4	5	6	7
Innovation	1	2	3	4	5	6	7
Farming in general	1	2	3	4	5	6	7

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A.1.13. Education and other personal information

Q13.1. What is your year of birth?	__ __ __ __
Q13.2. What is your gender?	☐ Male ☐ Female
Q13.3. What is your expectation for the succession of your farm?	☐ I have no expectations ☐ I expect a family member to take over the farm (e.g. son, daughter, brother) ☐ I expect to sell the property ☐ I expect to give up the tenancy ☐ Other, please specify_____
Q13.4. What is your highest completed educational degree?	☐ No education ☐ Primary school ☐ Secondary school ☐ Undergraduate ☐ Graduate
Q13.5. Did you complete any agricultural education or training?	☐ Yes ☐ No

This is the end of the questionnaire. Please check carefully if you have answered all questions. Thank you very much for your participation!

If you want to receive a summary of the questionnaire results, please leave your email address below.

Email address:

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Appendix 2. Description of case study regions

5.1.1 Belgium

The Belgian case study is the dairy farming system in Flanders, the northern region of Belgium. In 2017, there were 5,794 farms in Flanders with dairy cows, out of a total of 23,225. A percentage of these farms with dairy cows does not market milk; they have a very low number of cows of which the milk is used on the farm, for instance as feed for beef calves. Our estimate is that the population of interest (farms that market milk, with or without additional enterprise(s)) amounts to some 4,500 farms. With this, dairy farming is an important farming activity in the region as a whole, together with arable farming and beef farming (when looking at land use) and together with arable farming, beef farming and pig farming (when looking at number of farms).

5.1.2 Bulgaria

The area assigned for agriculture in 2017 was 5,224 thousand ha, or approximately 47% of country's territory. Utilised Agricultural Area (UAA) consisted of arable land, perennial crops, plant nurseries, permanent grasslands and family gardens and orchards. The grain sector is around 38% of UAA, the wheat 64% of the grains and 23% of UAA for 2017. The chosen sector was wheat specialized and the total famers which are in the sample are 30 and they cultivate average 1708.93 ha per farm. The chosen regions were North Central BG32 and Northeast BG33 where the grain sector is a dominate by UAA.

5.1.3 France

The French case study region is Bourbonnais (more or less the department of Allier), located in the Central part of France, and traditionally dominated by beef production. The agricultural branch represents 5.1% of the workforce of the region (2.5% at the national scale). About 10,000 people work in farms in the department of Allier. The beef sector is the main activity of the region (42%), followed by crop (16%) and the goat/sheep production (12%). 483,000 ha are available for agricultural activities. There are 5,523 farms in Bourbonnais (minus 25% between 2000 and 2010). Farms repartition is as follow:

- 200,000 cows in 3,102 Beef farms, Charolais breed, 62 cows on average (48 in 2000). Mainly specialized breeder system.
- 10,000 dairy cows
- 124,000 ewes

The average size of the farms is 88ha, which is quite big for the region: 1,924 small farms (less than 40 cows), 2,205 medium farms (around 70 cows), 1,394 big farms (more than 100 cows).

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5.1.4 Germany

The Altmark is located in the North of Saxony-Anhalt and consists of the two districts Altmarkkreis Salzwedel and Landkreis Stendal. The region covers an area of 4,715 km² (STALA 2019, p.8). In 2016, a total number of 1,094 farms used close to 65% of this area for agriculture (STALA 2016). The agricultural structure of the Altmark is typical for wide parts of eastern Germany. Different land reforms in the former German Democratic Republic resulted in large farm sizes, which mostly were continued after reunification in similar sizes. 5.3% of the farms in the Altmark have a size over 1,000 ha and cultivate close to 33% of the agricultural land (STALA 2016). Due to rather poor soils and a comparatively high proportion of grassland, dairy farming and livestock production in large units are important specialisations in the region.

5.1.5 Italy

Italy is the second largest world producer of hazelnut, after Turkey, accounting for around 13% of total surface and production, in 2017 (FAOSTAT, 2019). More than one-third of Italian production comes from the Lazio region, where Viterbo's territory accounts for 97% of both surface and production, 21,000 hectares and 553,500 tons, respectively, in 2018 (ISTAT, 2019). Hazelnut generates 73 million Euro of added value in the Lazio Region, according to last data available for the year 2015 (INEA, 2017). Viterbo hosts more than 6,000 hazelnut farms, of which 86% is represented by farms under 10 hectares (ISTAT, 2010). This means that most of the farms are managed on a family and part-time basis. In traditional production areas, farms don't use irrigation and are less prone to the impact of heat waves. But, new settlements in less suitable areas are facing an increasing amount of environmental pressure as a result from climate change and diminishing water availability. However, the quality of the Viterbo hazelnut production is recognized as very high (proved by the recognition of PDO "Nocciola Romana") and is an opportunity for promoting and differentiating the local products on both domestic and foreign markets.

5.1.6 The Netherlands

The Dutch case study region includes three provinces in the North-East of the Netherlands: Drenthe, Friesland, and Groningen. In 2017, 9,655 farms operated in total in the three provinces, out of which the vast majority were either specialised on grazing livestock (67.5%) or on arable crops (22.9%) (CBS, 2019). Every farmer from the region could participate in the survey, regardless of specialisation.

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5.1.7 Poland

Horticulture and gardening are an important element of agriculture, covering the production of fruit from trees and shrubs, outdoor (ground) vegetables and under covers, flowers in the ground and under covers, ornamental trees and shrubs. Two groups of farms were included in our research: (i) fruit production from trees, shrubs, bushes and (ii) production of outdoor (ground) vegetables. In 2017, the area dedicated for growing fruit trees and shrubs amounted to 390 thousand. ha (2.7% of arable land) and outdoor vegetables to 170,000 ha (1.2% of arable land). Fruit production was established in over 173 thousand farms (12.3% of the total number of holdings) and vegetable production in around 73 thousand farms (5.1%), of which the number of specialized farms was accordingly 58 thousand and 26 thousand. Respondents were selected from Lubelskie and Mazowieckie voivodeships as almost half of the area of above-mentioned crops and farms were located in those regions.

5.1.8 Romania

The case study in Romania consists of mixed farms in the Nord-Est region (RO 21) (NUTS2). The last Farm Structural Survey (2016) shows that 73% of Romanian farms are mixed (crop production and livestock). Of those, the largest share (22%) are located in the Nord-Est region. In terms of utilized agricultural area, 98% of the farms in Nord-Est region have less than 10 ha and 95% less than 5 ha. The livestock is composed (% in the region's total LLU) of: bovines (42%, mostly dairy cows), poultry (19%), sheep (15%), pigs (12%), and equidae (9%, mainly horses for transport purposes). A more recent development in the region is the intensification of bee farming. In terms of specialization, FADN data indicate in 2016 a total of 79,840 mixed farms - field crops-grazing livestock combined (type 80 in TF8 classification, calculated with SO), of which 34% are located in the Nord-Est region.

5.1.9 Spain

The Spanish case study covers two specializations and regions: the extensive sheep farming in Huesca and the extensive beef farming in Sierra de Guarradama (Comunidad de Madrid). Regarding the extensive sheep farming, the number of farms has decreased from 2,902 (1995) to 1,221 farms in Huesca (2015) and the number of ewes from 811,590 (1995) ewes to 491,621 (2015) (Gobierno de Aragón, 2016). The size of farms (600 - 2,300 ewes) is increasing due to lack of new generation of farmers. Related to the beef extensive farming in the Sierra de Guadarrama (Comunidad de Madrid), the number of farms has decreased from 1,100 (1990) to 850 farms. In 2016 there are 36,367 suckler cows in the Comunidad de Madrid (INE,2017).

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5.1.10 Sweden

The Swedish case study includes the high value livestock egg and poultry sector. There are approximately 100 egg farms (Jordbruksverket, 2019a) and 100 poultry farms with more than 1,000 chicken (Jordbruksverket, 2019b) in Sweden. In 2016, a total of 180 farms were registered as having poultry or egg (bird production) as their main production orientation (Statistics Sweden, 2018). Members of the Swedish egg and poultry association produced approximately 118,200 tons of eggs in 2017, which represents a market share of approximately 86% (Swedish Board of Agriculture, 2019). Most eggs were produced in a free-range system (68%), and approximately 17% were organic production (Jordbruksverket, 2019a). Approximately 100.02 million chicken were slaughtered for human consumption in 2017 (Swedish Board of Agriculture, 2019). Household consumption of poultry meat has almost tripled since 1990 and self-sufficiency was approximately 65% in 2017 (Jordbruksverket, 2019b). Most farms are located in the South of the country. Poultry meat is generally considered by the consumers as healthy and climate friendly. As a result of a salmonella control program, eggs of Swedish origin are free of salmonella and thus considered safe by consumers.

5.1.11 United Kingdom

The East of England region is highly productive and contributes more to the UK's agricultural gross value added than any other UK region. Production includes a variety of crops (cereals, industrial crops, potatoes, sugar beet), with cereals (especially wheat and barley) being by far the most important crops, covering almost half of the farmed area. The majority of farms are capital intensive with an average size exceeding 100ha. Farmers are mainly land owners and are highly market-oriented. The level of specialization and of input use is high. Labour force comes mainly from hired full- and part time employees and farmers invest heavily in seed and chemicals.

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Appendix 3. Peculiarities of data collection in the case study regions

A.3.1. Belgium

We reached our population in two different ways. In both ways, we developed an online survey and sent a web link through email. First, the survey was sent, in September 2018, to the whole Flemish FADN sample (750 farms of which dairy farms constitute a share equivalent to their share in the population). This was done through the government department that was responsible for collecting the FADN data. After 1 reminder in November 2018, a total of 408 responses was obtained, of which 119 were dairy farms. Second, our survey was sent to roughly the whole population, in October 2018, through a cooperative organisation for bovine livestock genetics. By January 2019, 264 responses were obtained, out of which 101 were complete. Our total complete sample size is 220. It is difficult to calculate exact response rates, since we have no detailed information of how many farms received the email invitation, but all evidence suggests that it was quite low.

A.3.2. Bulgaria

The study was conducted in the period July-October 2018, and its planning started a few months earlier. The questionnaires were taken personally with the farm owner and two interviewers. Filling in a questionnaire took about half a day/ per farm, because most of the farmers were willing to tell a lot of stories from their field experience. Including the interviewers, they were showing around their land/machines/laboratories etc. for more complete explanations. There were no problems during the interviews, and we checked their claims twice in an open conversation. The information gathered was completed in the proposed excel mask (sent 23.10.2018), as was checked by re-filling of every third questionnaire .

A.3.3. France

In October and November 2018, we asked local partners (agricultural chambers, producers' organisation etc.) to send some farmers' details, in order to build a list of farmers likely to answer a survey about risk management. From November 2018 to January 2019, we conducted some face-to-face interviews but regarding the high number of surveys (90) we decided not to go on with these kind of interviews (not enough time scheduled on this task of the project). Therefore we went on calling the farmers to complete the survey, but it resulted to be much more complicated than with physical interviews (45 minutes on average for 1 producer), because of the wide range of responses available for each question. In order to reach more farmers, we built an internet survey, which was widely sent to the contacts we had. But the length of the survey was too long and most of the farmers only answered the first questions and then gave it up. This is the main reason why we only managed to complete 50 surveys. Although it is not what the project

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planned (90), regarding the homogeneity of meat production in the region, we think that these results illustrate the diversity of the situations.

A.3.4. Germany

We sent out the link to the online survey to different multipliers, such as farmer associations, and different farms in the case study region. Furthermore, the survey was distributed via social media. The survey was online from October 10, 2018 to January 5, 2019. In total, 70 people took part in the survey. 30 questionnaires were fully completed and could be used for the Analysis.

A.3.5. Italy

The questionnaire was distributed during the period July – September 2018, that is prior to the harvesting period for hazelnut producers (second half of September), directly to farmers (only 10% of the whole sample filled out the questionnaire by e-mail). With the support of PO's and farmers' associations, the survey reached 60 farmers, supplied at the end of meetings, seminars, and visits of farmers to the offices of such organizations. At least two persons were always present on the spot for supporting the respondent in completing the survey.

A.3.6. The Netherlands

In November 2018, the survey was sent by e-mail to selected Dutch farmers via an agricultural publisher; to increase response, we placed advertisements and banners on the website and in the electronic newsletter of this agricultural publisher. A reminder was sent by e-mail in December 2018. This resulted in 186 fully completed surveys. Only completed surveys are included in the data set. The response rate remains unknown because it is undeterminable how many farmers were reached and recruited by the advertisements and banners. We randomly raffled one tablet and 24 vouchers of €25 among the respondents for their participation.

A.3.7. Poland

The selection of respondents was based on the data from FADN (TF8), which was representing the structure of area for two types of farms (horticultural crops - 2 and permanent crops - 4) in Lubelskie and Mazowieckie voivodeships.

Table A.3.1. Number of respondents by area of farms, type of crops and voivodeships

Farm area, ha	**Horticultural crops**		**Permanent crops**	
	Lubelskie	Mazowieckie	Lubelskie	Mazowieckie
<5	1	2	4	3

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5-9.99	1	5	3	6
10-19.99	1	5	3	6
20-29.99	1	4	3	5
30-49.99	1	3	3	3
50 and more	1	1	3	2
Total	6	20	19	25

The questionnaire and information about the project were sent out via e-mail to district offices of Agricultural Advisory Center, Agricultural Chambers and producer groups in Lubelskie and Mazowieckie voivodeships with a request to send it further, to individual fruit and vegetable producers in the area. The questionnaires were also sent to the subscribers of the monthly magazine "SAD" (Miesięcznika Praktycznego Sadownictwa – SAD). In total, about 3 thousand e-mails were sent out. The response was very small - only 12 completed questionnaires were obtained via this method. Due to low effectiveness of this method, Piotr Gradziuk – person responsible for this activity - used his own network of contacts with farmers and industry experts and conducted over 600 telephone conversations what resulted in 126 face-to-face meetings. During interviews 26 farmers filled in whole questionnaires whereas 66 respondents stop after reaching points 3.a.1 – 3.b.3 and 13.a.1 -13.b.3 and said that they need more time to think about them. Therefore the interviewer agreed that respondents can fill them in later and send them to him by traditional mail. Despite many prompts (reminders) and repeated promises from respondents, by January 15th 2019 only 12 questionnaires were sent back to the interviewer. Hence the interviewer decided to repeat face-to-face meetings with respondents in order to complete unfinished questionnaires.

A.3.8. Romania

Data have been collected through face to face interviews with the farmers. The survey has been conducted in November-December 2018, and the final sample consists of 122 farms (completed questionnaires). The sample was stratified in order to ensure representativeness in terms of geographical distribution, landforms (plain, hill) and climatic conditions. Two of the six counties (NUTS3) in the region were selected for the survey: Iași and Suceava. Statistically, they have the largest population in the region (Iași 22.5% and Suceava 19.7%). They are representative physically and geographically for the Nord-Est region; their geographical position, dominant landforms and climate regime are relevant for the repartition and intensity of agricultural and entrepreneurial activity. The farms surveyed were located in 24 villages in 12 communes. There

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were two criteria for including the farms in the sample: size of the farm (less than 5 ha); livestock (less than 5 LLU, that would be 5 dairy cows, or 50 sheep/ewes, or a combination of the two).

A.3.9. Spain

In October 2018, we got in contacts with the focal point in Huesca, the officers of the Regional Agricultural services. They recommend us to hire the veterinarians who work with the farmers to conduct the surveys. Due to the characteristics of the territory (it takes time get the farms) and the farmers profile it is better that the surveys are conducted by someone the farmers trust. With this in mind, we hired three veterinarians to conduct 60 surveys in Huesca and we replicated the procedure to conduct 60 surveys in Sierra de Guarrama. The 120 face to face surveys were conducted between the 01st of November and 15th of January. The veterinarians selected the farmers to interview randomly. They provided information and answered any questions the farmer may have. This procedure has proven to be the best way to get the survey fully answered.

A.3.10. Sweden

Because the farm population is small, data collection aimed at the whole population of specialized egg and poultry farms, which amounted at the time of data collection to 176 individual farms. In September through November 2018, a market research company (Next Research & Consulting AB) approached all farmers to fill out the survey and used different survey modes to satisfy different preferences for response modes among respondents. Farmers received frequent reminders through phone calls, text messages and e-mails. In total, we received 79 responses, out of which there were 21 partly and 47 fully completed questionnaires (four on paper, 16 phone interviews, and 27 online surveys). As we targeted the whole population of 176 farms, the response rate was approximately 45% (27% if only considering the fully completed questionnaires).

A.3.11. United Kingdom

Data have been collected through telephone interviews for a sample of 200 arable farms in the East of England region. The sample was stratified to ensure representativeness in terms of geographical distribution and farm size. The farms in the sample are located in the following English counties: Bedfordshire, Hertfordshire, Essex, Cambridgeshire, Norfolk and Suffolk. An initial pilot was conducted on 30 farms in November 2019. After fine tuning the methodology for the telephone interviews, the rest of the data were collected in December 2019. As an incentive to improve the response rate, respondents were entered into a lottery, with a £100 voucher randomly assigned to three of the surveyed farmers.

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Appendix 4. Descriptive statistics

A.4.1. General

Table A.4.1. Descriptive statistics of major demographic characteristics of respondents.

	Age Mean St.Dev.	**Share of male respondents**	**Share of female respondents**	**Share of respondents who completed any agricultural education or training (0-1)**	**Average years of farming experience** Mean St.Dev.
BE	48.84	0.87	0.13	0.81	23.59
	8.61				9.85
BU	55.60	0.97	0.03	0.43	18.07
	11.62				8.71
DE	46.80	0.83	0.17	0.90	
	12.54				
ES	48.85	0.95	0.05	0.76	20.28
	12.51				12.54
FR	43.62	0.88	0.12	0.85	17.38
	9.93				10.36
IT	45.30	0.83	0.17	0.23	17.23
	14.97				14.33
NL	53.12	0.93	0.07	0.91	31.11
	10.34				10.75
PL	43.74	0.91	0.09	0.89	17.63
	11.95				10.99
RO	51.51	0.80	0.20	0.50	20.47
	13.63				12.82
SE	52.04	0.89	0.11	0.81	22.07
	11.10				12.66
UK	56.94	0.97	0.04	0.81	35.60
	12.47				13.97
Total Sample	50.83	0.91	0.09	0.75	25.33
	12.21				13.86

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Table A.4.2. Descriptive statistics of highest completed educational degree of respondents

	What is your highest completed educational degree? Share of respondents given the respective answer					
	Edu_dum1 ... Edu_dum6 refer to case-study-specific educational degrees; in any case study, Edu_dum1 refers to the lowest educational degree (e.g., no education), and Edu_dum6 – to the highest one (e.g., postgraduate degree)					
	Edu_dum1	Edu_dum2	Edu_dum3	Edu_dum4	Edu_dum5	Edu_dum6
BE	0.00	0.01	0.75	0.20	0.05	0.00
BU	0.00	0.00	0.30	0.00	0.70	0.00
DE	0.00	0.10	0.17	0.07	0.67	0.00
ES	0.24	0.33	0.28	0.10	0.06	0.00
FR	0.00	0.00	0.17	0.33	0.45	0.05
IT	0.00	0.07	0.15	0.43	0.35	0.00
NL	0.00	0.00	0.21	0.47	0.27	0.05
PL	0.01	0.03	0.50	0.26	0.20	0.00
RO	0.08	0.15	0.31	0.27	0.08	0.11
SE	0.00	0.02	0.43	0.23	0.19	0.13
UK	0.07	0.09	0.10	0.40	0.32	0.03
Total Sample	0.05	0.08	0.34	0.29	0.22	0.03

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Table A.4.3. Descriptive statistics of succession expectations of respondents

	What is your expectation for the succession of your farm? Share of respondents given the respective answer				
	1 (I have no expectations)	2 (I expect a family member to take over the farm)	3 (I expect to sell the property)	4 (I expect to give up the tenancy)	5 (Other)
BE	0.40	0.26	0.04	0.01	0.29
BU					
DE	0.13	0.47	0.03	0.10	0.27
ES	0.35	0.49	0.05	0.09	0.02
FR	0.14	0.60	0.07	0.05	0.14
IT	0.18	0.42	0.05	0.02	0.33
NL	0.35	0.44	0.14	0.01	0.06
PL					
RO	0.23	0.61	0.07	0.03	0.07
SE	0.38	0.34	0.21	0.00	0.06
UK	0.00	0.71	0.06	0.03	0.21
Total Sample	0.26	0.48	0.07	0.03	0.16

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Table A.4.4. Descriptive statistics related to self-assessment of risk preferences

	How do you see yourself: 0 (not at all willing to take risks) ... 10 (very willing to take risks)	**I am willing to take more risks than other farmers in terms of ... (1 – Strongly disagree ... 7 – strongly agree)**				
	Mean St.Dev.	Mean St.Dev.				
		Production	Marketing and prices	Financial risks	Innovation	Farming in general
BE	5.13	3.77	3.59	3.42	3.63	3.85
	2.23	1.57	1.43	1.56	1.56	1.44
BU	5.62	4.23	3.83	3.37	4.27	4.43
	2.69	1.96	1.60	1.92	1.74	1.63
DE	6.90	4.53	4.40	3.53	4.60	4.17
	2.14	1.55	1.40	1.72	1.59	1.34
ES	4.78	4.23	3.84	2.97	3.74	4.08
	2.76	1.72	1.82	1.87	1.99	1.63
FR	6.34	4.37	3.68	3.07	4.83	4.23
	2.21	1.84	1.68	1.54	1.46	1.31
IT	5.02	4.27	4.00	4.07	5.05	4.83
	2.24	1.54	1.67	1.73	1.66	1.59
NL	6.02	4.22	3.99	4.09	4.26	4.38
	1.88	1.31	1.31	1.40	1.42	1.19
PL	6.01	4.36	4.36	3.79	4.29	4.23
	1.80	1.20	1.25	1.46	1.59	1.63
RO	6.02	4.24	4.07	3.57	3.97	4.43
	2.54	1.78	1.89	2.07	2.02	1.73
SE	6.32	4.51	4.36	4.13	4.89	4.34
	2.42	1.54	1.50	1.65	1.43	1.45
UK	6.12	4.59	4.63	4.36	5.01	4.97
	1.98	1.40	1.32	1.49	1.31	1.20
Total Sample	5.71	4.24	4.05	3.74	4.28	4.36
	2.29	1.56	1.55	1.70	1.69	1.48

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Table A.4.5. Descriptive statistics related to self-assessment of ability to handle with probabilities

	To what extent do you agree or disagree with the following statements? (1 – strongly disagree ... 7 – strongly agree)			
	Mean St.Dev.			
	It is often helpful to see percentages on the weather forecast (e.g. a 45% chance on rain)	I am good in working with percentages	Information expressed using numbers is often useful	If the market price increases with 15%, I am good in figuring out what the new market price will be
BE	5.49	5.12	5.40	5.45
	1.39	1.33	1.36	1.26
BU	5.30	5.53	6.30	5.07
	1.78	1.48	1.02	1.80
DE	5.03	5.33	5.73	6.23
	1.69	1.15	1.11	1.07
ES	5.03	4.63	5.42	5.42
	1.86	1.83	1.72	1.73
FR	5.37	4.88	5.32	5.17
	1.77	1.79	1.47	1.79
IT	5.60	4.50	5.38	5.12
	1.30	1.49	1.26	1.55
NL	5.18	5.21	5.41	5.42
	1.20	1.17	1.21	1.45
PL	5.96	5.91	6.11	6.00
	1.17	0.90	0.89	1.08
RO	5.92	4.71	5.11	5.20
	1.53	1.97	1.91	1.91
SE	4.02	5.32	5.72	6.17
	2.02	1.60	1.31	1.22
UK	5.33	5.75	5.74	5.90
	1.60	1.19	1.09	1.17
Total Sample	5.36	5.18	5.52	5.54
	1.57	1.50	1.39	1.48

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A.4.2. Farm characteristics

Table A.4.6. Descriptive statistics of agricultural specialisation

	What is your main agricultural specialisation? Share of respondents given the respective answer							
	1 (Crops)	2 (Horticulture)	3 (Dairy)	4 (Specialist pig)	5 (Specialist poultry)	6 (Other grazing livestock)	7 (Mixed activities)	8 (Other)
BE	0.00	0.00	0.68	0.01	0.00	0.00	0.30	0.00
BU	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.10
DE	0.33	0.00	0.27	0.03	0.00	0.10	0.13	0.13
ES	0.00	0.00	0.03	0.00	0.00	0.46	0.51	0.00
FR	0.00	0.00	0.00	0.00	0.00	0.00	0.45	0.55
IT	0.03	0.03	0.00	0.00	0.00	0.05	0.12	0.77
NL	0.19	0.03	0.62	0.01	0.02	0.06	0.04	0.01
PL	0.63	0.37	0.00	0.00	0.00	0.00	0.00	0.00
RO	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
SE	0.06	0.00	0.00	0.00	0.00	0.00	0.04	0.89
UK	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Sample	0.29	0.03	0.25	0.00	0.00	0.06	0.26	0.11

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Table A.4.7. Descriptive statistics of production systems

	Is your farm conventional or organic? Share of respondents given the respective answer			
	1 (Conventional)	2 (Organic)	3 (Converting)	4 (Other)
BE	0.99	0.01	0.00	0.00
BU	0.97	0.03	0.00	0.00
DE	0.73	0.20	0.03	0.03
ES	1.00	0.00	0.00	0.00
FR	0.79	0.17	0.02	0.02
IT	0.77	0.17	0.03	0.03
NL	0.94	0.04	0.01	0.01
PL	0.90	0.10	0.00	0.00
RO	0.92	0.08	0.00	0.00
SE	0.72	0.19	0.00	0.09
UK	0.97	0.01	0.01	0.03
Total Sample	0.93	0.05	0.01	0.01

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Table A.4.8. Descriptive statistics of legal forms

	Which legal form is most applicable to your farm? Share of respondents given the respective answer						
	Legal1 ... Legal7 refer to case-study-specific legal forms						
	Legal1	Legal2	Legal3	Legal4	Legal5	Legal6	Legal7
BE	0.69	0.23	0.00	0.00	0.00	0.00	0.08
BU	0.27	0.20	0.27	0.27	0.00	0.00	0.00
DE	0.53	0.30	0.10	0.07	0.00	0.00	0.00
ES	0.78	0.14	0.03	0.00	0.02	0.00	0.03
FR	0.21	0.21	0.50	0.05	0.00	0.02	0.00
IT	0.65	0.00	0.32	0.02	0.02	0.00	0.00
NL	0.27	0.58	0.11	0.04	0.01	0.00	0.00
PL	0.99	0.00	0.00	0.00	0.01	0.00	0.00
RO	0.84	0.12	0.03	0.00	0.00	0.00	0.00
SE	0.30	0.60	0.11	0.00	0.00	0.00	0.00
UK	0.06	0.78	0.09	0.06	0.03	0.00	0.00
Total Sample	0.50	0.35	0.09	0.03	0.01	0.00	0.02

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Table A.4.9. Descriptive statistics of farm sizes and land uses

	Farm size in hectares				
	Mean St.Dev.				
	Total size	Share of arable land	Share of pastures	Share of owned land	Share of rented land
BE	59.87	0.56	0.44	0.37	0.63
	34.49	0.19	0.19	0.23	0.23
BU	1708.96	0.99	0.01	0.19	0.81
	1672.03	0.03	0.03	0.22	0.22
DE	493.60	0.78	0.22	0.46	0.54
	585.19	0.26	0.26	0.33	0.33
ES	337.07	0.52	0.48	0.34	0.66
	560.39	0.25	0.25	0.32	0.32
FR	218.64	0.58	0.42	0.36	0.64
	118.33	0.27	0.27	0.33	0.33
IT	46.56	0.76	0.24	0.62	0.38
	97.03	0.28	0.28	0.36	0.36
NL	75.15	0.35	0.65	0.77	0.23
	81.63	0.39	0.39	0.26	0.26
PL	27.60	0.93	0.07	0.89	0.11
	72.70	0.11	0.11	0.21	0.21
RO	6.87	0.67	0.33	0.65	0.35
	10.58	0.37	0.37	0.39	0.39
SE	162.20	0.86	0.14	0.81	0.19
	235.48	0.25	0.25	0.28	0.28
UK	465.81	0.95	0.05	0.70	0.30
	601.10	0.09	0.09	0.33	0.33
Total Sample	221.02	0.67	0.33	0.58	0.42
	522.92	0.34	0.34	0.36	0.36

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Table A.4.10. Descriptive statistics of labour use and livestock amount

	What is the average number of workers on your farm? Please express in full time equivalents (FTE). A FTE corresponds to 8 working hours for each working day of the year.				How much livestock do you keep on your farm for commercial usage?		
	On-farm (family) labour Mean St.Dev.	On-farm (family) labour per ha Mean St.Dev.	Hired workers Mean St.Dev.	Hired workers per ha Mean St.Dev.	Share of farms having livestock	Number of LSU per farm Mean St.Dev.	Number of LSU per ha Mean St.Dev.
BE	1.61 0.90	0.03 0.02	0.37 0.82	0.01 0.02	1.00	122.87 178.12	2.43 4.44
BU	2.00 4.16	0.00 0.00	10.83 8.06	0.01 0.00	0.10	52.31 255.65	0.03 0.12
DE	1.82 2.13	0.02 0.04	5.76 9.97	0.01 0.01	0.67	191.13 330.72	0.54 1.09
ES	0.65 0.59	0.01 0.02	0.41 0.69	0.00 0.00	1.00	55.04 98.33	0.76 3.00
FR	1.33 1.24	0.01 0.01	0.61 1.31	0.00 0.00	1.00	192.95 402.07	0.98 2.38
IT	232.15 202.07	16.94 18.34	208.79 185.84	7.78 11.57	0.20	6.57 25.32	0.10 0.32
NL	1.88 7.86	0.04 0.20	1.18 4.14	0.15 1.83	0.77	127.76 213.02	3.04 11.96
PL	2.40 1.08	0.24 0.18	2.84 13.21	0.07 0.12	0.76	0.66 2.14	0.05 0.15
RO	1.04 0.69	0.31 0.38	0.10 0.35	0.01 0.04	1.00	6.16 9.97	1.26 1.66
SE	0.97 2.14	0.03 0.09	5.55 11.14	0.22 0.53	0.98	817.16 898.38	35.86 79.69
UK	0.52 0.82	0.00 0.01	3.39 5.99	0.01 0.02	0.21	72.99 238.08	0.24 1.09
Total Sample	12.63 66.85	0.90 5.44	8.13 47.89	0.28 2.50	0.73	112.73 304.33	2.74 18.04

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A.4.3. Challenges

Table A.4.11. Descriptive statistics of perception of major challenges (Part I)

	Considering the next 20 years, to what extent do you think that the following events will be challenging for your farm? Please circle your answer on a scale of 1 (not challenging at all for my farm) to 7 (very challenging for my farm).					
	Mean St.Dev.					
	Persistently high input prices (e.g. fertiliser, feed, seed)	Input price fluctuations (e.g. fertiliser, feed, seed)	Persistently low market prices	Market price fluctuations	Low bargaining power towards processors and retailers	Low bargaining power towards input suppliers
BE	4.81	4.73	5.55	5.38	5.21	4.55
	1.46	1.44	1.41	1.40	1.56	1.60
BU	4.80	5.07	4.93	5.03	4.37	3.57
	1.95	1.84	2.20	1.67	2.30	2.19
DE	4.50	3.97	5.17	4.43	4.77	4.27
	1.53	1.47	1.91	1.68	1.91	1.46
ES	5.81	4.91	6.11	5.30	5.15	5.33
	1.48	1.85	1.39	1.63	1.58	1.49
FR	4.52	4.33	4.90	5.18	4.64	4.51
	1.86	1.82	1.59	1.55	1.91	1.86
IT	4.62	4.58	5.38	5.20	5.10	4.70
	1.39	1.46	1.49	1.38	1.61	1.72
NL	4.26	4.19	4.66	4.71	4.77	3.93
	1.44	1.42	1.57	1.34	1.62	1.51
PL	5.74	5.11	6.21	5.69	5.87	5.20
	1.30	1.55	1.14	1.31	1.17	1.41
RO	5.25	4.76	5.48	4.98	4.88	4.39
	1.84	1.92	2.04	1.87	2.27	2.34
SE	5.45	5.09	5.60	5.02	5.60	5.06
	1.59	1.47	1.51	1.55	1.58	1.59
UK	5.76	5.12	5.77	5.31	5.27	5.12
	1.25	1.25	1.15	1.04	1.51	1.36
Total Sample	5.10	4.74	5.48	5.16	5.10	4.65
	1.60	1.58	1.58	1.46	1.71	1.72

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Table A.4.12. Descriptive statistics of perception of major challenges (Part II)

	Considering the next 20 years, to what extent do you think that the following events will be challenging for your farm? Please circle your answer on a scale of 1 (not challenging at all for my farm) to 7 (very challenging for my farm). Mean St.Dev.						
	Limited access to loans from banks	Late payments from buyers	Persistent extreme weather events (e.g. floods, droughts, frost)	Pest, weed, or disease outbreaks	Low soil quality	Limited availability of skilled farm workers	Limited ability to work on the farm due to illness, divorce or other circumstances
BE	3.86	3.70	5.07	4.64	3.93	2.71	3.74
	1.74	1.75	1.39	1.53	1.69	1.72	1.83
BU	3.07	4.33	6.37	6.00	5.50	5.03	2.97
	2.00	2.02	1.43	1.76	2.11	2.34	2.30
DE	3.23	2.80	4.73	3.57	3.67	4.23	4.03
	1.83	1.56	1.72	1.61	1.79	1.91	1.47
ES	3.43	4.00	5.28	5.08	3.76	4.46	4.43
	2.10	1.98	1.78	1.77	1.81	2.28	2.19
FR	3.37	3.32	5.83	5.12	4.05	4.00	4.17
	1.77	1.94	1.53	1.66	1.85	2.11	1.89
IT	4.07	3.48	5.12	5.30	3.78	3.20	3.07
	1.73	1.94	1.78	1.52	1.86	1.77	1.87
NL	4.15	3.15	4.40	4.03	4.20	3.52	2.91
	1.67	1.66	1.42	1.50	1.73	1.83	1.46
PL	3.04	4.69	5.86	5.49	4.33	4.43	4.16
	1.52	1.53	1.22	1.50	1.93	2.20	1.89
RO	2.69	2.50	5.55	4.80	4.08	4.16	4.43
	2.25	2.03	1.60	1.93	1.84	2.51	2.25
SE	4.00	3.36	5.04	4.62	2.79	4.81	3.83
	1.94	1.86	1.61	1.64	1.69	1.73	2.05
UK	3.90	3.90	4.93	5.04	3.73	4.76	4.04
	1.57	1.57	1.43	1.34	1.54	1.75	1.71
Total Sample	3.65	3.56	5.11	4.78	3.93	3.92	3.80
	1.86	1.85	1.57	1.65	1.79	2.11	1.94

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Table A.4.13. Descriptive statistics of perception of major challenges (Part III)

	Considering the next 20 years, to what extent do you think that the following events will be challenging for your farm? Please circle your answer on a scale of 1 (not challenging at all for my farm) to 7 (very challenging for my farm).						
	Mean St.Dev.						
	Strict regulations (e.g. environmental, animal welfare, or competition)	Reduction in direct payments of the Common Agricultural Policy (CAP)	Public distrust in agriculture	Low societal acceptance of agriculture	Others (CS-specific challenge)	Others (CS-specific challenge)	Others (CS-specific challenge)
BE	5.38	5.11	5.07	5.11			
	1.40	1.55	1.58	1.60			
BU	3.43	4.87	3.63	3.70			
	1.94	2.43	2.27	2.09			
DE	5.73	4.47	4.93	5.00	3.60		
	1.46	2.00	1.86	1.84	1.85		
ES	5.34	6.18	5.43	5.27	4.83	4.28	5.69
	1.75	1.35	1.53	1.80	1.75	2.38	1.92
FR	4.57	5.93	4.90	4.68	3.63	5.44	5.90
	2.07	1.11	1.76	1.89	2.05	1.45	1.28
IT	3.58	4.10	3.77	3.65	3.73	4.42	4.62
	1.85	2.10	2.02	2.15	2.07	2.13	2.06
NL	5.33	4.61	4.92	4.75	3.56	4.69	
	1.56	1.75	1.52	1.63	2.01	1.78	
PL	4.19	4.41	3.17	3.33	4.69	5.29	4.33
	1.79	1.73	1.76	1.67	1.68	2.04	1.77
RO	3.52	5.43	3.63	3.09	4.52	2.67	3.96
	2.09	2.26	2.19	2.04	2.17	2.33	2.31
SE	5.49	3.21	4.19	4.60			
	1.60	1.86	1.86	1.95			
UK	5.25	5.53	5.53	4.88	5.85	4.92	
	1.46	1.58	1.31	1.65	1.26	1.58	
Total Sample	4.91	5.08	4.74	4.54	4.55	4.42	4.81
	1.81	1.87	1.84	1.91	2.01	2.15	2.13

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Table A.4.14. Descriptive statistics of bad and good years expectations

	In a bad year, your yearly gross farm income is at least 30% lower than you expected.		In a good year, your yearly gross farm income is at least 30% higher than you expected.	
	How likely do you think it is that next year will be a bad year for your farm?	How likely do you think it is that your farm will face one or more bad year(s) in the coming 10 years?	How likely do you think it is that next year will be a good year for your farm?	How likely do you think it is that your farm will face one or more good year(s) in the coming 10 years?
	Mean St.Dev.	Mean St.Dev.	Mean St.Dev.	Mean St.Dev.
BE	43.97 18.41	56.40 23.27	39.50 18.83	48.33 23.05
BU				
DE	40.62 20.19	75.17 24.33	39.24 19.28	70.00 23.11
ES	36.85 20.32	62.00 28.98	47.42 24.44	62.55 31.19
FR	44.23 24.43	47.76 21.89	39.08 21.65	43.95 19.00
IT	39.40 14.05	48.26 18.13	48.19 15.78	52.67 16.39
NL	34.25 19.43	52.91 25.41	54.28 19.94	64.26 20.43
PL				
RO	41.87 21.41	50.03 27.79	48.37 23.56	58.24 26.71
SE	37.55 28.34	44.57 28.96	47.34 30.32	60.04 27.35
UK	48.10 17.92	73.55 20.25	51.60 17.35	73.50 19.79
Total Sample	41.29 20.26	58.23 26.11	47.39 21.35	60.27 25.03

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A.4.4. Essential functions

Table A.4.15. Descriptive statistics related to essential functions

	Distribute a total of 100 points between 9 potential functions of your farm. The more points you distribute to a function, the more important the function is for your farm.								
	Mean St.Dev.								
	Deliver high quality food products	Deliver bio-based resources (e.g. hemp, wood) to produce biomass and biofuels	Ensure a sufficient farm income	Provide employment and good working conditions for my employees	Maintain natural resources (e.g. water, air, soil) in good condition	Protect biodiversity	Ensure the attractiveness of rural areas in terms of agro-tourism and residence	Ensure animal welfare	Others
BE	26.88	0.81	34.67	2.61	10.98	5.16	3.16	13.40	2.34
	16.06	3.18	21.83	5.72	10.67	6.51	5.34	10.59	8.82
BU	14.50	1.17	48.58	16.57	9.55	5.05	3.28	1.29	0.00
	16.89	3.47	21.90	9.33	10.28	8.60	6.76	4.49	0.00
DE	19.70	5.67	31.20	10.83	13.43	7.20	3.80	6.83	1.33
	12.23	10.22	21.07	8.02	8.88	6.46	4.59	8.27	4.54
ES	17.92	1.07	40.71	6.01	9.37	6.31	3.13	14.62	0.85
	12.23	6.42	22.86	9.92	7.06	6.86	5.68	9.84	3.95
FR	17.64	4.70	22.91	6.33	14.40	10.45	7.83	13.66	2.09
	8.54	6.10	13.16	6.85	7.17	6.04	7.06	6.99	8.61
IT	36.67	5.33	23.25	12.07	8.23	7.32	2.98	3.32	0.83
	26.10	7.36	18.20	11.85	11.86	8.91	7.26	6.48	5.30
NL	21.85	2.95	34.02	4.54	13.01	7.27	5.44	10.09	0.82
	16.55	5.77	18.85	7.91	12.41	6.99	5.82	9.31	4.49
PL	23.17	0.78	44.26	7.90	11.17	5.71	2.56	2.94	1.51
	14.24	2.49	20.68	7.93	7.58	5.28	4.52	5.68	6.94
RO	33.66	2.42	15.96	2.61	11.74	7.57	1.71	23.51	0.82
	20.56	6.63	15.89	6.41	13.01	8.55	4.07	18.60	9.05
SE	28.85	1.39	25.54	11.48	8.59	4.30	2.17	15.07	2.61
	15.64	3.71	17.23	9.13	8.48	5.33	4.15	11.55	14.97
UK	25.68	2.06	30.48	10.44	11.18	9.49	5.63	4.82	0.23
	14.08	4.21	14.40	9.13	5.93	5.72	5.25	7.15	2.85
Total Sample	25.13	2.13	31.89	6.61	11.18	7.02	3.92	10.94	1.17
	17.13	5.44	20.49	8.97	10.00	7.01	5.65	11.99	6.90

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A.4.5. Resilience capacities and attributes

Table A.4.16. Descriptive statistics of self-assessment of capacity of robustness

	To what extent do you agree or disagree with the following statements? Please circle your answer on a scale of 1 (strongly disagree) to 7 (strongly agree). Mean St.Dev.			
	Robustness			
	After something challenging has happened, it is easy for my farm to bounce back to its current profitability	As a farmer, it is hard to manage my farm in such a way that it recovers quickly from shocks	Personally I find it easy to get back to normal after a set back	A big shock will not heavily affect me, as I have enough options to deal with this shock on my farm
BE	3.49	4.16	3.50	3.15
	1.44	1.62	1.47	1.46
BU		2.90		
		2.01		
DE	3.90	3.83	4.30	4.20
	1.63	1.60	1.47	1.77
ES	3.16	4.44	3.36	3.22
	1.44	1.60	1.69	1.73
FR	4.33	4.33	4.31	3.83
	1.56	1.54	1.72	1.85
IT	3.90	3.85	3.73	3.50
	1.40	1.51	1.42	1.70
NL	4.36	4.09	4.62	4.09
	1.39	1.49	1.40	1.46
PL		4.34		
		1.63		
RO	3.52	4.13	3.71	3.31
	1.64	1.92	1.75	2.00
SE	3.94	3.81	3.89	3.40
	1.63	1.47	1.64	1.72
UK	4.20	4.18	4.28	4.17
	1.37	1.40	1.26	1.48
Total Sample	3.84	4.12	3.95	3.64
	1.52	1.61	1.56	1.67

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Table A.4.17. Descriptive statistics of self-assessment of capacity of adaptability

	To what extent do you agree or disagree with the following statements? Please circle your answer on a scale of 1 (strongly disagree) to 7 (strongly agree). Mean St.Dev.			
	Adaptability			
	If needed, my farm can adopt new activities, varieties, or technologies in response to challenging situations	As a farmer, I can easily adapt myself to challenging situations	In times of change, I am good at adapting myself and facing up to agricultural challenges	My farm is not flexible and can hardly be adjusted to deal with a changing environment
BE	2.70	3.01	3.35	4.02
	1.50	1.48	1.43	1.70
BU		4.70	4.47	2.43
		1.74	1.83	1.65
DE	3.43	4.03	4.57	3.33
	1.89	1.59	1.43	1.58
ES	3.48	3.63	3.89	4.00
	1.79	1.53	1.52	1.71
FR	4.40	4.21	4.33	3.81
	2.21	1.93	1.76	1.88
IT	4.17	4.47	4.60	3.95
	1.60	1.56	1.48	1.76
NL	3.75	4.65	4.72	3.26
	1.67	1.34	1.24	1.50
PL		3.19	3.59	3.84
		1.37	1.48	1.53
RO	3.45	4.11	4.55	3.52
	1.95	1.89	1.72	1.98
SE	3.62	3.83	4.62	3.70
	1.69	1.70	1.55	1.64
UK	4.61	4.94	5.01	3.28
	1.52	1.31	1.17	1.54
Total Sample	3.66	4.05	4.29	3.61
	1.80	1.67	1.55	1.70

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Table A.4.18. Descriptive statistics of self-assessment of capacity of transformability

	To what extent do you agree or disagree with the following statements? Please circle your answer on a scale of 1 (strongly disagree) to 7 (strongly agree).			
	Mean St.Dev.			
	Transformability			
	For me, it is easy to make decisions that result in a transformation	I am in trouble if external circumstances would drastically change, as it is hard to reorganise my farm	After facing a challenging period on my farm, I still have the ability to radically reorganise my farm	If needed, I can easily make major changes that would transform my farm
BE	2.64	4.34	2.86	2.70
	1.53	1.92	1.42	1.46
BU	4.57	3.60	4.77	4.47
	1.94	2.06	1.87	1.85
DE	4.50	3.70	4.23	3.93
	1.72	1.68	1.48	1.72
ES	3.85	4.51	3.98	3.56
	1.88	1.71	1.87	1.77
FR	4.45	3.51	4.08	4.20
	1.92	1.73	1.80	1.86
IT	4.43	4.27	4.42	4.47
	1.57	1.68	1.52	1.63
NL	3.96	3.77	4.11	3.84
	1.47	1.41	1.42	1.54
PL	3.59	3.51	3.59	3.47
	1.54	1.39	1.30	1.44
RO	4.43	3.85	4.35	4.17
	1.97	1.97	1.89	2.05
SE	3.98	4.19	3.47	3.38
	1.76	1.76	1.56	1.71
UK	4.52	3.97	4.43	4.17
	1.32	1.41	1.37	1.50
Total Sample	3.89	4.02	3.91	3.70
	1.75	1.70	1.65	1.73

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Table A.4.19. Descriptive statistics of self-assessment of involvement in networks

	To what extent do the following statements apply to you? Please circle your answer on a scale of 1 (does not apply to me at all) to 7 (strongly applies to me).					
	Mean St.Dev.					
	I know a lot of other farmers in my region	Concerning farming, I often interact with neighbouring farmers	Farmers in my region tend to support each other when there is a problem	I know a lot of agricultural professionals, experts, or value chain actors	When I attend agricultural events and meetings, I interact a lot with professionals, experts, or value chain actors	I feel I can receive support from agricultural professionals, experts, or value chain actors in my network
BE	5.20	4.40	3.41	4.34	3.96	4.00
	1.38	1.61	1.38	1.49	1.47	1.49
BU	6.27	4.53	3.97	6.07	5.63	5.17
	1.20	2.16	2.37	1.11	1.56	1.95
DE	5.93	5.13	4.47	5.67	5.30	4.83
	0.98	1.59	1.28	1.37	1.64	1.46
ES	5.73	5.52	4.81	5.39	5.07	5.38
	1.40	1.40	1.70	1.49	1.64	1.50
FR	6.14	5.86	3.74	5.19	4.79	4.54
	1.07	1.47	1.98	1.78	1.63	1.78
IT	5.27	5.27	4.18	5.03	5.28	5.30
	1.45	1.48	1.63	1.40	1.51	1.46
NL	5.56	4.99	4.28	4.89	4.46	4.59
	1.19	1.42	1.48	1.34	1.37	1.43
PL	5.81	5.34	4.00	4.96	4.63	4.54
	1.34	1.57	1.69	1.70	1.77	1.64
RO	6.12	5.47	5.00	4.33	4.11	4.41
	1.25	1.71	1.72	1.95	2.19	2.21
SE	5.43	4.43	4.87	5.51	4.96	5.32
	1.79	1.73	1.81	1.54	1.85	1.43
UK	5.55	5.29	5.30	5.39	5.16	5.34
	1.32	1.34	1.33	1.24	1.40	1.24
Total Sample	5.61	5.07	4.40	4.96	4.65	4.76
	1.36	1.59	1.70	1.56	1.68	1.64

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Table A.4.20. Descriptive statistics of self-assessment of openness to innovation

	To what extent do the following statements apply to you? Please circle your answer on a scale of 1 (does not apply to me at all) to 7 (strongly applies to me).	
	Mean St.Dev.	
	Compared to other farmers, I am among the first to try out a new practice on my farm	I like to try out all kinds of new technologies or varieties
BE	3.41 1.67	3.30 1.60
BU	4.60 1.75	5.00 1.86
DE	4.23 1.91	4.30 1.80
ES	4.08 1.86	3.85 1.92
FR	5.00 1.71	5.07 1.69
IT	4.63 1.54	4.97 1.67
NL	4.03 1.47	3.88 1.51
PL	4.10 1.47	4.71 1.38
RO	3.51 1.95	4.07 2.18
SE	4.94 1.29	4.91 1.19
UK	4.43 1.53	4.54 1.47
Total Sample	4.06 1.71	4.14 1.75

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Table A.4.21. Descriptive statistics of self-assessment of capacity to cope with agricultural challenges

	To what extent do you agree or disagree with the following statements? Please circle your answer on a scale of 1 (strongly disagree) to 7 (strongly agree).							
	Mean St.Dev.							
	If I wanted to, it would be easy for me to deal with agricultural challenges on my farm	It is mostly up to me whether or not I can deal with the challenges on my farm	I have a lot of control about agricultural challenges affecting my farm	For me, it is difficult to deal with the challenges that affect my farm	I know a lot about agricultural challenges on my farm	If I consider the last 5 years, my farm has often experienced negative consequences of agricultural challenges	For the next 5 years, I expect my farm to be resilient to agricultural challenges	For the next 20 years, I expect my farm to be resilient to agricultural challenges
BE	3.60	4.18	3.29	4.03	4.14	4.16	3.75	3.57
	1.38	1.50	1.48	1.39	1.32	1.71	1.40	1.48
BU	4.90	4.87	4.43	2.40	5.47	3.50	5.50	5.07
	1.67	2.05	1.83	1.59	1.48	2.16	1.36	1.39
DE	5.07	5.47	5.27	3.07	5.57	4.50	5.27	4.97
	1.26	1.17	1.14	1.53	1.36	1.55	1.36	1.50
ES	4.01	5.24	4.63	3.87	4.73	4.08	5.66	5.02
	1.51	1.51	1.48	1.75	1.63	1.70	1.34	1.61
FR	4.42	5.60	5.13	2.73	5.42	4.03	5.08	4.60
	1.73	1.72	1.34	1.62	1.62	1.80	1.19	1.54
IT	4.22	4.23	4.27	3.53	4.97	3.98	4.67	4.53
	1.38	1.44	1.40	1.32	1.38	1.59	1.17	1.46
NL	4.74	4.65	3.94	3.28	4.81	3.58	5.09	4.52
	1.08	1.50	1.36	1.31	1.21	1.77	1.26	1.42
PL	3.49	3.70	3.33	3.71	4.87	4.37	4.44	4.14
	1.58	1.51	1.35	1.38	1.14	1.53	1.39	1.64
RO	4.80	5.40	4.90	3.75	5.23	4.48	5.25	4.84
	1.75	1.58	1.68	2.03	1.51	1.71	1.24	1.72
SE	4.51	4.81	4.45	3.21	5.02	3.70	4.89	4.85
	1.16	1.73	1.53	1.64	1.54	1.86	1.39	1.43
UK	4.48	5.79	3.87	4.30	5.30	4.27	4.45	4.43
	1.29	1.20	1.72	1.37	1.22	1.53	1.35	1.31
Total Sample	4.28	4.89	4.07	3.71	4.88	4.08	4.73	4.42
	1.48	1.62	1.63	1.59	1.42	1.71	1.46	1.56

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A.4.6. Strategies

Table A.4.22. Descriptive statistics of implemented on-farm risk management strategies (Part I)

	Share of farms that have been implementing the following risk management strategies in the last 5 years? Share of respondents given the respective answer						
	Maintained financial savings for hard times	Had low debts or no debts at all to prevent financial risks	Invested in technologies (e.g. irrigation or hail nets) to control environmental risks	Implemented measures to prevent pests or diseases (e.g. strict hygiene rules)	Worked harder to secure production in hard times	Had an off-farm job (either myself or a family member)	Used market information to plan my farm activities for the next season
BE	0.51	0.27	0.04	0.22	0.51	0.22	0.25
BU	0.43	0.47	0.43	0.63	0.37	0.27	0.77
DE	0.50	0.37	0.13	0.23	0.37	0.37	0.17
ES	0.61	0.57	0.48	0.77	0.63	0.40	0.32
FR	0.43	0.36	0.12	0.69	0.33	0.12	0.21
IT	0.68	0.25	0.18	0.23	0.30	0.22	0.32
NL	0.62	0.46	0.12	0.23	0.32	0.33	0.23
PL	0.37	0.30	0.47	0.40	0.50	0.53	0.46
RO	0.51	0.57	0.39	0.70	0.83	0.53	0.43
SE	0.45	0.36	0.26	0.77	0.40	0.43	0.32
UK	0.70	0.70	0.72	0.88	0.83	0.33	0.84
Total Sample	0.56	0.46	0.32	0.51	0.55	0.34	0.41

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Table A.4.23. Descriptive statistics of implemented on-farm risk management strategies (Part II)

	Share of farms that have been implementing the following risk management strategies in the last 5 years? Share of respondents given the respective answer							
	Diversified in production (e.g. mixed livestock and crop farming or a combination of several crops or animals)	Diversified in other activities on my farm (e.g. agri-tourism, on-farm sales, nature conservation, or renewable energies)	Improved cost flexibility (e.g. renting land instead of buying, temporal labour contracts instead of permanent contracts)	Improved flexibility in the timing of my production (e.g. to deal with seasonality)	Opened up my farm to the public (e.g. open farm days)	Others (CS-specific risk management strategies)	Others (CS-specific risk management strategies)	Others (CS-specific risk management strategies)
BE	0.19	0.20	0.13	0.04	0.10	0.23	0.00	0.00
BU	0.40	0.13	0.27	0.47	0.20	0.00	0.00	0.00
DE	0.57	0.33	0.17	0.07	0.40	0.03	0.03	0.03
ES	0.30	0.11	0.21	0.44	0.13	0.18	0.29	0.27
FR	0.57	0.45	0.17	0.17	0.14	0.86	0.31	0.55
IT	0.25	0.17	0.12	0.20	0.17	0.33	0.42	
NL	0.15	0.32	0.15	0.14	0.12	0.06	0.08	
PL	0.44	0.37	0.07	0.36	0.27	0.01	0.00	0.00
RO	0.47	0.20	0.22	0.14	0.01	0.02	0.02	0.01
SE	0.23	0.26	0.23	0.34	0.23			
UK	0.56	0.72	0.61	0.73	0.16			
Total Sample	0.34	0.32	0.24	0.29	0.14	0.16	0.10	0.09

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Table A.4.24. Descriptive statistics of implemented risk-sharing strategies (Part I)

	Share of farms that have been implementing the following risk management strategies in the last 5 years? Share of respondents given the respective answer					
	Cooperated with other farmers to secure inputs or production (e.g. buy inputs together or share machinery with other farmers)	Member of a producer organisation, cooperative or credit union	Member of an (inter)branch organisation (e.g. collaborate with value chain actors such as processors, retailers, and technology providers)	Had access to a variety of input suppliers (e.g. feed, seed, fertiliser, or finance suppliers)	Learned about challenges in agriculture (e.g. farmer group, consultant, or agricultural training)	Bought any type of agricultural insurance
BE	0.20	0.38	0.00	0.49	0.20	0.03
BU	0.17	0.43	0.17	0.53	0.43	0.40
DE	0.63	0.53	0.13	0.53	0.57	0.67
ES	0.24	0.53	0.08	0.30	0.63	0.78
FR	0.86	0.38	0.07	0.67	0.24	0.50
IT	0.25	0.70	0.20	0.32	0.43	0.32
NL	0.46	0.59	0.15	0.52	0.51	0.19
PL	0.00	0.44	0.13	0.20	0.76	0.23
RO	0.48	0.23	0.07	0.52	0.53	0.07
SE	0.43	0.53	0.68	0.51	0.36	0.72
UK	0.55	0.65	0.36	0.68	0.70	0.39
Total Sample	0.37	0.50	0.16	0.50	0.49	0.30

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Table A.4.25. Descriptive statistics of implemented risk-sharing strategies (Part II)

	Share of farms that have been implementing the following risk management strategies in the last 5 years? Share of respondents given the respective answer				
	Used production or marketing contracts to sell (part of) my production	Hedged (part of) my production with futures contracts	Others (CS-specific risk management strategies)	Others (CS-specific risk management strategies)	Others (CS-specific risk management strategies)
BE	0.21	0.03	0.17	0.00	0.00
BU	0.40	0.17	0.03	0.03	0.03
DE	0.50	0.07	0.03	0.00	0.00
ES	0.14	0.00	0.21	0.11	0.32
FR	0.43	0.67	0.38	0.07	0.21
IT	0.05	0.07	0.17		
NL	0.17	0.05			
PL	0.29	0.20	0.04	0.00	0.00
RO	0.20	0.01			
SE	0.36	0.30			
UK	0.57	0.58			
Total Sample	0.28	0.18	0.16	0.03	0.09

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Appendix 5. Revealing case-study-specific options

A.5.1. Belgium

Question	Options
Case-study-specific options predefined by researchers	
On-farm strategies	2.13: Experimenting with precision farming and smart farming 2.14: - 2.15: -
Risk-sharing strategies	2.24: Cooperation with other dairy farmers, e.g. sharing machinery, manure, crop rotation 2.25: - 2.26: -
Challenges	5.18: - 5.19: - 5.20: -
Open options added by respondents (only reported if exceed 5% in total)	
Specialisation	1.2:-
Other livestock	1.3.12: - 1.3.13: -
Conventional or organic	1.4: -
Other functions	4.9: -
Succession others	13.3: Don't know at this stage

A.5.2. Bulgaria

Question	Options
Case-study-specific options predefined by researchers	
On-farm strategies	2.13: Opened up my farm to the public (e.g. open farm days) 2.14: -

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	2.15: -
Risk-sharing strategies	2.24: Export part of the production by market derivate
	2.25:
	2.26:
Challenges	5.18: Reduction in direct payments of the Common Agricultural Policy (CAP)
	5.19: Public distrust in agriculture
	5.20: Low societal acceptance of agriculture
Open options added by respondents (only reported if exceed 5% in total)	
Specialisation	1.2:crops 100%, (wheat)
Other livestock	1.3.12:
	1.3.13:
Conventional or organic	1.4:
Other functions	4.9:
Succession others	13.3:

A.5.3. France

A.5.4. Germany

Question	Options
Case-study-specific options predefined by researchers	
On-farm strategies	2.13: -
	2.14: -
	2.15: -
Risk-sharing strategies	2.24: -
	2.25: -
	2.26: -
Challenges	5.18: Limited availability of high-qualified workforce (management level, succession farm management)
	5.19: -

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	5.20: -
Open options added by respondents (only reported if exceed 5% in total)	
Specialisation	1.2:
Other livestock	1.3.12: calves (breed) 1.3.13: suckler cows
Conventional or organic	1.4:
Other functions	4.9:
Succession others	13.3: I expect that a suitable person will be found to take over the management of the farm.

A.5.5. Italy

Question	Options
Case-study-specific options predefined by researchers	
On-farm strategies	2.13: Active defence against weather events and wild animals (e.g., anti-hail net, fences protecting from wild boars) 2.14: Using different hazelnut cultivars 2.15: -
Risk-sharing strategies	2.24: Selling contracts with PO's to stabilise farm-gate selling prices 2.25: - 2.26: -
Challenges	5.18: Decrease in ground water availability 5.19: The arrival of the so-called Asian Bug (Halyomorpha Halys) 5.20: The Turkish market
Open options added by respondents (only reported if exceed 5% in total)	
Specialisation	1.2: 77% is specialised in hazelnut production, whereas the remaining 23% is predominantly "mixed farm" (i.e., 12%).
Other livestock	1.3.12: - 1.3.13: -
Conventional or organic	1.4: -

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Other functions	4.9: -
Succession others	13.3: 33% in total, mainly "Further business development" (i.e., performing some on-farm transformation) (35%), "Improve the business" (15%), and "Continuing managing the farm" (15%).

A.5.6. Netherlands

Question	Options
Case-study-specific options predefined by researchers	
On-farm strategies	2.13: - 2.14: - 2.15: -
Risk-sharing strategies	2.24: - 2.25: - 2.26: -
Challenges	5.18: - 5.19: - 5.20: -
Open options added by respondents (only reported if exceed 5% in total)	
Specialisation	1.2: -
Other livestock	1.3.12: - 1.3.13: -
Conventional or organic	1.4: -
Other functions	4.9: 5.9% in total, out of which farmer's well-being (27.3%) and societal acceptance of farming (18%) dominate
Succession others	13.3: 5.4% in total, out of which farm being recently taken over (50%) dominates

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A.5.7. Poland

During the interviews and conversations advisers, experts and farmers indicated that the main reason for such reluctance to provide information is a big dissatisfaction about the current situation in the industry.

Question	Options
Case-study-specific options predefined by researchers	
On-farm strategies	2.13: - 2.14: - 2.15: -
Risk-sharing strategies	2.24: - 2.25: - 2.26: -
Challenges	5.18: - 5.19: - 5.20: - 5.21.1: Problems with improvement of the structure of Polish farms 5.21.2: Lack of seasonal workers 5.21.3: Lack of successors 5.21.4: Deficit of organic matter in the soil 5.21.5: Protests against intensive poultry farms 5.21.6: New regulations on biofuels Lower payments 5.21.7: Lower payments
Open options added by respondents (only reported if exceed 5% in total)	
Specialisation	1.2: -
Other livestock	1.3.12: - 1.3.13: -
Conventional or organic	1.4: -
Other functions	4.9: -
Succession others	13.3: -

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A.5.8. Romania

Question	Options
Case-study-specific options predefined by researchers	
On-farm strategies	2.13: Spouse / children working abroad part of the year 2.14: Providing services outside the farm 2.15: Accessed support measures from NRDP
Risk-sharing strategies	2.24: - 2.25: - 2.26: -
Challenges	5.18: Low intention of cooperation 5.19: Diminishing amounts of money (remittances) received from abroad 5.20: New source of constant income (ex. pension, salary, interest rate, etc.)
Open options added by respondents (only reported if exceed 5% in total)	
Specialisation	1.2: -
Other livestock	1.3.12: 20.5% in total, of which: ducks (28%); bee families (16%); turkeys (12%); rabbits (12%); quails (12%); geese (12%); guinea fowl (8%) 1.3.13: -
Conventional or organic	1.4: organic 8.2% in total
Other functions	4.9: -
Succession others	13.3: 6.6% in total ("too early to think about it")

A.5.9. Spain

Question	Options
Case-study-specific options predefined by researchers	
On-farm strategies	2.13: Intensification of feed systems 2.14: Extensification of feed sytems 2.15: Find new marketing channels
Risk-sharing strategies	2.24: Increase the number of clients

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	2.25: Make lobby
	2.26: Belong to the Protect Geographical Indication (PGI)
Challenges	5.18: Reduction of pastures
	5.19: Land abandonment
	5.20: Increase of wild fauna
Open options added by respondents (only reported if exceed 5% in total)	
Specialisation	1.2: -
Other livestock	1.3.12:- Suckler cows.
	1.3.13: -
Conventional or organic	1.4: -
Other functions	4.9:- There are 7 responses. Four out of seven are related with family conciliation and succession.
Succession others	13.3: -

A.5.10. Sweden

As for specialization, we distinguished between egg and broiler farms (question 1.2). Almost all respondents identify with one of the two systems. Most respondents have only broilers and laying hens, but some have added other options such as specific cow breeds or breeding of horses on the farm (question 1.3). Instead of subscribing to either organic or conventional production, some respondents have indicated their specific production system (e.g., free-range laying hens, question 1.4). In question 4.9, two respondents indicated specific functions (farming as a personal challenge, income is the only purpose) as being very important for them. In two instances, they also distributed points to the "other functions option" without further specifying them. In the succession question (13.3), three respondents went into more details, as they either just took over the farm (they do not yet think about succession) or they were still undecided (e.g., on which son should take over the farm). We did not add any case-study specific options, but for purposes of validation and as an additional risk measure, we added an item battery of a domain-specific scale (see Hansson and Lagerkvist, 2012 for details).

A.5.11. United Kingdom

Question	Options
Case-study-specific options predefined by researchers	

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On-farm strategies	2.13: - 2.14: - 2.15: -
Risk-sharing strategies	2.24: - 2.25: - 2.26: -
Challenges	5.18: Uncertainty about the future UK agricultural policy 5.19: Access to EU markets 5.20: -
Open options added by respondents (only reported if exceed 5% in total)	
Specialisation	1.2:-
Other livestock	1.3.12: - 1.3.13: -
Conventional or organic	1.4: -
Other functions	4.9: -
Succession others	13.3: 17% of the farmers could not answer this question, suggesting a very strong uncertainty about the future of their farm.

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