Project acronym: SURE-Farm
Project no.: 727520
Start date of project: June 2017
Duration: 4 years

D 2.6 Report on state and outlook for risk management in EU agriculture

Work Performed by Partner No 9, UPM

Bárbara SORIANO[1*], Isabel BARDAJÍ[1], Daniele BERTOLOZZI[1], Carolina SAN MARTÍN[1], Alisa SPIEGEL[2], Thomas SLIJPER[2], Miranda MEUWISSEN[2], Jens ROMMEL[3], Helena HANSSON[3], Simone SEVERINI[4], Federico ANTONIOLI[4], Robert BERRY[5], Amr KAHFAGY[5], Julie URQUHART[5], Hristina HARIZANOVA-BARTOS[6], Zornitsa STOYANOVA[6], Isabeau COOPMANS[7], Erwin WAUTERS[7], Jo BIJTTEBIER[7], Delphine NEUMEISTER[8], Francesco ACCATINO[8], Corentin PINSARD[8], Monica TUDOR[9], Camelia GAVRILESCU[9], Lucian LUCA[9], Anca-Marina IZVORANU[9], Katarzyna ZAWALIŃSKA[10], Blazej JENDRZEJEWSKI[10], Piotr GRADZIUK[10], Katarzyna BAŃKOWSKA[10], Vitaliy KRUPIN[10], Franziska OLLENDORF[11], Franziska APPEL[11], Alberto GARRIDO[1].

(*Corresponding author: barbara.soriano@upm.es)

1 Research Centre for the Management of Agricultural and Environmental Risks (CEIGRAM), Universidad Politécnica de Madrid, Spain
2 Business Economics Group, Wageningen University, the Netherlands
3 Department of Economics, Sveriges Lantbruksuniversitet, Sweden
4 Department of Agricultural and Forestry Sciences, Università degli Studi della Tuscia, Italy
5 Countryside and Community Research Institute, University of Gloucestershire, UK
6 Department of Economics of Natural Resources, Business Faculty, University of National and World Economy (UNWE), Sofia, Bulgaria
7 Agricultural and Farm Development, Institute for Agricultural and Fisheries Research (ILVO), Belgium
8 Department of farm work and society, French Livestock Institute, France
9 Institute of Agricultural Economics, Romania
10 Institute of Rural and Agricultural Development, Polish Academy of Sciences, Poland
11 Leibniz Institute of Agricultural Development in Transition Economies (IAMO), Germany

Due date	31/10/2019
Version/Date	Final version, 31/01/2020
Work Package	WP 2
Task	T. 2.4
Task lead	UPM
Dissemination level	Public

INDEX

TABLES INDEX

FIGURE INDEX

1   Introduction

The SURE-Farm project aims to analyse, assess and improve the resilience and sustainability of farming systems in Europe. Farming systems face a whole range of social, ecological, economic and political disturbances and changes, such as sharp market fluctuations, severe weather events, climate change, new technologies, changes in consumer preferences and in governance structures and so forth, operating at a range of scales (local, regional, national and global). Some stresses on the farm system can be predicted (e.g. retirement of farmers), while other shocks are more uncertain and unpredictable (e.g. flooding, sudden price drop, illness).

Project's WP2 aims to comprehensively understand farmers' risk behaviour and risk management (RM) decisions, and to develop and test RM strategies and decision support tools that farmers can use to cope with increasing economic, environmental and social uncertainties and risks. WP2 contributes to the development of RM in EU farming systems by understanding and eliciting farmers' risk perceptions and preferences; learning about farmers' adaptive behaviour; learning capacity and preferred improvements of current RM tools; designing and analysing improved strategies to deal with extreme weather; and co-creating improved RM tools and map-related institutional challenges.

Previous work under WP2 has provided scientific knowledge in the following areas:

[Deliverable 2.1. Report] on farmers' perceptions of risk, adaptive capacity and resilience[1], based on a farmer survey designed accordingly with theories of risk communication, decision theory and psychometric models. The survey was conducted in 11 case study (CS) regions across the European Union, gathering 1,890 individual observations.

[Deliverable 2.2 Report] on biographical narratives exploring short- and long-term adaptive behaviour of EU farmers[2]. Biographical stories were collected from nine to ten narrators (early-, mid- and late-career), in each of five CS chosen to represent a range of regions and farming systems in Europe. A single question was used to initiate the narrators' stories, without qualification beforehand, supported only with expressions of interest and encouragement in the first part of the interview, with subsequent exploratory questions devoted to clarifying the internal structure of the narrative.

---

[1]   https://surefarmproject.eu/wordpress/wp-content/uploads/2019/04/SURE-Farm-D.2.1-Report-on-farmers-perception-of-risk-and-resilience-capacities.pdf
[2]   https://surefarmproject.eu/wordpress/wp-content/uploads/2019/05/SURE-Farm-D2.2-Report-on-analysis-of-biographical-narratives-report.pdf

[Deliverable 2.3 Report] on farmers' collective learning and self-organization[3], which examines the role that learning plays across the resilience capacities. Through 11 farming system CS across Europe, this work aims at: identifying farmer attributes that enable or constrain learning; understanding the networks of influencers on farmer decision-making; identifying the external factors that enable or constrain learning; and assessing European farmers' learning capacity in the context of the resilience capacities of robustness, adaptability and transformability.

[Deliverable 2.4 Open-access paper] on the use of remote sensing-based approaches for crop and livestock production[4], which provide the first systematic overview of 12 index insurances put into practise for grasslands in Europe and North America. Additionally, based on this overview, this work presents prevailing findings that are important for further research and insurance practitioners. It is concluded that insurances tailored to single farm's risk exposure, the combination of satellite with other geodata (e.g. land use information) or adapting legal specifications that disadvantage some types of insurances can improve an insurance's risk reducing capacity and make grassland based farming systems more resilient to weather extremes. Findings provide an entry point for such process, ensuring the development of efficient measures for farmers to cope with climatic risks.

Furthermore, related to another SURE-Farm's deliverable (**D5.3 Report on resilience assessment of current farming systems across the EU**[5]), a few questions were posed in the section 'Further work" (p.342-434) such as "What are the actors doing? …", "more insight is needed into the actual behaviour and decision-making power of all farming system actors. This likely enables to formulate more concrete policy recommendations. While some insights have been obtained from the methods reported, the role of actors has not yet been synthesized".

Building and relying on these findings, the aim of this deliverable is to identify improved RM strategies and tools to enhance the resilience of EU farming systems. Three specific objectives have been defined: 1) providing an outlook of the RM strategies in the EU farming systems; 2) defining the ways to improve existing RM strategies; and 3) assessing the ways RM contribute to resilience. Three sources of data are analysed in this report: i) information from surveys conducted with farmers in 11 CS under the Task 2.1 leaded by Wageningen University; ii) Focus

---

[3]   https://surefarmproject.eu/wordpress/wp-content/uploads/2019/07/D2.3-Report-on-farmers-learning-capacity-and-networks-of-influence.pdf

[4]   https://surefarmproject.eu/wordpress/wp-content/uploads/2019/10/D2.4-Index-insurances-for-grasslands-%E2%80%93-A-review-for-Europe-and-North-America.pdf

[5]   https://surefarmproject.eu/wordpress/wp-content/uploads/2019/12/D5.3-Resilience-assessment-of-current-farming-systems-across-the-European-Union.pdf

groups held in 11 CS, gathering stakeholders to identify used and prospective RM instruments that contribute to farming systems' resilience and coping capacity to the identified challenges; and ii) findings from a virtual co-creation platform with EU stakeholders participating in several inter-active activities with similar purposes than with the Focus Groups.

Section 2 presents the research gaps the deliverable aims to bridge, with the new findings combining the three empirical sources i.e., farmer's surveys, the focus groups and the virtual co-creation platform. Section 3 summarises relevant findings gathered from the farmers' survey related to their perceptions about prospective challenges. Section 4 describes the methodology followed with the focus groups and the virtual co-creation platform. Results are gathered in sections 5 and 6, presenting first the improved RM tools and the actors, which might be more responsible in leading their implementation, and then how RM pools contribute to farming systems resilience. Sections 7 and 8 summarises the main findings and conclusions, and the limitations of the empirical strategies and data collected.

2   Risk management and resilience assessment

The agricultural sector in Europe faces a broad array of environmental, economic, social and institutional challenges that threaten its stability, but also its survival and the functions it provides. Diverse and heterogeneous risks are inherent in European agriculture (European Commission, 2017), especially those concerning environmental factors leading to losses in production, such as extreme climatic conditions, local weather extreme events and crop/animal diseases, most of them exacerbated by global climate warming. But there are also risks related to changes in trade policy, changing social preferences and markets behaviour (i.e., volatility of prices, financial and macroeconomic factors, competition, other sectors connection…) (Agricultural Markets Task Force, 2016). Production losses and unfavourable market prices may unfold into farms' unfavourable income fluctuations, and as a final consequence, the farm closure. Unpredictable price movements, foremost changes in volatility, also discourage farmers to invest in productivity improvements (European Commission, 2017) that, in the long run, might improve the farm profitability and resilience.

The literature about farmers' risk perceptions is vast. But according to Komarek et al. (2020) 66% of the studies address only production risks, 15% consider more than one type of risk, just 18 out of 3,283 reviewed studies considered all five types of risk (economic, production, financial, institutional and personal). This is clearly a limitation, because farmers are concerned by all sources of instability and hazards. In terms of policy analysis, proposals and evaluation, the academic and grey literature is also abundant (Bardají and Garrido, 2016; European Commission, 2017). The public policy dimension of the literature focusing on the EU agriculture is generally

limited to the types of instruments either considered by the CAP of different periods or eligible accordingly to the Treaty of the Functioning of the European Union. Many other tools or instruments do not fall in either and, as a result, have not received much attention in the literature.

Another limitation stems from the fact that RM focuses on the impact of stochastic variables (production, market price, exchange rate, disease outbreak) on the farms' income, and does not deal with long-term pressures such as changing diets or public distrust on agricultural practices. Furthermore, conventional RM focuses on farmers with no or weak consideration of other relevant stakeholders.

The findings of this whole literature are patchy and detached from a more desirable holistic approach, within which all sources of risks and all potential measures could be jointly analysed, as a thoughtful farmer presumably does regularly.

Furthermore, it is difficult to establish defined frontiers in the scope of action for each management tool, due to loose classification of risks and their perception by farmers and the public sector. The election of one management tool or another will also depend on the average incomes level in each sector, the regional concerns, farmer's coordination, the size of farms, and even the willingness of farmers to face risks (European Commission, 2017). Moreover the intervention of public support, especially through *ex-post* measures considering catastrophic losses, might discourage farmer to adopt private ex-ante tools (i.e., private insurances), or simply be less risk adverse (i.e., concentrating on a single crop) because of the income buffer (European Commission, 2017; Lehmann et al., 2013).

The ability of farming systems to cope with the identified challenges can be addressed with the concept of resilience (Bullock et al., 2017; Folke et al., 2010). According to the Farming System Resilience Framework proposed by Meuwissen et al. (2019) (Figure 1), resilience is the potential for ensuring the provision of the essential functions in the face of increasingly complex challenges.
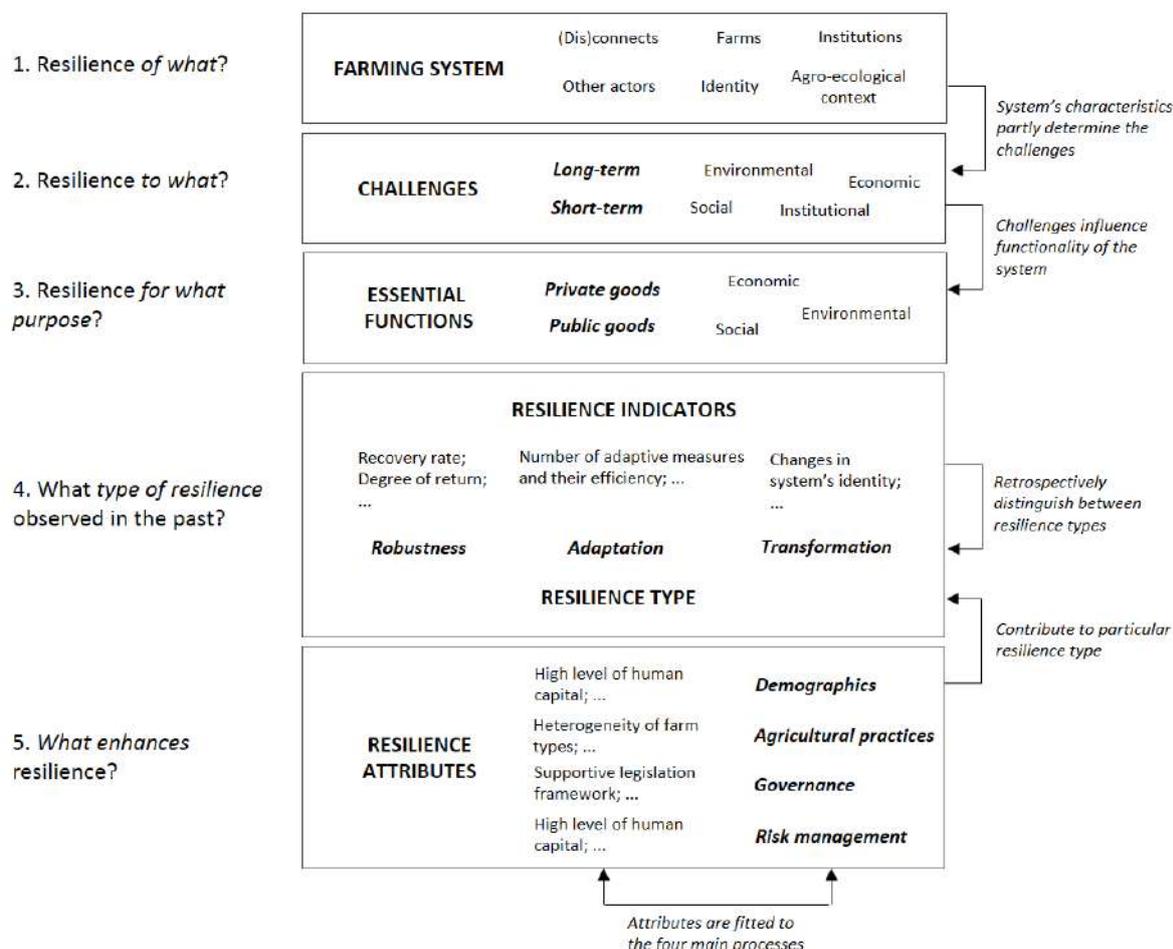
Source: Meuwissen et al. (2019)

Figure 1. Framework to analyse the resilience of farming systems, including example resilience indicators and attributes.

Meuwissen et al. (2019) propose conducting the resilience assessment at farming system level, characterized by its functions, local conditions, and actors. Not only farmers but also other stakeholders, who have a close mutual connection to farmers, are considered as relevant actors for farming system's resilience. The functions are the provision of private goods (i.e. the provision of food and reasonable livelihood for people involved in farming) and public goods (i.e. maintaining natural resources in good condition and ensuring that rural areas are attractive places for residence). The locality refers to the local agro-ecological context, climate characteristics, functions of the farming systems, and its identity.

Three resilience capacities are considered in the resilience framework: i) Robustness or the capacity to withstand stresses and (un)anticipated shocks; ii) adaptability, defined as the capacity

to change the composition of inputs, production, marketing and RM in response to shocks and stresses but without changing the structures and feedback mechanisms of the farming system; and iii) transformability as the capacity to significantly change the internal structure and feedback mechanisms of the farming system in response to either severe shocks or enduring stress that make business as usual impossible (Darnhofer, 2014).

Finally, the framework embraces the assessment of the resilience attributes i.e. the individual and collective competences that enhance the resilience capacities.

In SURE-Farm, the resilience capacities and attributes are grounded in three different processes: agricultural practices, farm demographics, governance and RM. Focusing on RM processes, previous studies stated that promoting and applying RM strategies strengthen farming systems' resilience. RM is the systematic application of management procedures and practice to the tasks of identifying assessing, treating and monitoring risks (Huirne et al., 2000). It thus can be considered an entry point for implementing and measuring resilience (Dahms, 2010; Mitchell and Harris, 2012). Effective RM strategies support farmers' decisions (Chuku and Okoye, 2009; OECD, 2018) and make their system more resilient (Mitchell and Harris, 2012; Shiferaw et al., 2014). As resilience is a context-specific characteristic, any toolkit including RM strategies requires certain contextual capacities (institutional, economic and social) that enable efficient RM implementation. This in turn must be adaptable to different contexts and time (Foresti et al., 2011).

Our approach has several distinctive features:

- It is multi-actor, inclusive of representatives of all relevant stakeholders at CS level, and at EU level. It considers the roles and views of farmers, their associations, banks and financial institutions, cooperatives and value-chain actors.
- It offers a heterogeneous view of EU agriculture, including different sectors, Member States, climates and institutional development.
- It addresses policy multi-scales, considering the EU level and the national/regional levels of each CS.
- It combines risk perceptions materialised as long-term pressures with expected shocks, giving the analysis a time dimension.

In such a holistic approach, the assessment is performed both at the farming system level, considering all relevant actors in 11 farming systems, and at the European Union level. Farming systems are thus characterized by its functions, local conditions, and actors. Not only farmers but also other stakeholders, who have a close mutual connection to farmers, are considered as relevant actors for farming system's resilience. The functions are the provision of private goods (i.e. the provision of food and reasonable livelihood for people involved in farming) and public

goods (i.e. maintaining natural resources in good condition and ensuring that rural areas are attractive places for residence). The locality refers to the local agro-ecological context, climate characteristics, functions of the farming systems, and its identity.

3   Agricultural challenges and the strategies to deal with them: Evidence from the farmer's surveys

Under the Task 2.1 of WP2 leaded by Wageningen University a survey was defined with an explorative approach with the aim at assessing the subjective perception of risk preferences, challenges, objectives and resilience capacities of farmers in the EU (Spiegel et al., 2019). The farm survey was conducted in the 11 CS regions following different methods: face-to-face, via phone, via mail and online. A total of 1,890 interviews were carried out, of which 220 corresponded to CS in Belgium (dairy farming), 30 in Bulgaria (arable farming), 30 in Germany (arable farming), 50 in France (extensive beef cattle farming), 60 in Italy (perennial crops), 924 in the Netherlands (arable and livestock farming , 70 in Poland (small fruit and vegetable farming), 122 in Romania (mix-farming), 120 in Spain (extensive sheep farming) , 64 to Sweden (egg and broiler farming) and 200 to UK (arable farming).

Regarding challenges, farmers were asked (with an open question) to list the three main challenges to deal with in the next 20 years. Figure 2 presents the results of the 3,544 survey answers codified and classified according to the challenges classification proposed in the SURE-Farm resilience framework into *shocks* and *long-term pressures*. A shock is a sudden change in the risk environment of a farming system that influences (part of) the farming system on the short term through negative effects on people's current state of well-being, level of assets, livelihoods, or safety, or their ability to withstand future shocks (e.g. extreme price drops). Long-term pressures refer to stressors slowly changing the context of a farming system, inherently leading to new uncertainties (e.g. demographic changes) (Zseleczky, 2014).

At the same time shocks and long.-term pressures are classified according their *institutional*, *environmental*, *social* or *economic* origin. In total eight categories emerged from the combination of each challenge and the binary condition of *long-term pressure* and *shock*, which are distinguished in the figure by colours and textures.

Combining the answers from the 11 CS regions (top bars of Figure 2), the most important challenges perceived by farmers have an *economic* nature, followed by *social* challenges, and less importantly by *environmental* and *institutional*. Most answers in the *economic*, *institutional*, and *social* categories indicated a greater concern for *long-term pressures* (96%, 86%, and 71%, respectively) than for *shocks*, whereas for *environmental* challenges concerns for *shocks* turned to be more important (57%) than *long-term pressures*.

For *long-term pressures*, the 'Improvement of profitability' is the most worrisome economic issue by European farmers, where 483 of them cite this challenge (corresponding to 38% of all economic *long-term pressures* answers). Far away, the 'Investment in modernization to ease the work (machinery, new technology)' and the 'Increase of production' also suppose important *long-term pressures*. In relation to the *institutional* challenges, the 'Changing agriculture policies' (in both national and EU levels) is the most important concern of European farmers (82% of *institutional long-term pressures* answers). For *social long-term pressures* the 'Farm transmission' is the most cited challenge by farmers (30% of social *long-term pressures* answers), followed to a lesser extent by the concerns of 'Hard working conditions (physical effort, time)' and the 'Changing social perception of agriculture' (mainly related to the quality of consumed products). As aforementioned, *shocks* for these three categories count on a low percentage of responses by farmers. The 'Uncertainties of the market' and the 'Changes in the access to market' are the most *economic* (prices volatility) and *institutional shocks* (mainly related to the Brexit for UK farmers and the embargo for exports to Russia from Polish farmers), respectively. 'Lack of workforce' and the 'Unplanned retirement' contribute to the *social shocks*.

In contrast, the 'Extreme weather events' and the 'Pests, weeds and diseases outbreaks' suppose the 70% and 30% of the *environmental shocks* responses, respectively. In this case, although with a less importance, *long-term pressure* contributes to 43% responses of the *environmental* category, where the 'Environmental performance' (considered mainly as the sustainability of the ecosystem and its conservation) is the most important by far (42% of *environmental long-term pressures* answers).

In general, this pattern (*long-term pressures* are more important than *shocks*, with the exception of *environmental* challenges) occurs in all countries with the exception of UK, Italy, France, Germany and Bulgaria. UK clearly emerges as a stand-alone hierarchy of challenges, where *institutional* impacts (combining with equal weigh *long-term pressures* and *shocks*) attract the greatest concerns (34%), closely followed by *economic* challenges (31%), and the *social* and *environmental* issues. For British, the 'Changes in the agriculture policies' (*long-term pressure*) and 'Changes in the access to markets' (*shock*), suppose a challenge mainly in relation to the Brexit uncertainty.

On the other hand, after the *economic* issues, Italy and Bulgaria farmers consider as the most important issues the *environmental* challenges. For both countries the extreme weather events, (related to climate change and droughts), as well as the pest and plant diseases, suppose a great concern and are the most cited responses. However, closely followed by the *economic* challenges, *social long-term* responses were the most mentioned by French and German farmers. French farmers expressed their concerns mainly on farm transmission and changing consumers'

preferences, whereas in Germany only the farm transmission challenge suppose the main *long-term pressure.*
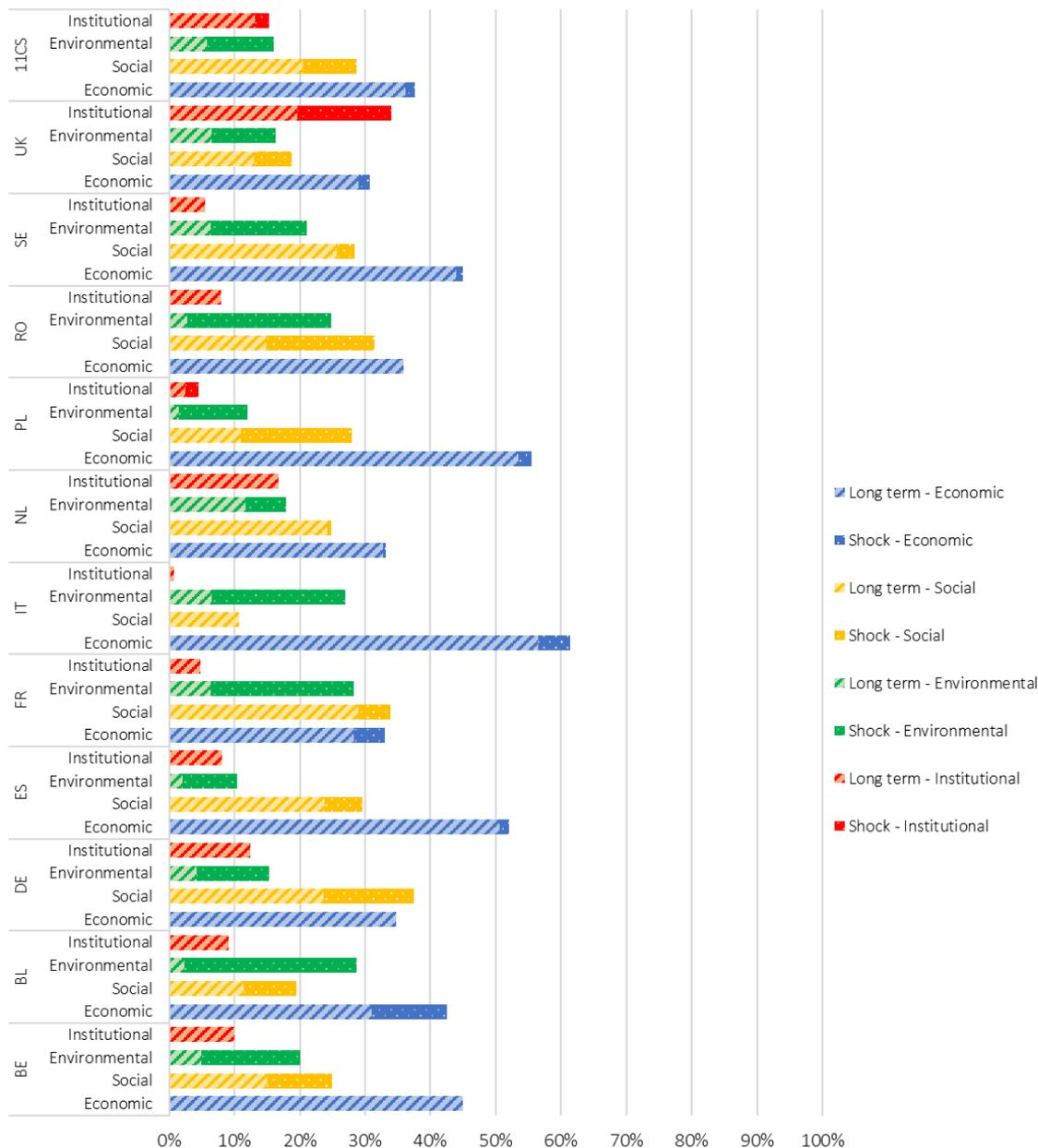
Figure 2. Future challenges perceived by European farmers[6].

[6] Numbers represent the percentage of farmers perceiving the challenge included in each category, by CS region. The total of answers is 3,544 distributed through the CS regions as following: BE (20), BL (87), GE (72), ES (298), FR (124), IT (122), NL (1,703), PL (200), RO (315), SE (109), UK (494).

Farmers were also asked about the RM strategies implemented in the last five years. To this end, farmers were provided with a list of *on-farm* and *risk-sharing* RM strategies to select. Table 1 reports the percentage of famers implementing each RM strategy by CS region. The most frequent answered strategies (>40% of the farmers in each CS region) are highlighted in light green, whereas the least frequent strategies (<10% of the farmers in each CS region) are coloured in light red.

Table 1. Current strategies to deal with challenges.

		BE	BL	DE	ES	FR	IT	NL	PL	RO	SE	UK	EU
On farm strategies	Maintained financial savings for hard times	51%	43%	50%	60%	42%	68%	62%	37%	51%	44%	70%	58%
	Had low debts or no debts at all to prevent financial risks	27%	47%	37%	57%	32%	25%	53%	30%	57%	36%	70%	49%
	Worked harder to secure production in hard times	51%	37%	37%	63%	34%	30%	36%	41%	83%	38%	83%	47%
	Implemented measures to prevent pests or diseases	22%	63%	23%	77%	68%	23%	31%	40%	70%	66%	88%	44%
	Used market information to plan my farm activities for the next season	25%	77%	17%	32%	24%	32%	31%	46%	43%	27%	84%	37%
	Had an off-farm job	22%	27%	37%	40%	10%	22%	32%	53%	53%	33%	33%	32%
	Diversified in other activities on my farm	20%	13%	33%	11%	42%	17%	29%	37%	20%	20%	72%	30%
	Invested in technologies	4%	43%	13%	48%	12%	18%	19%	47%	39%	19%	72%	27%
	Diversified in production	19%	40%	57%	30%	54%	25%	13%	44%	47%	19%	56%	25%
	Improved flexibility in the timing of my production	4%	47%	7%	44%	14%	20%	18%	36%	14%	31%	73%	25%
	Improved cost flexibility	13%	27%	17%	21%	16%	12%	18%	7%	22%	20%	61%	22%
	Opened up my farm to the public	10%	20%	40%	13%	12%	17%	15%	27%	1%	20%	16%	15%
Risk-sharing strategies	Member of a producer organisation, cooperative or credit union	38%	43%	53%	53%	40%	70%	58%	44%	23%	47%	65%	53%
	Learned about challenges in agriculture	20%	43%	57%	63%	20%	43%	53%	76%	53%	33%	70%	50%
	Had access to a variety of input suppliers	49%	53%	53%	29%	70%	32%	50%	20%	52%	44%	68%	50%
	Used production or marketing contracts to sell (part of) my production	21%	40%	50%	14%	42%	5%	23%	29%	20%	30%	57%	27%
	Bought any type of agricultural insurance	3%	40%	67%	78%	46%	32%	20%	23%	7%	59%	39%	27%
	Cooperated with other farmers to secure inputs or production	20%	17%	63%	24%	86%	25%	39%	0%	48%	34%	55%	37%
	Member of an (inter)branch organisation	0%	17%	13%	8%	6%	20%	19%	13%	7%	58%	36%	18%
	Hedged (part of) my production with futures contracts	3%	17%	7%	0%	62%	7%	6%	20%	1%	28%	58%	13%

Percentage of farmers who have selected the strategy in each CS region
The most implemented strategies (> 40% of the farmers in the CS)
The least implemented strategies (< 10% of the farmers in the CS)

Considering all CS regions (EU column) the most implemented strategies corresponded to both the *on-farm* strategies and *risk-sharing* strategies, although the pattern is observed throughout all CS. The most current implemented *on-farm* strategies have an economic (and productive) nature, such as 'Maintained financial savings for hard times', 'Had low debts or no debts at all to prevent financial risks', 'Work harder to secure production in hard times', and 'Used market information to plan my farm activities for the next season'. Farm system good state of health and preservation is also considered important to face challenges through the strategy

'Implementation of measures to prevent pest and diseases'. The rest of *on-farm* strategies are also implemented by more than 40% of farmers, but in a lower number of CS. Those strategies are mainly related to the diversification and flexibility of on farm activities and production.

In relation to *risk-sharing* strategies, some of them are also well implemented (by more than 40% of farmers) in almost all CS, such as 'Member of a producer organisation, cooperative or credit union', 'Learned about challenges in agriculture' and 'Had access to a variety of inputs suppliers'.

Worth mentioning is the great diversity of implemented strategies throughout the CSs. There are some countries such as Belgium where the number of strategies implemented by a great proportion of farmers is low (in this case, two *on-farm* strategies and a sole *risk-sharing* strategy), and it presents the great number of strategies poorly implemented by farmers (less than 10%). The Belgian CS is referred to a dairy intensive system, contrasting to the extensive arable farming systems in the UK and Bulgaria, where the majority of proposed strategies were implemented by a great percentage of farmers, either *on-farm* and *risk-sharing* strategies. The wide frame of strategies considered by British farmers might be related to the alarming *institutional* and *economic* challenges that mainly Brexit is bringing to the UK. Other countries as Italy, present a more homogenous system of strategies, reflecting the great variety of strategies' implementation among Italian farmers. France and Germany, together with the UK and Bulgaria, were the countries that implemented the most *risk-sharing* strategies, being greater in number regarding *on-farm* strategies. Sharing risks might be the best way these countries considered to tackle the important *social* challenges they consider.

Finally, farmers were asked (open question) to list the strategies to deal with the perceived future challenges (Figure 2). As it is an open question, the answers are coded into a strategies classification. Table 2 reports the percentage of famers identifying each future RM strategy by CS region. The least frequent answered strategies (>5% of the farmers in each CS region) have been coloured in light red.

Table 2. Strategies to deal with future challenges.

		BE	BL	DE	ES	FR	IT	NL	PL	RO	SE	UK	EU
On farm strategies	Diversification (business, crop, practices)	23%	18%	35%	16%	25%	24%	11%	24%	21%	1%	33%	17%
	Increase efficiency (technology, specialisation, better management)	31%	22%	16%	16%	12%	29%	11%	27%	21%	10%	14%	15%
	Economic measures	0%	11%	9%	24%	11%	5%	20%	5%	4%	29%	16%	16%
	Management optimization	31%	3%	10%	16%	20%	8%	18%	7%	23%	16%	6%	15%
	Preservation / Defense of the natural environment	8%	0%	4%	0%	4%	2%	9%	2%	1%	6%	3%	6%
	Consumer orientation (society acceptance, new sellings places)	0%	1%	7%	9%	14%	8%	5%	5%	3%	10%	4%	5%
	Flexibility (cost, time management)	8%	3%	3%	1%	2%	6%	3%	11%	6%	3%	5%	4%
	Worked harder	0%	7%	1%	4%	4%	0%	3%	2%	7%	5%	5%	3%
	Learned about challenges in agriculture	0%	11%	4%	4%	0%	5%	3%	1%	1%	8%	2%	3%
	Implemented measures to prevent pests or diseases	0%	3%	0%	5%	0%	3%	2%	4%	5%	3%	2%	3%
	Used market information to plan my farm activities for the next season	0%	3%	1%	0%	2%	0%	3%	2%	0%	3%	1%	2%
	Adapt to new regulations	0%	0%	0%	0%	1%	0%	2%	0%	0%	0%	2%	1%
	Diversified in other activities on my farm	0%	0%	0%	0%	1%	2%	0%	1%	0%	0%	0%	0%
Risk-sharing strategies	Cooperated with other farmers to secure inputs or production	0%	7%	3%	1%	5%	2%	4%	1%	3%	4%	2%	3%
	Member of an (inter)branch organisation	0%	0%	0%	2%	0%	2%	2%	1%	1%	3%	1%	1%
	Deal with financial institutions	0%	9%	0%	0%	0%	3%	1%	2%	2%	1%	0%	1%
	Member of a producer organisation, cooperative or credit union	0%	1%	4%	0%	1%	0%	1%	2%	1%	0%	2%	1%
	Had access to a variety of input suppliers	0%	0%	0%	0%	0%	0%	1%	3%	0%	0%	1%	1%
	Used production or marketing contracts to sell (part of) my production	0%	3%	1%	0%	0%	2%	0%	3%	0%	0%	1%	1%

Percentage of farmers who have selected the strategy in each CS region

The least implemented strategies (< 5% of the farmers in the CS)

As Table 2 shows the strategies to deal with future challenges go with the strategies currently implemented by farmers in the CS regions. *On-farm* strategies are those most cited by farmers to deal with future challenges. Mainly they mentioned strategies related to economic and management issues, such as 'Diversification (Business, crop, practices)', 'Increase efficiency (technology, specialization, better management)', 'Economic measures (low debts, reduced costs, appropriate investments, cash flow management, improved prices)', and 'Management optimization (improve natural resources – water, soil- management, economies of scale, appropriate farm size, optimize production process, breeds selection, secure an autonomy level)'. Some exceptions are found in Belgium, Italy, Poland and Romania where economic measures are selected by less than 5% of the farmers. In Sweden (egg and broiler farming) the diversification strategy is mentioned by 1% of the farmers.

Risk-sharing strategies are mentioned by farmers in a very low proportion when considering future challenges. This result may be partly explained by the nature of the question to farmers. As the question is open instead of multi-choice selection (when analysing current strategies) the farmers' answers are less conditioned and hence more diverse. Furthermore, the responses are directly linked to the future perceived challenges. The results should lead to the idea that farmers

seem to prioritize on-farm strategies (improved management and economic efficiency) versus risk-sharing strategies to deal with future challenges.

4 Multilevel and multi-stakeholder approach: The case study focus groups and the virtual co-creation platform with stakeholders

A multi-stakeholder approach is followed to reach the two-fold objective of the deliverable: i) to find the opportunities to improve RM strategies; and ii) to assess the RM contribution to resilience capacities. Multi-stakeholder initiatives (MSIs) are arrangements in which actors from business, civil society, governments and academia come together in order to find a common approach to an issue that affects them all (Roloff, 2008). MSIs brings together actors with complementary resources to address issues that actors would not be able to individually (Selsky and Parker, 2005). MSIs have featured prominently in several domains, including management theory (Bryson, 2003), policy definition (Byrd, 2007) and agricultural and environmental research (Luyet et al., 2012; Podestá et al., 2013; Reed, 2008). To ensure that the engagement is effectively empowering, the stakeholders must be involved throughout the whole process and be aware that their participation will influence the final decisions (Byrd, 2007; Carmin et al., 2003). Stakeholder participation can be facilitated through different activities such as public hearings, advisory committees, surveys, focus groups, public deliberation, citizen review panels, collaboration, civic review boards, work groups, implementation studies or written comments (Nanz and Steffek, 2004).

With the previous findings as background information, it is developed a two-fold empirical strategy with similar purposes: first held focus groups with stakeholders relevant to each CS, and secondly gathered information and proposals via a virtual co-creation platform in which stakeholders with a European perspective participated.

4.1 Focus groups in eleven case study regions

The focus group is a technique widely spread to engage stakeholders in informal group discussions focusing on one or several topics. It is a way of collecting qualitative data from multiple individuals simultaneously (Wilkinson, 2004). According to Kamberelis and Dimitriadis (2011), the focus groups allow researchers to access the social-interactional dynamics among specific groups of people. The selection of the stakeholders participating in the focus group is the key to ensure the relevance of the results achieved. The absence of a relevant actor could lead to an irrelevant focus group, to the marginalization of important groups and could skew the results (Reed, 2008).

Focus groups were conducted in 11 CS regions (Table 3). All the focus groups followed standardized guidelines to guarantee that all pursue the same goal and follow the same approach,

making the results comparable (Appendix 1). Also, common criteria were used to select the participants in the focus groups. Preliminary guidelines were designed to conduct a pilot focus group in Spain to test its structure and activities. Based on this preliminary experience, the updated guidelines were written and shared with the CS partners. A dedicated training session was held to explain the focus groups and structure to the partners involved. Two skype rounds were scheduled after these training sessions with all partners involved to solve any questions on how to conduct the focus group and how to report the results.

Table 3. Characteristics of the focus groups and the case study regions.

Country	Region of study	Farming system	Meeting date	Number of participants (women): sectors
BE	Flanders	Dairy intensive livestock	13.06.2019	12 (2): 6 banks & insurance companies; 1 governmental institution; 1 advisory service; 1 processing industry
BL	North-East Bulgaria	Arable farming	15.07.2019	6 (1): 3 agricultural producers; 1 insurance company; 1 local administration; 1 cooperative
FR	Bourbonnais	Beef extensive livestock	09.07.2019	8 (4): 4 producers' organisation; 2 insurance companies; 2 banks
DE	Altmark	Arable farming	12.06.2019	6 (1): 3 farmers; 2 financial sector; 1 consulting service
IT	Viterbo	Perennial crop	05.06.2019	6 (1): 2 agricultural producers; 2 insurance companies (1 Agronomist); 1 producer organisation's president; 1 technical & financial advisory service
NL	Veenkoloniën	Arable farming	03.09.2019	5 (0): 2 farmers (1 engaged to Dutch farmers union); 1 insurance company; 1 regional policymaker; 1 agrochemical trader (engaged in local government)
PL	Mazovian	Horticultural farming	12.06.2019	9 (4): 1 insurance company; 2 chamber of agriculture representative; 1 plant health inspector; 1 parliament assistant; 1 advisory service; 1 scientist; 1 producer; 1 employment office represent
RO	North-Eastern Romania	Mixed farming	11.07.2019	5 (0): 2 farmers (1 representing a Farmers' association too); 2 banks (1 also representing an insurance company); 1 insurance company
ES	Huesca	Sheep extensive livestock	04.04.2019	9 (0): 1 farmer; 2 farmers' organisation; 1 bank; 1 insurance company; 1 cooperative; 1 policy maker; 2 local administration
SE	Southern Sweden	Egg & broiler intensive livestock	24.07.2019	5 (1): 3 farmers; 1 banker; 1 branch organisation representative
UK	Eastern England	Arable farming	27.06.2019	7 (5): 4 business advisory, 2 bankers, 1 national farmers' union representative

The SURE-Farm focus groups seek a two-fold objective, that is, to identify the opportunities to improve the RM strategies in farming systems and to assess the contribution of RM to resilience

capacities. Following the planning and organizations recommendations proposed by Onwuegbuzie et al. (2009) the following activities were designed to be conducted during 3.5 hours (Table 4):

Table 4. Focus groups activities and timing.

Activities	Time
Welcome & SURE-Farm Introduction	10 min
1. Identifying challenges and main RM strategies to deal with them	20 min
2. Identifying the actors involved in RM, their roles when implementing RM strategies, their potential to improve and how they could improve	70 min
Coffee break	20 min
3. Brainstorming about how to improve the stakeholder roles	50 min
4. Assessing to what extent and why the actors contribute to resilience capacities	40 min
Conclusions	10 min

As the introductory activity, the SURE-Farm research framework was presented covering the meaning of resilience and resilience capacities. Then, based on the information collected in farmer's surveys about risk perception and RM strategies (Spiegel et al., 2019) (see section 3), the following activity consisted of discussing about the perceived challenges that the farming system is facing and the main RM strategies to deal with them.

This first step allowed to select the most important strategies to guarantee the sustainability of the farming systems and identify the actors involved their implementation. An in-depth discussion was followed to address which is the role of the actors involved in the selected RM strategies and whether there is any room to improve their roles. A brainstorm activity based on written notes (post-its) was designed to encourage participants to generate ideas on the actors' roles, how to improve them and, hence, how to improve RM. Once the detailed range of roles about what each actor is currently doing in the farming system were discussed, the participants were asked to rank the extent to which the actors contribute to resilience capacities according to what they are doing. Finally, time for reflection was devoted to concluding about main insights achieved in the focus groups.

The number of participants in the SURE-Farm focus groups was between 8 and 10. This number of participants ensures the diversity of stakeholders and points of view and enables the environment to stimulate sharing their thoughts, opinions or beliefs (Onwuegbuzie et al.,2009). A selection criterion was defined to identify the participants (Kamberelis and Dimitriadis, 2011): i)

belong to the farming system; the combination of the participants need to represent the diversity of actors in the farming system; or ii) be directly or indirectly involved in the main RM strategies implemented in the farming system; or iii) have proven experience and knowledge of the farming system; or iv) be farmers; or v) represent financial institutions (banks and insurance companies). Overall, 86 stakeholders participated in the 11 SURE-Farm focus groups. In almost all cases, participants were involved in the activities 1-4 (Table 4). The activity 4 in the Netherlands focus group was not conducted due to the lack of time.

At least two researches from every CS partner in SURE-Farm were involved in conducting the focus group. The work of the moderator, assisted by another researcher, is crucial to ensure a well-designed focus group (Krueger, 2014). The SURE-Farm moderator was responsible for presenting the focus groups and the goals of the session, asking the members to engage in the activities, facilitating and moderating the discussion. The assistant moderator's responsibilities was to record the session, taking notes, helping the moderator to analyse and/or interpret the focus group data (Krueger and Casey, 2000).

The focus groups were recorded to allow researchers to review and get a more in-depth understanding of the written ideas provided by participants in the focus groups and their own notes. Permissions were requested previously recording with an informed consent.

4.2 The virtual co-creation platform

The availability of new technologies allows to develop virtual spaces to engage stakeholders in valuable co-creation activities. Virtual (on-line) communities provide a new space where like-minded users can interact with each other, share information and opinions (Füller et al., 2010; Stanke, 2016). Sawhney et al. (2005) outlined the distinctive capabilities of the online communities such as the interactivity, enhanced reach, persistence, speed, and flexibility. The virtual co-creation platforms build up an engaged community of persons willing to participate in future co-creation projects (Stanke, 2016). This sense of community and engagement also raises the commitment to the project (Gebauer et al., 2013). Virtual communities can be classified according to two criteria (Pater, 2009): the ownership (one initiator or the initiator together with collaborations) and the openness grade (everyone joins or a selection process is defined).

Co-creation methodologies emerged in the field of firm management and products' design (Prahalad, C.K. and Ramaswamy, 2004), but its use expanded to new research areas such as policy design (Considine, 2012). Co-creation promotes mutually beneficial collaboration (Frow et al., 2011; Jaakkola et al., 2015) where innovation emerges as a result of an interactive process. Co-creation summons stakeholders who are willing to participate and share their knowledge and creativity (Füller et al., 2011) and are especially skilled in their field (Romero and Molina, 2009).

The SURE-Farm virtual co-creation platform was designed and launched in July 2018 as a cross-cutting methodology servicing specific goals of SURE-Farm, i.e. the definition of the farming system resilience framework (Challenge 1), the co-creation of improved RM (Challenge 2 and 3), the assessment of the functioning and resilience of the EU agricultural sector (Challenge 4) and the co-creation of enabling resilience policies (Challenge 5) (Figure 3).
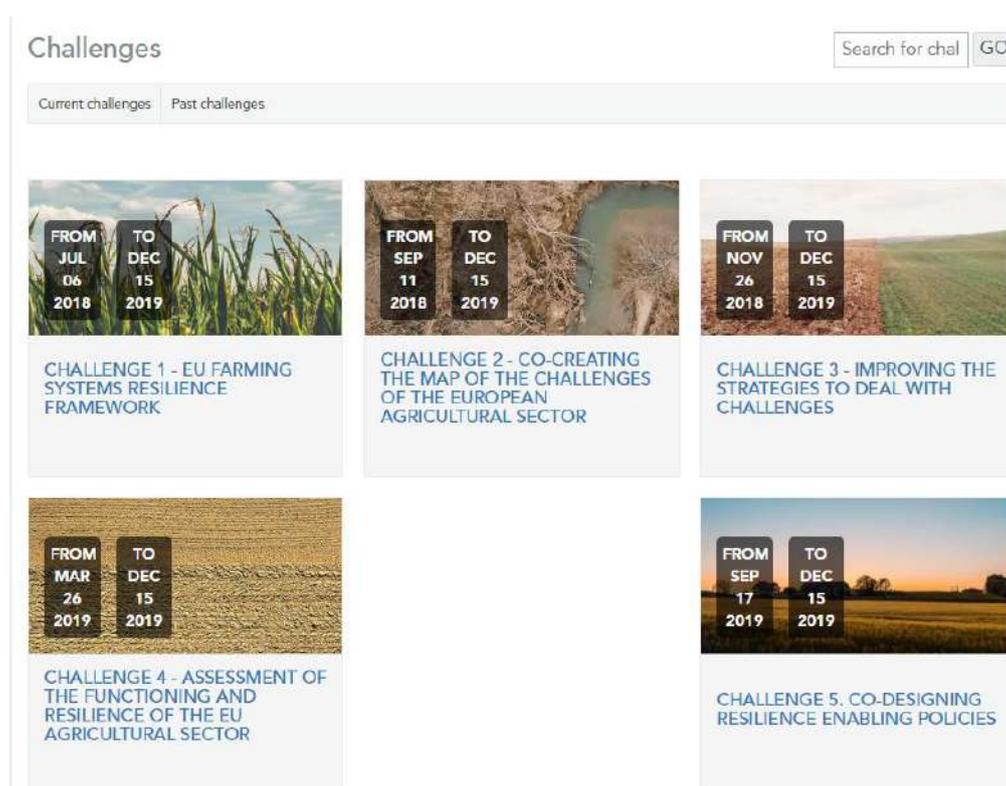
Figure 3. Challenges in the virtual co-creation platform.

Intense moderation is key to ensure the participation and engagement of the stakeholders in virtual platforms. Several actions have been performed to keep the virtual platform alive and with an active participation of the stakeholders: 1) sending weekly/bi-weekly messages about news, articles, videos, and new activities in the platform to keep participants informed; 2) running a repository of reports, scientific papers and videos available for participants; 3) informing about new entrants in the platform to encourage networks among virtual co-creation platform participants; 4) defining and publishing rankings (karma) based on the participation in the activities; 5) awarding Prizes to those topping the participation rankings (Figure 4).
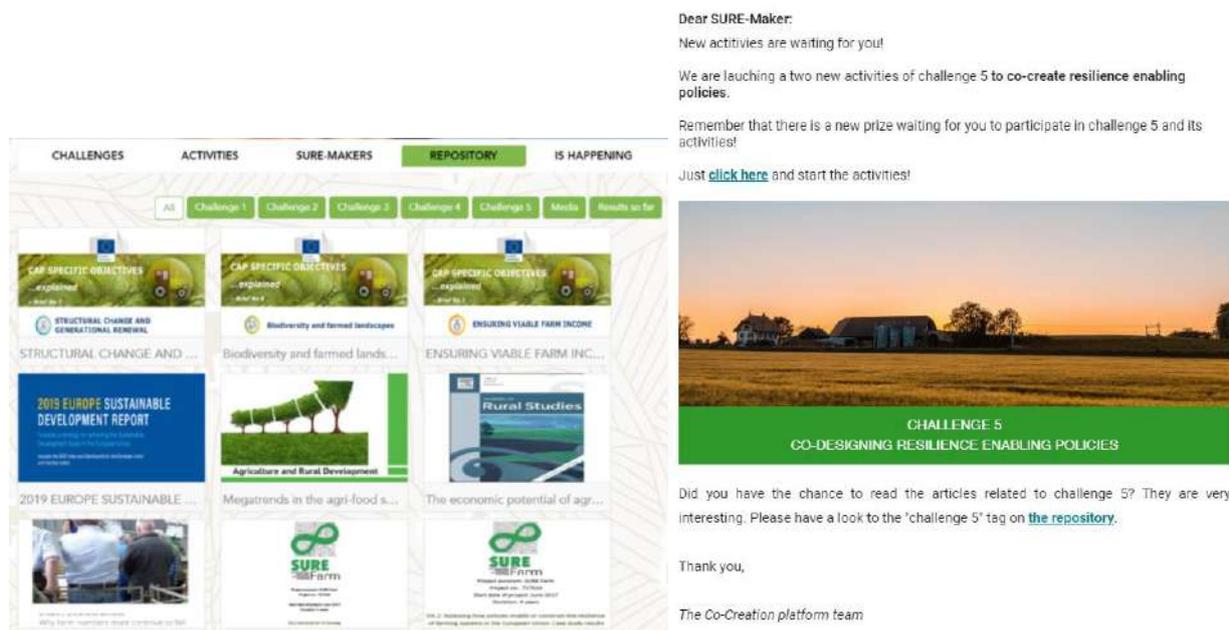
Figure 4. Examples of moderation activities.

To ensure the attractiveness of the activities in the virtual platform, the activities fulfil the following conditions: i) low time demanding; ii) easy to solve; iii) flexible scheduled to be fulfilled; iv) facilitate sharing new ideas; v) encourage knowledge sharing; and vi) encourage discussion. Considering these conditions, the following types of activities were defined in the virtual co-creation platform: selection, scoring, open questions, on-line debates, reports, and participation results repository. Before the beginning of the activities, participants were informed about relevant information and or results already achieved to foster the participation rates and innovation process (see Figure 5).
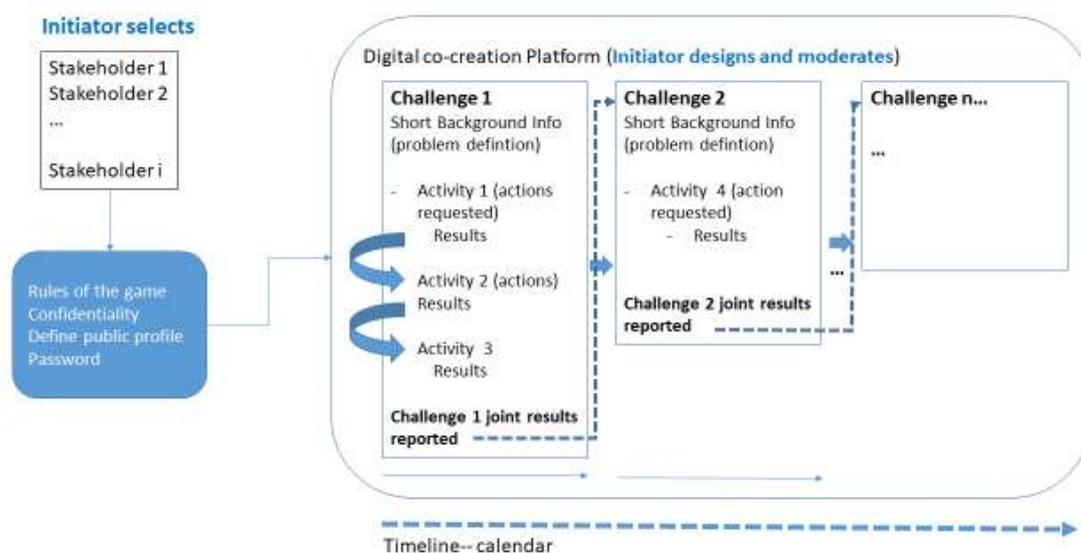
Figure 5. Generic schematic representation of the virtual co-creation platform.

The process to select the participants selection followed several criterions: i) proven experience and background in the agricultural sector at national/European level; ii) having knowledge about or surrounding RM, policy, farm demographics and/or agricultural production at national/European level; iii) working on public or private sectors in any of the following activity areas: farmers organizations, policymakers, insurance companies, banks, research centres and universities, value chain actors, environmental NGOs, consumer associations; and iv) pertaining to one of the next staff category: experts, managers or directors. SURE-Farm consortium that comprises 16 European universities and research centres provided candidates who fulfil the selection criteria. The Universidad Politécnica de Madrid (UPM) team, in charge of the virtual co-creation platform, selected the participants by ensuring an adequate balance among activity sectors.

97 European stakeholders in the EU agricultural sector were contacted by e-mail, of which 60 logged into the virtual co-creation platform and 27 actively participated in the virtual co-creation platform activities from July 6th, 2018 to December 15th, 2019. Stakeholders from eight European countries participated in the activities, where Spain (11) and the Netherlands (6) contributed with the greater number of participants (Figure 6). Six activity sectors are represented by the participants (Figure 6), with a greater presence of farmers' organizations, financial institutions (banks and insurance companies) and University and Research centres.
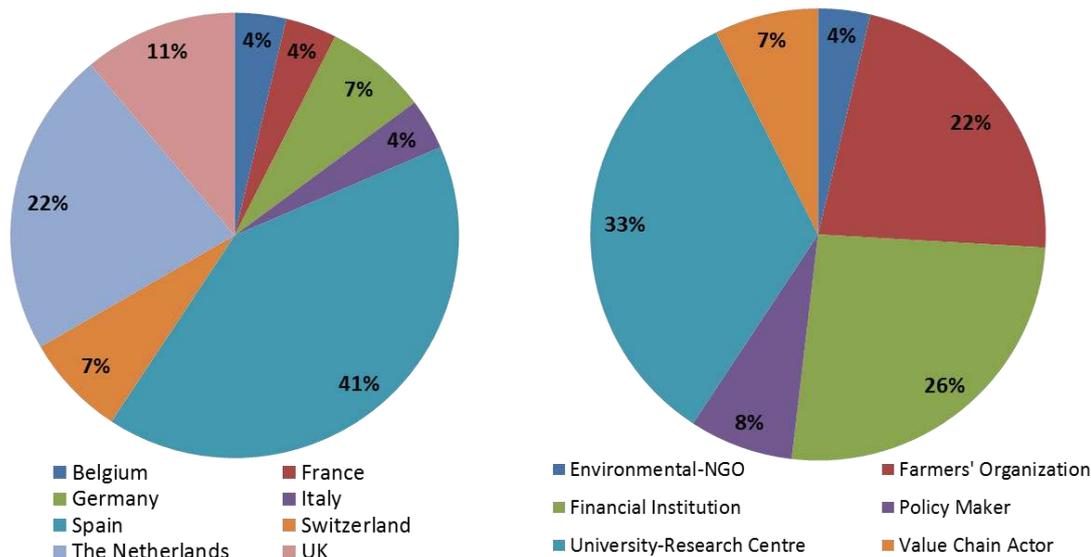
Figure 6. Stakeholders participating in the virtual co-creation platform by origin country and activity sector.

This report focuses on the participation of the stakeholders in the challenges 2 and 3 referred to the virtual co-creation of improved RM strategies that enhance farming systems' resilience.

The aim of the Challenge 2 is to create a map of challenges in the agricultural sector. To this end, participants are called to rank the ten most relevant challenges that EU agricultural sector will have to cope in the next 10-15 years within a list of 45 proposed challenges. Specific rankings were also requested for each of eight main agricultural sectors.

As Table 5 shows the number of participants varies depending on the activity from 7 to 24 participants.

Table 5. Description of the virtual co-creation platform activities related to risk management.

	Starting date	Participants	Estimated time (min)	Average time (min)
Challenge 2				
Activity 2.1. Map of challenges	11.09.18	24	20	11 ± 6
Challenge 3				
Activity 3.1. Matrix of strategies to deal with shocks	26.11.18	11	15	19 ± 18
Activity 3.2. Matrix of strategies to deal with long-term pressures	10.12.18	10	15	42 ± 51
Activity 3.3. Improving RM strategies	20.02.19	7	15	16 ± 10
Activity 3.4. RM strategies contribution to resilience capacities	20.02.19	8	15	30 ± 26

Based on the results of the challenge 2, the challenge 3 proposes the participants to co-create the matrix of the existing strategies to deal with the main agricultural *shocks* (Activity 3.1) and *long-term pressures* (Activity 3.2) by considering the role of every actor involved in RM. Challenges selected by participants in the virtual co-creation platform are classified according to the SURE-Farm resilience framework (Meuwissen et al., 2019), i.e. *shocks* and *long-term pressures* classified regarding the type of challenge (*environmental*, *economic*, *social* and *institutional*). Actors involved in RM are categorized into six groups: *Farmers*, *Farmers' organizations*, *Processors/Distributors*, *Input suppliers*, *Bank/Insurance companies* and *Public sector* (Figure 7).

		Farmers	Farmers' Organization	Processors /Distributors	Input Suppliers	Banks/ Insurance Companies	Public Sector
Shocks	Greater occurrence of weather extreme events	?	?	?	?	?	?
	Price volatility						
	Farmers' income volatility						

Figure 7. Example table of the matrix of the existing strategies to deal with shocks at farming system level.

The aim of the Activity 3.3 is to assess how RM strategies could be enhanced by improving the performance of the stakeholders involved in their implementation. In this case, participants were asked to identify the actors involved in RM strategies implementation and brainstorm ideas on how their performance could be improved.

Finally, Activity 3.4 consists of assessing how RM strategies contribute to the resilience capacities (*robustness*, *adaptability* and *transformability*). Participants in the virtual co-creation platform are provided with the list of the strategies most implemented by farmers in the SURE-farm CS regions (Spiegel et al., 2019). They are asked to select those they consider the most relevant for the sustainability and resilience of the farming systems and provide a rank (and explanation) indicating to what extent they consider the selected RM strategies contribute to resilience capacities. The score ranges from -3 (very constraining) to +3 (very enabling) and explain the score.

4.3   Qualitative content analysis

The information facilitated by the stakeholders in the focus groups and the virtual co-creation platform was analysed by applying qualitative content analysis. This involves creating a block of contents and defining a code for each block. Coding facilitates a better understanding of the information and allows to compare the data from different sources (Elo and Kyngäs, 2008).

SURE-Farm partners conducting the CS focus groups reported the main results of the focus groups in two manners: 1) A word report explaining the activities and main results and conclusions; and 2) an excel document with the detailed answers by participants and activity during the focus groups. These detailed answers supported by the explanations provided in the word documents are the basis of the coding process. Before initiating the manual coding, doubts on participants' answers and explanatory report were solved together with CS partners.

The participation of the stakeholder in the virtual co-creation platform is systematically recorded and discharged in excel files. These files provide the answers by participants and activity performed in the co-creation platform and are the basis for the manual coding process.

Once the contents are coded, the codes are placed into similar groupings and counted. The frequency of each code (quantitative information) is supplemented with a rich description of the codes (qualitative information) (Onwuegbuzie et al., 2009). Tables are used to report detailed results (Elo and Kyngäs, 2008). This procedure is followed in the assessment of the insights from the focus groups and digital co-creation platform separately.

Deductive analysis is followed in the assessment of perceived challenges, the RM strategies' improvements and the contribution of RM to resilience capacities. Deductive analysis is appropriate when the research aim is to test the existing theory or retest existing data in a new context. It starts with preconceived codes derived from prior literature (Kondracki et al., 2002). Deductive analysis has been applied in three assessments: 1) Challenges were grouped according to the categorization proposed by Meuwissen et al. (2019); 2) RM strategies were classified into

two groups: *on-farm* RM strategies and risk-sharing strategies (Huirne et al., 2000); 3) Reasons provided by participants in the focus groups explaining how the actors involved in RM contribute to resilience were framed under the resilience attributes (Cabell and Oelofse, 2012) and resilience principles (Reidsma et al., 2019; Resilience Alliance, 2010).

5 How to improve risk management: Evidence from the focus groups and the virtual co-creation platform.

Emerging from the focus groups, 584 potential improvements to enhance stakeholders' role in RM were collected. As the applied methodology did not set a pre-selected amount of improvements to be identified, the number of improvements varies across the CS (for more information about each CS see Appendix 2).

In order to manage such density of qualitative findings, the list of improvements were organized and analysed through the related actors and strategies discussed in the focus groups. This is coherent with the scope of assessment, which aims at highlighting potential improvements of actors' role in RM strategies' implementation. Different actors and RM strategies were analysed in each focus group. This advised against performing a direct comparison of results. To overcome such a mismatch, it was necessary to converge actors and strategies into more comprehensive definitions of them. This allows to manage the overall amount of data, and to carry on an across-cases analysis.

As a first step, the 93 actors analysed in the eleven focus groups (for more information see **Error! R eference source not found.**) were grouped into eight main actors' categories. Those new general categories are *Farmers*, *Policy makers* (local, national, and EU institutions and administrations), *Financial institutions* (banks and insurance companies), *Associations & Cooperatives* (both vertical and horizontal), *Value chain actors* (input suppliers, distributors, processors, and advisors), *Research* (Universities and research centres), a group of *NGOs, Media & Civil society*, and a non-defined group named *Other actors*. The latter was disregarded in the assessment because clear conclusions could not be drawn from such a miscellaneous group. In fact, despite being considered in the focus groups, from those actors we failed to identify any improvement.

Once the actors' categories were defined, we classified the strategies. Overall, 42 RM strategies were selected and discussed across the focus groups. As shown in Table 6, those strategies have been grouped into seven main categories of RM, that are: i) 'Enhancing profit and financial strength' that includes strategies for the stability of the balance debts/savings to enhance both buffer and investment capacity, but also the protection of profitability through insurances and hedging; ii) 'Innovation' that regards the implementation of innovative technologies and novelties in farm production (although similar to the resource management strategy, this category is

particularly focused on innovation and novelties); iii) 'Cooperation' that includes all kinds of vertical and horizontal organizations, associations, and cooperatives; iv) 'Learning and information exchange' that includes strategies for learning with particular regard to agricultural challenges and available policies, training, knowledge exchange and transfer, information flow and use market and weather info to plan activities; v) 'Resource management' that includes strategies to optimize inputs' sourcing, efficiency and flexibility in resource use, and in general farm management to improve production (strategies to improve work conditions and performance have been grouped in this category, as it regards the management of the labour resource); vi) 'Diversification' that includes strategies for both on-farm and off-farm, agricultural and non-agricultural diversification; and vii) 'Consumer orientation' that concerns especially strategies to better focus production on consumer demand and expectations (for example by valuing positive contribution of agriculture), and measures for the promotion and marketing of products. In this case, the classification aimed at highlighting the areas of main interest for RM. Nonetheless, as in the case of actors' classification, the consistence of data related to each strategy was taken into account to identify the main RM strategies.

Table 6. Categorization of the risk management strategies selected in the case study focus groups.

Country	Identified strategies	Strategy category
FR	Limiting debts	
UK	Financial stability	
SE	Generate sufficient farm income/profitability	
IT	Maintaining financial savings for hard times	
	Bought any type of agricultural insurance	**Enhancing profit and financial strength**
BL	Use of market instruments to reduce risk	
	Decreasing market uncertainty	
ES	Investment and financing capacity	
BE	Maintain financial savings for hard times	
	Hedging	
UK	Increase efficiency	
PL	Invested in technologies to control environmental risks	**Innovation**
BE	Technological optimisation	
IT	Being member of a producer organisation, cooperative	
BE	Cooperation with value chain actors	**Cooperation**
NL	Improve cooperation with other farmers	
RO	Cooperation / Associations	
UK	Engaging in learning and knowledge exchange	
DE	improvement of information flow	
IT	Learning about challenges in agriculture	
BL	Policy	**Learning and information exchange**
PL	Used market/weather information to plan activities for the next season	
ES	Training and knowledge transfer	
BE	Use market information	
NL	Learned about challenges in agriculture	
FR	Improving food self-sufficiency	
	Improving life quality at work	
DE	Increase farm efficiency	
	Climate change adaptation	**Resource management**
BL	Access to markets of inputs	
	Overcoming lack of working force	
PL	Improved cost flexibility	
RO	Technological and managerial change	
UK	Non-agricultural diversification	
DE	Farm diversification	**Diversification**
PL	Diversified in production	
RO	Diversification	
FR	Changing the practices to meet social expectations	
SE	Consumer demand for produce (quantity and quality)	
ES	Value extensive livestock contribution to environmental conservation and population retention	**Consumer orientation**
	Promoting of lamb meat consumption	
RO	Marketing	

By means of those classifications of strategies and actors, data about RM improvements can be better handled. Table 7 reports the number of improvements per country and strategy. The most targeted strategies to improve are 'Enhancing Profit and financial strength', 'Resource management', and 'Learning and information exchange'. However, the strategies' improvements vary across cases, as the number of suggested improvements is different. The strategies 'Enhancing profit and financial strength' and 'Learning and information exchange' have been discussed in 8 focus groups, 'Resource management' in 5, and the others in 4.

Table 7. Opportunities to improve risk management strategies by case study region.

	Country - case study (*)												**Case studies**
Strategies	BL	PL	RO	ES	DE	FR	UK	BE	IT	NL	SE	**Total**	
Enhancing profit and financial strength	61			15	6	12	10	16	18		5	**143**	**8**
Resource management	61	13	31		16	13						**134**	**5**
Learning and information exchange	39	11		8	7		10	4	8	24		**111**	**8**
Consumer orientation			8	37		14					5	**64**	**4**
Innovation		39			1		11	12				**63**	**4**
Diversification		5	21		11		8					**45**	**4**
Cooperation			4					7	10	3		**24**	**4**
Total	**161**	**68**	**64**	**60**	**41**	**39**	**39**	**39**	**36**	**27**	**10**	**584**	

(*) The figures in the table represent the number of improvements proposed by risk management strategy in the CS focus groups.

Table 8 shows improvements per country and actor. In each case, actors gathered a different number of improvements. Besides, each actor has not been considered in all cases (except *Farmers*). *Policy makers* were discussed in 10 cases, whereas *Financial institutions* in 9 and *Value chain actors* in 8.

Table 8. Opportunities to improve risk management by actor involved and case study region.

Actors	BL	PL	RO	ES	DE	FR	UK	BE	IT	NL	SE	Total	Case studies
Policy makers	51	23	17	17	18	9	23	12	11	5		**186**	**10**
Farmers	47	10	9	6	5	5	6	11	6	4	5	**114**	**11**
Associations & Cooperatives	38		8	28		7			9	4		**94**	**6**
Financial institutions	23	10	11	9	9	5		4	7	14		**92**	**9**
Value chain actors	2	20	9		6	9		11	3		1	**61**	**8**
Research institutes & Universities			9		3	2	10	1				**25**	**5**
NGOs, Consumers & Media		5	1			2					4	**12**	**4**
Total	**161**	**68**	**64**	**60**	**41**	**39**	**39**	**39**	**36**	**27**	**10**	**584**	

(*) The figures in the table represent the number of improvements proposed by actor involved in risk management in the CS focus groups.

Table 9 shows the number of improvements per RM strategies and actors' categories. Here the table casts light on the actors that should or could improve the most within each RM strategy. From another point of view, it shows which strategies each actor could improve the most. For example, *Policy makers* and *Financial institutions* are the most required to improve for 'Enhancing profit and financial strength'. *Policy makers* are the most important in all strategies, except 'Consumer orientation' where *Associations & Cooperatives* should improve the most.

At last, this table lists the actors' categories that need the biggest improvement (in the participants' opinion). *Policy makers* have evidently the highest potential to improve, and *Farmers*, *Associations & Cooperatives*, and *Financial institutions* have a high potential as well.

Table 9. Opportunities to improve risk management by strategy and actor involved.

RM strategies (*)	Enhancing Profit & financial strength	Resource management	Learning and information exchange	Consumer orientation	Innovation	Diversification	Cooperation	Total	Nº strategies
Policy makers	42	44	33	12	22	24	9	**186**	**7**
Farmers	26	33	20	8	16	6	5	**114**	**7**
Associations & Cooperatives	24	15	19	29		3	4	**94**	**6**
Financial institutions	44	15	19	3	8	3		**92**	**6**
Value chain actors	7	17	7	7	13	4	6	**61**	**7**
Research & Education institutions		8	11		1	5		**25**	**4**
NGOs, Consumers & Media		2	2	5	3			**12**	**4**
Total	**143**	**134**	**111**	**64**	**63**	**45**	**24**	**584**	
Nº of actors	**5**	**7**	**7**	**6**	**6**	**6**	**4**		

(*) The figures in the table represent the number of improvements proposed by risk management strategy and actor involved.

5.1 How to improve the strategies to deal with agricultural challenges: Evidence from the focus groups

As reported in the *Business Brief on opportunities for improved risk management for EU agriculture* (D2.7), four main pathways to improve RM were identified throughout the focus groups: 'Training and advice', 'New tailored products and services', 'Information flow' and 'Cooperation'. Those pathways group the collected improvements around four conceptual pillars. The pathway containing most of the improvements is 'Training and advice', which refers to process of learning, training services, knowledge exchange, and openness to experimentation and implementation of innovations. This includes also practices of peer learning (Cooreman et al., 2018), horizontal networks of learning (Gibb et al., 2017), and group extension (Prager and Creaney, 2017). In this pathway, it is considered also the advisory services, which are often interpreted as training and support to farmers' learning. However, the role of advisory services in EU farming systems is recognized (and in other context also, see for example Eastwood et al. (2019) and Services (2012), as well as the policies aimed at facilitating access to such services (Sutherland et al., 2017). This pathway fits with the concept of Agricultural Knowledge and Innovation Systems (POPPE, 2012).

The pathway of 'New tailored products and services' regards all those market instruments, financial products, policy measures and, in general, all those services provided to farms which at

present might not respond to farmer's needs. Many existing tools/services are not tailored to specific needs, and should be improved, whereas in some cases there are no instruments or services to cope with (new) challenges. This includes also claims for public-private collaboration to improve (mainly financial) RM instruments, which is recognized to be of increasing interest for the future of agriculture (Dick and Wang, 2010).

The pathway 'Information flow' includes all those unilateral and reciprocal links to exchange information and data. It also refers to specific seminars, meetings, public events, digital platforms, web sites, and social networks aimed at exchanging/providing information and data. The web may play a key role, as shown in other studies (Bruce, 2016), involving not only farmers, but also information exchange between other stakeholders (Materia et al., 2015). The design of new digital tools to provide easy-to-read information is an interesting point (also in other context, see for example (Wilkinson et al., 2015)). Nevertheless, farmers' social relations keep playing a crucial role in knowledge exchange, as highlighted in previous research (Thomas et al., 2020).

The pathway 'Cooperation' includes all those improvements that refer to the construction of networks of cooperation and collaboration between stakeholders, or to the enhancement of the existing ones. It includes both horizontal and vertical cooperation, involving different stakeholders and production/trading processes. Several studies analysed cooperative farms' performance (see Benos et al. (2018) for an overview). Although often focused on increase of prices/reduction of costs (Burt and Wirth, 1990), the cooperation strategy can serve different scopes, such as link different sectors to exploit synergies (Regan et al., 2017), or short the value chain to address the sector to the local market (Berti and Mulligan, 2016). However, different organizational forms of cooperation are possible (Kontogeorgos et al., 2018), and their scope could be expected to be more connected with the rural/territorial context (Fonte and Cucco, 2017). The role played by policies is also controversial and often debated, as in the case of Producers' Organizations (Michalek et al., 2018). At last, cross-border cooperation deserves mention within this pathway, as formerly emerged in EU context (SCAR, 2016). In the light of such landscape, the improvement of cooperation models and mechanisms has emerged across the focus groups as a consistent pathway to improve RM across EU farming systems, despite the case-specific differences and the diverse RM strategic targets.

The four presented pathways are evidently interlinked, and work in synergy. For instance, it is recognized the importance of information flow/availability to improve insurance services (Lunt et al., 2016), or the importance of cooperation to learning, training and advisory processes (Hermans et al., 2015). The role of institutions and the policy implications cut across the four pathways, therefore they emerged in each one.

Figure 8 shows the main pathways to improve RM within the focus groups. The contribution is measured through the share of improvements belonging to each pathway on the total improvements suggested within the case. At a first glance, it does not emerge a dominant pathway to improve RM. However, the pathways 'Training and advice', and 'New tailored products and services' seem quite relevant in most of the focus cases, whereas the contribution of the pathways 'Cooperation' and 'Information flow' exchange varies more significantly across the cases.
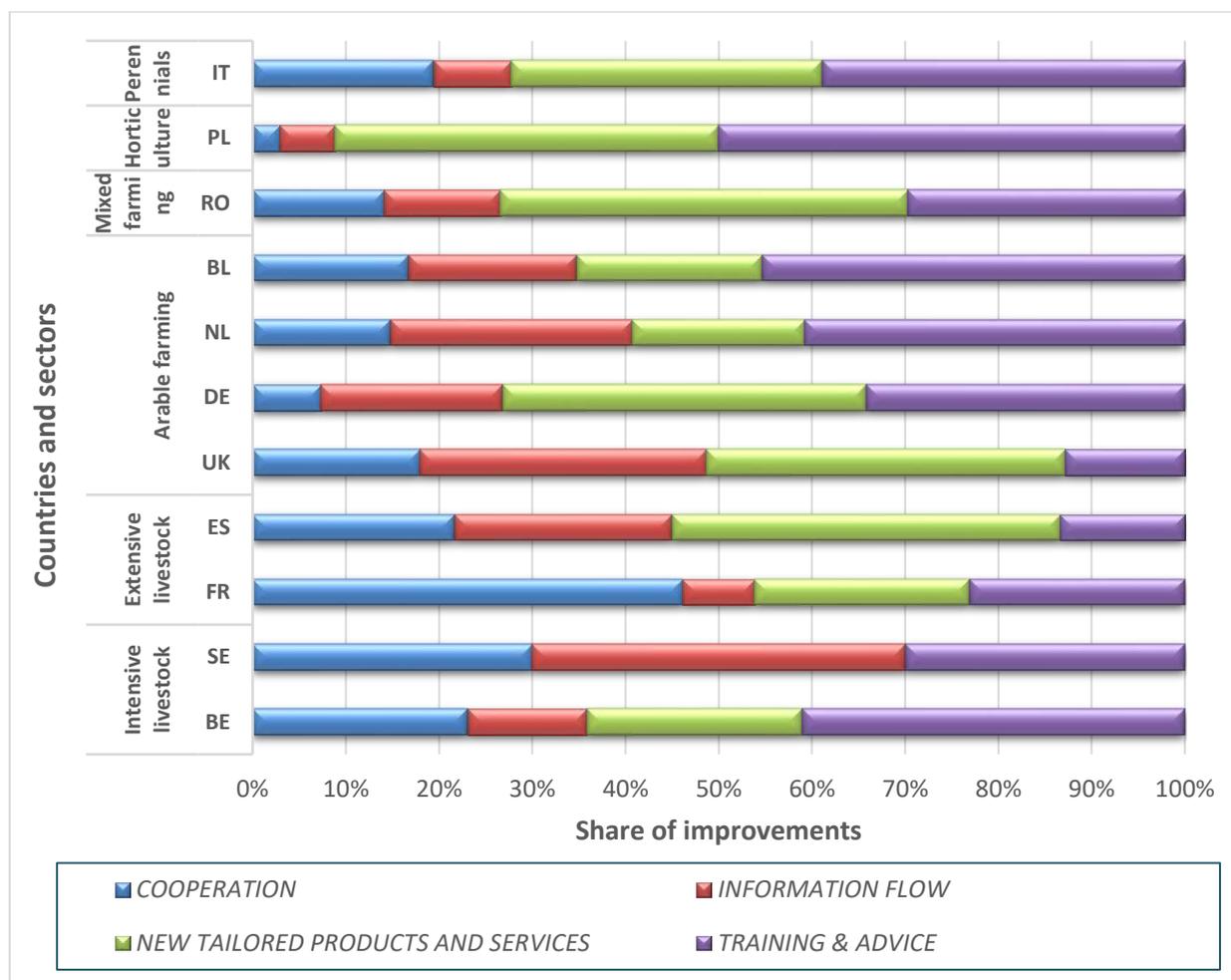
Figure 8. Pathways to improve risk management by case study region.

The pathway 'Cooperation' appears more important for intensive and extensive livestock systems, although with evident differences between these cases. In fact, cooperation is very important in France, whereas it is less relevant in Sweden, Belgium and Spain. In Poland and Germany it does not seem significant.

The relevance of the pathway 'Information flow' varies evidently across cases. It is the more relevant pathway in Sweden, whereas it is not significant in France, Italy, Belgium, Romania and Poland. However, it emerges clearly in the Netherlands, and UK. This pathway is quite significant in arable farming systems, as it also emerges in Germany and Bulgaria. In livestock sectors, also the Spanish case shows this pathway.

Except for the Swedish case, the pathway 'New tailored products and services' emerges clearly across all cases. In the cases of Romania, Germany, United Kingdom, and Spain is the most relevant pathway. Besides, it is significant in the horticultural and perennials' sectors (Poland and Italy).

Finally, the importance of the pathway 'Training and advice' differs across cases, although it emerges in all of them. It is the most relevant pathway in Italy, Poland, Belgium, the Netherlands and Bulgaria, whereas it is the least significant in Spain and United Kingdom. In Germany, Sweden, Romania and France it is important, although not the most relevant.

All the pathways vary significantly across the cases and the different productions. Therefore, it could be argued that the pathways of improvement are more case-specific rather than specialization-specific. The challenges differ among the cases, thus the focus groups discussed different RM strategies to be improved. This clearly contributed to lead towards case-specific evidences. Nevertheless, the four pathways that we identified throughout the analysis may highlight key concepts and elements to improve existing RM strategies, or to design new patterns of RM. In fact, it is worth noting that the focus groups' participants put forward mainly these four themes. In general, it could indicate that the widest margin of improvement in RM is likely to be within such areas. However, the measures to be taken and the decisions to be made to pursue such pathways are very case-specific, not always transferable from one system to another as such.

Besides the general overview, a deeper insight into data is needed to obtain a full understanding of results, and to identify the key emerging concepts to improve RM in EU farming systems. To delve into the actors' role in RM, data were analysed in reference to the actors' categories. The observation of improvements across strategies seems less relevant to the scope of the assessment, which aims to provide indications to stakeholders about potential pathways to improve RM. Thus, the following analysis of RM improvements is presented by looking closer at each of the seven actors' categories. Within each group of actors, improvements are classified in a double-scale level to get both a more general and a narrower insight on the main targets of improvement.

5.1.1 Opportunities for Policy makers to improve risk management

The actors included in the *Policy makers*' group are public authorities at all scales, from local to European, and reach to EU Institutions and policies, national Ministries, national agencies for payments and labour offices, local and regional administrations, organization of municipalities. This actor has been considered in all cases except one (Sweden).

The category *Policy makers* received the highest number of observations and proposals. In total, 186 improvements have been collected across the focus groups. Improvements have been classified in general and specific categories to identify the main concerns with specific labels, as reported in Figure 9 below.
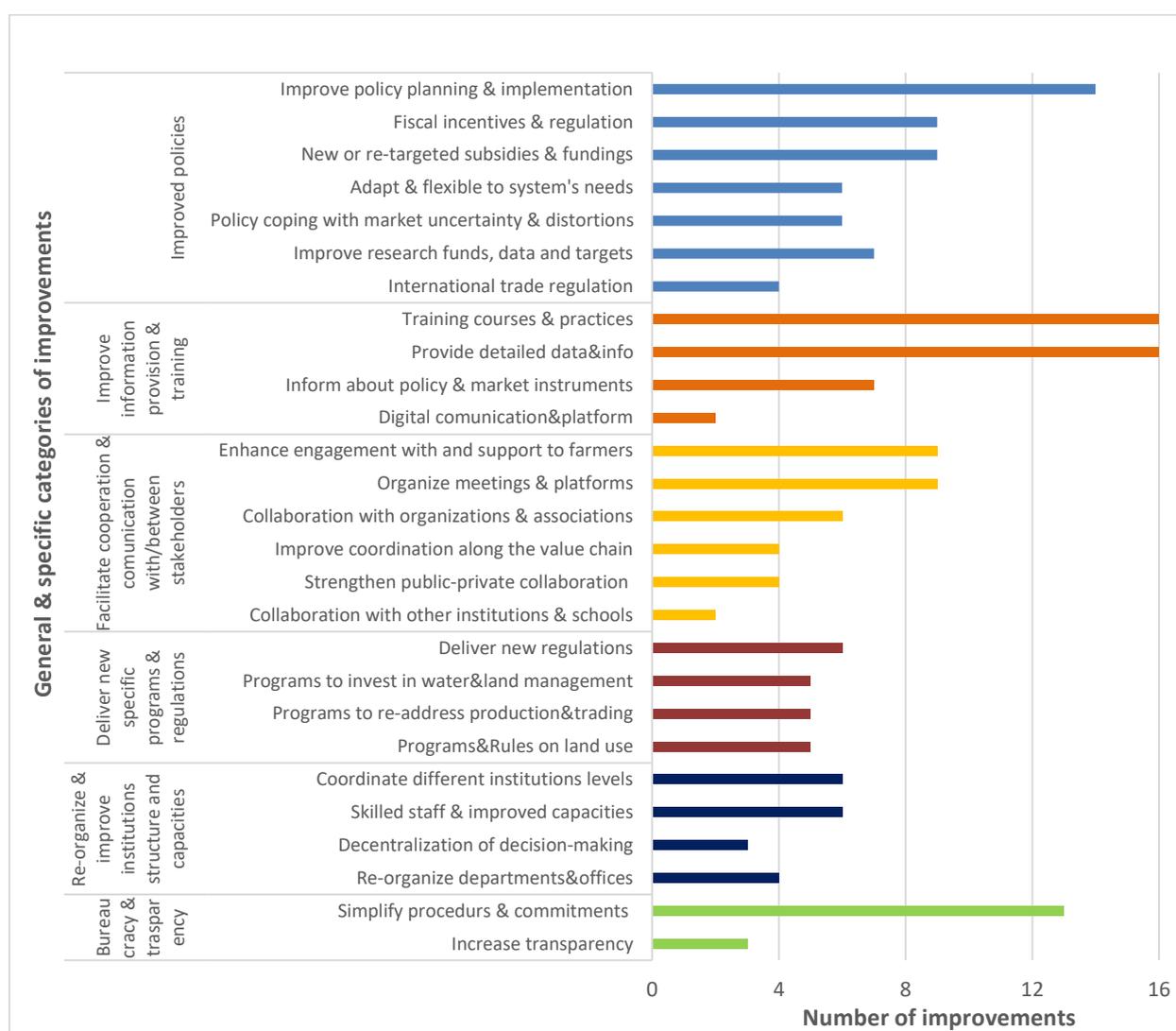
Figure 9. Opportunities for Policy makers to improve risk management.

Improvements have been divided in six main areas of interest, corresponding to six general categories. The main concern is the *Improvement of existing policies*, even by designing new RM tools. The highest potential relies in the better policy planning and operationalization of plans. The results indicate that policies should be more flexible to better respond to specific, local needs. However, more specific improvements have been highlighted by focus group discussions. The fiscal policy could reduce the VAT for certain products (depending on the criticisms and/or positive functions provided by the sector), decrease fiscal pressure on niche products and rural areas, and reduce taxes to boost environmental investments (and consequential profits) and the build-up financial buffer in farms.

Subsidies and aids should be better distributed among sectors and farmers, and should re-target their focus, for example supporting innovating investments instead of ordinary ones, fund labour costs at the first steps of a new activity, or the purchase of critical means of production. This might stimulate farmers to engage in networks, and ensure that subsidies focus on farm performance, and address processing and sales activities too.

On the side of international trade, the opportunity for a re-modulation of duties and quotas (to protect the EU market) has emerged.

Research policy (and the public research itself) should count on more data and funds support, and target more practical issues to investigate to improve the operationalization of solutions.

Regarding the need for improved policies, another avenue for improvements concerns passing *New regulations* (such as sanitary and environmental), *and programs* for investments and management of land, water and production.

A further significant theme is the provision of *Information and training*. First, a permanent and structured service of seminars, meetings, and training courses at local level can be functional. This training service can be addressed to farmers and other stakeholders, such as consultants, a system of local training centres would improve it. Besides, it is important that updated information be provided and facilitated by dynamic, local solutions such as informative caravans. The public administrations should aim to increase the farmers' knowledge and awareness about policy measures and opportunities. A crucial aspect to improve dissemination is the digitalization of communicative means.

The public authority is seen as a facilitator of *Cooperation between all stakeholders*. There is a significant potential for improvement in this field. Administrations could create and manage rooms for cooperation, above all through a scheduled and structured organization of meetings, and by designing digital platform that may engage farmers from at local, national, and EU levels.

A particular focus has been set on the collaboration with financial institutions to improve their services and products.

Finally, it has been highlighted by the focus group discussions that a *Re-organization of institutions and administrative structures* could improve their capacity. The coordination between local and national (or EU) level could improve, also to unifying procedures and regulations. The public staff should be trained and its presence at local level could be increased. To better respond to specific needs, institutions could decentralize decision making. Redundant offices could be eliminated, and existing departments could specialize on new emerging issues in RM. Across all institutional and administrative levels, the digitalization of procedures would improve public performance.

In relation with the re-organization of public structures, the *Reduction of bureaucracy* for the simplification and transparency of procedures and commitments has a significant potential for improvement.

In Figure 10 the cases' contributions to the main areas of improvement are presented in terms of suggested improvements. Ten cases discussed improvements for *Policy makers* (except Sweden). Bulgaria seems to gather the greatest number of improvements, contributing mainly to improvement of *Information provision and training*, and facilitated *Cooperation*. However, its contribution to the *Delivering of specific programs and regulations* appears low. Instead, Poland shows a high concern about *New programs and regulations* and about the *Reduction of bureaucracy and increase of transparency* as well. In the case of UK, improvements are mainly concentrated on the need to *Improve policy tools and measures*, *Improve institutional structure and capacities*, and more support for *Cooperation*. Germany and Italy are focused on the *Reduction of bureaucracy*, *Increased transparency*, and *Re-organization and improvement of institutional structures and capacities*. The case of Spain shows a need for *New or improved regulations* and supported *Cooperation*, while the Dutch CS seems to request facilitating *Cooperation*. France is focused on *Improved policy tools and measures*, and on facilitated *Cooperation* as well.
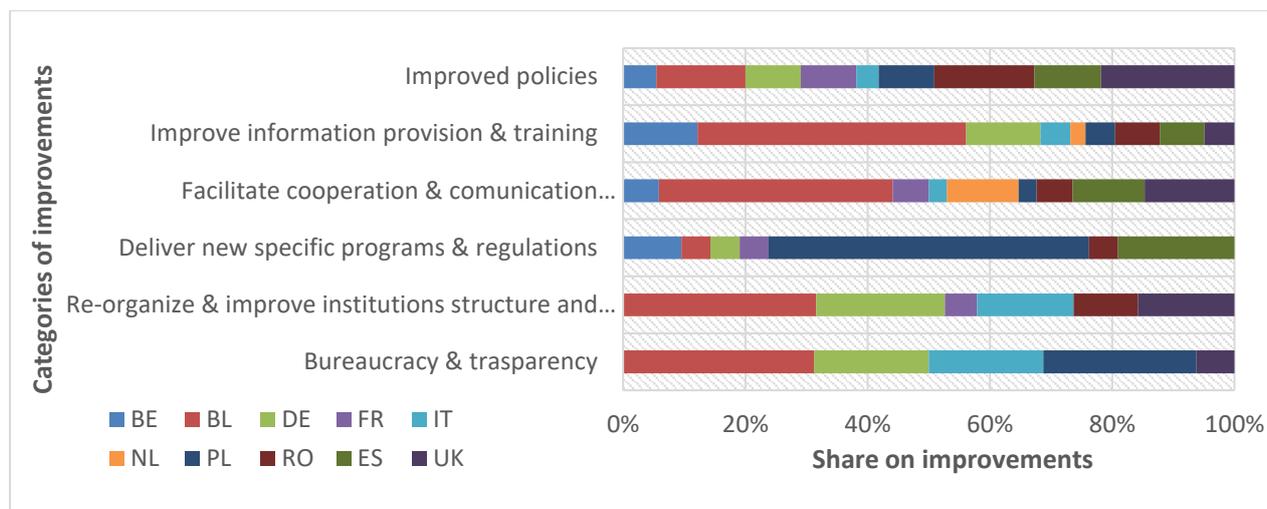
Figure 10. Opportunities for Policy Makers to improve risk management by case study region

5.1.2 Opportunities for Farmers to improve risk management

The actor *Farmers* refers evidently to the livestock and agricultural producers directly involved in farming and farm management. This actor's role was assessed in all cases study except in the Netherlands. About 114 improvements have been collected across the cases. Farmers have been one of the most discussed actors in the focus groups. Improvements have been classified in general and specific categories to identify the main concerns with specific labels, as reported in Figure 11 below.
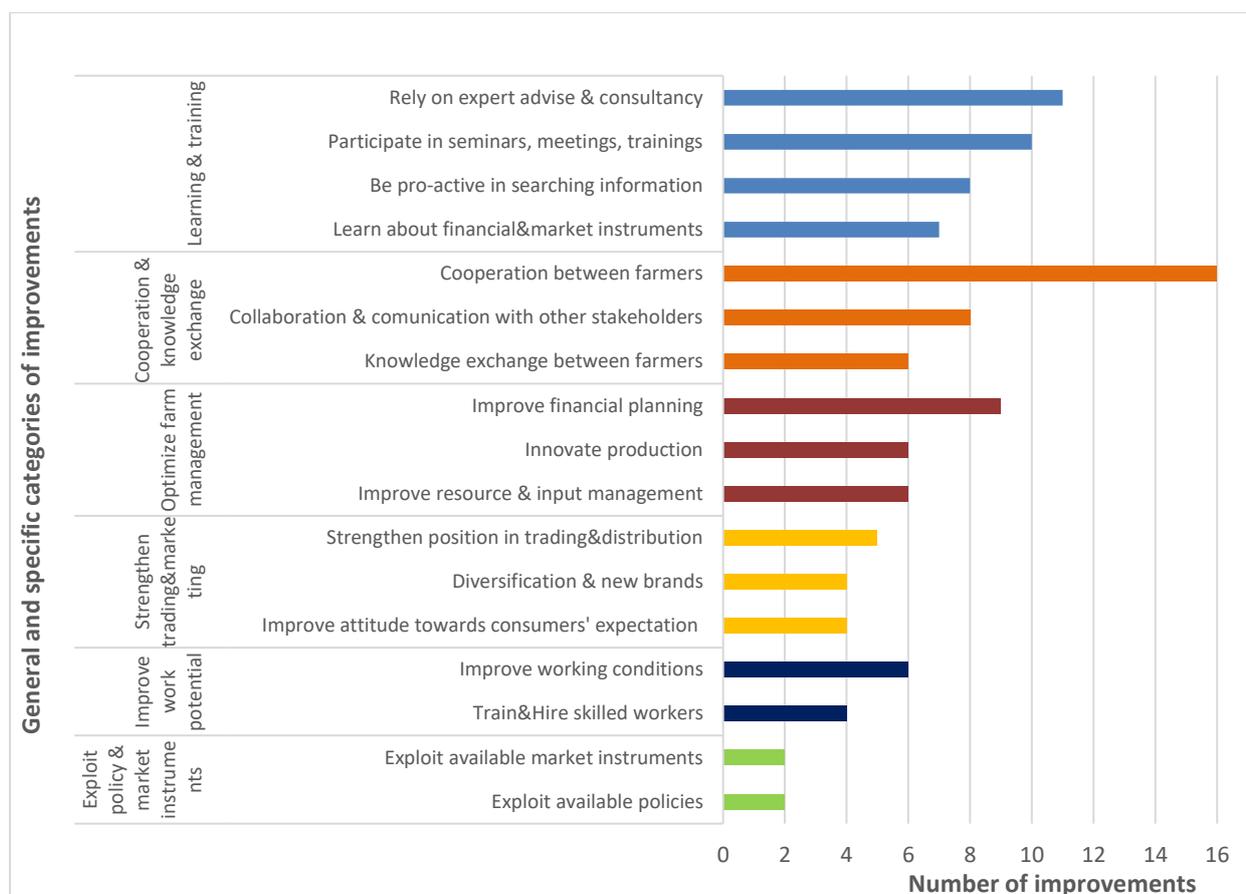
Figure 11. Opportunities for farmers to improve risk management.

Six general categories of improvements were identified from the collected information, corresponding just as to six main concerns. The main area of improvement regards farmers' *Learning and training*. There is potential for improving their capacity and skills, above all related to financial and market instruments. Their participation in seminars and training courses should increase and be a regular practice. Farmers should be encouraged to pro-actively search for information. Importantly, farmers should rely on others' experience and expert advice.

The second main area of improvement relates to the *Cooperation and exchange of knowledge* between farmers. Farmers could cooperate in many fields, for example in risk mutualisation, exchange of input of production within the farming system, sharing means of production and services, development of collective projects. Besides, the cooperation along the value chain should be fostered. Farmers should be active in sharing ideas and experiences and be transparent with their data. This would improve the learning potential within a farming system. New digital, social networks could be used to favourite knowledge exchange.

A further category of improvement is the potential to *Optimize farm management*. In this regard, particular concern stands in the domain of financial planning. Farmers' would improve their RM capacity if they got aware of the gap in the optimization of the costs of production. Besides, they should plan their financial flows to invest in technologies and innovation, and to save buffer resources. Moreover, farmers could innovate their production processes, and improve the input management in production.

Farmers could improve in another area: their *Trading and marketing capacity and skills*. First of all, they could strengthen their position in trading and distribution by reducing the number of intermediaries, increasing the number of wholesalers, or boosting the local trade. Secondly, they could differentiate both in and off farm activities, and diversify their production by targeting organic, niche or higher-quality brands. Finally, farmers should take into account consumers' trends and expectation when planning their production.

The *Work potential* in farms is another theme, and it is related on the one hand to the need to hire and train skilled staff, and on the other to improve the working conditions of employees by implementing bonus system, performing team building, and increasing salaries.

Last, some farmers identify the gap in using policy and financial instruments, and suggest they should *Exploit many policy measures or market tools* available in agriculture.

Figure 12 presented below contains the suggestions to the main areas of improvement for *Farmers*. Also, for this actor, Bulgaria predominantly focuses on improving *Work potential*, *Exploitation of available policy/market tools*, and *Learning and training*. However, both Spain and Romania underline the need to *Strengthen their trading and marketing capacities*, while Poland brings suggestions mainly to *Farm management optimization* and *Exploitation of policy and market instruments*. The Netherlands, France and Italy focus on *Cooperation and knowledge exchange* as the key to improve RM on the farmers' side. The UK targets *Farm management optimization*, and *Cooperation and knowledge exchange* as well. The Sweden highlights a need to improve *Work potential* and *Cooperation*, while Germany focuses mainly on *Optimize farm management*.
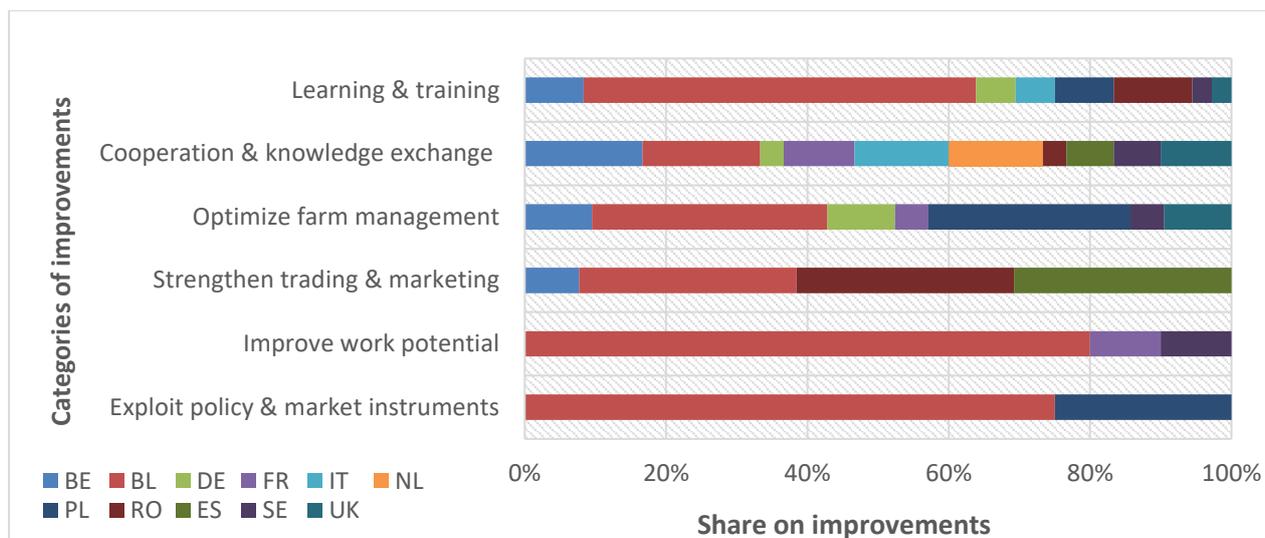
Figure 12. Opportunities for farmers to improve risk management by case study region.

5.1.3 Opportunities for Associations & Cooperatives to improve risk management

The actor *Associations & Cooperatives* encompasses both horizontal and vertical organization grouping farmers and other stakeholders along the value chain. This actor was analysed in 8 cases out of 11 (Germany, Poland and Belgium did not consider the actor in their focus groups). *Associations & Cooperatives* accumulated 94 improvements across the focus groups. Improvements have been classified in general and specific categories to identify the main concerns with specific labels, as reported in Figure 13 below.
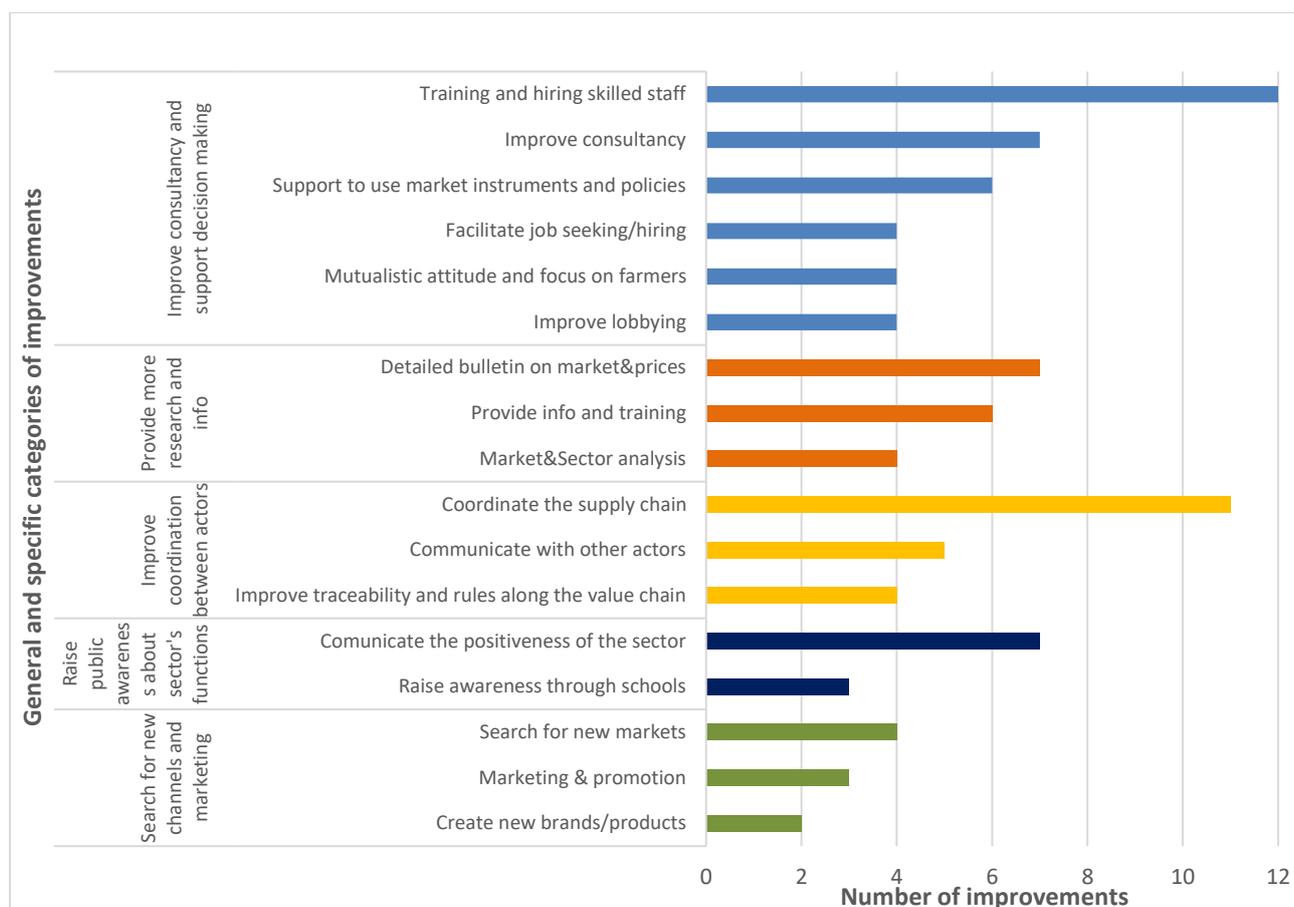
Figure 13. Opportunities for Associations & Cooperatives to improve risk management.

Five main categories of improvements have been identified for *Associations & Cooperatives*. The first category of improvement relates to the *Quality of consultancy and support to decision making* given to farmers. There is an evident need for more skilled workers and consultants in associations and cooperatives, above all in the fields of market analysis and communication. Besides, there is a need for more specialized consultancy to improve farmers' RM. Above all, farmers should be supported to improve the use of financial products and policy measures. Associations and cooperatives should monitor and communicate policy opportunities and changes. It emerges also the need for a direct role of cooperatives in job hiring. The lobbying capacity of associations and cooperative could improve, mainly in relation with policy making and contracts along the value chain.

A further area of improvement is the *Provision of information and research*. Associations and cooperatives should dedicate part of their activity to market analysis and organize a structured service of market and prices info provision. Bulletins could be spread via mail, social networks, and digital platform on a daily basis. Moreover, *Associations & Cooperatives* could provide a

training service improved in contents and focused on novelties, technologies, and experiences from other farming systems.

Another category of improvement is the *Cooperation with stakeholders of the value chain*. *Associations & Cooperatives* have two main roles: the one is to manage meetings between different stakeholders, the other is to pursue collective bargaining along the chain. Next, associations & cooperatives may play a better role in communication with actors out of the chain, such public institutes and research centres. At last, *Associations & Cooperatives* are key actors to improve transparency of data, information and procedures between different actors. This would lead also to an improved regulation among stakeholders.

An important target of improvement is the role that *Associations & Cooperatives* should play to *Raise public awareness and education* about the agricultural concerns and the positive functions of farming. A relevant part of the activity should be dedicated to this point, through the cooperation with schools and media, but also by improving staff's communicative capacity. Social media networks should be exploited.

Finally, *Associations & Cooperatives* could have a more significant role in *Trading and marketing*. A specific capacity should be developed to avoid misalignment between consumers' demand and farms' production. Therefore, *Associations & Cooperatives* should be active in searching for new market opportunities, designing new brands and productions, and promoting farmers' products.

The Figure 14 below shows the cases' contribution to the main areas of improvements for *Associations & Cooperatives*. In six CS improvements for these actors have been discussed. The Spanish case seems to bring the higher contribution, especially for the *Raise of public awareness* (which is uniquely a Spanish concern), and the search for *Other channels and marketing*. Again, Bulgaria has a high contribution, although it is not the highest. In the Bulgarian case, the focus is on the *Provision of information and research*, then on *Improved advice and support to decision making*, and *Improved coordination between actors*. The Netherlands, France and Romania highlight the need to *Improve coordination between stakeholders*, while Italy focuses on the improvements of *Consultancy and support to decision making*.
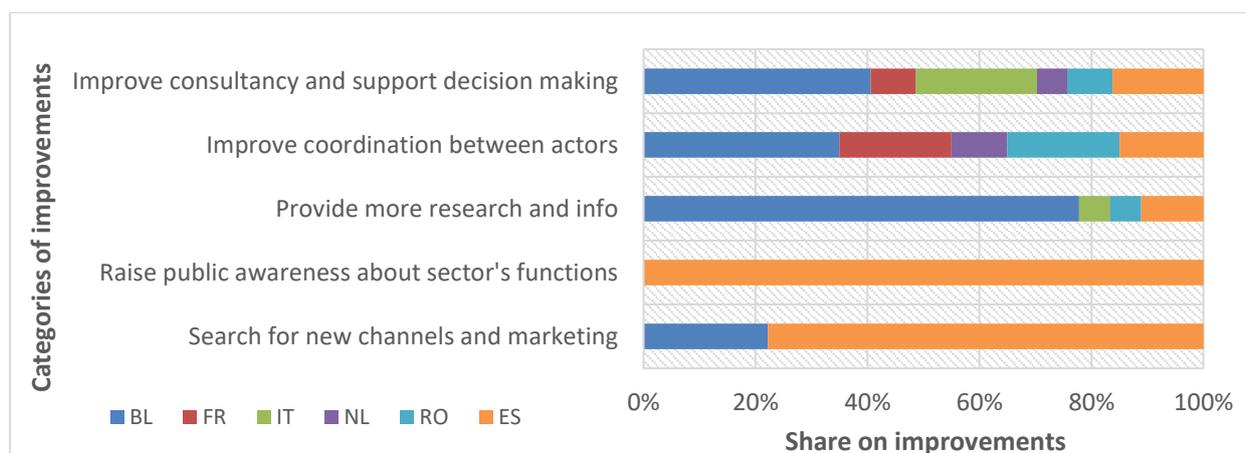
Figure 14. Opportunities for Associations & Cooperatives to improve risk management by case study region.

5.1.4 Opportunities for Financial institutions to improve risk management

The actors' category *Financial institutions* are providers of financial products, instruments, and services such as insurance and credit. This category has been considered in all the CS and includes banks and insurance companies.

To improve the role of *Financial institutions* in the implementation of different types of RM strategies, the participants of focus groups suggested 91 improvements. Such improvements have been qualitatively analysed and classified into meaningful categories that highlight the main concerns in the participants' opinion. Those concerns are related to the most significant gaps to exploit the potentiality of financial institutions in RM at farming system level. Figure 15 shows those improvements distributed in different thematic categories, in order to facilitate the identification of the main elements emerged.
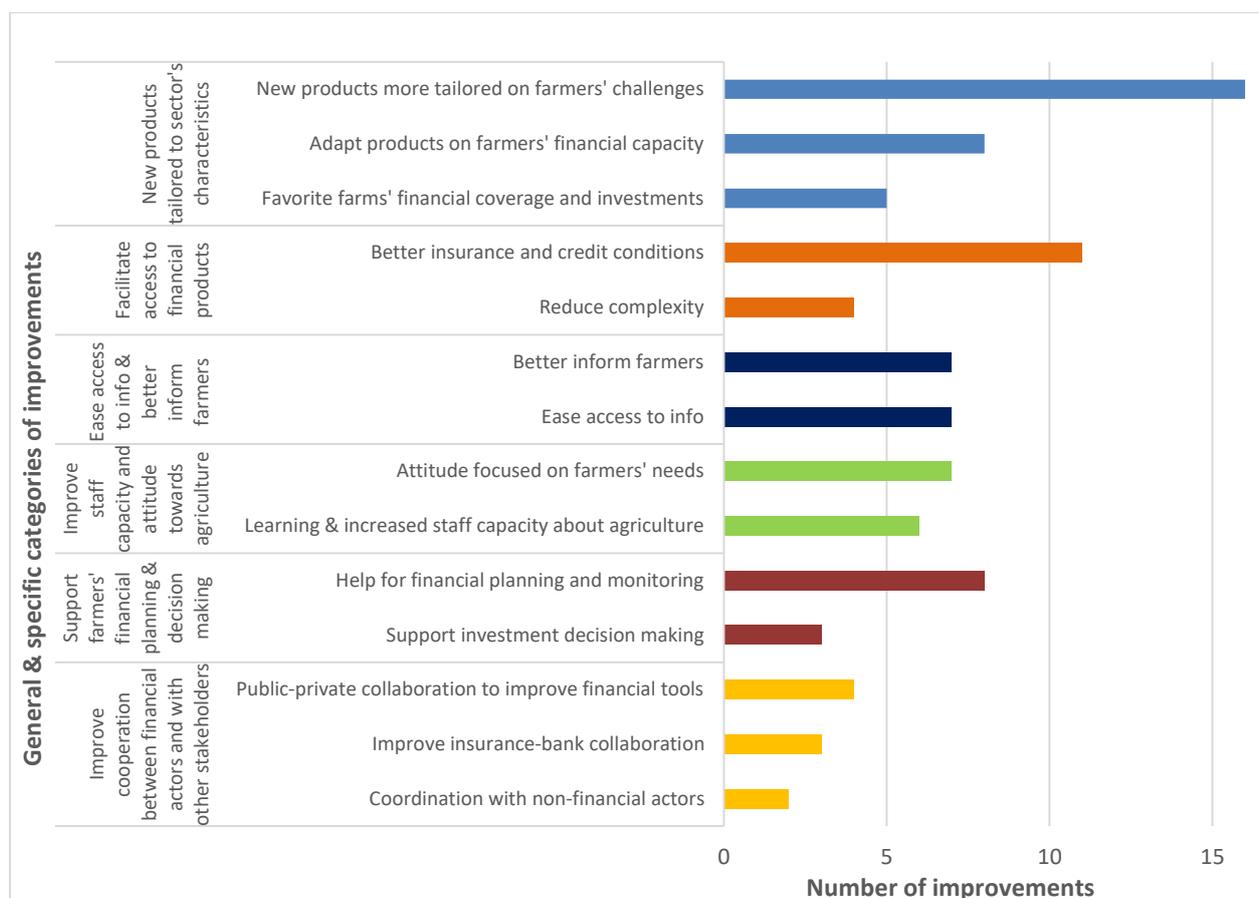
Figure 15. Opportunities for Financial institutions to improve risk management.

Improvements of *Financial institutions* offering better RM strategies can be grouped in six major topics. The most significant appears to be the *Supply of new financial products* which might help cope with new or uncovered risks, and that consider farms' and agriculture's characteristics and trends. New types of risks are emerging, including climate change related ones, thus the coverage of existing financial products should be extended, or new financial products should be designed. Insurance products should be more specific and consider further qualitative/quantitative parameters of the specific production covered. The amount and timing/schedule of the financial products' costs (loans' rates and insurance premiums for example) should be adapted to the farms' cash flow (revenues and public aids). Also new financial products could be designed in this sense, such as short-term loans to fund next production campaign expenses. It would help in balancing the cash flow (and the farm business) along time.

Another area of improvement is to *Facilitate the access to the existing financial products and services*, mainly related to loans' rates and insurance premiums. In those sectors with low profitability and unstable farm income, farmers' propensity to use financial products is scarce, while it is in such affected sectors that financial products have the highest potential. Guarantees

and rates are often not aligned with the financial capacity of farmers, and they could be decreased in specific cases such as for investments in innovation and novelties that contribute to the farm profitability. Guarantees could also consider sales contracts between farmers and value chain agents. Insurance premiums could be paid in a longer period. There is also a need to reduce the complexity in procedures and bureaucracy to access financial services, this constrains the use of these products.

Furthermore, a two-fold aspect related to knowledge emerged: on the one hand, farmers do not have a good knowledge about financial products, and financial institutions should cover this gap by *Easing the access to their services' information* and being proactive in informing farmers. Here the financial institutions should develop a standard communication tailored on farmers' concerns and on agricultural issues, with a focus on the relation between specific farmers' risk and proper product offered. The communication should be offered in web portals, including tutorials if possible, with friendly tools to explore risks and products to cope with them.

On the other hand, financial staff often shows a scarce awareness and knowledge about agriculture, which results in weak skills and attitude to respond to farmers' needs. In this regard, financial institutions could get an agricultural-specific competence and attitude by *Developing specialized structures and staff*.

Financial institutions are often asked to participate and play a role in the financial and investments planning of farmers, who are not always able to deal with long-term accounting and financial operations along time. If financial actors could provide continuous advice to farmers on accounting and financial planning in the long-term, this would *Facilitate and optimize the use of financial products*. A more spread presence in the rural areas of consultants and advisors would be positive, and perhaps encourage farmers to plan their finances more solidly and optimally.

If farmers were committed to plan the farm finance and business to get financial services like credit or insurances, the financial planning of farms would improve (or would exist), because now farmers are not so able in doing so, or they do not seem willing to do that. This would push them to use this good practice.

A closer *Cooperation*, especially between banks and insurance (to co-design their financial services), and with public actors could significantly strengthen the operational and economic potentiality of financial products by mitigating the risk of financial actors to cover certain agricultural risks, and by increasing farmers' access to financial requirements and commitments. Banks could ease the access to their products when farmers use financial products (such as insurances or futures) to protect their profitability. Public authorities could support the design of products for younger farmers, or the launch of new medium-term, soft credits, or co-participate in guarantees requested by institutes to deliver loans to farmers. Policies have the potential to

reduce the misalignment between 'what the farmers can guarantee', and 'what financial institutions can offer'.

Figure 16 shows the results of the cases study related to the main areas of improvement. In some cases, studies no improvements for financial actors were discussed. The case of Bulgaria seems to gather more comments, gathering proposals for all the six areas of improvements. The case of the Netherlands is more focused on *Staff capacity* and *Easier access to information*, while the cases of Spain and France (extensive livestock) target mainly the need for more *Cooperation between financial actors and other stakeholders*. Poland and Romania need a more *Facilitated access to the existing financial products*, or *New products more tailored to their needs*. The Netherlands, also Belgium, Germany, and Italy put forward the need for more *Support in financial planning and decision making*.
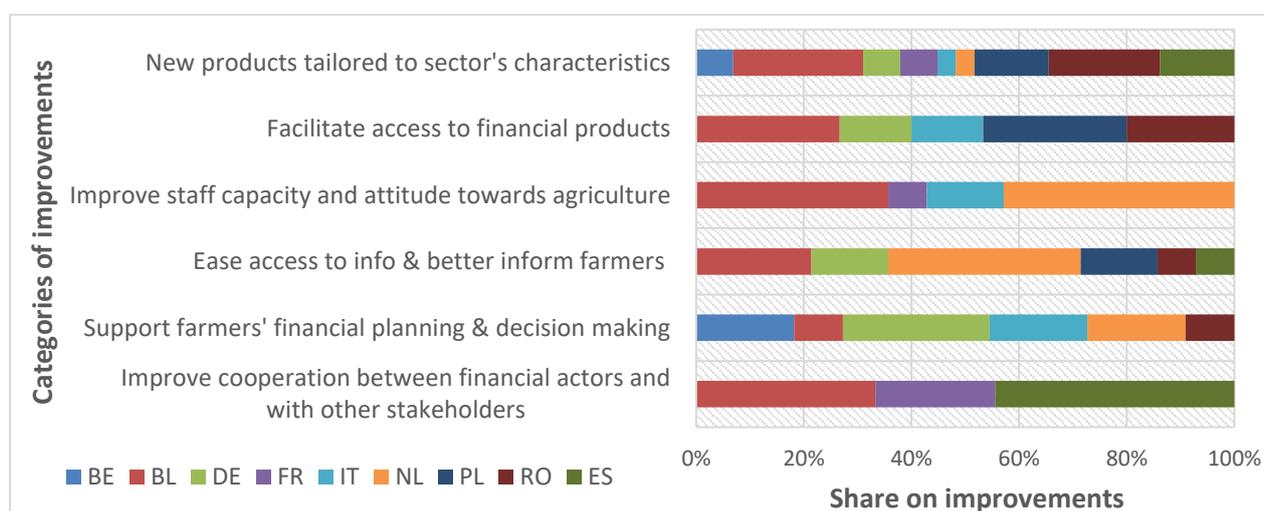
Figure 16. Opportunities for Financial institutions to improve risk management by case study region.

5.1.5   Opportunities for Value chain actors to improve risk management

The *Value chain actors* include all stakeholders involved along the chain, such as the input suppliers, consultants, food processors, buyers, and distributors. This actor was considered in all focus groups except three (Bulgaria, Spain, and the Netherlands). Across the cases, it has received 60 suggestions for improvement. The Figure 17 shows those improvements distributed in different thematic categories, in order to facilitate the identification of the main elements emerged.
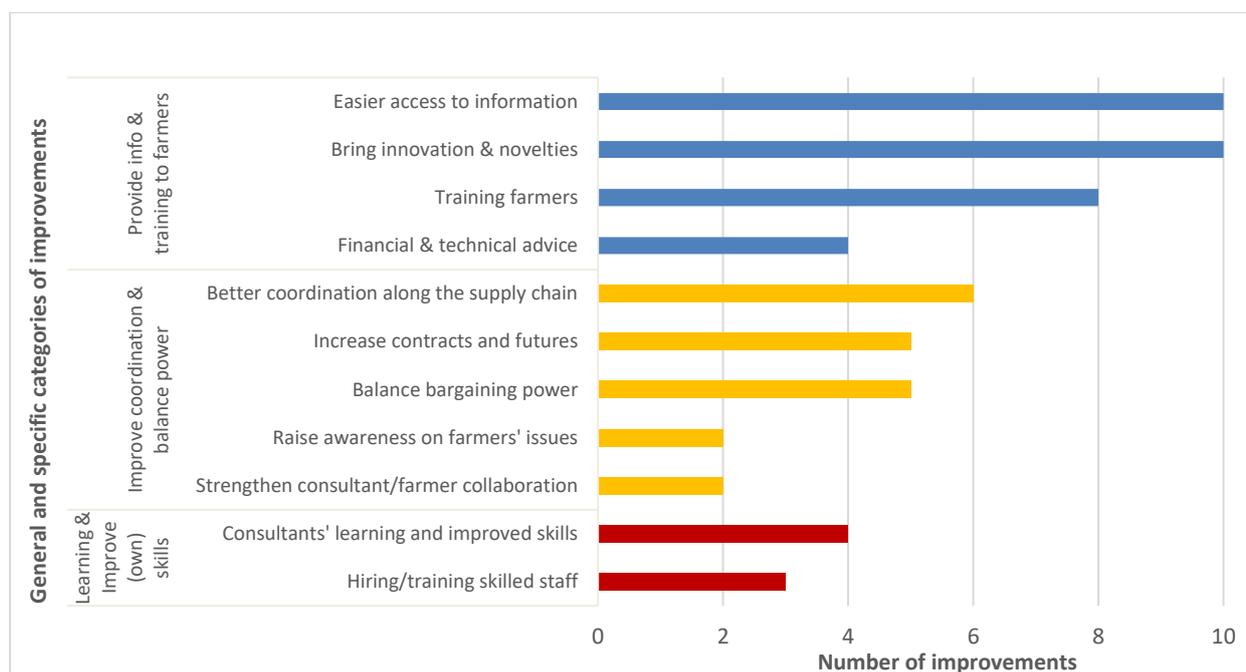
Figure 17. Opportunities for Value chain actors to improve risk management.

Three main areas of improvement were defined in relation to the *Value chain actors*. The main area of improvement regards the *Provision of information and training to farmers*. Around the central figure of the farmer, other stakeholders should work as consultants and trainers (in relation to their specific fields) and increase the transparency of their activities. This would lead to an improved awareness, openness and capacity of farmers to take the new opportunities within the value chain. Input providers should organize a systematic service of information about existing opportunities and financing possibilities through the web and digital platforms, but also by means of brochures and documents. On the same side, the supply of innovative technologies and novelties should increase. In order to help farmers in understanding the new opportunities and getting familiar with novelties, the input suppliers themselves should organize training courses, seminars, and demonstrations for farmers. In addition, other actors such as consultants and buyers should provide specialized training courses. Equally, stakeholders could provide financial and technical advice.

Of course, another area of interest for improvement concerns the *Coordination among stakeholders*. It regards mainly the *Balance of bargaining powers and the use of collective bargaining along the chain*. Besides, it is generally claimed that different actors should coordinate their economic activities to increase the business opportunities.

The last category of improvement regards *Learning and increased capacity and skills of stakeholders and consultants*. Often there is not any specific knowledge or competence about the agricultural production within the value chain, there coordination and business relation between stakeholders are constrained. All actors should hire skilled staff or train the current personnel. Ad-hoc courses could be organized, but also 'experience and knowledge exchange' meeting and seminars.

Figure 18 reports the cases' contribution to the main areas of improvements for the *Value chain actors*. Here eight cases discussed improvements for these actors. The most evident contribution is brought by Poland, which focuses mainly on *Learning and improve (own) skills* and *Provide information and training*. France targets the improvement of *Coordination between actors to balance the bargaining power*, while Belgium and Romania contribute mainly to the *Provision of information and training*, and improved *Coordination*. Germany focuses on *Provision of information and training* and *Learning and improve (own) skills*. Italy contributes mainly to *Learning* and improve *Coordination*. Bulgaria has a little contribution to *Information provision*, whereas Sweden to improved *Coordination*.
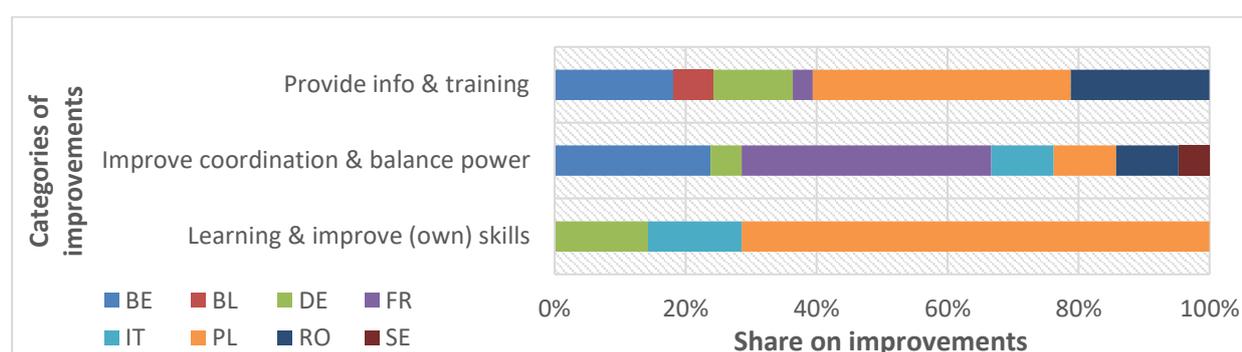
Figure 18. Opportunities for Value chain actors to improve risk management by case study region.

5.1.6 Opportunities for Research & Education institutions to improve risk management

The actor *Research & Education institutions* includes both public and private institutions whose activity is the research in agriculture and related fields. The role of this actor was assessed in 6 cases out of 11 (Sweden, Bulgaria, Poland, Spain, and the Netherlands did not consider this actor). Only 25 improvements were collected across the focus groups. The Figure 19 shows those improvements distributed in different thematic categories, in order to facilitate the identification of the main elements emerged.
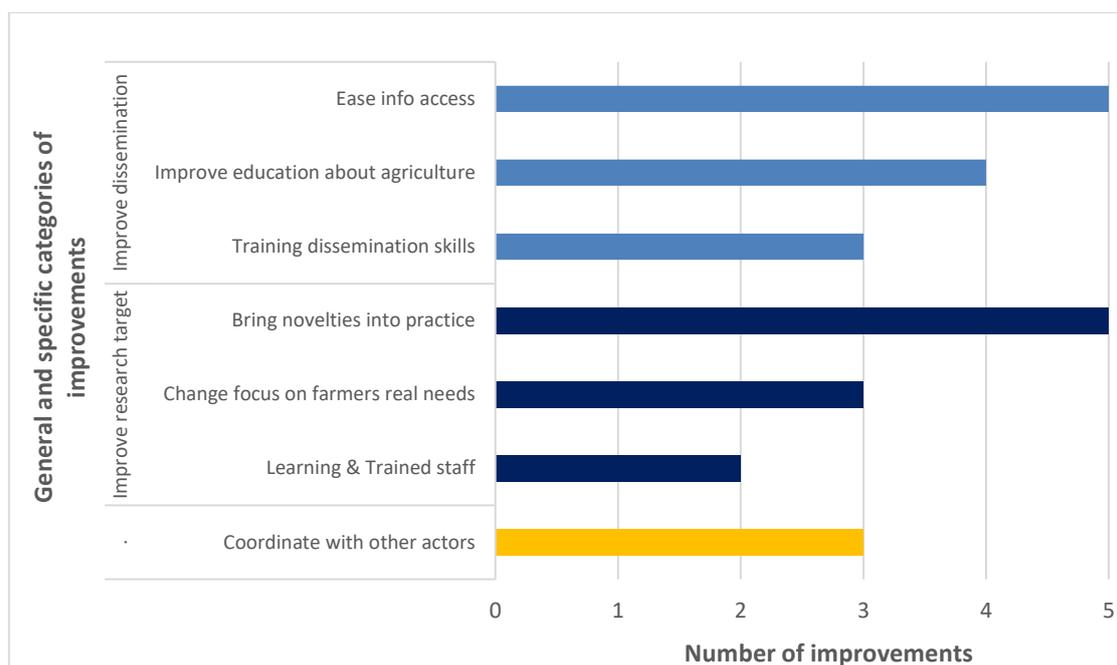
Figure 19. Opportunities for Research & Education institutions to improve risk management.

In the case of *Research & Education institutions*, three areas of improvement were defined. The main one concerns the *Dissemination of research*. This is critical since farmers and other stakeholders express having difficulties to access to scientific information. For this reason, researchers should train specific skills of dissemination, and rely on expert disseminators. The results of their research should be easily accessible and readable for farmers.

Secondly, the researchers should *Target their work on real farmers' needs* and fix as objectives to design solution to be operationalized in practice. In this regard, research staff could train specific skills and knowledge about agriculture.

Finally, a last small area of improvements concerns the *Coordination of researchers with other stakeholders*. To improve the above-mentioned aspects, stakeholders and farmers should be involved in the research activity as much as possible.

Figure 20 shows the cases' contribution to the main areas of improvements for *Research & Education institutions*. In five cases, improvements for this actor were discussed. The UK seems to gather more contributions, especially to *Improve dissemination*, whereas Romania also contributes consistently to *Improve the research target*, and the *Dissemination*. France and Germany focus mainly on the *Coordination between research and other actors*, while Belgium underlines the need to *Improve the research target*.
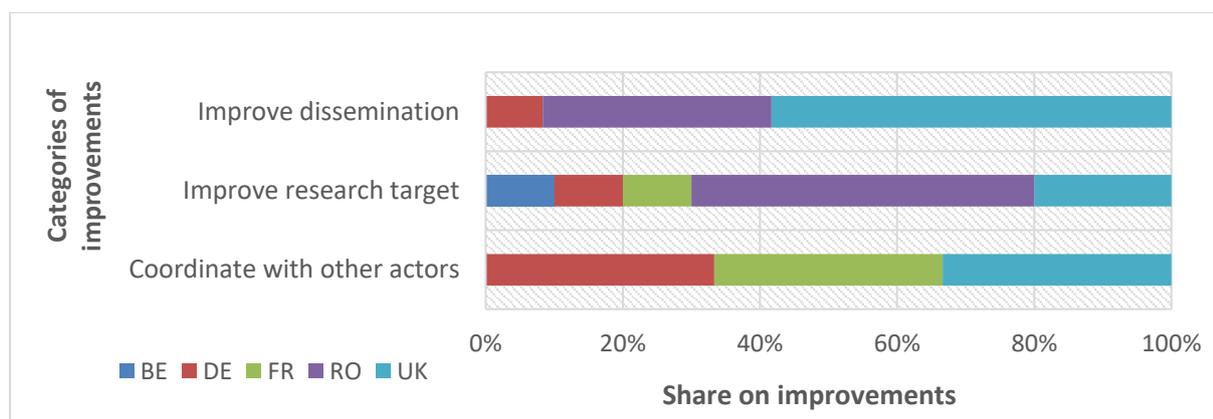
Figure 20. Opportunities for Research & Education institutions to improve risk management by case study region.

5.1.7 Opportunities for NGOs, Consumers & Media to improve risk management

The actor *NGOs, Consumers & Media* refers clearly to the mentioned private actors of the civil society. Its role was analysed in just four cases (France, Sweden, Romania and Poland) out of eleven. Only 12 improvements were suggested for this actor. The Figure 21 shows those improvements distributed in different thematic categories, in order to facilitate the identification of the main elements emerged.
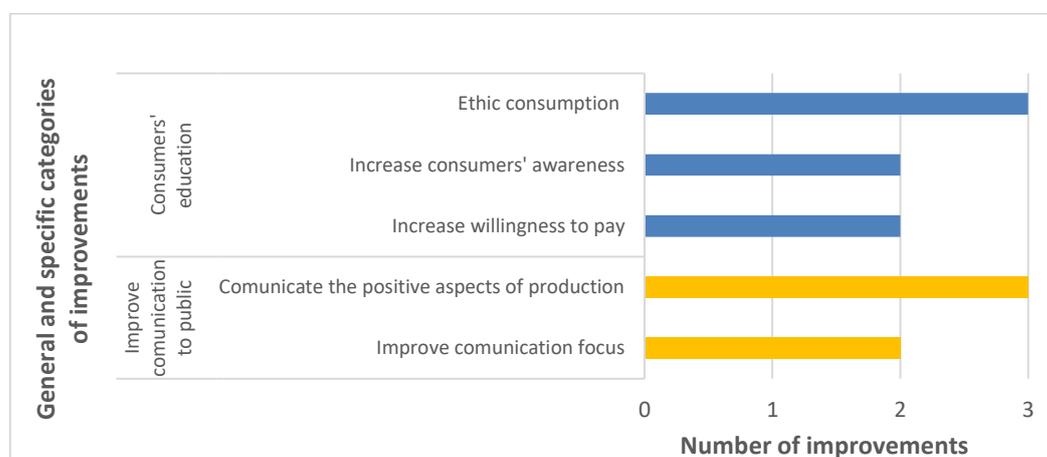
Figure 21. Opportunities for NGOs, Consumers & Media to improve risk management.

Essentially, two areas of improvement were identified. The first area concerns the *Consumers*, whose *perception and awareness* of agricultural problems might be better built, helping them change to better consumption style. This would lead also to a higher willingness to pay.

The second area is about the role of media, which can *Improve the quality and re-target the focus of the message* that they deliver to the public. The positive roles and functions of agriculture

should be communicated, and their problems and risks explained, rather than exacerbate criticisms.

Figure 22 shows the cases' contribution to the main areas of improvements. Only four cases discussed improvements for *NGOs, Consumers & Media*. Poland highly contributes to the *Consumers' education*, and France as well in a smaller measure. By contrast, Sweden contributes significantly to *Improve communication to public*, whereas Romania brings a smaller contribution.
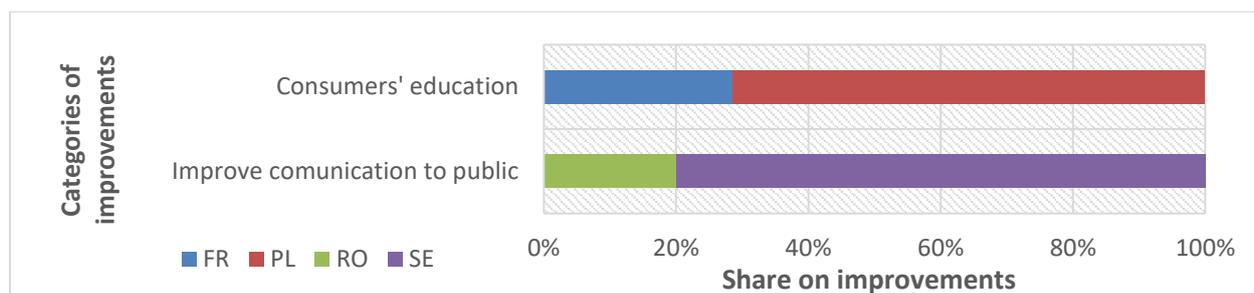
Figure 22. Opportunities for NGOs, Consumers & Media to improve risk management by case study region

5.2 How to improve the strategies to deal with agricultural challenges: Evidence from the virtual co-creation platform

As explained in section 4.2, several activities were defined in the virtual co-creation platform to co-create with the stakeholder how to improve RM in farming systems. Before assessing the RM strategies, participants in the virtual co-creation platform reflected on the main challenges that the agricultural sector will be facing in the next 20 years (Figure 23).
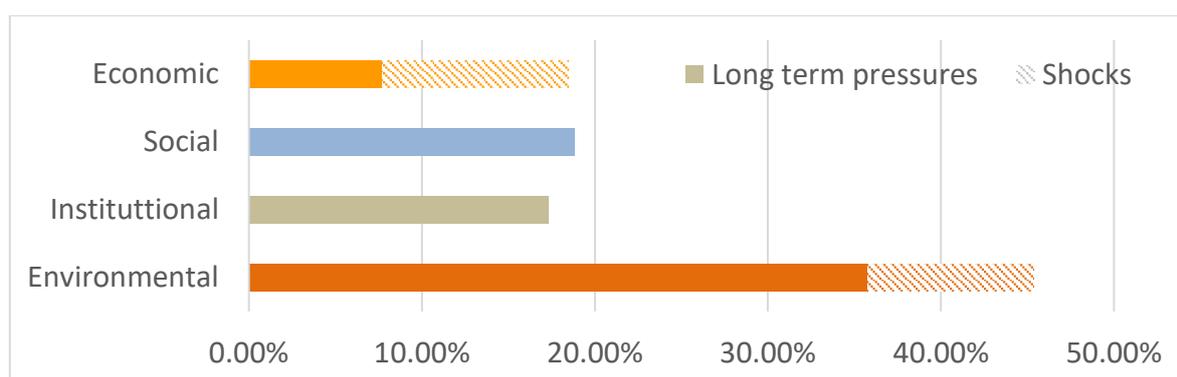
Figure 23. Future challenges perceived by the stakeholders participating in the virtual co-creation platform.

Stakeholders in the virtual co-creation platform are concerned to a greater extent with *long-term pressures* than to *shocks* (with stripes). The strong preoccupations on *long-term pressure* challenges are in line with previous research findings. Assefa et. al, (2017) found that farmers are more concerned about long-term price changes than short-term prices volatility. Among the *long-term pressures*, *environmental* challenges are the main challenges perceived by European stakeholders, followed by *social*, *institutional* and *economic* challenges.

Table 10 details the main *shocks* and *long-term pressures* identified by stakeholders in the virtual co-creation platform, grouped by the main risk categories (Meuwissen et al., 2019). Regarding the *environmental* challenges, Table 10 shows that the greater occurrence of extreme weather events, global warming, water scarcity and pollution, changes in precipitation patterns, the decline of pollinators and reduced soil fertility are among the 10 most important agricultural challenges identified by the European stakeholders. These results are in line with Tangermann (2011) that found that weather events, sanitary and phytosanitary conditions, pests and diseases can strongly impact both crops and livestock productions. Consumers' wishes of quality foods characteristics (McInemey, 2002), increase society's expectations of farmers in relation to their environmental performance (Greiner et al., 2009) may also play an important role of the environmental challenges from the European stakeholder' point of view.

Table 10. Detail of the challenges perceived by the stakeholders participating in the virtual co-creation platform.

Environmental	Shock	**Greater occurrence of extreme events**// Animal and plant diseases
	Long term pressure	**Global warming**// **Water scarcity**// **Change in precipitation patterns**// **Decline of pollinators**// **Water pollution**// Reduced soil fertility (soil mining, depletion of soils nutrients)// Nitrogen emissions// Sea level rise// Altered phosphorous cycle// Soil Pollution by heavy metals// Species extinction// Antimicrobial resistance// Loss or impairment of habitats.
Economic	Shock	**Price volatility in agricultural markets**// **Farmer's income volatility**// Lower agricultural yield
	Long term pressure	Upstream and downstream market power along the value chain// Increased cost of hired labour// New competitors in internationalized and liberalized markets, competition on and reallocation of resources// Reduced access to bank loans or other sources of finance// Price of agricultural land// High (start-up) costs// Farms' taxation
Institutional	Shock	
	Long term pressure	**Changes in government support for agriculture**// Changing policy objectives and administrative demand// Trade and WTO reforms// Other countries agricultural policies (e.g. American Farm Bill, ASEAN policies, BRICS policies)// Restrictive standards (e.g. GM-free standards and regulations)// Intellectual property ('biopatents')// Changes in food safety regulations// Changes in regulations in destination markets (non-tariff barriers)// Changes in production control policies (quota)// Changes in land tenure regulations.
Social	Shock	
	Long term pressure	**Ageing of rural areas (lack of generational renewal)**// Changing societal concerns about agriculture (safety, animal welfare, resource utilization)// Population growth// Demographic change (increasing urbanization, rural outmigration, migration)// Changing attitude towards farm employability (succession, hired labour, part-time farming)// Remoteness, reduced access to social services (housing, education, health), less developed infrastructure (transportation, ICT)// Lack of consumer confidence// Gender gap// Reduced access to extension or advisory services & skills training// Wars and conflicts.

(*) In bold: The 10 most cited challenges cited by the stakeholders in the virtual co-creation platform

Regarding the *economic* challenges, stakeholders are concerned to the greatest extent with economic *shocks*, such as price and income volatility. In addition, stakeholders prioritize the ageing of the rural area population and the lack of generational renewal (*social* challenges) and changes in government support for agriculture, mainly referred to CAP payments reduction (*institutional* challenges). Noteworthy, neither Mercosur nor Brexit were mentioned.

Not every agricultural specialization would need to deal with the same range of challenges (Table 11). Although the greater occurrence of extreme events seems to strongly affect most of the specialisation types, the wine and olive oil sector and the organic farming sector seem to be the most heavily specializations affected by this challenge. The intensive livestock sector and the dairy sector are less sensitive to this challenge. Global warming was found to similarly affect all specialisation types. Water scarcity is a main threat for the horticulture and fruit sector, the extensive livestock sector and the organic farming sector. Price volatility of agricultural markets is

especially a large threat for the intensive livestock and dairy sector. This also goes for the farmer's income volatility. These sectors are also most heavily affected by changes in government support. The declining number of pollinators is a threat for the horticulture, fruits and organic farming sectors. The extensive livestock sector is most strongly affected by the ageing of the countryside. Reduced soil fertility especially affects the arable crops sector.

Table 11. The most important challenges by agricultural specialization perceived by the stakeholders participating in the virtual co-creation platform.

Challenges	EU Agriculture	Extensive livestock	Intensive livestock sector	Dairy sector	Arable crops	Horticulture fruits	Wine and olive oil sector	Organic farming
Greater occurrence of extreme events	13	14	9	9	14	15	16	16
Global warming	11	9	10	9	11	10	11	11
Water scarcity	12	13	11	12	13	13	11	12
Change in precipitation patterns	9	10	10	9	11	9	11	10
Price volatility in agricultural markets	10	9	11	12	8	10	9	8
Changes in government support for agriculture	9	10	11	11	10	7	8	8
Decline of pollinators	8	7	7	6	7	11	7	10
Farmer's income volatility	9	8	10	11	8	7	7	7
Ageing of rural areas	8	9	6	6	6	5	7	5
Water pollution	5	6	8	8	5	6	6	6
Reduced soil fertility	6	5	7	7	8	7	6	7
Total	100	100	100	100	100	100	100	100

(*)Participants were asked to rank from 1 (lowest) to 5 (highest) the impact of a list of challenges on the different agricultural specialization. Numbers in the table shows the relative relevance of the challenges in each agricultural specialization (sum of the scores by challenge and specialization divided by the total score by specialization). The most important challenges by specialization are coloured in red; the least important challenges by specialization are coloured in dark green.

Once agricultural challenges were assessed, three activities were subsequently implemented to identify the main strategies to cope with *shocks* and *long-term pressures*, and to collect indications to improve RM strategies (Table 5).

The first and the second activities aimed at identifying the main farmers' strategies to face *shocks* and *long-term pressures*, respectively. Figure 24 shows collected information about such

strategies, by comparing results for from *shocks* and *long-term pressures*. The strategies mentioned by participants were classified in seven general categories.
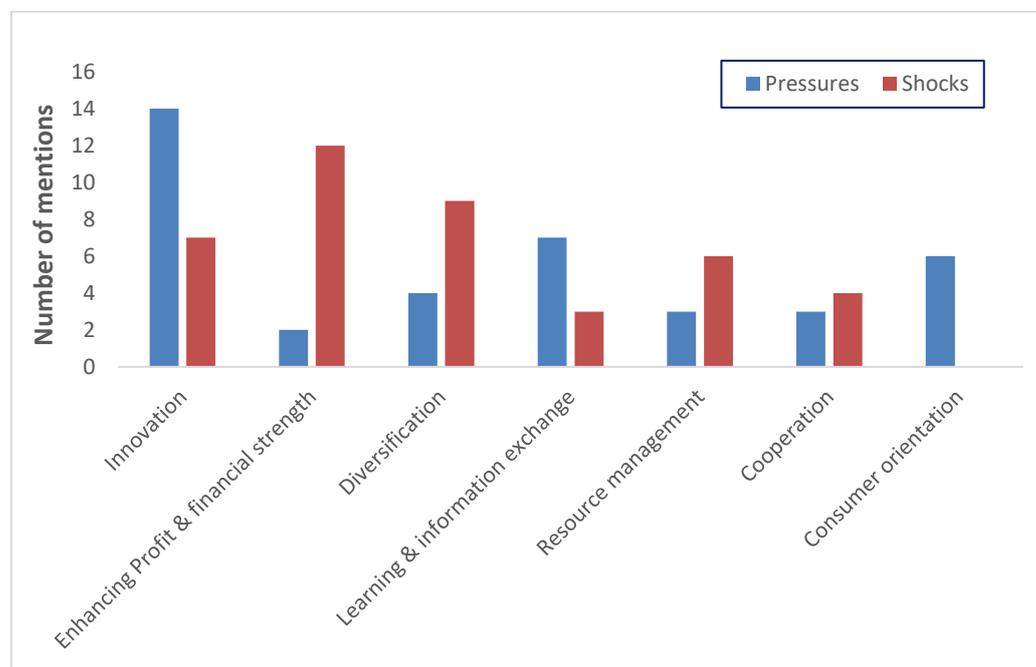
(*) From left to right, strategies are ordered by the number overall number of mentions, summing up shocks and long-term pressures.

Figure 24. Main risk management strategies identified by stakeholders participating in the virtual co-creation platform.

There is a significant discrepancy between the strategies to deal with *shocks* and *long-term pressures*, except for the 'Cooperation' strategy, which gained approximately the same low score in both cases. The strategies 'Innovation', 'Learning and knowledge exchange' and 'Consumer orientation' are important to face *long-term pressures*, whereas with the remaining ones it is opposite. It is particularly clear that 'Enhancing profit and financial strengths' is seen as exclusively related to *shocks*. This strategy refers mainly to keeping and preserving reserves, use insurances, and restructuring fixed costs.

Overall, the strategy 'Innovation' is the most mentioned, and it includes mainly the adoption of new technology and novel practices. Most of the time those innovations imply a change in production model.

The strategy 'Diversification' refers to input sources, output buyers, on-farm and off-farm activities, and crop production.

The next activity developed through the digital platform targeted improvements of RM strategies (Table 5). These improvements are actors' related. The suggested improvements were collected and classified in general categories within each actor. Such improvements categories are reported in Figure 25.
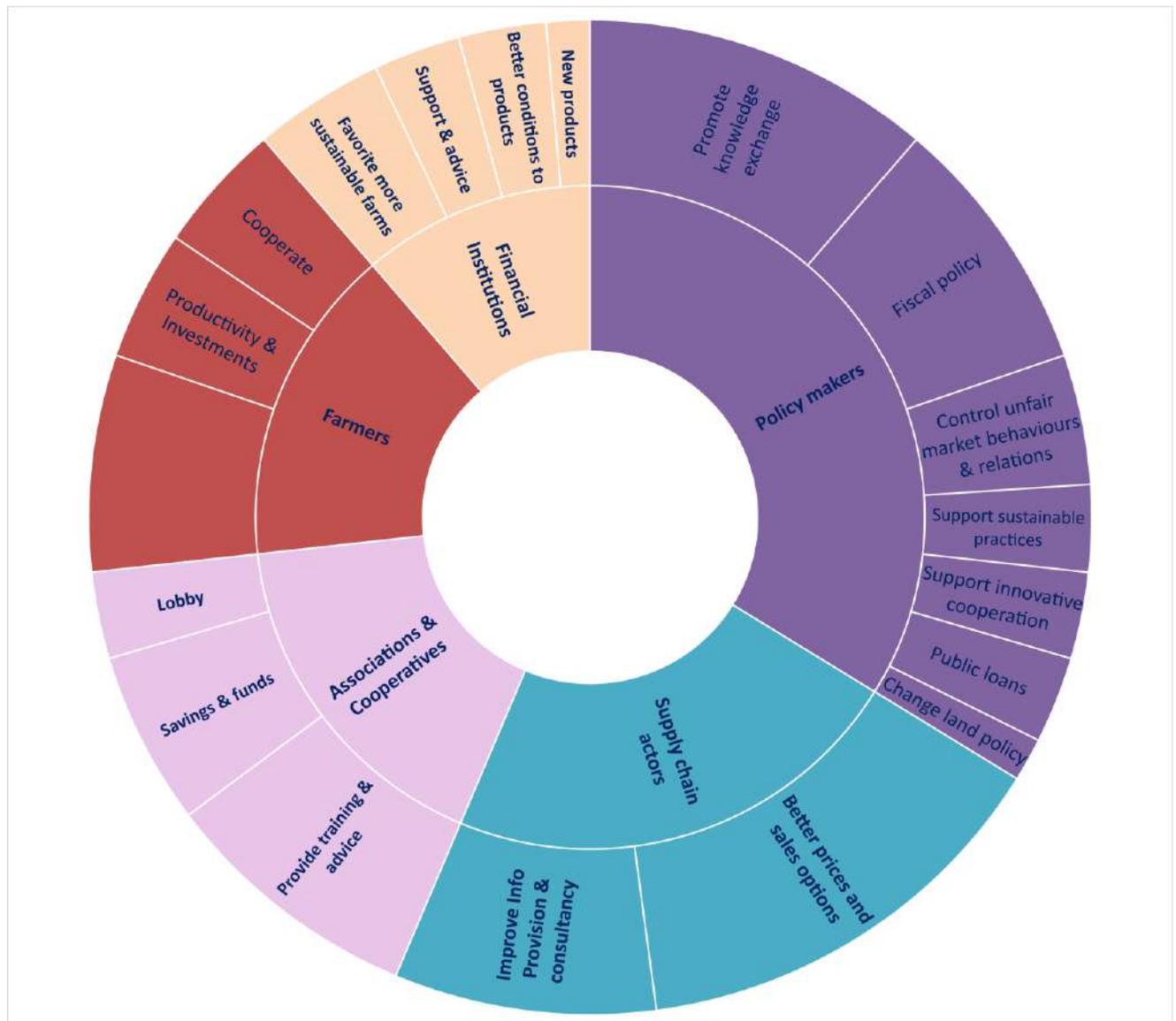
(*) The internal ring shows the five actors analysed, and their relative importance in terms of suggested improvements. The external ring shows the categories of improvement within each actor, and their relative importance in terms of suggested improvements.

Figure 25. Opportunities for actors involved to improve risk management, identified by the stakeholders participating in the virtual co-creation platform.

The *Policy makers* are evidently the most indicated for improvements. In their regards, main suggestions target the *Promotion of knowledge exchange* (which includes also the extension services), and a *New fiscal policy*. This view coincides with the focus groups' results, even though the focus groups indicate many more types of improvements, such as the *Support to cooperation and communication*.

Next, the *Value chain actors* were indicated. The related improvements belong to two main areas: *Offer better input/ output prices and enlarge the purchase options* for farmers on the one hand and *Improve information provision and consultancy to farmers*. In the focus groups, *Value chain actors* are relatively less important to improve RM, nevertheless the indications to improve their role fit into the platform view.

Regarding *Associations & Cooperatives*, there is particular focus on the cooperatives' role to *Provide continuous advice and training services* to increase the farmers' skills. It was suggested also to *Improve the lobbying activity* to Policy makers and Value chain actors. It is coherent with the evidence emerge in the focus groups, the role to advice, training, and lobbying activities is central.

The *Farmers*' improvements belong to three substantial categories. In accordance with the focus groups' findings, the main one regards the need for *Learning and openness to others' advice*, that relates to farmers' participation in training activities and to a change in their attitude. Next, farmers are asked to pay more attention in *Efficiency and productivity*, and to the importance of *Making new investments*. In this regard, the focus groups underline the need for financial planning to better investments. At last, farmers could *Cooperate* to increase their bargaining power in the value chain, and to create new RM opportunity such as mutual funding. This aspect appears more relevant in the focus groups.

Finally, unlike the focus groups, the actor *Financial institutions* was the least targeted by the platform participants to improve RM strategies. In this case, improvements were divided into four areas. The main suggestion indicate that financial products should be more convenient to those farms that *Prioritize sustainable management and practices*. Besides, financial institutions are asked to play a major role in *Advice to farmers*. Finally, the access to *Financial products should be facilitated* in terms of requirements and commitments, and *New products* more tailored to agriculture could be provided. All these aspects emerged also in the focus groups, indicating that there is a widespread agreement on such points.

Comparing to the focus groups, the viewpoint emerged in the co-creation platform is relatively coherent. The *Policy makers* are the most regarded actor, whereas the main indications are similar. What differ between the methodologies is the degree of attention on the different actors

and improvements. For instance, the *Value chain actors* play a major role in the platform view to improve RM (unlike the focus groups), whereas the *Policy makers*' improvements are exclusively related to knowledge exchange and fiscal policy. The difference between the methods could be due to the diversity in participants and viewpoint scale. In fact, the platform participants have a wider point of view extended to the EU scale, while the focus groups' participants have a point of view embedded in a case-specific context at local scale. As a result, evidence from focus groups are more detailed and abundant.

6   Assessing the contribution of risk management to farming systems resilience

This section seeks a two-fold aim: i) to assess whether and to what extent RM enables/constrains farming system resilience; and ii) to address how RM enables/constrains farming system resilience. The first aim is achieved through the assessment of the participants explanations related to the actors contribution to the three resilience capacities: *robustness*, *adaptability* and *transformability* (Meuwissen et al., 2019). To understanding how RM enables/constrains farming system resilience an inferring process has been followed. The explanations provided by the participants in the focus groups about how actors in farming systems enable/constrain resilience are classified according to the resilience attributes (Cabell and Oelofse, 2012; Meuwissen et al., 2019; Reidsma et al., 2019) and resilience principles (Resilience Alliance, 2010) the referred actions impact.

The results are based on the information gathered in 10 focus groups across Europe (Belgium, Bulgaria, France, Germany, Italy, Poland, Romania, Spain, Sweden and the United Kingdom) and the virtual co-creation platform.

6.1   Evidence from the focus groups

6.1.1   Whether and to what extent risk management enables/constrains farming system resilience

To obtain insightful leads about the contribution of RM to farming system resilience, participants in the focus groups were asked to rank the contribution of the actors involved in RM, i.e. *Farmers*, *Associations & Cooperatives*, *Financial institutions*, *Value chain actors*, *Research & Education institutions*, and *NGOs, Consumers & Media*, to farming systems' resilience capacities when implementing RM strategies. The ranking ranges [-3, 3], where negative values mean that the actor constrains resilience capacities at different intensity levels (-1,-2,-3), 0 means that the actor's contribution to resilience is not clear, and positive values shows that the actor enables the resilience capacities at different intensity levels (1, 2, 3).

Figure 26 shows the average of the rankings provided by participants in the 10 CS focus groups. As Figure 26 shows, *Farmers*, *Associations & Cooperatives* and *Financial institutions* are the actors who contribute to the greatest extent to *robustness* capacity[7]. They are the main source of human capital, networks and financial resources of the farming systems. *Value chain actors* and consumers enhance more the *adaptability* capacity than the *robustness*. They are the main trigger of changes and provide support to steer the change. *Transformability* is the capacity enabled by the lowest extent. Furthermore, *Farmers* and *Associations & Cooperatives* appear to slightly constrain the *transformability* capacity mainly explained by their low propensity for radical changes.
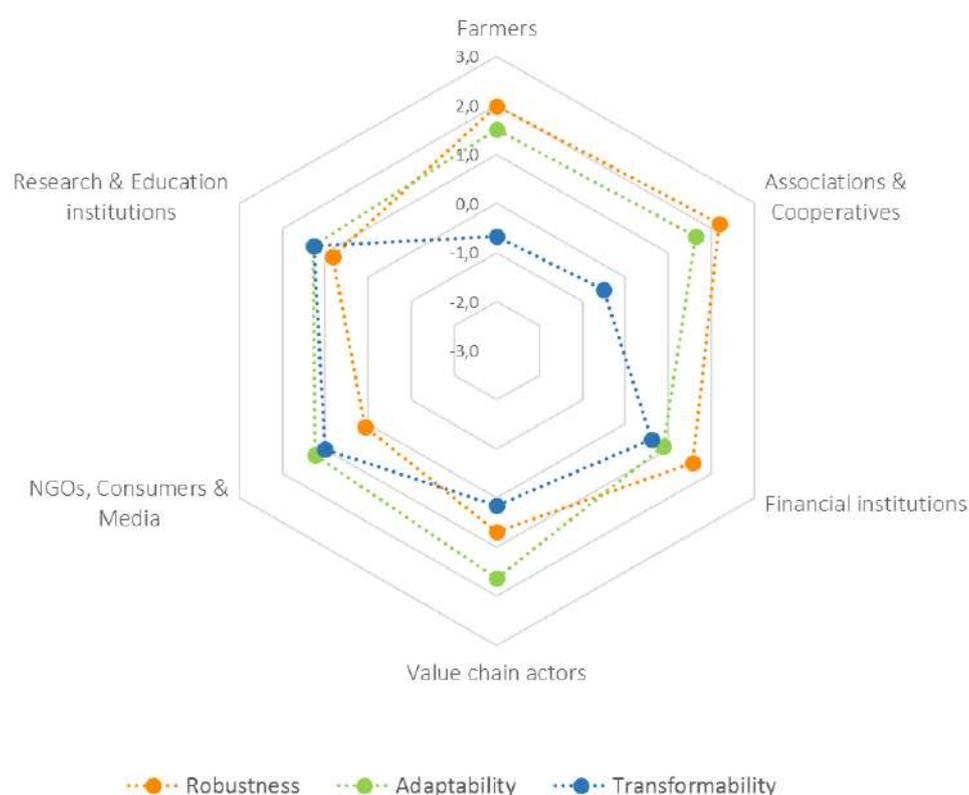
Figure 26. Contributing and constraining role of the actors involved in risk management towards capacities of robustness, adaptability and transformability

---

[7] Policy-makers are not included in the graphic as dedicated analysis of resilience enabling policies is conducting is SURE-Farm by applying the ResAT tool (https://surefarmproject.eu/wordpress/wp-content/uploads/2019/05/D4.1-Resilience-Assessment-Tool-RP1.pdf)

Table 12 shows the summary of the reasons explaining the contribution of the actors involved in RM. The actors involved in RM contribute to resilience capacities by performing different roles. For example, financial institutions contribute to robustness because they are a source of funds; contribute to adaptability because the provide investment training and funding; they reinforce transformability because they facilitate access to innovation and international markets. Value chain actors contribute to resilience capacities to a different manner. They contribute to robustness because they provide contracts to famers, transparency and define preventive actions; they enhance adaptability by favouring knowledge exchange and cooperation; they positively contribute to transformability as lead new projects following market trends and innovation.

Table 12. Detail of the actions performed by actors involved in risk management by resilience capacity.

Actors	Robustness	Adaptability	Transformability
Farmers	Preventive actions and planning; Cooperation with other actors; Reducing costs; keeping savings; Contracting insurance products; Improve farm management; Searching advice services; Developing local actions; Be aware and communicate agricultural value added; Information; Investment/financing decision.	Training; Good practices; Knowledge exchange; Local actions; Investment/financing decision; Environmental measures; Improve farm management; Information; Research and innovation; Consumer orientation; Advisory; Public awareness; Be aware and communicate agricultural value added.	Investment/financing decision; Environmental protection measures; Business diversification; Research and innovation.
Associations & Cooperatives	Advisory; Negotiate contracts with insurance companies; Negotiate contracts with processors; Define preventive actions; Provide information; Enhance transparency; Boost value chain cooperation; search public/private collaboration.	Enhance good practices; Promote knowledge exchange; Public awareness; Lobby; Boost value chain cooperation; Open new market channels; Support local actions; Promote consumer orientation; Training; Research and innovation.	Research and innovation; Capacity to involve other actors in the system.
Financial institutions	Providing financing products; Insurance products; Reinsurance products; Collateral products; Public/ private collaboration insurance; Transparency.	Training; Investment products; Research and innovation; Good practices.	Provide funds for innovation; Research and development; Access to international markets.
Value chain actors	Contracts; Transparency; Preventive actions; Reduced costs; Value chain cooperation;	Knowledge exchange; Value chain cooperation; Research and innovation; Training; Good practices; New market channels; Consumer orientation; Influence environmental measures.	Research and innovation; Best practices knowledge; Market experience; Awareness about the need to change.
Research & Education institutions	Information for investments properly disseminated; Qualified technical assistance.	Long-term perspective research that enables long terms changes - adaptability; Qualified technical assistance; Multisectoral approach; Provide new technologies, techniques and varieties.	Long-term perspective research that enables long terms changes - transformability; Bring new ideas in the field.
NGOs, Consumers & Media	Demand changes; Provide information; Questions practices; Affect the news impact.	Trigger of changes.	Trigger of changes.

The participants' rankings vary across CS regions (Figure 27). Most of the participants in the 10 CS focus groups agree that *Farmers* (orange colour) are those who contribute to *robustness* to the greatest extent. Bulgaria and France rank with the highest scores the *Financial institutions* (grey colour) and *Value chain actors* (yellow colour), respectively. Bulgarian participants explain this ranking by arguing that *Financial institutions* provide the farming with quick liquidity, in depth knowledge and multisector experienced and market skills personnel, transparency and well-structured procedures. *Associations & Cooperatives* and *Financial institutions* are ranked in the second position mostly in every CS region.
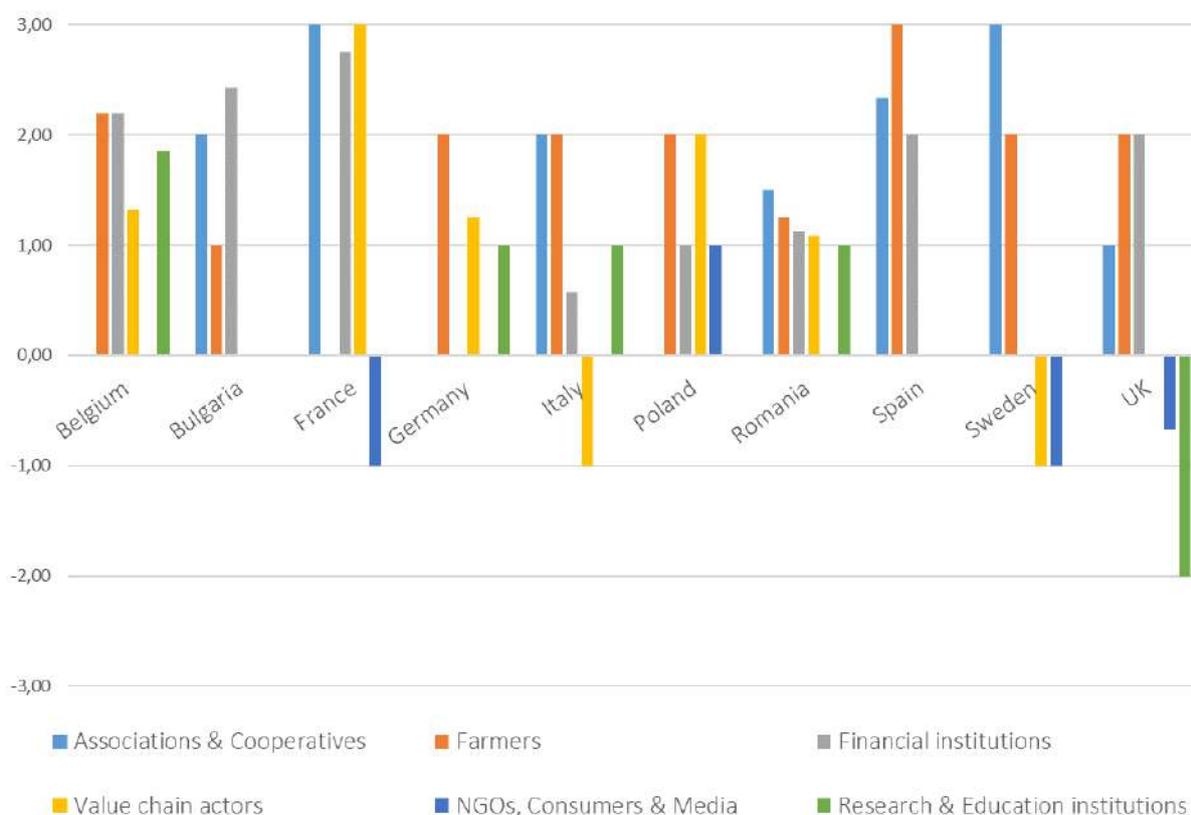
Figure 27. Contributing and constraining role of the actors involved in risk management towards robustness by case study region.

France, Sweden and UK regions agree that the *NGOs, Consumers & Media* (dark blue colour) slightly constrain *robustness*. Participants argue that this actor group questions farmers' practices and may have influence on policies that constrain farming system *robustness*. This actor may aggravate short-term scandals (e.g. animal welfare or environmental issues) and constitute a source of concerns when changing diets. *Value chain actors* are also identified as constraining *robustness* actors in Italy and Sweden explained by their strong bargaining power.

Regarding *adaptability* capacity, in Figure 28 *Value chains actors* (yellow colour) are categorized in the first or second position in 6 out of 10 CS focus groups (France, Germany, Italy, Poland, Sweden and United Kingdom). *Value chain actors* enhance *adaptability* because they are the link to markets, offer the opportunities for change and the support, the experience and training and cooperation to change. They are the source of new inputs, new products and varieties. They are good at marketing and communication, managing regulations and policy implementation.
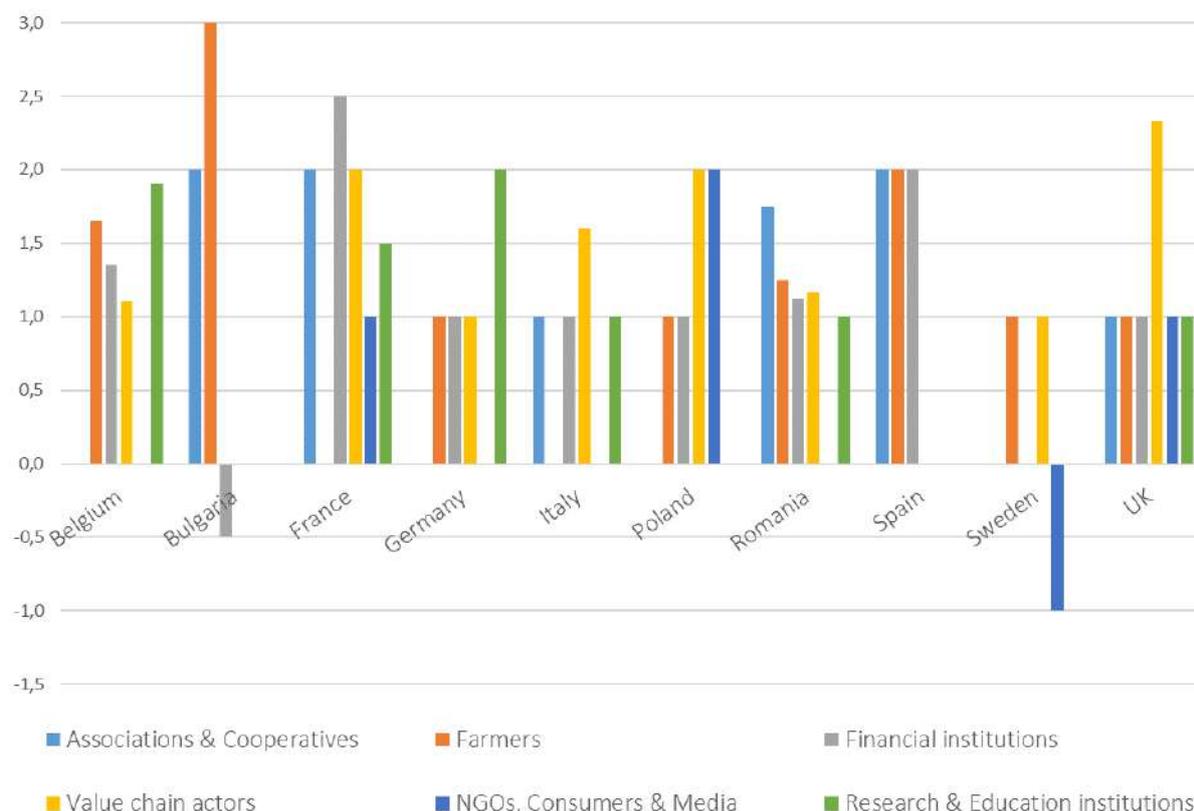
Figure 28. Contributing and constraining role of the actors involved in risk management towards adaptability by case study region.

Farmers also appear as important for enhancing *adaptability* capacity actors in Belgium Bulgaria, Spain and Sweden. *Farmers* enhance farming system adaptability if they are open to change, and they open to new crops, techniques and markets. Therefore, they wish to be trained and updated by attending training courses and they develop investing and financing plans. The low indebtedness allows *Farmers* to have a greater scope for adaptation. There is not clear famers' impact *adaptability* capacity according to participants in the French and Italian CS workshops.

Finally, the Figure 29 shows that there is a great diversity of rankings among the CS regions when scoring the contribution of the RM actors to *transformability* capacity. *Research & Education*

institutions (green colour) receive the major ranking in Belgium, Italy and the United Kingdom. *Research & Education institutions* contributes to *transformability* by providing adequate information for investments, providing qualified technical assistance, multi-sector knowledge and long-term innovation. *Financial institutions* also are ranked as enhancing *transformability* actors in Bulgaria, Poland, Romania, Spain, and United Kingdom, mainly explained by the reason that they provide funds and advise to carry out transformation projects. *NGOs, Consumers & Media* are scored with the maximum level in France, as they are the main triggers of changes when questioning farmers' practices.
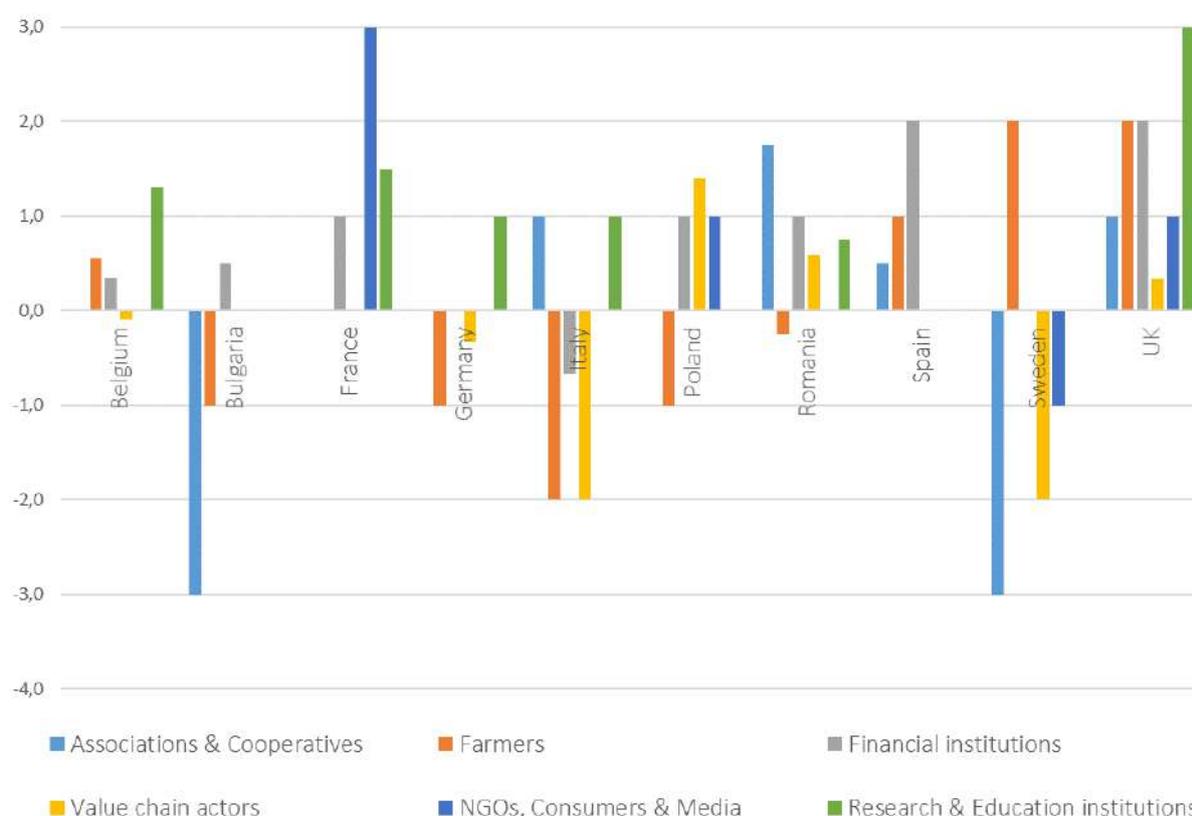
Figure 29. Contributing and constraining role of the actors involved in risk management towards transformability by case study region.

6.1.2 How risk management enables/constrains farming system resilience

Meuwissen et al. (2019) define resilience attributes as the individual and collective competences that enhance the resilience. In this assessment attributes are identified with agricultural practices, farm demographics, governance and RM. Regarding RM, some examples are provided such as

organizing societal feedbacks on the role of farming (*tightness of feedbacks*), encouraging learning, flexibility and openness to new ideas (*modularity*).

Previous research exploring resilience attributes have been previously addressed in SURE-Farm. Feindt et al. (2019) assessed 12 attributes categorized by resilience capacity when analysing to what extent polices enhance/constrain resilience capacities. They assessed s*hort-term focus*, *protecting status quo*, *buffer resources* and *RM* in the *robustness* assessment; *middle-term focus*, *flexibility, variety and tailor-made responses*, and *social learning* in the *adaptability* assessment; and *long-term focus, dismantling status quo, in-depth learning* and *accelerating niche innovation* in the *transformability* assessment.

Reidsma et al. (2019) performed an additional assessment of the current resilience of the farming systems. In this approach, the authors assessed 13 resilience attributes adapted from Cabell and Oelofse (2012): *Reasonably profitable*; *Production is coupled with local and natural capital*; *Supports rural life*; *socially self-organized*; *Legislation which is coupled with local and natural capital*; *Response diversity*; *Functional diversity; Diverse policies*; *Infrastructure for innovation*; *Exposed to disturbance*; *Spatial and temporal heterogeneity of farm types*; *Appropriately connected with actors outside the farming system*; and *Optimally redundant*. The resilience attributes assessment was performed in the context of the five resilience principles, i.e. *Diversity, Modularity, Openness, Tightness of feedbacks* and *System reserves* (Resilience Alliance, 2010).

Building on these previous assessments, we address how RM enhances/constrains resilience capacities by improving or limiting the resilience attributes. The research procedure is as follows (Figure 30): i) Farming systems actors, by implementing RM strategies, reinforce or limit the resilience attributes. In SURE-Farm we understand RM as the application of management procedures and practices to the tasks of identifying, assessing, and treating *shocks* and *long-term pressures* by farming system actors. More than 500 statements emerged from the focus groups explaining how the actors implementing RM strategies contribute to farming systems' resilience capacities. Enhanced/constrained resilience attributes are inferred as a result of categorizing the stakeholders explanations according to the resilience attributes proposed by Cabell and Oelofse (2012) and the positive (improvement) or negative impact (limitation) explained by the participants in the focus groups. For example, as *Farmers* invest their savings in farms, they improve their profitability. This explanation corresponds with one of the resilience attributes defined by Cabell and Oelofse (2012) which is *Reasonable profitability*; as *Associations & Cooperatives* facilitate the cooperation between farmers and value chain actors, they improve the *Socially self-organization* of the farming systems. This is a resilience attribute proposed by Cabell and Oelofse (2012). ii) Resilience attributes are framed in the context of the generic principles of

resilience, i.e. *Diversity*, *Openness*, *ightness of feedbacks*, *System reserves*, and *Modularity* (Reidsma et al., 2019).

Figure 30. Procedure to assess how risk management enhances/constrains resilience capacities.

The more than 500 statements provided by participants in the focus groups are classified according to the resilience attributes proposed by Cabell and Oelofse (2012). Systems in which the resilience attributes are present are more likely to be resilient. Their absence or disappearance exposes vulnerabilities or movements away from resilience.

Table 13 summarizes the resilience attributes proposed by Cabell and Oelofse (2012) and Reidsma et al. (2019). The results of the focus group information assessment allow complementing the resilience attributes description (third column of the Table 13).

Table 13. Definition of the resilience attributes.

Resilience attributes Cabel and Oelofse (2012)	Definition Cabel and Oelofse (2012)	Complementary description from the SURE-Farm Focus groups approach
Socially self-organized	The social components of the system are able to form their own configuration based on their needs and desires.	Actors in farming systems have the ability to be tighten to the farming system needs, to involve and support the other actors to carry out new projects, to create close and balanced relationships between actors in value chain, to provide quick and in time services and responses through the whole farming system region, to be well-structured to enhance associationism and coordination and to develop communication channels.
Ecologically self-regulated	Ecological components self-regulated via stabilizing feedback mechanisms that send information back to the controlling elements.	No mention classified under this resilience attribute.
Appropriately connected with actors the farming system	Connectedness describes the quantity and quality of relationships between systems elements.	No mention classified under this resilience attribute.
Functional and response diversity	Functional diversity: variety of ecosystems services that components provide to the system; Response diversity: range of responses of these components to environmental change.	Diverse responses available in farming system: Easy and diverse RM instruments, credits, liquidity, diverse insurance products, medium-long term financing programs and guarantees, timely and flexible financing, new inputs and varieties, short-term innovation, contracts, preventive measures and emergency payments, quality programs.
Optimally redundant	Critical components and relationships with the systems are duplicated in case of failure.	Adequate number of different actors in farming systems (farmers, farmers' family, employees, services providers) that ensures proper relationships within the farming system.
Spatial and temporal heterogeneity	Patchiness across the landscape and changes through time.	There is a diversity of actors in farming systems with regard to size, diversification, orientation and specialization.
Exposed to disturbance	The system is exposed to discrete, low-level events that cause disruptions without pushing the system beyond critical threshold.	Ability to adapt to the market demands, low-level dependency on markets, low exposure to climate change, low indebtedness level and insurance products availability.

Couple with local natural capital	The systems functions as much as possible within the means of the bioregionally available natural resource base and ecosystem services.	Soil fertility, water resources and existing nature are maintained well (Reidsma et al., 2019).
Reflective and shared learning	Individuals and institutions learn from past experiences and present experimentation to anticipate change and create desirable futures.	Advise, monitoring, assistance, information, awareness, training, know-how (e.g. on long-term planning, adaptation procedures, new technology, good practices), provided by actors in the farming systems.
Globally autonomous and locally interdependent	The system has relative autonomy form exogenous (global) control and influences and exhibits a high level of cooperation between individuals and institutions at local level.	No mention classified under this resilience attribute.
Honours legacy	The current configuration and future trajectories of systems are influenced and informed by past conditions and experiences.	Traditions, habits, history, entrepreneurial culture existing in the farming system.
Builds human capital	The system takes advantages of and builds resources that can be mobilized through social relationships and membership social networks.	The actors in farming systems are open to change, flexible, persistence, motivated, engaged and committed with the sector; they seek to reach common farming systems interests; they trust the other actors in the sector and the future of the sector.
Reasonably profitable	Society involved in agriculture are able to make a livelihood from the work they do without relying too heavily on subsidies	Social components have solid financial basis, liquidity and assets, search and provide the farming system with buffer resources and certain funds.
Resilience attributes (Reidsma, 2019)	**Definition (Reidsma et al., 2019)**	**Complementary description from the SURE-Farm Focus groups approach**
Legislation coupled with local and natural capital	Norms, legislation and regulatory frameworks are well adapted to the local conditions.	Low bureaucracy and control measures, adapted instruments, in time and enough payments, flexible framework easier to adapt, coordination at different regional level and involved personnel.
Diverse policies	Policies stimulate all three capacities of resilience, i.e. robustness, adaptability, transformability.	No mention classified under this resilience attribute.
Infrastructure for innovation	Existing infrastructure facilitates knowledge and adoption of cutting-edge technologies (e.g. digital).	No mention classified under this resilience attribute.
Supports rural life	Farmers can stop without endangering continuation of the farming system and new farmers can enter the farming system easily.	No mention classified under this resilience attribute. Statements related to rural services availably has been considered as optimally redundant attribute.

The Figure 31 shows the proportion (%) of the participants explanations arguing that actors by implementing RM strategies reinforce or limit resilience, classified according to the resilience attributes (Cabell and Oelofse, 2012). If the proportion of the resilience improving statements (green colour) is higher/lower than the resilience limiting statements (red colour), it is assumed that RM improves/limits the corresponding resilience attribute.
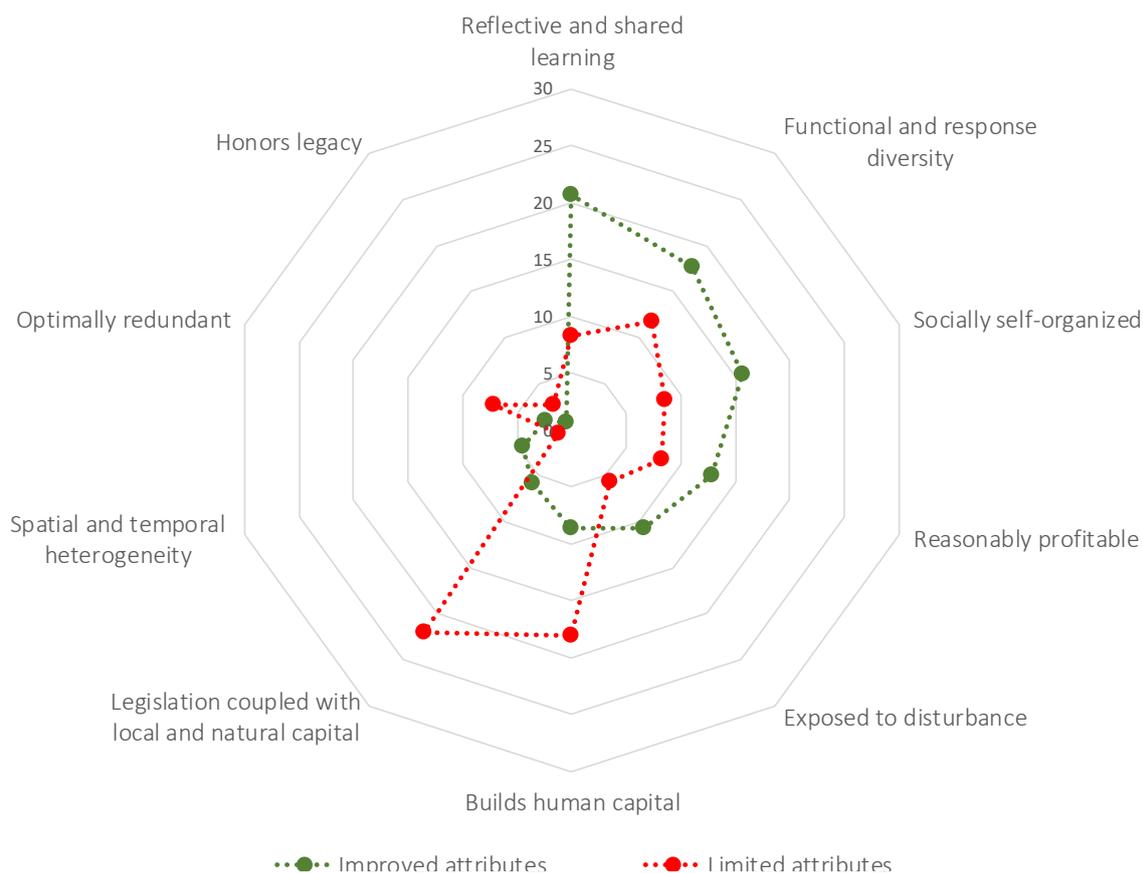
(*) Proportion of resilience improving statements (green) and resilience limiting statements (red) mentioned by participants in the 11 focus groups

Figure 31. Improved and limited resilience attributes when implementing risk management strategies.

11 out of 17 resilience attributes summarized in the Table 13 have been inferred among focus groups participants' statements. Five resilience attributes are improved by actors in farming systems implementing RM strategies. First, RM reinforces the capacity of the farming system actors to learn from past and present experience to create desirable future - technical assistance, advising and training, know how - *Reflective and shared learning* (Carpenter et al., 2012; Darnhofer et al., 2010; Urquhart et al., 2019). Second, implementing RM strategies improves the

Functional and response diversity, i.e. the existence of a variety of responses to disturbance such as a battery of financing products and insurances, activities and products diversification and contracts availability in the value chain (Chapin III et al., 2009). Third, RM reinforces the farming systems' *Reasonable profitable*, allowing actors in the system to make a livelihood for the work they do without relying too heavily on subsides or secondary employment (Cabell and Oelofse, 2012). Fourth, RM boosts the capacity of the actors to form their own configuration based on their needs and desires, *Socially self-organized* (Milestad and Darnhofer, 2003). And fifth, RM contributes to keep the farming system exposed to a discrete, low-level events that cause disruption - *Exposed to disturbance* (Chapin III et al., 2009; Folke, 2006).

Table 14 summarizes the statements explaining why the actors involved in RM reinforce the mentioned resilience attributes, i.e. *Reflective and shared learning, Functional and response diversity, Socially self-organised, Reasonably profitable,* and *Exposed to disturbance*. The statements explaining the actions which limit these resilience attributes are also summarized in Table 14, thought they were mentioned to a lower extent in the focus groups (Figure 31). Table 14 shows that every actor involved in RM enhances/hinders resilience in different ways. Different actors' roles have been identified; some of them enhance resilience and some others constrain resilience. For example, farmers mainly enhance the attribute *Reflective and shared learning* explained by the fact that they are willing to learn and attend training courses, meetings and workshops, share experiences with other farmers and get advice from experts for investments plans. At the same time farmers' actions may also hinder the *Reflective and shared learning* when they rely largely on technical issues and do not express interest in a more in-depth training. Farmers' associations also enhance *Reflective and shared learning* in a different way. They are the source of advice, training, knowledge, and monitoring, they help farmers to comply with good practices. Farmers' associations lead research to develop new agricultural practices, but not always are put in practice by farmers, limiting the resilience attribute.

Table 14. Actions explaining how the actors involved in risk management influence the improved resilience attributes.

Improved resilience attributes	The actions of the actors in RM that improve the resilience attributes (*)	The actions of the actors in RM that limit the resilience attributes (*)
Reflective and shared learning	Farmers attend training courses, meetings and workshops, share experiences with other farmers and get advice from experts for investments plans; A&C provide and facilitate advise, training, knowledge and monitoring, ensure farmers comply with good practices, and research to develop new agricultural practices; FI provide advice on investments plans, risk management, and promote innovation; PM provide advice and support training programs; R&E develop new technology, provide qualified technical assistance and data, and bring new ideas to the field; VCA provide knowledge and advise in decision-making and adaptation measures, support adaptation changes, and manage regulations and policy implementation.	Farmers are scarce of technical knowledge, depend on technical external research activities and need to improve long-term investment plans; A&C do not have an applied research service to promote huge changes; FI have a lack of information and advice services and trained professionals in the sector; PM provide insufficient technical aid and present a lack of knowledge in farming needs and requests; R&E focus in medium-long term; they do not offer solutions in the short-term. Scarce knowledge transfer and their economic and human resources are limited; VCA do not share enough information and advice and there is a lack of trained and tailored farmers' needs professionals.
Functional and response diversity	Farmers adapt farms to current circumstances, innovate with new varieties and new products in the market, take advantage of technology, have off-farm employments, contract insurance and financing products; A&C are flexible, adapt to changes, promote, support and develop (new) products, negotiate with financial institutions new products, introduce new services to farmers, and provide or negotiate with authorities emergency payments; FI provide variety of insurance products, facilitate credits and anticipations, contribute to good risk balance, diversified the products portfolio, and adapt the appropriate service to the situation; R&E carry out multifunctional strategies and long-term innovations; VCA provide preventive measures, contracts, and new inputs, products and varieties, and adjust to shocks and stresses.	Farmers have difficulties to adapt to market and access to different sources of funds. Their activities and source of financing are not diversified enough; A&C do not provide enough services and they seek short-term objectives; FI do not provide new and improved products, are not flexible regarding financial proceedings and farmers' circumstances, and prefer the most profitable sectors; R&E do not provide short-term innovation and reinforce the opportunities for quick reactions; VCA are market dependent, promote the same agricultural practices, do not adapt to farmers circumstances and are interested in high short-term profitability.

Socially self-organised	Farmers develop initiatives to boost local commerce and are open to consultant services; A&C allow communication and gathering between farmers, support commercialization, encourage lobby on sector aids, increase producer's bargaining power, support their members, and adapt to value chain changes; FI are well structured and flexible, and adapt to regulations and farmers' needs; R&E are quick to reorganize; VCA are able to operate on large territories, offer support and cooperation, adapt to changes and farmers' needs.	Farmers prefer not to be involved in associations; A&C have strict member's requirements, lack of legislation framework and power to influence on policy makers; FI are not coordinated with other actors (especially farmers), not connected to agricultural sector, need long timing for measures implementation; PM focus cooperation programs between farmers, not considering other stakeholders; R&E have weak relationships with farmers to transferring knowledge; VCA are not flexible enough to adapt farmers' needs, impose prices, high demands and strict quality requirements, react slowly to changes, and present lack of cooperation with other actors.
Reasonably profitable	Farmers invest most of their savings, look for financing to adapt the farm and are able to withstand short-term stresses; A&C negotiate funding with banks, are provided by buffer resources and farmers' participation fees, secure sales with contractualisation, and invest in R&D; FI provide quick liquidity and funding to carry out investments, facilitate short-term credits, anticipations and compensations in terms of disasters to farmers, and support innovation; PM provide financial support; R&E contribute with new and more profitable projects; VCA seek increasing profits.	Farmers have to deal with low profitability, insufficient funds, increasing difficulties to land access, expensive technologies and costly investments; A&C have low incentives to support the least profitable farmers; FI provide scarce resources; PM provide insufficient resources to the sector and requires a slow and complex bureaucracy; R&E have low incentives for agricultural research.
Exposed to disturbance	Farmers research new markets, have low debt-to-equity ratios, and adapt to external factors that trigger changes; A&C stabilize demand and prices, ensure farmers to sell the entire production, and open to new commercialization channels; FI provide insurances, support to avoid debts, adapt to market's needs; VCA adapt to market changes and are facilitated by world supply.	Farmers are not adapted enough to consumers' needs and environmental shocks, and only change in the presence of unfavourable situations; A&C are not open to other activity sectors; FI do not have competition and the need to adapt to currents markets; VCA are conditioned by the market fluctuations.

(*) **A&C**: Associations & Cooperatives; **FI**: Financial Institutions; **PM**: Policy makers; **R&E**: Research & Education institutions; **VCA**: Value chain actors.

Three attributes emerge as limited when implementing RM strategies (Table 15). First, actors claim that policy instruments and communication processes with public authorities are not properly adapted to the farming system's needs – *Legislation coupled with local and natural capital* (Reidsma et al., 2019). Second, according to Shava et al. (2010) to *build human capital*, i.e. the individual skills, attitudes and education, enhance resilience. Although the commitment, engagement and openness to innovation of the farming system actors are frequently mentioned in the focus groups as enhancing attributes, attitudes such as *not being keen or interested in changes* or the *lack of confidence and motivation* are mentioned as resilience limiting attributes to a greater extent. Carpenter et al. (2012) identify trust as an enabling condition for general resilience. Finally, the limited presence of diverse actors in the sector with adequate knowledge and qualification emerge as a limited attribute, attribute called *optimally redundant* (Low et al., 2003).

Table 15 details the actions explaining how the actors involved in RM limit the mentioned resilience attributes, i.e. *Builds human capital, Legislation coupled with local and natural capital, Spatial and temporal heterogeneity, Optimally redundant*, and *Honours legacy*. The statements explaining the actors' actions that enhance these resilience attributes are also summarized in the Table 14, thought they were mentioned to a lower extent in the focus groups (Figure 31). As previously explained, every actor involved in RM may limit /enhance the resilience attributes in a different manner. For example, while policy makers is the key actor limiting the resilience attribute *Legislation coupled with local and natural capital*, no Policy makers' limiting actions have been identified when assessing the *Spatial and temporal heterogeneity* and *Honours legacy.*

Table 15. Actions explaining how the actors involved in risk management influence the limited resilience attributes.

Limited resilience attributes	The actions of the actors in RM that limit the resilience attributes (*)	The actions of the actors in RM that improve the resilience attributes (*)
Builds human capital	**Farmers** present aversion to change and distrust in farmers, cooperatives and associations; **A&C:** the lack of transparency limits the farmers' participation. There are no clear and common interests, goals and visions; **FI** show little interest in the agricultural sector and risky and/or low profitable investments, have little awareness about farming system and its positive contribution to environment and human being; Big institutions with slow changes; **PM** show a lack of freedom to change and count on low motivated personnel; **R&E** present a lack of involvement and confidence in the sector; **VCA** have no interest in changing, adapt slowly and risk averse.	**Farmers** are flexible, invest their effort and time, committed and attached to the sector, open to new technology implementation; **FI** are open to finance new and more profitable business; **VCA** are willing to change, and have great commitment with advisory and great attachment to proven methods.
Legislation coupled with local and natural capital	**PM** provide a regulatory framework too general or not enough adapted to sector needs, insufficient aids support, wildlife protection and environmental practices limiting agricultural practices, strict control and complex bureaucracy, lack of investment in R&D, often changing and non-fitting regulations generating policy uncertainty, big institutions that prevent communication, and difficulties of some countries (Bulgaria, Poland) to adapt to EU regulations.	**PM** provide funds and aids to support investments, sustainable practices and new entrants in the sector, implement improvement plans, support sanitary campaigns and establish legal framework.
Spatial and temporal heterogeneity	**Farmers** are used to horizontal development based on increasing size and infrastructure; **VCA** present a high dependency of specialized production.	**Farmers** are open to new crops, techniques, activities and agricultural diversification. Farmers conduct diverse types of farms; **A&C** present different sizes and supports the diversity of farm types with different services; **FI** support diversification with different products depending the type of farms.
Optimally redundant	**Farmers** need (skilled) workers and services and innovation providers. Succession is not ensured; **A&C** present a shortage in staff; **FI** have a low presence in rural areas; **PM** present a lack of consultants and qualified specialists in the agricultural sector.	**A&C** provide local services to members in remote areas; **FI** bring human resources to provide services to farmers; **PM** contribute to deal with the high level of unemployment in rural areas and regulate on seasonal workers contracts
Honours legacy	**Farmers** are stuck to traditional practices and habits that difficult the change.	**Farmers** have a good infrastructure, culture and know how.

(*) **A&C**: Associations & Cooperatives; **FI**: Financial Institutions; **PM**: Policy makers; **R&E**: Research & Education institutions; **VCA**: Value chain actors.

Finally, additional resilience attributes influenced by RM emerge from the categorization assessment of the focus groups insights. Less than 5% of statements are related to the *Honours legacy* (the culture memory embodied in the system), and the *Spatial and temporal heterogeneity* (diversity of farms types regarding economic size intensity, orientation or specialization degree) (Carpenter, et al., 2001) .

Not every actor contributes in the same manner to resilience attributes.

Figure *32* shows how each actor contributes to each resilience attribute. The horizontal axis represents the net number of the resilience-improving statements minus the resilience-limiting. This figure reflects the relevance of the multi-stakeholder approach in the resilience assessment as mostly every actor influence on every resilience attribute.
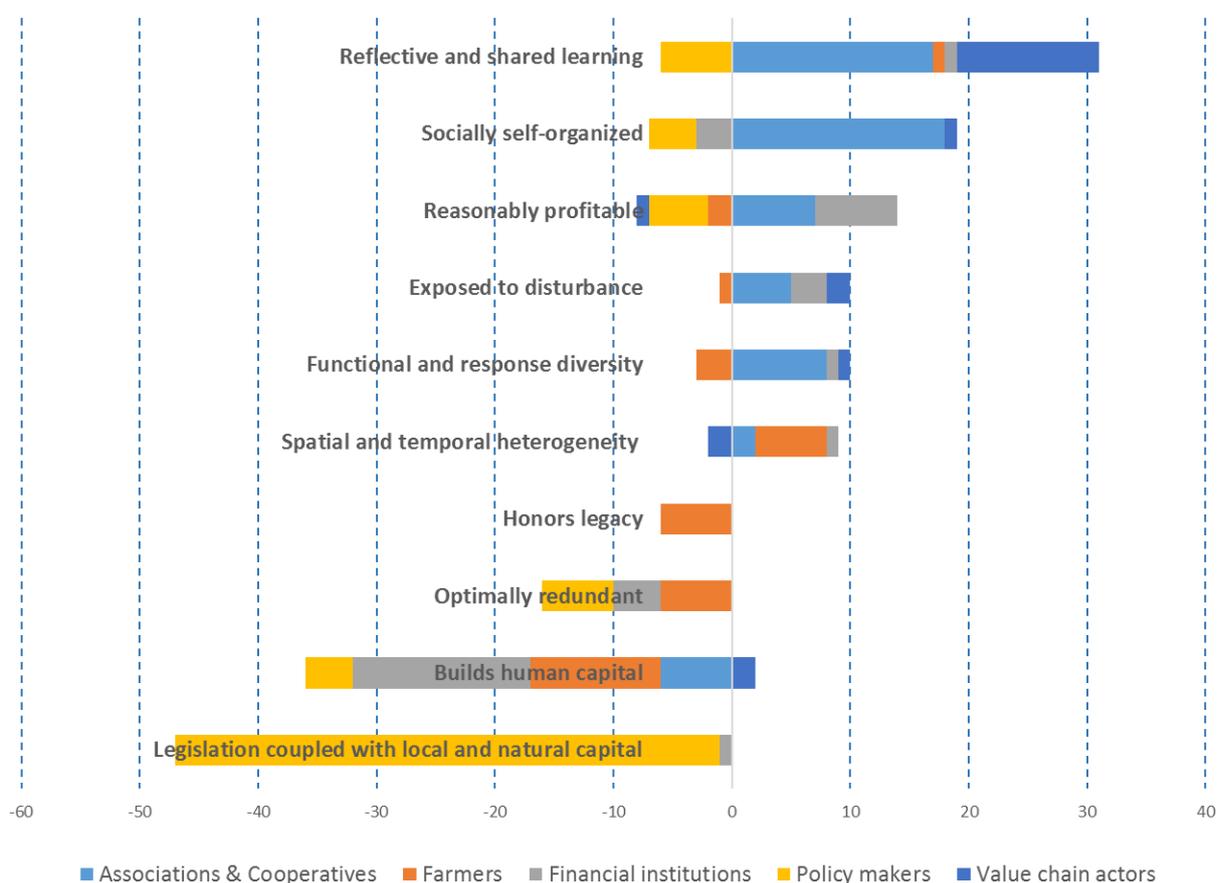
(*) Number of the resilience improving statements minus the resilience limiting statements.

Figure 32. The contribution of the actors involved in risk management to the resilience attributes.

As previously explained, *Reflective and shared learning* and *Socially self-organized* are the attributes enhanced to the greatest extent when implementing RM strategies. These attributes are mainly boosted by the actions performed by *Associations & Cooperatives* and *Value chain actors*. They are the main promoters of alliances in the farming system and the source of knowledge, support, and advise in the implementation of RM strategies. The net impact on *Reasonable profitable*, the *Functional and response diversity* and *Exposed to disturbance* is also positive. In this occasion, *Financial institutions* are also among the leading actors together with *Associations & Cooperatives* and *Value chain actors*. They are the main providers of a diverse RM toolkit to reduce the exposure of the farming system to challenges and facilitate a diverse range of responses. *Farmers* appear as the main enhancing actor of the *spatial and temporal heterogeneity* mainly explained by the implementation of diversification strategies.

The influence of past conditions and experiences (*Honours legacy*) is perceived as a limited resilience attribute. The statements provided by the participants in the focus groups reflect that the willingness of farmers to preserving traditions is generally understood as a limiting factor of the resilience capacities as it limits the willingness to change. In addition, the low number of actors, not only Farmers and Associations & Cooperatives but also Value chain actors and Financial institutions in the farming systems explain that the *Optimally redundant* attribute is limited. Once again every actor in the farming system limit the *Builds human capital* attribute; the lack of confidence of every actor in the future of the sector, their low commitment and willingness to change and the diversity and not always converting interests of the actors' in the farming systems explain the limitation of this resilience attribute. Finally, the lack of *Policies coupled with local and natural capital* is limited mainly driven by policy makers in the farming systems.

As Table 16 shows (column freq.) participants in every focus provide insights on the positive contribution of RM to *functional and response diversity*; and almost in every focus groups (9 out of 10 focus groups) participants provide arguments that allows to infer the RM positive contribution on *Reflective and shared learning* and *Socially-self organized attributes*. Except the mentioned resilience attributes, the enhanced/limited attributes vary across CS. In Belgium, three resilience attributes *Reasonably profitability*, *Functional and Response diversity* and B*uilds human capital* emerge as improved attributes while in Bulgaria (9 out of 10) and the UK region (8 out of 10) almost every resilience attributes emerge as improved attributes. *Honours legacy* just emerge in two CS regions, Poland and in the UK; *Improved legislation coupled with local and natural capital* emerges in Bulgaria, Romania and Spain, and *Optimally redundant* in Bulgaria, France and Spain.

Table 16. Improved resilience attributes when implementing risk management strategies by case study region.

Resilience attributes	Belgium	Bulgaria	France	Germany	Italy	Poland	Romania	Spain	Sweden	UK	Freq.
Builds human capital	2	4				11		2		2	5
Exposed to disturbance		4	2		8	5	1	3	2	1	8
Functional and response diversity	3	9	3	6	6	2	2	6	3	6	**10**
Honors legacy						1				1	2
Legislation coupled with local and natural capital		6					3	5			**3**
Optimally redundant		4	1					1			3
Reasonably profitable	1	2	5	4	8		3	6		3	**8**
Reflective and shared learning		7	5	5	6	4	3	20	2	7	**9**
Socially self-organized		8	2	2	11	5	1	5	2	3	**9**
Spatial and temporal heterogeneity		4		1	1		4			1	**5**

Green color means that mentions related to the corresponding resilience attribute have been identified in each focus group
The number in the colured cells is the number of mentions related to the corresponding resilience attributes in each focus

Similar diversity among CS regions is found when assessing the limited resilience attributes. As shown in Table 17 (column freq.) almost in every CS regions (9/8 out of 10 focus groups), *Builds human capital, Functional and response diversity, Legislation coupled with local and natural capital, Optimally redundant, Reasonably profitable, Reflective and shared learning* and *social-self organized* appear as limited resilience attributes when implementing RM strategies. The lowest consensus is found in the assessment of *Coupled with local and natural capital*, *Honours legacy* and *Spatial and temporal heterogeneity* of farms types mentioned just in four and *exposed to disturbance* in six CS focus groups.

Table 17. Limited resilience attributes when implementing risk management strategies by case study region.

Resilience attributes	Belgium	Bulgaria	France	Germany	Italy	Poland	Romania	Spain	Sweden	UK	Freq.
Builds human capital	1	15		5	10	14	5	3	4	3	9
Coupled with local and natural capital		1		1	5	1					4
Exposed to disturbance		4		2	3	4	2	2			6
Functional and response diversity		6	1	14	1	5	2	5		4	8
Honors legacy		1		1	1	5					4
Legislation coupled with local and natural capital		27		18	11	14	3	7		6	7
Optimally redundant		10		2	4	1	1	1	2	1	8
Reasonably profitable	1	4		2	11	2	1	2	1	2	9
Reflective and shared learning		12	2	1	6	1	2	2	1	1	9
Socially self-organized		8	3		6	2	2	2	3	2	8
Spatial and temporal heterogeneity		1		1	1	1					4

Red color means that mentions related to the corresponding resilience attribute have been identified in each focus group

The number in the colured cells is the number of mentions related to the corresponding resilience attributes in each focus

The following step in the process is to frame the resilience attributes in the context of the generic principles of resilience proposed by Resilience Alliance (2010): (i) **Diversity**, defined as the variety of components in a system that entails the functional and response diversity. Functional diversity is the provision of a variety of components such as processes, measures, functions, sources of knowledge, actors and institutions to achieve a mission or task (Kerner and Thomas, 2014). Response diversity refers to the different responses to disturbance of these processes, measures and functions. Diverse response maintains some components even if others are damage (Carpenter et al., 2012); (ii) **Modularity**, that consists of dividing the system in independently modules (Carpenter et al., 2012) that can have different functions. Modularity contributes to contain disturbance by compartmentalizing the systems (Carpenter et al., 2012) (iii) **Openness,** principle related to modularity but at larger scale (Carpenter et al., 2012). While modularity relates to connectivity within the system (internal connectivity), openness refers to connectivity between systems (external connectivity); (iv) **Tightness of feedbacks**, defined as the response of part of the system to changes occurred in other part of the system (Walker et al., 2006). Institutions and social networks are key in determining the tightness of the feedbacks. As feedbacks lengthen is more likely crossing a threshold without identifying at an early stage (e.g.,

through engaging stakeholder groups); and (v) **System reserves**, defined as the capital resource stores (i.e. natural, economic, social) upon which a system can rely when responding to stress (Kerner and Thomas, 2014). It is also called redundancy and is seen as an "insurance" that allows some components to compensate for the loss or failure of others system damages (Biggs et al., 2012). In general terms, more reserves mean greater resilience (Resilience Alliance, 2010).

Based on resilience principles definition and previous SURE-Farm findings and procedures (Reidsma et al., 2019) the following resilience attributes classification is followed (Table 18):

Table 18. Classification of the resilience attributes according to the resilience principles.

Resilience attributes Cabel and Oelofse (2012)	Resilience principle
Functional and response diversity	Diversity
Optimally redundant	Diversity
Spatial and temporal heterogeneity	Modularity
Exposed to disturbance	Openness
Reflective and shared learning	Tightness of feedbacks
Socially self-organized	Tightness of feedbacks
Legislation coupled with local and natural capital	Tightness of feedbacks
Coupled with local natural capital	Systems reserves
Honours legacy	Systems reserves
Builds human capital	Systems reserves
Reasonably profitable	Systems reserves

Diversity entails *Functional and response diversity* and the availability of enough and diverse actors (*Optimally redundant)* to ensure the functional and response diversity. **Modularity** resilience principle is directly related to *Spatial and temporal heterogeneity*, as it implies diverse and independent functions. **Exposed to disturbance** (related to climate change, markets, and indebtedness levels) is directly associated to *Openness* and the farming system external connections. The **Tightness of feedbacks**, where the connections between farming systems actors is the key element, comprise three resilience attributes: The *Reflective and shared learning*, *Legislation coupled with local and natural capital* and *Socially self-organized*. Finally, based on **Systems reserves** definition, it comprises three different capitals: i) natural (*Coupled with local natural capital*); ii) social (*honours legacy* and *builds human capital*); iii) and economic (*reasonably profitable*) capital.

Based on the previous classification, the Figure 33 shows the RM contribution to the resilience principles. The **Tightness of feedbacks** is the resilience principle enhanced to the greatest extent when implementing RM strategies. As the number of resilience improving statements is almost

the same as the number of the resilience limiting statements, there is no clear consensus on the sign of the impact of RM on this resilience principle. As summarized in Table 18, the **Tightness of feedbacks** embraces three resilience attributes: *Reflective and sharing learning*, *Self-organized* attribute and the *Legislation coupled with local capital*. The positive contribution of RM to *Reflective and sharing learning* and *Socially self-organized* is compensated with the limited *Legislation coupled with local capital* (Figure 31). This situation also appears when assessing *Diversity*, as the diverse products and services available are not accompanied by enough actors to offer and implement them. The impact of RM on *Openness* is clearly showed in the Figure 33. RM reinforced the capacity of the farming systems to keep low-level of dependency on markets and low exposure to climate change.
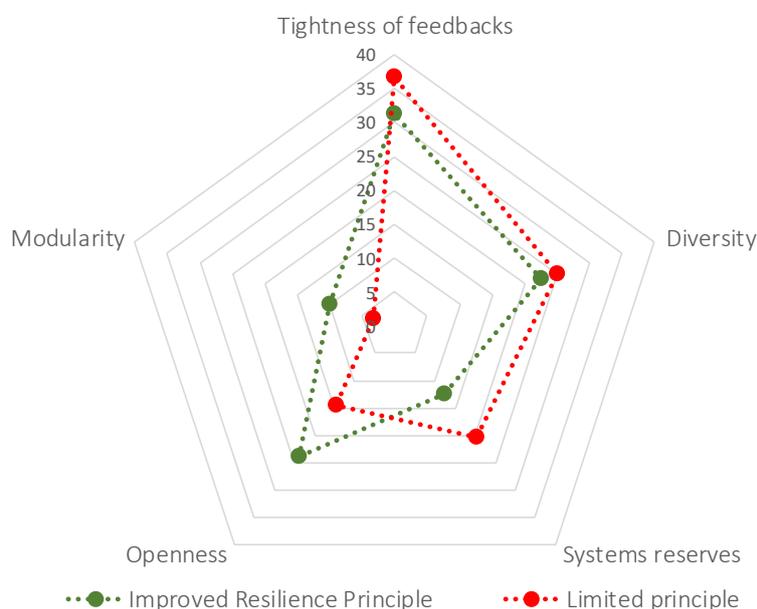
(*) Percentage of resilience improving statements (green) and the resilience limiting statements (red). The percentage by resilience principle has been weighted according to the number of the resilience attributes included.

Figure 33. Improved resilience principles when implementing risk management strategies.

Systems reserves appear as limited resilience principle when implement RM strategies. It is mainly explained by the fact that this principle comprises the resilience attribute *Builds human capital*. As shown in Figure 31 the low presence of actors who are open to change, committed with the sector and engaged in common interests is limiting the social capital. Finally, **Modularity** is enhanced by implementing RM strategies but to the lowest extent.

6.2   Evidence from the virtual co-creation platform

As described in section 4.2, a dedicated activity is defined in the virtual co-creation platform to assess to what extent RM strategies contribute to resilience capacities (*robustness*, *adaptability* and *transformability*). The strategy can enable (positive values) or constrain (negative values) the resilience capacities, from -3: very capacity constraining, to +3: very capacity enabling.

The first step consisted on the selection of the most important strategies to deal with the challenges faced by EU farming system (Figure 34).
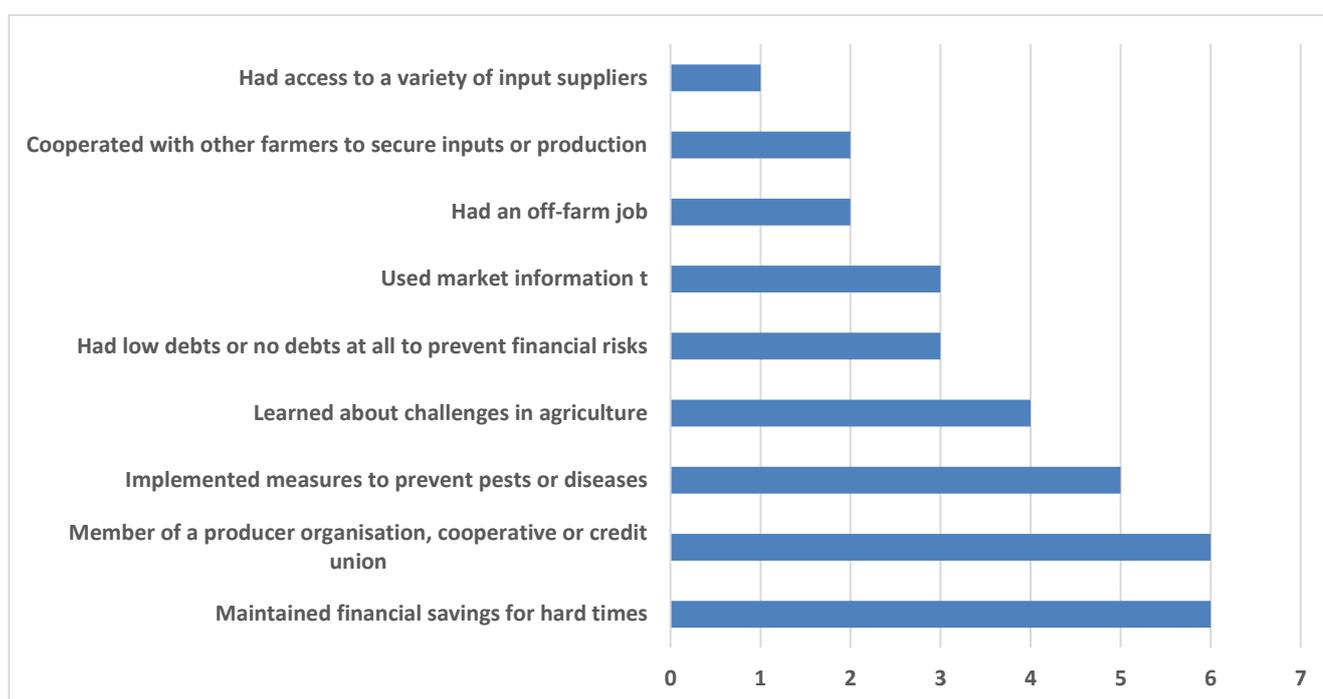
Figure 34. Most relevant strategies to deal with agricultural challenges, identified by the stakeholders participating in the virtual co-creation platform.

Identified in the list of strategies, stakeholders provide information about the strategies' contribution to resilience capacities. The strategies can enable (positive values) or constrain (negative values) the resilience capacities, from -3: very capacity constraining, to +3: very capacity enabling.

Figure 35 shows the percentage of times each strategy has received the specific punctuation. The strategies which contribute to a greatest extent to *robustness* are: 'Maintaining financial savings for hard times', 'Having low debts or no debts at all to prevent financial risks'; and 'Implementing measures to prevent pests or diseases.
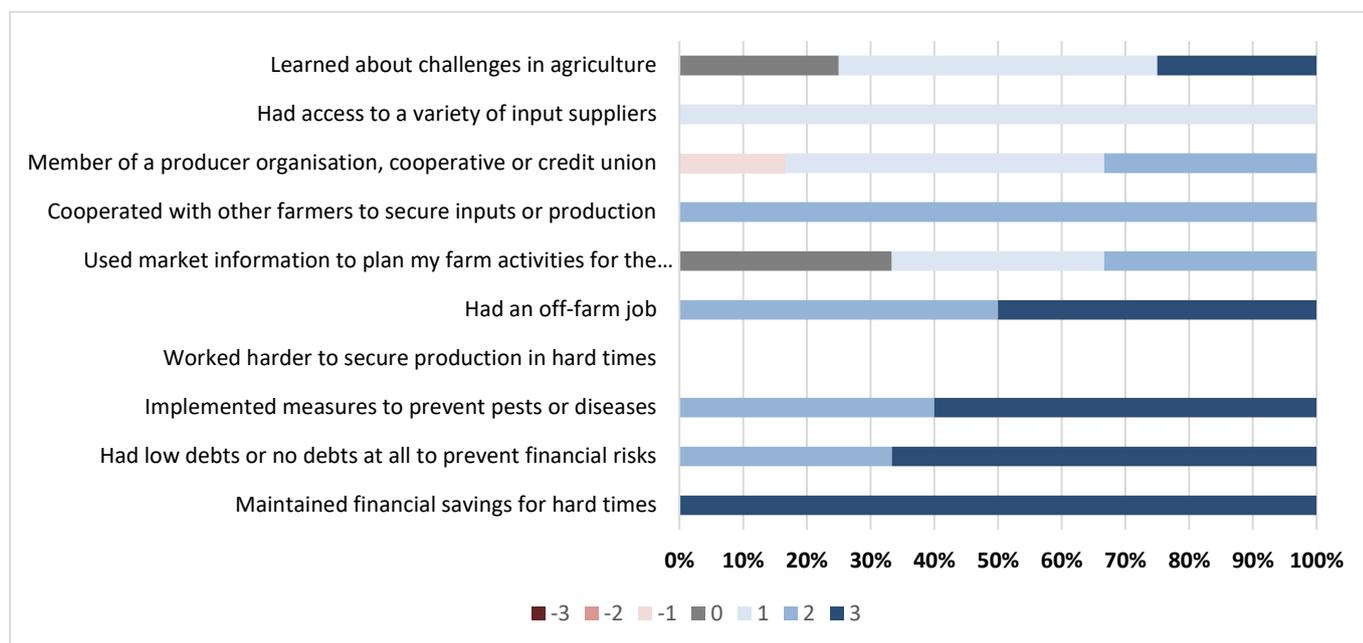
(*) Contribution are indicated from -3 (very capacity constraining) to +3 (very capacity enabling).

Figure 35. The contribution of risk management strategies to robustness capacity.

Referring the strategy 'Maintaining financial savings for hard times', one of the reasons explained by SURE-Makers is that most of the problems can be saved with money. In addition, it helps to afford inputs, loans, and insurance avoiding interrupting the production circle. The 'Implementation of measures to prevent pests or diseases would enhance *robustness* capacity by allowing a better response of the production elements (soil, water...) against natural/climate adverse phenomena. Moreover, the healthier status of the natural resources in which farming relies on the higher the capacity to face shocks.

Regarding the *adaptability* capacity, Figure 36 shows that the strategies that contribute the most to adaptability are: 'Maintaining financial savings for hard times', 'Having low debts or no debts at all to prevent financial risks', and 'Learning about challenges in agriculture'.
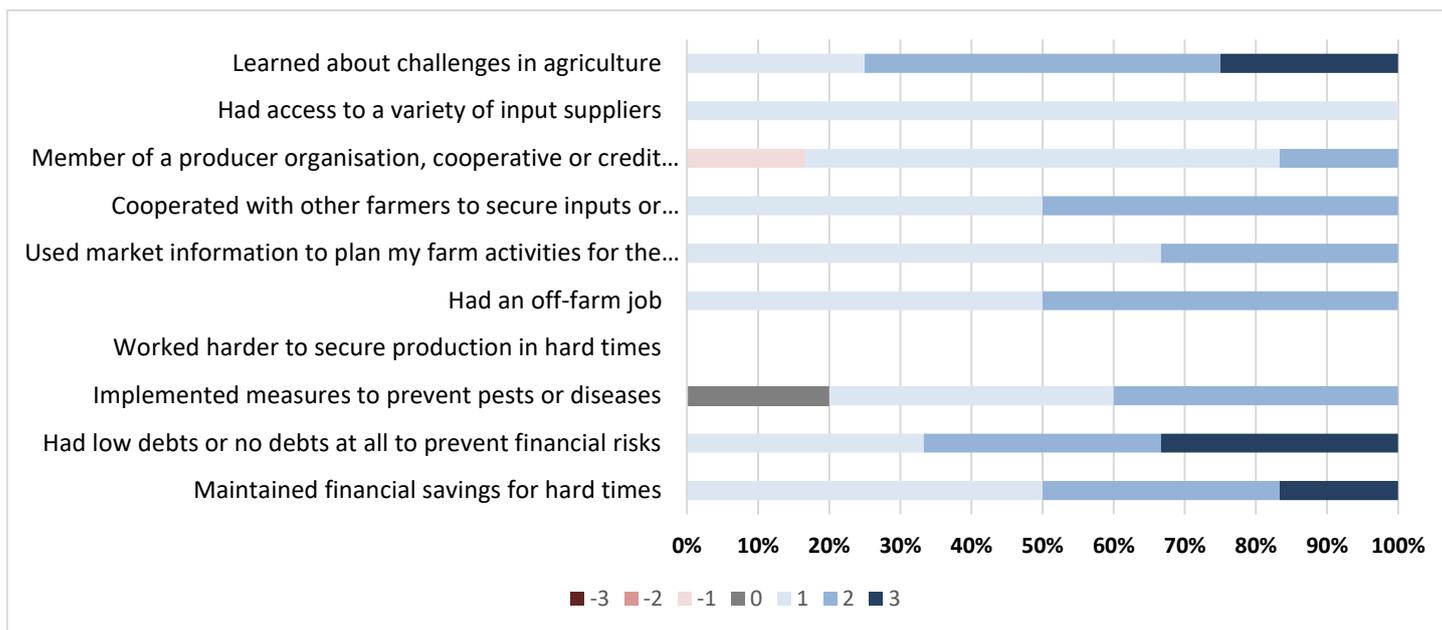
(*) Contribution are indicated from -3 (very capacity constraining) to +3 (very capacity enabling).

Figure 36. The contribution of risk management strategies to adaptability capacity.

'Having low debts' is important to SURE-Makers since it allows them to be prepared for difficult moments. Having lower fixed costs gives them a margin to innovate and to face the transition costs. Some reasons given by SURE-Makers about the importance of 'Learning about challenges in agriculture' are that knowledge about the challenges may give them the time to think about strategies for adaptation. Knowledge always facilitates to foresee future scenarios and have time enough to adapt and cope with challenges.

Finally, regarding transformability, the Figure 37 shows that the strategies that contribute the most to transformation are: 'Maintained financial savings for hard times'; 'Had low debts or no debts at all to prevent financial risks'; and 'Learned about challenges in agriculture'.
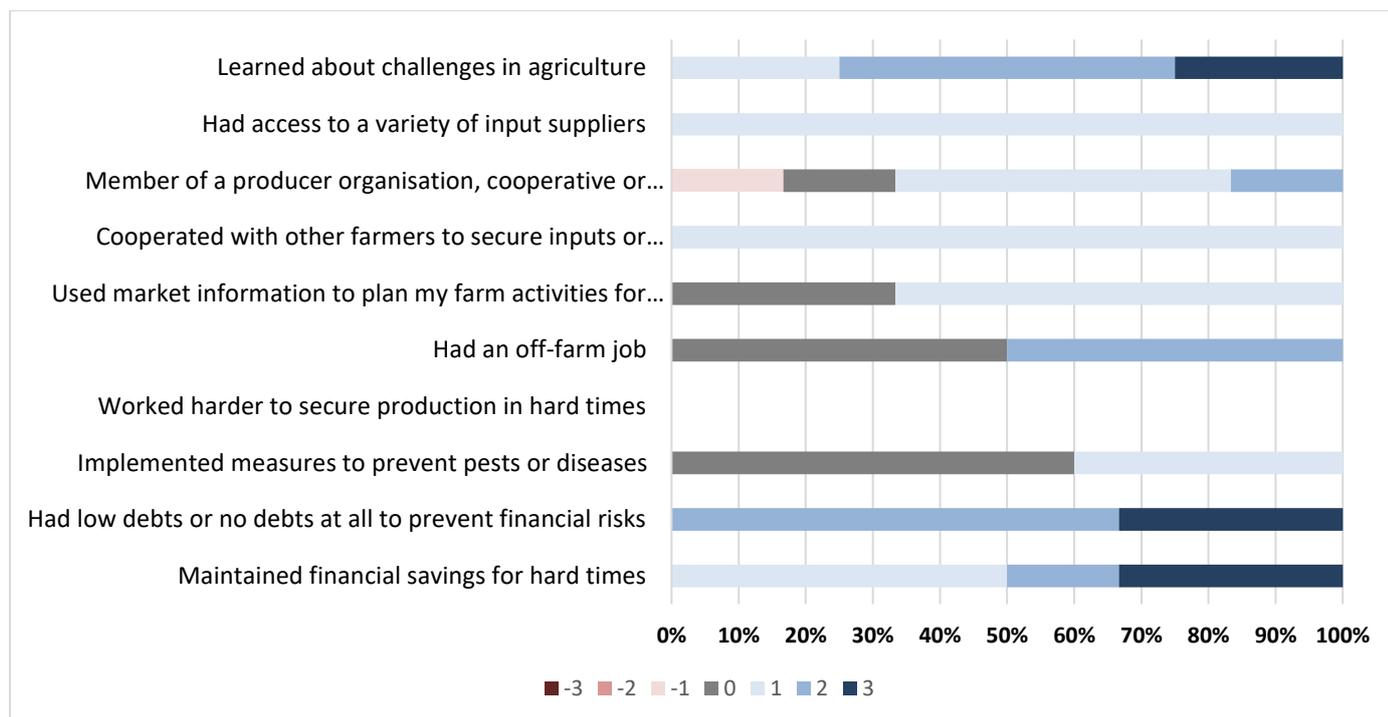
(*) Contribution are indicated from -3 (very capacity constraining) to +3 (very capacity enabling).

Figure 37. The contribution of risk management strategies to transformability capacity.

One of the main reasons that explains the contribution of 'Low debts' to *transformation* is that high level of debts may decrease the credibility for further loans towards transformation; likewise, 'Keeping low debts' gives the farmer a margin to innovate and to face transition costs. Farmers who maintain financial savings have resources to invest in new activities.

7   Conclusions

The aim of this deliverable is to find the opportunities to improve risk management (RM) to enhance the resilience of EU farming systems. Three specific objectives are defined: 1) Providing an outlook of the RM strategies in the EU farming systems; 2) Defining the ways to improve RM strategies; and 3) Assessing the ways through which RM contributes to resilience.

The focus of the resilience analysis is on the *farming system*, i.e. the resilience assessment considers not only farmers but also the other actors in the farming systems such as farmers' associations and cooperatives, value chain actors, financial institutions and the public administrations.

To reach this end, a *multi-stakeholder approach* is followed considering two different regional scales: i) *at local level* to involve stakeholders with experience and knowledge at farming system level; for that purpose focus groups are held in 11case study (CS) regions across Europe; and ii) at *European level* to engage the participation of the stakeholders with experience and knowledge at European level; a dedicated virtual co-creation platform is developed to enable the on-line participation of EU stakeholders across Europe.

More than 600 ideas on improving RM risk management strategies and 500 ideas explaining the RM contribution to resilience have been provided by more than 80 stakeholders across Europe. Ideas were coded and categorized to reach results and draw the following conclusions which are categorized in the following four main topics.

7.1   Perceptions about challenges

EU farmers are primarily concerned about the *economic* and *social long-term pressures*, like the downward trends of products prices, the increasing costs of inputs, the reduced consumption of animal products, and the poor understanding of the social and environmental functions of agriculture. Some exceptions are found among the CS regions, such as British farmers who are more concerned about *institutional long-term pressures* and *shocks* (Brexit, among them) or Bulgarian farmers who are concerned to a greater extent about droughts. This farmers' perception on future challenges facing EU agriculture is generally reinforced by the stakeholders in the CS regions.

In contrast, EU stakeholders consider that *long-term environmental pressures* (global warming and water scarcity) and *shocks* (greater occurrence of extreme events) represent the most pressing challenges for EU agriculture.

There is a noteworthy discrepancy between farmers and local stakeholders' perception and EU stakeholder's perception about the nature of the most pressing challenges threatening the future of farming systems: economic challenges identified by farmers and local stakeholders versus environmental challenges identified by European stakeholders. This might be interpreted considering that farmers and local stakeholders are more concerned about the closer consequences of the economic and social challenges, and EU stakeholders seeing into global challenges as the future climate change impact. But all of them agree that long-term pressures are the most pressing challenges versus shocks in the EU agricultural sector. This result sheds light on the need of defining and boosting long-term RM strategies to deal with long-term pressures.

The differences amongst farmers and EU stakeholders about the importance of the challenges threatening farming systems suggest the value making of multi-actor consultations at different scales, including European and regional/local visions.

7.2 Used and future risk management strategies

The most frequently used strategies by EU farmers in the past to deal and cope with challenges are diverse. EU Farmers implemented in almost similarly proportion *on-farm strategies*, such as 'Maintaining financial savings for hard times', 'Implementing measures to prevent pests or diseases', and 'Diversifying production' and *risk-sharing strategies* such as 'Member of a producer organization, cooperation or credit union', 'Learned about challenges in agriculture' and 'Had access to a variety of input suppliers'. Differences can be found across CS regions. For example, arable farmers in the UK applied the largest range of RM strategies compared to Belgium where the most implemented strategies by dairy farmers are 'Maintained financial savings, `Worked harder to secure production in hard times' and 'Had access to variety of input suppliers'.

The list of the strategies varies when farmers identify the strategies to deal with the future challenges. In this case, *on-farm strategies* are those mainly cited by famers, mainly focused on 'Diversification (business, crop, practices) ', 'Increase efficiency (technology, specialization, better management) ', 'Implementation of economic measures ', and 'Management optimization'. In the future, *on-farm* strategies seem more preferred than *risk-sharing* strategies or any other alternative that relies on third parties.

When the scope of the risk management assessment is broadened at farming system level, the stakeholders identify a more diverse range of strategies to deal with future challenges. Local stakeholders add *risk-sharing* strategies to the farmers' RM strategies list such as 'Learning and information exchange', and 'Cooperation' (vertical and horizontal) and additional *on-farm strategies* ('Innovation' and 'Orientation to consumers demand'). The EU stakeholder's

perspective is in line with that of local stakeholders but reinforces to a greater extent the relevance of the innovation and information exchange to deal with future challenges.

Despite the policy and academic importance given to RM instruments, neither the farmers nor the stakeholders identify conventional instruments as fundamental to deal with future challenges. Farmers' results suggest the wish to become more self-reliant, efficient, and knowledgeable, and are eager to exchange information, learn and be better trained.

The RM strategies identified by the stakeholders to deal with future challenges are like those already implemented by famers. This finding place utmost importance in the improvement of those already available or on offer, and which stakeholders should be responsible in enabling progress and betterment of the known and used strategies.

7.3   How to improve risk management for resilient farming systems

There are several ways to improve RM in EU farming systems. However, four main pathways seem to be predominant across all the cases. 'Cooperation', 'Information flow', 'Training and advice', and 'New tailored products and services' gather the essential indications to improve RM. Many of these proposals are already on the ground but stakeholders in farming systems call for their improvement. Existing initiatives need to be adapted to better reflect the farming systems' specific context and needs. The relative significance of the RM improvements varies across the cases. 'Training and advice' is clamed to a greatest extent by the stakeholders in Poland and Bulgaria, and the lowest extent in the UK and Spain. The stakeholders in the latter regions mainly claim for new financial products tailored to farmer's needs.

All the actors involved in RM are important and needed to improve RM. Each actor may improve RM in a different manner: i) *Farmers* are called to improve the cooperation with other actors in the farming systems and reinforce their confidence on experts advise; ii) *Associations & Cooperatives* have the opportunity to improve information and training provision, reinforce the staff professionalization and boost the coordination with other actors in the value chain; iii) *Policy makers* could contribute to improving RM by improving policy planning, facilitating communication platforms and simplifying control and administrative procedures; iv) *Value chain actors* are encouraged to improve the information exchange about innovation, reinforce the training programs and provide innovative contracts; and v) *Research & Education institutions* are called to better outreach and disseminate the applied innovation and knowledge.

The assessment at CS levels shows that the opportunities to improve RM varies across CS regions. For example, *Farmers* are called to strengthen trading and marketing in Denmark while in Poland they are primary encouraged to optimize the farm management; *Associations & Cooperatives* are

mainly called to raise awareness about the contribution of the agricultural sector to the environment conservation and provide more information and research in Bulgaria; *Financial institutions* have the opportunity to improve their cooperation with other stakeholders in France or to ease access to inform to farmers in the Netherlands.

7.4 Progresses on the assessment of the contribution of risk management to farming system resilience

The contribution of RM to resilience is addressed by analysing what the actors are doing when they implement RM strategies. From the assessment of the roles performed by actors when implementing RM strategies in farming systems emerges that the actors in farming systems enhance the three resilience capacities (*robustness*, *adaptability* and *transformability*). Not every resilience capacity is reinforced to the same extent. *Robustness* is reinforced by actors involved in RM to the greatest extent nearly followed by *adaptability*. *Transformability* is reinforced to the lowest extent. This pattern has been found in every CS region.

Additionally, not all the actors engaged in RM strategies contribute to the resilience capacities to the same extent. *Farmers*, *Associations & Cooperatives*, and *Financial institutions* are the most suitable actors to promote *robustness* and *adaptability*. Promoting *transformability* is primarily the role of *Research & Education institutions* and *NGOs, Consumers & Media*. The role of different actors in promoting the three capacities vary significantly considering the diversity of the CS regions. In terms of *robustness*, the only common actor emerging as relevant in every CS region are *Farmers*, followed by *Associations & Cooperatives* and *Financial institutions*. In France, Sweden and UK, *NGOs, Consumers & Media* are considered to hinder *robustness*; as well as *Value chain actors* in Italy and Sweden. *Adaptability* can be adequately promoted by all actors, except for *NGOs, Consumers & Media* in Sweden. Regarding *transformability*, *Farmers* constrain *transformability* in Bulgaria, Germany, Italy, Poland and Spain. *Transformability* constraining actors in Sweden and Italy are the *Value chain actors*. *Research & Education institutions* enhance *transformability* in Belgium, France, Germany, Italy, Romania and UK. And *Financial institutions* performed positively in all focus groups except in Italy.

Interesting trade-offs, supported by local stakeholders' perceptions, emerge when comparing actors reinforcing/constraining resilience capacities. *Farmers* and *Associations & Cooperatives* are those actors who contribute to the greatest extent to *robustness* explained by the fact that they are the main actors providing funds, labour force, family, commitment. At the same time, they are also the main liming actors of *transformability* capacity. There is a general trend of changing aversion among *Farmers* who prefer farming as they are used to.

Additional perspectives and knowledge are provided by EU stakeholders when assessing the contribution of the RM strategies to resilience capacities. *Robustness* is promoted the most by the strategies such as 'Maintaining financial reserves', 'Having low debts' and 'Implementing measures to prevent pests and diseases'. *Adaptability* is promoted via 'Maintaining financial reserves' and 'Having low debts' as well, but also with 'Learning about changes in agriculture'. Stakeholders do not find a clear contribution of RM strategies to transformability.

Finally, additional conclusions are reached concerning how RM enhances the resilience capacities. This assessment is based on the resilience attributes of the farming systems. Based on stakeholders' insights, it emerges that RM management contributes to resilience capacities because RM reinforces some of the attributes of the farming systems. RM reinforces the capacity of the farming system actors to learn from past and present experience *(Reflective and shared learning)* (9 out to 10 CS regions), the *Functional and response diversity* (10 out to 10 CS regions), the farming systems' *Reasonable profitable* (8 out to 10 CS regions), the *Socially self-organization* (9 out to 10 CS regions) and the ability to keep the farming system exposed to a discrete, low-level disruptive events *(Exposed to disturbance)* (8 out to 10 CS regions). There is a clear agreement on the positive contribution of RM on these resilience attributes across CS regions.

In addition, three attributes emerge as limited when implementing RM strategies: first, policy instruments and communication and control processes with public authorities *(Legislation coupled with local and natural capital)* are not properly adapted to the farming system's needs (7 out to 10 CS regions); second, it seems that attitudes such as not being keen or interested in changes or the lack of confidence and motivation *(Builds human capital)* are mentioned as resilience limiting attributes (9 out to 10 CS regions); third, there is a limited presence of diverse actors in the sector with adequate knowledge and qualification to ensure the proper implementation of the RM strategies (*Optimally redundant*) (8 out to 10 CS regions).

The future risk management towards resilient farming systems should find the pathways to allow RM actors to overcome the limited resilience attributes mainly related to human capital and the legislation coupled with local needs, and to consolidate their positive impact on the improved resilience attributes referred to learning, diversity, cooperation, profitability, and disturbance exposition management. Actions focused on improving cooperation, learning, knowledge and information exchange, and defining financing and insurance products adapted to farmers needs are key to improve RM. Furthermore, strategies towards transformability need to be defined and implemented for resilient farming systems.

As final remark, this report reinforces the need of broadening the focus of the RM assessment by considering a wider range of long-term pressures and a longer planning horizons. The diversity of

actors involved in the RM strategies and their different roles and the diversity across EU regions regarding risk perception, risk management and its impact on resilience emerge as a relevant source of knowledge to improve RM to make the farming systems more resilient.

8   Limitations and caveats

The conclusions and findings are subject to a number of empirical limitations and caveats:

CS are subject to very different conditions and environments, warning against drawing generalizations. The institutional circumstances prevailing in each case differ widely, fundamentally in the way local and regional administrations behave, the development of the financial and insurance companies and training level of the farmers.

While all focus groups followed the same research design and structure, a different group of researchers, which in addition summoned a diverse group of stakeholders, coordinated each.

The participation in the virtual co-creation platform subsided as the different challenges were presented and addressed by participants. Most of the challenges posed in the platform required answering closed-format questions or rating numerically different options.

The findings are based on language coding of the verbal expressions gathered in the course of the focus groups. Most of the results are rooted in the mentions and their frequency.

9 References

Agricultural Markets Task Force, 2016. Improving Market Outcomes: Enhacing the posistion of farmers in the supply chain.

Assefa, T.T., Meuwissen, M.P.M., Oude Lansink, A.G.J.M., 2017. Price risk perceptions and management strategies in selected European food supply chains: An exploratory approach. NJAS - Wageningen J. Life Sci. 80, 15–26. https://doi.org/10.1016/j.njas.2016.11.002

Bardají, I., Garrido, A., 2016. Research for Agri Commitee - State of play of risk management tools implemente by members states during the period 2014-2020: National and European frameworks.

Benos, T., Kalogeras, N., Wetzels, M., de Ruyter, K., Pennings, J.M.E., 2018. Harnessing a "currency matrix" for performance measurement in cooperatives: A multi-phased study. Sustain. 10, 1–38. https://doi.org/10.3390/su10124536

Berti, G., Mulligan, C., 2016. Competitiveness of small farms and innovative food supply chains: The role of food hubs in creating sustainable regional and local food systems. Sustain. (United States) 8. https://doi.org/10.3390/su8070616

Biggs, R., Schlüter, M., Biggs, D., Bohensky, E.L., BurnSilver, S., Cundill, G., Dakos, V., Daw, T.M., Evans, L.S., Kotschy, K., Leitch, A.M., Meek, C., Quinlan, A., Raudsepp-Hearne, C., Robards, M.D., Schoon, M.L., Schultz, L., West, P.C., 2012. Toward Principles for Enhancing the Resilience of Ecosystem Services. Annu. Rev. Environ. Resour. 37, 421–448. https://doi.org/10.1146/annurev-environ-051211-123836

Bijttebier, J., Coopmans, I., Appel, F., Unay Gailhard, I., Wauters, E., 2018. Project acronym: SURE-Farm D3.1 Report on current farm demographics and trends Work Performed by P3 (OCILVO), in cooperation with P12 (IAMO) 1–96.

Bruce, T.J.A., 2016. The CROPROTECT project and wider opportunities to improve farm productivity through web-based knowledge exchange. Food Energy Secur. 5, 89–96. https://doi.org/10.1002/fes3.80

Bryson, J.M., 2003. What To Do When Stakeholders Matter: A Guide to Stakeholder Identification and Analysis Tecniques. Acad. Manag. J. 15, 281–292. https://doi.org/10.1016/j.lrp.2010.08.001

Bullock, J.M., Dhanjal-Adams, K.L., Milne, A., Oliver, T.H., Todman, L.C., Whitmore, A.P., Pywell, R.F., 2017. Resilience and food security: rethinking an ecological concept. J. Ecol. 105, 880–884. https://doi.org/10.1111/1365-2745.12791

Burt, L., Wirth, M.E., 1990. Assessing the Effectiveness of Fann Supply Cooperatives: A Comparison of Farmer and Manager Viewpoints. J. Agric. Coop. 5, 17–26.

Byrd, E.T., 2007. Stakeholders in Sustainable Tourism Development and their Roles: Applying Stakeholder Theory to Sustainable Tourism Development. Tour. Rev. 62, 8. https://doi.org/10.1108/16605370780000309

Cabell, J.F., Oelofse, M., 2012. An Indicator Framework for Assessing Agroecosystem Resilience. Ecol. Soc. 17, art18. https://doi.org/10.5751/ES-04666-170118

Carmin, J.A., Darnall, N., Mil-Homens, J., 2003. Stakeholder involvement in the design of U.S. voluntary environmental programs: Does sponsorship matter? Policy Stud. J. 31, 527–544.

https://doi.org/10.1111/1541-0072.00041

Carpenter, S., Walker, B., Anderies, J.M., Abel, N., 2001. From Metaphor to Measurement: Resilience of What to What? Ecosystems 4, 765–781. https://doi.org/10.1007/s10021-001-0045-9

Carpenter, S.R., Arrow, K.J., Barrett, S., Biggs, R., Brock, W.A., Crépin, A.S., Engström, G., Folke, C., Hughes, T.P., Kautsky, N., Li, C.Z., Mccarney, G., Meng, K., Mäler, K.G., Polasky, S., Scheffer, M., Shogren, J., Sterner, T., Vincent, J.R., Walker, B., Xepapadeas, A., de Zeeuw, A., 2012. General resilience to cope with extreme events. Sustainability 4, 3248–3259. https://doi.org/10.3390/su4123248

Chapin III, F.S., Kofinas, G.P., Folke, C., 2009. Principles of ecosystem stewardship: resilience-based natural resource management in a changing world., First edit. ed. Springer, New York, New York, USA.

Chuku, C.A., Okoye, C., 2009. Increasing resilience and reducing vulnerability in sub- Saharan African agriculture: Strategies for risk coping and management. African J. Agric. Res. 4, 1524–1535.

Considine, M., 2012. Thinking Outside the Box? Applying Design Theory to Public Policy. Polit. Policy 40, 704–724. https://doi.org/10.1111/j.1747-1346.2012.00372.x

Cooreman, H., Vandenabeele, J., Debruyne, L., Ingram, J., Chiswell, H., Koutsouris, A., Pappa, E., Marchand, F., 2018. A conceptual framework to investigate the role of peer learning processes at on-farm demonstrations in the light of sustainable agriculture. Int. J. Agric. Ext. 91–103.

Dahms, T., 2010. Resilience and risk management. Aust. J. Emerg. Manag. 25.

Darnhofer, I., 2014. Resilience and why it matters for farm management. Eur. Rev. Agric. Econ. 41, 461–484. https://doi.org/10.1093/erae/jbu012

Darnhofer, I., Fairweather, J., Moller, H., 2010. Assessing a farm's sustainability: Insights from resilience thinking. Int. J. Agric. Sustain. 8, 186–198. https://doi.org/10.3763/ijas.2010.0480

Dick, W.J.A., Wang, W., 2010. Government interventions in agricultural insurance. Agric. Agric. Sci. Procedia 1, 4–12. https://doi.org/10.1016/j.aaspro.2010.09.002

Eastwood, C., Ayre, M., Nettle, R., Dela Rue, B., 2019. Making sense in the cloud: Farm advisory services in a smart farming future. NJAS - Wageningen J. Life Sci. 100298. https://doi.org/10.1016/j.njas.2019.04.004

Elo, S., Kyngäs, H., 2008. The qualitative content analysis process. J. Adv. Nurs. 62.

European Commission, 2017. Risk management schemes in EU agriculture. Dealing with risk and volatility Contents.

Feindt, P., Termeer, K., Candel, J., Buitenhuis, Y., 2019. Assessing how policies enable or constrain the resilience of farming systems in the European Union: Case study results- SURE-Farm Deliverable (7527520).

Folke, C., 2006. Resilience: The emergence of a perspective for social-ecological systems analyses. Glob. Environ. Chang. 16, 253–267. https://doi.org/10.1016/j.gloenvcha.2006.04.002

Folke, C., Carpenter, S.R., Walker, B., Scheffer, M., Chapin, T., Rockström, J., 2010. Resilience Thinking: Integrating Resilience, Adaptability and Transformability. Ecol. Soc. 15.

Fonte, M., Cucco, I., 2017. Cooperatives and alternative food networks in Italy. The long road

towards a social economy in agriculture. J. Rural Stud. 53, 291–302. https://doi.org/10.1016/j.jrurstud.2017.01.019

Foresti, M., Massa, I., Wild, L., Harris, D., 2011. Responding to external economic shocks: why state capacity and political incentives matter. ODI Brief. Proj. 54.

Frow, P., Payne, A., Storbacka, K., 2011. Co-creation: A typology and conceptual framework, in: Australian & New Zealand Marketing Academy Conference ANZMAC 2011, Australia.

Füller, J., Hutter, K., Faullant, R., 2011. Why co-creation experience matters? Creative experience and its impact on the quantity and quality of creative contributions. R D Manag. 41, 259–273. https://doi.org/10.1111/j.1467-9310.2011.00640.x

Füller, J., Mühlbacher, H., Matzler, K., Jawecki, G., 2010. Consumer Empowerment Through Internet-Based Co-creation. J. Manag. Inf. Syst. 26, 71–102. https://doi.org/10.2753/mis0742-1222260303

Gebauer, J., Füller, J., Pezzei, R., 2013. The dark and the bright side of co-creation: Triggers of member behavior in online innovation communities. J. Bus. Res. 66, 1516–1527. https://doi.org/10.1016/j.jbusres.2012.09.013

Gibb, J., Sune, A., Albers, S., 2017. Network learning: Episodes of interorganizational learning towards a collective performance goal. Eur. Manag. J. 35, 15–25. https://doi.org/10.1016/j.emj.2016.09.001

Greiner, R., Patterson, L., Miller, O., 2009. Motivations, risk perceptions and adoption of conservation practices by farmers. Agric. Syst. 99, 86–104.

Hermans, F., Klerkx, L., Roep, D., 2015. Structural Conditions for Collaboration and Learning in Innovation Networks: Using an Innovation System Performance Lens to Analyse Agricultural Knowledge Systems. J. Agric. Educ. Ext. 21, 35–54. https://doi.org/10.1080/1389224X.2014.991113

Huirne, R.B.M., Meuwissen, M.P.M., Hardaker, J.B., Anderson, J.R., 2000. Risk and risk management in agriculture: an overview and empirical results. Int. J. Risk Assess. Manag. 1, 125–136. https://doi.org/10.1504/IJRAM.2000.001491

Jaakkola, E., Helkkula, A., Aarikka-Stenroos, L., 2015. Service experience cocreation: conceptualization, implications, and future research directions. J. Serv. Manag. 26, 182–205.

Kamberelis, G., Dimitriadis, G., 2011. Focus groups: contingent articulations of pedagogy, politics and inquiry. sage Handb. Qual. Res. 545–562.

Kerner, D.A., Thomas, J.S., 2014. Resilience attributes of social-ecological systems: Framing metrics for management. Resources 3, 672–702. https://doi.org/10.3390/resources3040672

Komarek, A.M., De Pinto, A., Smith, V.H., 2020. A review of types of risks in agriculture: What we know and what we need to know. Agric. Syst. 178, 102738. https://doi.org/10.1016/J.AGSY.2019.102738

Kondracki, N.L., Wellman, N.S., Amundson, D.R., 2002. Content analysis: Review of methods and their applications in nutrition education. J. Nutr. Educ. Behav. 34, 224–230.

Kontogeorgos, A., Sergaki, P., Kosma, A., Semou, V., 2018. Organizational Models for Agricultural Cooperatives: Empirical Evidence for their Performance. J. Knowl. Econ. 9, 1123–1137. https://doi.org/10.1007/s13132-016-0402-8

Krueger, R., Casey, M., 2000. Focus Groups: A Practical Guide for Applied Research,. Thousand Oaks, CA: Sage Publications.

Krueger, R.A., 2014. Focus groups: A practical guide for applied research. Thousand Oaks, CA: Sage Publications.

Lehmann, N., Briner, S., Finger, R., 2013. The impact of climate and price risks on agricultural land use and crop management decisions. Land use policy 35, 119–130. https://doi.org/10.1016/j.landusepol.2013.05.008

Low, B., Ostrom, E., Simon, C., Wilson, J., 2003. Redundancy and diversity: Do they influence optimal management? Navig. Soc. Syst. Build. Resil. Complex. Chang. 83–114.

Lunt, T., Jones, A.W., Mulhern, W.S., Lezaks, D.P.M., Jahn, M.M., 2016. Vulnerabilities to agricultural production shocks: An extreme, plausible scenario for assessment of risk for the insurance sector. Clim. Risk Manag. 13, 1–9. https://doi.org/10.1016/j.crm.2016.05.001

Luyet, V., Schlaepfer, R., Parlange, M.B., Buttler, A., 2012. A framework to implement Stakeholder participation in environmental projects. J. Environ. Manage. 111, 213–219. https://doi.org/10.1016/j.jenvman.2012.06.026

Materia, V.C., Giarè, F., Klerkx, L., 2015. Increasing Knowledge Flows between the Agricultural Research and Advisory System in Italy: Combining Virtual and Non-virtual Interaction in Communities of Practice. J. Agric. Educ. Ext. 21, 203–218. https://doi.org/10.1080/1389224X.2014.928226

McInemey, J., 2002. The production of food: from quantity to quality. Proc. Nutr. Soc. 61, 273–279. https://doi.org/10.1079/pns2002156

Meuwissen, M.P.M., Feindt, P.H., Spiegel, A., Termeer, C.J.A.M., Mathijs, E., Mey, Y. de, Finger, R., Balmann, A., Wauters, E., Urquhart, J., Vigani, M., Zawalińska, K., Herrera, H., Nicholas-Davies, P., Hansson, H., Paas, W., Slijper, T., Coopmans, I., Vroege, W., Ciechomska, A., Accatino, F., Kopainsky, B., Poortvliet, P.M., Candel, J.J.L., Maye, D., Severini, S., Senni, S., Soriano, B., Lagerkvist, C.-J., Peneva, M., Gavrilescu, C., Reidsma, P., 2019. A framework to assess the resilience of farming systems. Agric. Syst. 176, 102656. https://doi.org/10.1016/j.agsy.2019.102656

Michalek, J., Ciaian, P., Pokrivcak, J., 2018. The impact of producer organizations on farm performance: The case study of large farms from Slovakia☆. Food Policy 75, 80–92. https://doi.org/10.1016/j.foodpol.2017.12.009

Milestad, R., Darnhofer, I., 2003. Building farm resilience: the prospects and challenges of organic farming. J. Sustain. Agric. 22, 81–97.

Mitchell, T., Harris, K., 2012. Resilinece: A risk Management approach.

Nanz, P., Steffek, J., 2004. Global Governance, Participation and the Public Sphere. Gov. Oppos. 39, 314–335. https://doi.org/10.1111/j.1477-7053.2004.00125.x

OECD, 2018. Agricultural Risk Management and Resilience: A Holistic Approach.

Onwuegbuzie, A.J., Johnson, R.B., Collins, K.M., 2009. Call for mixed analysis: A philosophical framework for combining qualitative and quantitative approaches. Int. J. Mult. Res. Approaches 3, 114–139.

Pater, M., 2009. Co-creation's 5 guiding principles.

Podestá, G.P., Natenzon, C.E., Hidalgo, C., Ruiz Toranzo, F., 2013. Interdisciplinary production of

knowledge with participation of stakeholders: A case study of a collaborative project on climate variability, human decisions and agricultural ecosystems in the Argentine Pampas. Environ. Sci. Policy 26, 40–48. https://doi.org/10.1016/j.envsci.2012.07.008

POPPE, K.J., 2012. Innovation Policy: Theory and Eu Initiatives, Agricultural Knowledge and Innovation Systems in Transition – a reflection paper. https://doi.org/10.2777/34991

Prager, K., Creaney, R., 2017. Achieving on-farm practice change through facilitated group learning: Evaluating the effectiveness of monitor farms and discussion groups. J. Rural Stud. 56, 1–11. https://doi.org/10.1016/j.jrurstud.2017.09.002

Prahalad, C.K. and Ramaswamy, V., 2004. Co-creating unique value with customers. Strateg. Leadersh. 32, 4–9. https://doi.org/10.1108/10878570410699249

Reed, M.S., 2008. Stakeholder participation for environmental management: A literature review. Biol. Conserv. 141, 2417–2431. https://doi.org/10.1016/j.biocon.2008.07.014

Regan, J.T., Marton, S., Barrantes, O., Ruane, E., Hanegraaf, M., Berland, J., Korevaar, H., Pellerin, S., Nesme, T., 2017. Does the recoupling of dairy and crop production via cooperation between farms generate environmental benefits? A case-study approach in Europe. Eur. J. Agron. 82, 342–356. https://doi.org/10.1016/j.eja.2016.08.005

Reidsma, P., Spiegel, A., Paas, W., Accatino, F., Antonioli, F., Appel, F., MAS, 2019. Resilience assessment of current farming systems across the European Union. SURE-Farm Deliverable (727520).

Resilience Alliance, 2010. Assessing resilience in social-ecological systems: Workbook for practitioners. Version 2.0.

Roloff, J., 2008. Learning from multi-stakeholder networks: Issue-focussed stakeholder management. J. Bus. Ethics 82, 233–250. https://doi.org/10.1007/s10551-007-9573-3

Romero, D., Molina, A., 2009. Value co-creation and co-innovation: Linking networked organisations and customer communities. Work. Conf. Virtual Enterp. 307, 401–412. https://doi.org/10.1007/978-3-642-04568-4_42

Sawhney, M., Verona, G., Prandelli, E., 2005. Collaborating to create: The Internet as a platform for customer engagement in product innovation. J. Interact. Mark. 19, 4–17. https://doi.org/10.1002/dir

SCAR, 2016. Agricultural knowledge and innovation systems towars the future, European commission.

Selsky, J.W., Parker, B., 2005. Cross-sector partnerships to address social issues: Challenges to theory and practice. J. Manage. 31, 849–873. https://doi.org/10.1177/0149206305279601

Services, A., 2012. Building Knowledge Systems in Agriculture Five Key Areas for Mobilising the Potential 12–17.

Shava, S., Krasny, M.E., Tidball, K.G., Zazu, C., 2010. Agricultural knowledge in urban and resettled communities: Applications to social-ecological resilience and environmental education. Environ. Educ. Res. 16, 575–589. https://doi.org/10.1080/13504622.2010.505436

Shiferaw, B., Tesfaye, K., Kassie, M., Abate, T., Prasanna, B.M., Menkir, A., 2014. Managing vulnerability to drought and enhancing livelihood resilience in sub-Saharan Africa: Technological, institutional and policy options. Weather Clim. Extrem. 3, 67–79. https://doi.org/10.1016/j.wace.2014.04.004

Spiegel, A., Slijper, T., De Mey, Y., Poortvliet, M., Rommen, J., Hansson, H., Vigani, M., Soriano, B., Wauters, E., Appel, F., Antonioli, F., Harizanova, H., Gavrilescu, C., Gradziuk, P., Neumeister, D., Meuwissen, M., 2019. D2.1. Report on farmers' perceptions of risk and resilience capacities – a comparison across EU farmers (SURE-Farm Project).

Stanke, T., 2016. Co-creation with online communities: what are the benefits and risks for companies? Part 1: co-creation and online co-creation communities [WWW Document]. Brandba.

Sutherland, L.A., Madureira, L., Dirimanova, V., Bogusz, M., Kania, J., Vinohradnik, K., Creaney, R., Duckett, D., Koehnen, T., Knierim, A., 2017. New knowledge networks of small-scale farmers in Europe's periphery. Land use policy 63, 428–439. https://doi.org/10.1016/j.landusepol.2017.01.028

Tangermann, S., 2011. Risk Management in Agriculture and the Future of the EU's Common Agricultural Policy.

Thomas, E., Riley, M., Spees, J., 2020. Knowledge flows: Farmers' social relations and knowledge sharing practices in 'Catchment Sensitive Farming.' Land use policy 90, 104254. https://doi.org/10.1016/j.landusepol.2019.104254

Urquhart, J., Accatino, F., Appel, F., Antonoili, F., Berry, R., Bertolozzi, D., Black, J., 2019. Report on farmers' learning capacity and networks of influence in 11European case studies. SURE-Farm Deliverable. H2020 project 727520.

Walker, B., Salt, D., Reid, W., 2006. Resilience Thinking: Sustaining Ecosystems and People in A Changing World. Bibliovault OAI Repos. Univ. Chicago Press.

Wilkinson, M.E., Mackay, E., Quinn, P.F., Stutter, M., Beven, K.J., MacLeod, C.J.A., Macklin, M.G., Elkhatib, Y., Percy, B., Vitolo, C., Haygarth, P.M., 2015. A cloud based tool for knowledge exchange on local scale flood risk. J. Environ. Manage. 161, 38–50. https://doi.org/10.1016/j.jenvman.2015.06.009

Wilkinson, S., 2004. Focus group research, in: Qualitative Research: Theory, Method, and Practice. Silverman (ed.), pp. 177–199.

Zseleczky, L., 2014. Are Shocks Really Increasing ? of Five Types of Shocks. A selective review of the global frequency, severity, scope, and impact of five types of shocks. 2020 Conference Paper 5. May 2014. Washington, D.C.: IFPRI.

Appendix 1. Focus Groups Guidelines

Project acronym: SURE-Farm
Project no.: 727520
Start date of project: June2017
Duration: 4 years

Case Study Focus Groups on Risk Management Strategies in Farming Systems

Work Performed by Partner 9, UPM

Bárbara Soriano, Alberto Garrido and Isabel Bardají

(Contact name: Bárbara Soriano: barbara.soriano@upm.es)

Issue date	06/May/2019
Version/Date	Third Version
Work Package	WP2
Task	T2.4
Task lead	P9
Dissemination level	Only for members of the consortium

1   Introduction

WP2 on "Risk management behaviour and strategies" aims to comprehensively understand farmers' risk behaviour and risk management decisions. It also seeks to develop and test risk management strategies and decision support tools that farmers can use to cope with increasing economic, environmental and social uncertainties and risks. WP2 contributes to the development of risk management in EU farming systems by developing a coherent approach for the analysis of risk behaviour and risk management instruments.

Task 2.4 "Co-creation of improved risk management strategies" aims to identify and describe improved risk management strategies for economic, social and environmental risks and to identify opportunities for public-private collaboration. Two main activities are planned within this task:

1. Develop and moderate a digital co-creation platform to co-create with stakeholders the improvements on risk management tools at European level.
2. Coordinate 11 local focus groups to improve risk management strategies at case study level.

The aim of this document is to provide the guidelines for planning, preparing, implementing and analysing the results of the 11 CS focus groups on risk management strategies.

The envisioned activity is associated with the findings resulting from the survey conducted during November 2018 and January 2019, which provides the basis for discussion in the focus groups regarding the risk management strategies to deal with future challenges in each CS.

The Focus groups results fulfil the deliverables D2.6 "*Report on state and outlook for risk management in EU agriculture*" and D2.7 "*Business brief on opportunities for improved risk management in EU agriculture*"

2   Case study Focus Group's approach

Stakeholder concept and participation were not important and relevant until the 1980s when Freeman wrote and defined stakeholder as "any group or individual who can affect or is affected by the achievement of the organization's objectives" (Freeman, 1984, p. 46). Since then, the "stakeholder" concept has assumed a prominent place in public and non-profit management theory and practice, and its analysis has always been important (Bryson, 2003). But it was not until the 1990s that stakeholders and policy development community participation began to be widely accepted by planners and policy managers (Byrd, 2007).

Stakeholder participation can include public hearings, advisory committees, surveys, focus groups, public deliberation, citizen review panels, collaboration, civic review boards, work

groups, implementation studies or written comments (Nanz and Steffek, 2004). Also, it can be facilitated or implemented in different forms, both informal and formal (Byrd, 2007).

To ensure that stakeholder's participation is effectively empowering, they must be involved throughout the process and know that their participation will influence the final decisions (Byrd, 2007; Carmin et al., 2003). Stakeholder analyses must be undertaken skilfully and thoughtfully, with a willingness to learn and revise along the way, being the key point the importance of thinking strategically about which analyses are to be undertaken, "why, when, where, how, and with whom, and how to change direction when needed" (Bryson et al., 2011, p. 11).

In recent decades, there has been an increased interest in participation in environmental decision-making (Luyet et al., 2012). Interdisciplinary research teams with stakeholder involvement are becoming an emerging pattern for the organization of scientific agricultural and environmental research integrated assessments (Podestá et al., 2013). For environmental management and research, Reed (2008) made a review, which traced the development of stakeholder's participatory approaches in different disciplinary and geographical contexts, categorizing and selecting different participatory methods like focus groups. This author reported that stakeholder participation can enhance the quality of environmental decisions by considering more comprehensive information inputs, emphasizing participation throughout the process and institutionalizing this participation.

One of the techniques widely spread and used within strategies of stakeholder collaboration is focus groups. They are collective conversations or group interviews that can be small or large, and directed or non-directed. They facilitate access to social-interactional dynamics that produce particular memories, positions, practices, and desires among specific groups of people and show the ways people position themselves in relation to each other (Kamberelis and Dimitriadis, 2011).

Multi-stakeholder collaboration and integration take advantage of difference, diversity, and divergence (Ferreyra and Beard, 2007) and benefit collectively from shared information, knowledge, improved capacities (Pérez Perdomo et al., 2015). This approach facilitates stakeholders to be aware about the collective consequences of their individual decisions and be able to initiate a process of negotiation between them (Souchère et al., 2010).

3 Main points of the Focus Groups

3.1 The aim of the Focus Group

Eleven focus groups will be conducted for each case study. The CS focus group has a twofold objective:

> 🌿 **Improve the risk management strategies** to deal with challenges in the next twenty years in the case study's region.
>
> 🌿 **Analyse the contribution of the farming system's actors involved in the risk management strategies to resilience capacities** according to the SURE-Farm resilience framework (Figure 1).

Figure 1. *Framework to analyse the resilience of farming systems*
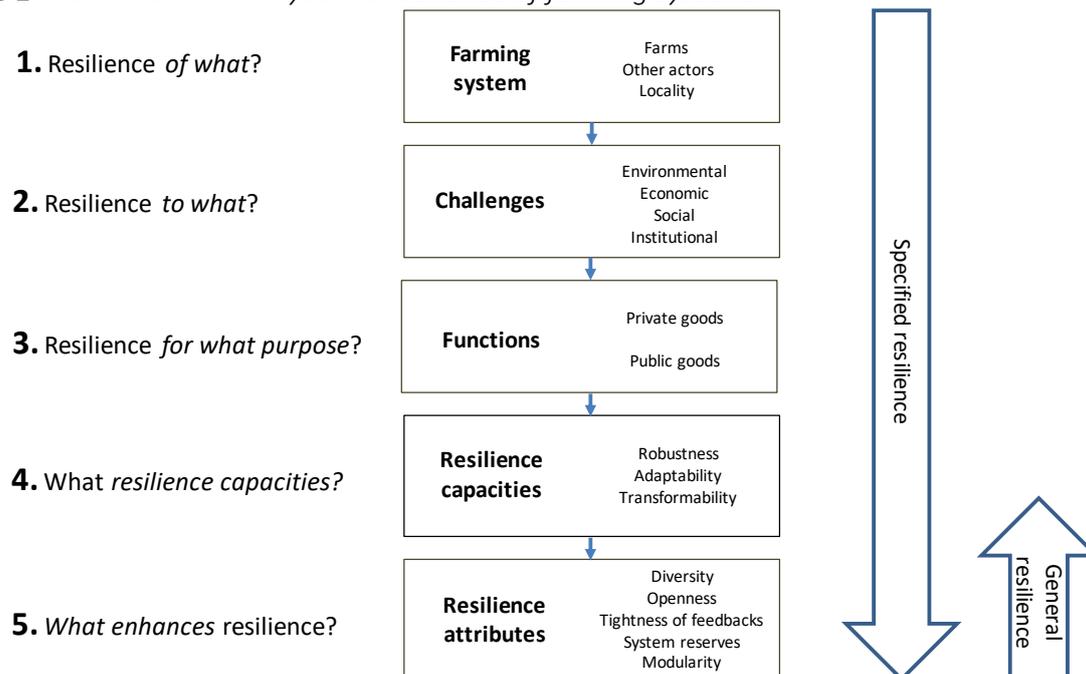
Source: Meuwissen et al. (2018)

The CS focus group draws from the strategies identified by farmers to deal with challenges in the future. These strategies have been identified in the farmers' risk perception surveys (WP2-T2.1).

With the aim of assessing the farming system's resilience, the CS focus group places significant attention on improving the roles of the farming system's stakeholders involved in the strategies (Bryson et al., 2011; Belletti et al., 2017). This activity rests on the idea that improvements for risk management strategies depend on the roles that each stakeholder plays in the strategy. In order to improve strategies, the stakeholders' roles, within each strategy, must be identified and improved.

Assessing the role of the actors of the farming system involved in the Risk Management Strategies fits with the SURE-Farm aim of addressing the resilience at farming system level.

3.2   Timeline:

The timeline for the focus group begins in March 2019 and ends July 2019, in accordance with the following benchmarks:

- 🍃 **29ᵗʰMarch 2019**: Guidelines are ready and sent to the SURE-Farm partners by the UPM team.

- 🍃 **4ᵗʰ April 2019**: UPM holds the Pilot Focus Group to test the proposed methodology and includes any improvements that could be needed.

- 🍃 **10ᵗʰApril 2019**: UPM team presents the CS partners the procedure and results of the pilot focus group in Spain in a training session in Viterbo.

- 🍃 **May-June 2019**: All CS partners are responsible for conducting the focus Group in their CS region.

- 🍃 **May-June 2019**: It is requested to do the final reporting within the month of the Focus groups' session. Reporting template is available on the intranet (ownCloud\SURE-Farm\9_Work Packages\WP2_Risk management\Task 2.4 RM Focus Groups\Reporting).
    - o   Follow-up skype meetings will be held with the CS partners.
- 🍃 **31ˢᵗ July2019**: All CS findings reports are available on the intranet (ownCloud\SURE-Farm\9_Work Packages\WP2_Risk management\Task 2.4 RM Focus Groups \CS Focus Group reporting).

3.3   Which stakeholders should be invited?

In order to guarantee robust outcomes from the focus group, the selection of the focus group's participants is very important (Kamberelis and Dimitriadis, 2011). Two criterions have been identified to select the participants in the focus group:

1. The focus group's objective is to analyse and improve the roles of stakeholders within each strategy; therefore, before selecting participants, we recommend identifying the main strategies to deal with challenges in the farming system and the stakeholders involved in. After identifying the stakeholders involved in the strategies, partners should make sure that most of them are invited to participate in the focus group. For example, if "Maintained

financial savings for hard times" is one of the agricultural risk management strategies, then at least one bank representative or a farm financial advisor should be present.

2. Among the farming system actors, **the participation of farmers and financial institutions (banks and insurance companies) is a priority**.

We propose inviting a maximum of **8 individuals for each focus group**. It is not a problem if some of them already attended the FoPIA workshop, **although inviting new stakeholders is recommended**.

3.4   Timing and main activities

The duration of the focus group is 3.5 hours long. The following chart specifies the timing and activities:

Activities	Time
Welcome & Introductions	10 min
Defining the stakeholders involved, their roles, and the roles' potential of improvement in a selection of strategies	90 min
Coffee break	20 min
Brainstorming about how to improve the stakeholder roles	50 min
Assessing to what extent the stakeholders contribute to resilience capacities	40 min
Conclusions	10 min

3.5   People Involved in organizing the workshop

At least two CS researchers have to organize and facilitate the workshop:

- One researcher is in charge of mediating and invigorating the focus group
- The other researcher is in charge of helping the mediator by taking responsibility for gathering the required materials and taking notes.

3.6   Materials

The following materials are required to carry out the workshop:

- Flipchart and markers
- Colour Post-its(two different sized ones)

- Pens
- Scotch-Tape
- Envelopes
- Recording device- record the session in order to provide summaries of the results (make sure to receive written consent before recording)
- Camera- take photos that will later be used as visual materials for reports (make sure to receive written consent before taking photos)

If you have access to more technological materials, feel free to use them. The list above should serve as a guideline to the minimum materials that are required for the workshop.

4 Conducting the focus groups

4.1 Activities before the day of the focus group

It is important to note that the focus groups' activities are centered around the results from surveys conducted in each case study (WP2-Task 2.1).The strategies to assess in the focus group are those identified by the farmers in the survey, in Question 2 "Risk Management strategies" and Question 3.b "Future Challenges in agriculture and strategies to deal with these challenges"

Prior to the focus group workshop, each CS assesses **the challenges (Q3.a)** and **RM strategies implemented (Q2)** and **to be implemented (Q3.b)** to deal with challenges. To select the strategies, we propose to follow the steps below:

- Copy in a new excel file/sheet the list of the three RM strategies mentioned by farmers (coded in the survey reporting excel in the columns BI-BK).
- Group similar RM strategies into new strategy categories by introducing three new columns in the excel file (Table 1).
- Count the frequency that each new strategy category has been proposed by the farmers and rank the strategies accordingly with their frequency (Table 2)
- Assess the challenges to deal with (3.a- columns BF-BH) by following the same procedure described above. Check if every challenge is covered by assessed strategies or additional strategies need to be considered in the list.
- Assess the RM strategies implemented in the past. If the CS partners consider that some of the most implemented strategies are relevant enough tube included in the focus groups' assessment, we recommend including them. To identify the most implemented RM strategies we propose to sum the responses by column (strategy), to show the

implementation frequency, by strategy: On-farm strategies (Columns AF-AT and EL-EO) and risk-sharing strategies (Columns AU-BE and EP-ES). The higher the sum, the higher the degree of implementation is. (Table3).

Table 1: *Example of codification of RM strategies categories to deal with challenges in the next 20 years in the Spanish focus group (Q 3.b option 1).*

Considering the next 20 years, what do you expect to be your 3 most important strategies to deal with challenges on your farm?	
d	
Strategy 1	
3.b.1	New strategy category
Local sale	Local sale
Breed selection	Improve animal handling
Other sources of income (rural turism or provide work to others)	Looking for other source of income
To buy or rent more lands	Increase the farm' size
To balance with other crops to maintain rentability	Diversification (crop)
Land concentration	Increase the farm' size
Higher promotion	Marketing
Labour force	Improve managment
Reduce negative information campaign	Marketing
Higher prices	Marketing
Breed selection	Improve animal handling
To work in an orderly manner and with discipline	Improve farm management
To increase livestock units up to 800 to optimize work	Increase the farm' size
To strengthen the farm	Investing in the farm
To work with discipline	Improve farm management
Retirement	Quit the sector
To increase fertility	Improve animal handling
To improve farm	Investing in the farm
Reduce negative information campaign	Marketing
Stimulate consumption	Marketing
Encourage consumption	Marketing

Then you can prepare Table 2 summarizing all the strategies and their implementation frequency.

Table 2: *Example of the frequency of the RM strategies to deal with challenges in the next 20 years in the Spanish focus group.*

New strategycategory	Frequency
Promote consumption-Invest in Marketing	19
Invest in the farm	12
Improve farm management	10
Increase prolificacy	10
Reducing costs	9
Improve quality (breed selection)	9
Invest in the farm- new technologies	8
Improve feeding systems	7
Training	6
Improve bargaining power in the value chain (short channels)	6

Investing in the farm - Increase the farm' size	5
Reducing labour intensity (improving life quality)	4

Table 3: *Example of frequency analysis of the strategies implemented in the past 5 years in the Spanish focus group (Q 2).*

Question	Which of the following risk management strategies have you been implementing in the last 5 years? On-farm strategies														
Answer options	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1
Item	Maintained financial savings	Had low debts or no debts	Invested in technologi	Implemented measures	Worked harder to secure	Had an off-farm job (either	Used market informatio	Diversified in productio	Diversified in other activities	Improved cost flexibility	Improved flexibility in the	Opened up my farm to	Intensification of feed	Extensification of feed	Find new trade channels
C7	1	1	1	0	1	0	0	1	0	0	0	0	0	0	0
C8	0	1	0	1	1	0	0	0	1	0	0	0	1	0	0
C9	0	1	0	1	1	0	0	0	0	0	0	0	0	1	0
C10	1	1	1	1	1	0	0	0	0	0	1	0	0	1	0
C11	0	0	1	0	1	0	0	1	0	1	0	0	0	0	0
C12	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0
C13	1	0	0	0	1	1	0	0	0	0	0	0	0	1	0
C14	0	0	1	0	1	0	0	1	0	1	0	0	0	1	0
C15	1	1	1	0	1	0	0	1	0	1	0	1	0	1	0
C16	0	0	1	1	1	0	1	1	0	1	0	0	0	0	0
C17	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
C18	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0
C19	1	0	0	1	1	0	0	1	0	0	0	0	1	0	0
C20	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
EL10	0	1	1	1	0	0	0	1	0	0	1	0	0	0	0
EL11	1	1	1	1	1	0	0	1	0	0	1	0	0	1	1
E12	0	1	1	1	1	0	1	1	0	0	0	0	1	0	0
EL13	0	0	1	1	0	1	0	1	0	0	0	0	0	1	0
EL14	0	1	1	1	0	1	0	1	0	0	1	0	0	1	0
EL15	0	0	1	1	1	0	0	1	0	0	1	0	0	1	0
EL16	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
EL17	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0
EL18	1	1	0	0	1	1	0	1	0	0	1	0	0	1	0
EL19	0	1	0	0	1	1	0	0	0	0	1	0	1	0	0
EL20	0	1	1	1	0	1	0	1	0	0	0	0	0	1	0
Total	30	30	45	45	42	10	16	31	2	19	30	4	11	24	12

Once the strategies- those implemented in the past and those to deal with future challenges- have been addressed, the CS partners select the 10 strategies to be assessed in the focus group. The combination of three selection criteria has been defined to select the 10 strategies:

1. The selected strategies will be those that address future challenges with the highest frequency of mention by farmers.
2. The selected strategies will be those that address future challenges that allows an assessment of a variety of the actors involved.
3. The selected strategies will be those that have been most implemented by farmers in the past and that the CS partner considers being important enough to assess in the focus group.

If the CS team considers that additional RM strategies need to be discussed in the Focus group, please feel free to include them into the list of the 10 strategies. CS partners are those who know the sector best and propose the list with the most interesting strategies to assess.

Once the 10 strategies have been selected, the CS partner:

🌿 Assess and describe how the 10 selected strategies are carried out in the farming system.
🌿 Identify which stakeholders are involved in each strategy (Table4).
🌿 Identify and define the roles of each stakeholder.

Table 4: *Example of the selection of the 10 strategies to assess in the Spanish Focus Group according to the selection criteria.*

	RM Strategies	Farmer	Farmer's association	Cooperatives	Distribution	Vets	Banks	Insurance companies	Public sector
1	Promote consumption-Invest in Marketing	X	X	X	X		X		X
2	Invest in the farm- new technologies-farm size	X	X	X			X		X
3	Improve farm management-reduce labor intensity	X	X						
4	Increase prolificacy	X	X	X			X		X
5	Reducing costs	X	X	X	X				
6	Improve quality (breed selection)	X	X	X		X	X		X
7	Training	X	X	X	X				X
8	Improve bargaining power in the value chain (short channels)	X	X	X	X				
9	Bought any type of agricultural insurance	X	X	X			X	X	X
10	Implemented measures to prevent pests or diseases	X	X			X		X	X

This previous analysis helps to identify which stakeholders should be invited to the focus group, and it prepares the facilitators so that they can ask precise questions and steer the debate, albeit without influencing the participants' ideas or positions. It is important to note that this first analysis should not be used to influence the attendees' opinions, they should only be used to support discussions if they require any.

In addition to this previous analysis, also make sure to prepare the following documents before the focus group meets:

🌿 Attendance list (Annex I)
🌿 Print copies confirmed consent forms (for recording and photos taken during the session (Annex II).
🌿 Print copies of the Table 5, 7 (one per strategy), and 8.
🌿 Draw in the flipchart Tables: 5, 6, 7, 8 (Annex IV)
🌿 Agenda (Annex V)

4.2   Activities of the Focus Group

In order to foster discussion among stakeholders, all the planned activities should result in open-ended discussions. As a result of the open-ended discussions, the roles of the involved researchers are critical (Luyet et al., 2012). During the focus group, the mediator will help ensure there are productive discussions, and the assisting researcher will take notes in order to gather relevant information. As recommended earlier, voice or video recordings are important in case the written notes require clarification at the time of writing the report.

Prior to the start of the activities, provide the attendance list (Annex I) and the written consent form (Annex II). Explain that in order to avoid any confusion or missing results, the session, along with notes, will be recorded (audio only). All the participants will be also provided with post-its and a pen.

To begin the focus group, we recommend preparing a power point presentation *(Annex III)* to*:*

- Provide a brief presentation on SURE-Farm and the Resilience Framework
- State the objectives, the structure, and timing of the focus groups
- Present the results from the surveys related to the challenges of the farming system and the strategies to deal with.
- Present and describe the 10 strategies that the focus group will analyze (Table 5).

The focus group consists of 3 activities with three clearly defined objectives:

1. Defining the actors, their roles, and the roles' potential for improvement.
2. Brainstorming about how to improve the stakeholders' roles.
3. Assessing to what extent the stakeholders contribute to resilience capacities.

4.2.1   Activity 1: Defining the actors, their roles, and the roles' potential for improvement

Objective

Identify the actors and define both their roles and capacity to improve the selected strategies.

Duration: 90 minutes.

Procedure:

This activity starts with a discussion aimed at selecting 4 out of the 10 selected strategies. New RM strategies, not previously included in the list, may arise from the discussion. Please, feel free

to add the new proposed strategies to the list if the participants agree with working on them during the workshop.

Due to the complexity and the time required to collectively analyze the strategies, we strongly recommend that the focus group analyze 4 out of the 10 selected strategies in the case study. If the CS partner considers that more strategies can be assessed in the focus group, please feel free to do it, with a maximum of 6 strategies.

It is advisable that two moderators conduct this activity.

To select 4 out of the 10 selected strategies (and possible strategies added by participants), the moderator 1 will give a paper with the list of the 10 strategies to the participants and ask them to select the four strategies they consider the most important for the sector (or write additional strategies not included in the table, if applies). The mediator will use table 5in the flipchart (this table needs to be designed on the flipchart before beginning the focus group). The moderator 1 will collect the responses from the participants and write down the votes (one tick, one vote) on the corresponding cells. The moderator 2 helps the moderator 1 to do it quickly (one reads the sticks, the other writes them).

The strategies selection will be made according to the participants' votes. If there is a tie, the participants will debate and select the four strategies to assess *(≃10 mins)*.

Once the activity is finished, the moderator 2 removes the sheet from the flipchart and sticks it onto a wall.

Table 5: *Selection of Risk management Strategies*

RM Strategies	Number of ticks
Strategy 1	
Strategy 2	
Strategy 3	
Strategy 4	
Strategy 5	
Strategy 6	
Strategy 7	
Strategy 8	
Strategy 9	
Strategy 10	
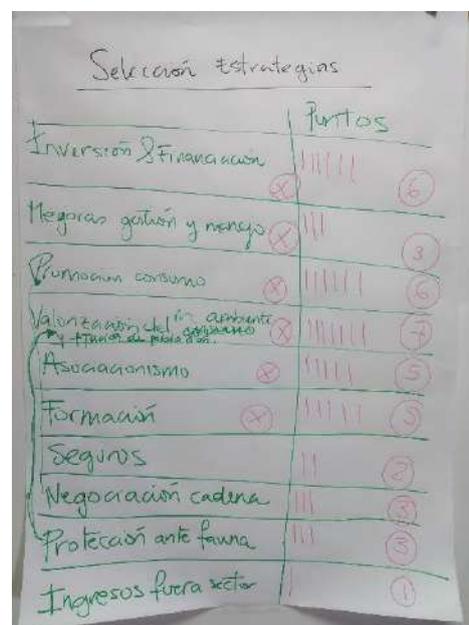
After this introductory activity, the moderator 1 opens a discussion aimed at identifying the actors involved in each of the four selected strategies. The activity will be conducted for each strategy. The participants will collectively:

1. Define the strategy and its implementation method in the CS.
2. Identify the actors that are involved in each strategy. As the actors are discussed and identified, the moderator will write an "X" in the corresponding cell in the Table 6.

In order to complete this activity, the moderator 1works with Table 6on the flipchart (this table needs to be drawn on the flipchart before the focus group) *(≃5 min/strategy; 20min total)*

Table 6: *Actors involved in the main risk management strategies within the sector*

Strategies	Name Actor 1	Name Actor 2	Name Actor 3	Name Actor 4	Name Actor 5	Name Actor 6
Strategy 1						
Strategy 2						
Strategy 3						
Strategy 4						
Strategy …..						

Once the actors of all the strategies are identified, the moderator 1 asks the participants to write down the roles of each stakeholder for the strategies (one post-it by role, actor, and strategy). It is advisable to write down on the top of the post-it the pair: strategy-actor. Then the moderator will ask them to get up and post the notes in the corresponding cells of Table6*(≃15 mins).*

Once all the post-its have been placed on Table 6, the moderator 2removes the sheet from the flipchart and sticks it onto a wall close to the flipchart to be able to show this table together with the table of the following activity, Table 7(already designed in the flowchart).

Beginning with the first strategy, the moderator 1 reads out loud the roles indicated by the post-it notes on Table 6. The moderator will then ask the group to come to a consensus on the main roles for each of the identified stakeholders. When a consensus is reached, the moderator 2 will write down the agreed-upon roles in the corresponding cells of column 2 (roles) on Table 7/Strategy one on the flipchart (the table needs to be drawn before the Focus Group begins- one per strategy). *(≃15 mins).*

Table 7*: The role of the actors: "Name of the strategy".*

Actor	Roles	Current (1-5)	Gap
Name Actor 1			
Name Actor 2			
Name Actor 3			
Name Actor 4			
Name Actor 5			

Table 7.1: *Example Table 7. The role of the actor in the strategy: Investing in Technology in the Spanish case study*

Once the roles of the actors have been specified and written down on the flipchart, the moderator1 asks participants to evaluate the current and potential performance of actors' roles. Moderator 1 distributes Table 7 and asks the participants to fill in individually:

- Participants write down the actors' roles (the same roles and order than that of already written by moderator 2 on the flipchart) and score their current performance. Current performance refers to how good the actors' performance is in the present. The moderator asks participants to score current performance from 1 to 5, 1= very bad current performance; 2= bad current performance; 3= decent current performance; 4= good performance; 5= very good performance.
- The potential of the actors to improve is the difference between 5 and the previous score. It measures how much room is there for the actors to improve. As higher the gap, the higher is the potential to improve.

Moderator 2 collect the responses and help Moderator 1 to write down the responses and get the average value of the current performance and gap.

Then, the moderator 1 opens a discussion on the average values in order to get a consensus on the final scores on the performance and the potential to improve of the actors' roles ($\simeq$20 mins).

Once the assessment of the first strategy is done, the moderator removes the sheet from the flipchart and sticks it onto a wall. A wall in the room is needed to place this sheet together with the rest of the tables (Table 7perstrategy assessment).

The assessment will be replicated for the four strategies. As each strategy assessment is finished the paper of the flipchart is removed from the flipchart and posted onto a wall, together with the previous strategy assessment.

Once the gaps have been defined for each role, the following step is to select, which roles, from each strategy, have the highest improvement potential. We recommend choosing at least 2 roles, with the greatest potential to improve, for each strategy ($\simeq$10 mins).

4.2.2 *Activity 2: Brainstorming how to improve the stakeholder roles*

Objective:

Brainstorm ideas on how to improve the RM strategies by improving the roles of the actors involved or by fostering innovations.

Duration: 50 mins.

Procedure:

The moderator splits the group into two teams and asks each team to brainstorm ideas on how to improve the roles of the actors for two strategies. The meditator will assign each group two strategies. It is important that there is a least one farmer in each group (*the farmers are the only actors that are present in every strategy*). Each team has a leader. All the participants will have post-its and the leader is provided with larger post-its.

The brainstorm starts with one strategy. The participants in each group will write their ideas on how to improve the selected roles in the strategy (one idea per post-it). Once all the ideas have been written by team members individually, the team shares the ideas among the group and the leader writes the summarized conclusions in the larger post-it*($\simeq$30 mins).*

The discussion should remain open-ended so that participants can propose methods to improve risk management strategy that goes beyond the stakeholders' roles.

Once the two actors' roles of the two strategies have been assessed the leader stands up and sticks the summarized conclusions on the corresponding cells of Table 7 and explains them to the group. A brief debate is moderated about the proposed ideas. Then, the second team replicates

the process. The generated ideas will be shared out loud, within each group, and a representative will write the agreed upon improvements on post-its *(≃10 mins/each group)*.

4.2.3 *Activity 3: Assessing to what extent the stakeholders contribute to resilience capacities*

Objective:

Assess to what extent the different farming systems' actor, through their roles in the strategies, contribute to resilience capacities.

Duration: 40 mins

Procedure:

Firstly, the moderator presents the three resilience capacities: Robustness, Adaptability, and transformability*(≃5 mins)*.
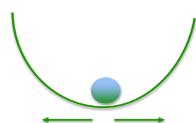
Robustness: farming system's capacity to withstand (un)anticipated shocks and stresses.
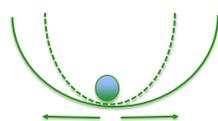
Adaptability: the capacity to change the composition of inputs, production, marketing, and risk management in response to shocks and stresses but without changing the operational logic of the farming system.
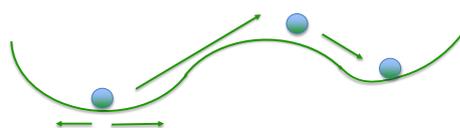
Transformability: the capacity to significantly change the operational logic of the farming system in response to either severe shocks or enduring stress that makes business as usual impossible

Then the moderator 1 asks participants to score to what extent each of the actors enhance or constrain resilience capacities. The rank is between -3 to +3. The actor may constrain the resilience capacity (negative values) or enable it (positive values). The moderator distributes the Table 8 and asks participants to score the contribution of each actor to resilience capacities. Participants are also asked to explain the score. To find the reasons, the participants need to take into consideration **the roles of the actors previously addressed and find how these different roles**

contribute to resilience capacities. Participants will write at least two reasons to explain the scores on the Table 8.

The moderator 2 collects the participants' responses (Table 8) and helps Moderator 1 to write down the scores on Table 8 on the flipchart (the table needs to be drawn before the Focus Group begins) and get the average value. The moderator 1 encourages participants to discuss and get a consensus on the final scores on the contribution of the actors to resilience capacities and the explanations. The moderator begins the discussion with the first identified actor. The aim is to reach an agreed score and identify the reasons that support it. Moderator 2 writes the reasons that emerge from the discussion, writes them on post-its, and sticks the post-it on the corresponding cells on the flipchart. Enough reasons need to be collected to explain the scores. This process will be repeated for each identified actor *(≃40 mins)*.

Table 8: *Rankings of each actor's contributions towards resilience capacities.*

Actor	Robustness (-3 a 3)	Why?	Adaptability (-3 a 3)	Why?	Transformability (-3 a 3)	Why?
Name of actor 1						
Name of actor 2						
Name of actor 3						
Name of actor 4						
Name of actor 5						
Name of actor 6						

Brief conclusions will be presented before the Focus group closure *(≃10 mins)*

4.3   Activities after the Focus Group: Findings reporting.

After the Focus group, please be careful and keep the material:

- Keep the post-its with the role of the actors in the envelopes (one envelope per each pair strategy-actor).
- Keep the post-its with the strategy's' improvements in the envelopes (one envelope per strategy).
- Keep the post-its with the explanations of the actors' contributions to resilience capacities in the envelopes (one envelope by pair actor-resilience capacity).
- Keep the flipcharts posters with Tables 5, 6, 7 (one per strategy), 8.

There are two reporting templates: Tables in **excel format** and brief explanation of main results in **word document**. The reporting templates are available on the intranet (ownCloud\SURE-Farm\9_Work Packages\WP2_Risk management\Task 2.4 RM Focus Groups\Reporting).

It is advisable that each team have completed their own report of their results within one month since the focus group session. The deadline to submit the focus group results is **31th July 2019.**

The expected results from the Focus groups are:

1. Description of the participants and the selection criteria (supporting documents: signed attendance list).
2. Selection criteria of the 10 RM strategies in the CS.
3. Actors, roles description, and performances scoring of the 4-6 strategies selected to conduct the Focus Group.
4. Improvements by RM strategy.
5. Scoring and explanations on the contributions of each actor in the farming system to resilience capacities.

5   Bibliography

Bryson, J.M., 2003. What To Do When Stakeholders Matter: A Guide to Stakeholder Identification and Analysis Tecniques. Acad. Manag. J. 15, 281–292. https://doi.org/10.1016/j.lrp.2010.08.001

Bryson, J.M., Patton, M.Q., Bowman, R.A., 2011. Working with evaluation stakeholders: A rationale, step-wise approach and toolkit. Eval. Program Plann. 34, 1–12. https://doi.org/10.1016/j.evalprogplan.2010.07.001

Byrd, E.T., 2007. Stakeholders in Sustainable Tourism Development and their Roles: Applying Stakeholder Theory to Sustainable Tourism Development. Tour. Rev. 62, 8. https://doi.org/10.1108/16605370780000309

Carmin, J.A., Darnall, N., Mil-Homens, J., 2003. Stakeholder involvement in the design of U.S. voluntary environmental programs: Does sponsorship matter? Policy Stud. J. 31, 527–544. https://doi.org/10.1111/1541-0072.00041

Freeman, R.E., 1984. Strategic management: A stakeholder approach. Boston: Pitman.

Kamberelis, G., Dimitriadis, G., 2011. Focus groups: contingent articulations of pedagogy, politics and inquiry. sage Handb. Qual. Res. 545–562.

Luyet, V., Schlaepfer, R., Parlange, M.B., Buttler, A., 2012. A framework to implement Stakeholder participation in environmental projects. J. Environ. Manage. 111, 213–219. https://doi.org/10.1016/j.jenvman.2012.06.026

Meuwissen, M., Paas, W., Slijper, T., Coopmans, I., Ciechomska, A., Lievens, E., Deckers, J., Vroege, W., Mathijs, E., Kopainsky, B., Herrera, H., Nitzko, S., Finger, R., De Mey, Y., Poortvliet, M., Nicholas-Davies, P., Midmore, P., Vigani, M., Maye, D., Urquhart, J., Balmann, A., Appel, F., Termeer, K., Feindt, P., Candel, J., Tichit, M., Accatino, F., Severini, S., Senni, S., Wauters, E., Bardaji, I., Soriano, B., Zawalinska, K., Lagerkvist, C.-J., Manevska-Tasevska, G., Hansson, H., Peneva, M., Gavrilescu, C., Reidsma, P., 2018. Report on resilience framework for EU agriculture.

Nanz, P., Steffek, J., 2004. Global Governance, Participation and the Public Sphere. Gov. Oppos. 39, 314–335. https://doi.org/10.1111/j.1477-7053.2004.00125.x

Podestá, G.P., Natenzon, C.E., Hidalgo, C., Ruiz Toranzo, F., 2013. Interdisciplinary production of knowledge with participation of stakeholders: A case study of a collaborative project on climate variability, human decisions and agricultural ecosystems in the Argentine Pampas. Environ. Sci. Policy 26, 40–48. https://doi.org/10.1016/j.envsci.2012.07.008

Reed, M.S., 2008. Stakeholder participation for environmental management: A literature review. Biol. Conserv. 141, 2417–2431. https://doi.org/10.1016/j.biocon.2008.07.014

Appendix 2 Summary of the focus groups in the eleven case study regions

1. The case of dairy farming in Flanders, Belgium

Flanders is located in the northern half of Belgium. It is a semi-autonomous region governed by the Flemish parliament. The region has a population of about 6.5 million, which accounts for 68% of the Belgian population and covers an area of about 13,500 km^2. Geographically, the region is mainly flat. The soils are predominantly clayey and loamy/sandy. Agricultural activities in the region vary widely. The total agricultural sector has a production value of 5.5 billion euros, whereas livestock farming accounts for 3.25 billion euros, of which dairy farming accounts for 639 million euros. About 12% of the total amount of farms are dairy farms. Historically, dairy farming has been very important in Belgium and Flanders. The dairy sector in Flanders is characterised by scale enlargement and high technological development over the last decades. Traditionally, dairy farming used to be combined with other agricultural production, typically arable farming or beef production. However, after the Second World War, agriculture gradually became more specialized. The European market was highly protected for the last decades and milk prices were relatively stable. However, since 2007, the dairy sector has been subjected to price volatility mainly due to the gradual decrease of protection measures by the CAP. In 2015, dairy quota in Europe was abolished which resulted in an increased production of milk, quickly followed by a fall in prices. However, after a few years of low profits and instability in the market, the milk price has become more profitable again in recent years. The average stocking rate between 2012 and 2016 in Flanders was 2.5 livestock units per hectare. The average number of dairy cows per farm is 55. Around 36% of the dairy farms have less than 30 cows, while 37% of the farms have more than 60 cows, and 73% of all dairy cows in Flanders are milked on farms with more than 60 cows.

1.1 Challenges and strategies

The five main challenges addressed by the Belgian focus group were "Profitability", "Land availability and prices", "Succession", "Labour pressure and ageing workforce", and "Keeping up to date with (changing) legislation". The most important challenges of intensive dairy farming in Flanders are mainly of economic nature. Profitability is the challenge most frequently mentioned by farmers. Entrance to international markets, has resulted into fluctuating milk prices, and several periods with low milk prices the last decade. Many farmers have responded by scale enlargement and intensification to deal with lower margins. They invest in technology as a response to increased labour demand on these growing farms and to improve efficiency of milk production. These capital-intensive farms are not easy to transfer to the next generation. Finally, changing legislation and consumer preferences are another source of insecurity.

To deal with the above mentioned challenges 5 main strategies were discussed the workshop: "Maintain financial savings for hard times", "Hedged (part of) my production with futures contracts", "Optimisation by using technology (e.g. precision farming and other technological solutions)", "Cooperation with value chain actors", and "Use market information to plan activities regarding production and marketing". These strategies are a combination of strategies that are frequently implemented or at least well known by many farmers and strategies that are not well known but promising as future strategies. Strategies such as optimization by use of technology, and the use of market information are frequently used but participants agreed that implementation of these strategies should be improved and/or more widespread. Other strategies, such as hedging and cooperation with value chain actors, are not often applied yet. However, for all these strategies, main roles of the actors is to inform farmers and other stakeholders, to stimulate and facilitate implementation by providing specific instruments, supporting legislation or other incentives.

1.2 Risk management improvements

After identifying each actor and their roles, participants discussed how to improve implementation of a particular strategy by each actor. Often, it was mentioned that farmers should be more proactive. They should be open to knowledge exchange and innovation. Sharing data among each other, might improve their position in the value chain. They should develop a long-term strategy for their farms by making more use of financial figures and market information. Participants believe that farmers should work more together to improve their position in the market and to guarantee a sustainable future for dairy farming in Flanders. The role of the other actors is mainly to support farmers in this, by informing them and by supporting them in taking actions to support a long-term strategy. Advisory services might facilitate cooperation among farmers. They can act as intermediates between farmers and other stakeholders. Government should provide a legal framework that stimulates innovation and cooperation. All actors in the value chain should pursue win-win situations.

1.3 Risk management contribution to resilience

Actors in and beyond the farming system mainly contribute to robustness and to a lesser extent to adaptability. Research organizations contribute more to adaptability than to robustness. Several actors constrain transformation of the farming system, such as distribution, processing industry and input suppliers. This is not really surprising as they have a big interest in retaining milk production as it supports their business model. It should be noted that the participants had difficulties in scoring the contribution of the actors to the different capacities of resilience. First, after scoring, it was really hard for the participants to give a clear clarification for the scores given.

Second, there was a large variability in scores. This might indicate different opinions or misinterpretation of the resilience capacities.

2. The case of arable farming in North-Eastern and Central Bulgaria

Crop production is important and has a long tradition in Bulgaria. North-East Bulgaria, where the research area is located, is known as "the granary of Bulgaria" and is of crucial importance. The landscape relief is varied with semi-mountainous areas, river valleys and lowlands and the climate is with well-defined four seasons. The soils are among the most fertile in the country, suitable for growing cereals, sunflower, industrial crops, fruits, vegetables. Agriculture (in particular grain production) is an important economic sector; on average the agricultural land amounts to 80-82%. In 2016, the total arable land in Bulgaria increased to almost 3.5 million ha, 40% of which is located in the CS region. 97% of the total number of registered holdings in plant production in the country belongs to physical people who manage 32% of the agricultural area. The share of the sole traders and corporate companies is 2.5% and they cultivate 51% of the area. In addition, 22.3% of the total number of holdings in Bulgaria (244,594) is set up in the CS region. In the CS region, areas are cultivated that account for 43% of the cereals, 42% of the oleaginous and 17% of industrial crops in the country. The share of the CS region in the total crop production of the country by crops is: 48% of wheat, 45% of barley and 56% of maize. North-East Bulgaria is a well-developed agricultural region as the production capacity results from the natural conditions on the first place.

2.1 Challenges and strategies

Bulgarian participants considered five main challenges of different nature: "Climate change", "Market uncertainty", "Lack of working force", "Policy", and "Technological challenges". However, the five strategies selected by participants as the most relevant to carry on the focus group work reflected more political and financial issues: "Policy", "Overcoming lack of working force", "Use market instruments to reduce risk (insurance contracts, futures)", "Decreasing market uncertainty", and "Access to markets of inputs". The strategies were represented with at least four actors. The most numerous strategies involved six actors (Policy and Decreasing market uncertainty), whereas strategies Overcoming lack of working force and Access to market inputs were represented by less actors (four actors per strategy).

2.2 Risk management improvements

Although in the selected ten strategies from the task 2.1 the policy strategy had the lowest score, it turned out the most scored strategy by the focus group participants. In general, all actors involved in the strategy have to improve their performance. The discussion revealed that

agricultural producers have insufficient knowledge for current policy. Most valuable ideas for the strategy improvement are related to collaboration between farmers, associations and MAFF (Government). MAFF should coordinate its organizational structures to becoming more flexible and preparing a sectorial RM strategy. On the other hand, SFA-Paying agency needs to coordinate better its activities and not to delay with payments to the farmers; labour office should develop a specialized measurement in collaboration with agricultural schools, association and MAFF to facilitate the agricultural producers; and the financial services have to provide better conditions for farmers and to propose combined instruments for risk reduce.

Secondly, in the strategy overcoming the lack of overcoming working force, participant considered that most of the actors have a room for improvement. The agricultural producers should stimulate the labour force by bonus system and higher salary. In order to overcome the current need of working force they should be use assistance by associations, the labour office or private agencies. The participants tried to give more responsibility to the association and MAFF, by including training of workers, organization of campaigns and courses, and improving communication. A very important role has been stressed by lack of connections between MAFF and agricultural schools. In relation to the labour office should improve each of the roles (training, campaigns, databases, etc.) in order to offer qualified workers for agricultural activities.

Regarding the Usage of market instruments strategy, the role of actors has to improve, especially the insurance companies in relation to the range of instruments provided. The actors evaluated with the highest performance were the financial services and the associations. The ideas to improve this strategy were implemented for all actors. For instance, the association could develop additional activities (technical support, informative channel, bulletins etc.). Agricultural producers need to seek for a specialist, when his knowledge is insufficient to cope with market instruments. Insurance companies have to develop better connection between the stakeholders and to propose innovative products. The SFA (Paying agency) has to be more dedicated to the needs of the farmers by increasing the current knowledge of the personal concerning market instruments.

For the Decreasing market uncertainty, agricultural producers need to improve the current knowledge of the market and how to use the market instruments. This could happen by participating in trainings for usage of market instruments and be more flexible to up to date ideas for decreasing market uncertainty. Farmers have to improve the planning processes in order to keep a sufficient level of financial savings. Moreover, for better implementation of this strategy, associations should help the agricultural producer by preparing analysis, bulletins, forecasts, etc. On the other hand, MAFF has to propose training for farmers concerning RM; and to response the farmer's needs there is an idea for reorganization of MAFF and launch specialized RM department. Insurance services need to decrease market uncertainty by proposing a specialized insurance for

the grain sector and to offer more attractive conditions. SFA - Paying agency should not delay with the payments, be more flexible, and offer consultation concerning this strategy.

Finally, for the Improvement of the access to markets inputs, participants concluded that farmers should find funding for innovations, to maintain stock availability, and to improve the planning of needed inputs. However, association and MAFF have informative roles, mostly by providing information and promoting the new findings and innovations in the sector.

2.3 Risk management contribution to resilience

Regarding the resilience capacities of Bulgarian farming systems, the contribution of actors differed. Agricultural producers contribute greatly to the adaptability of systems by diversifying their crops but also with the facilities modernization and a better loading of the technics by including additional service. For a lesser extent, robustness is enabling for the traditions in the sector, but the transformability is slightly constrained mainly for the market constrains, the expensive technologies and the lack of finance.

Associations are considered to have an important role in all resilience capacities. The aggregation of different local associations and the knowledge of the market information contribute to the robustness of system, whereas the flexibility in the activities and adequate reactions improve the adaptability. However, the lack of influence on policy makers and the existence of some private interest lead to decrease the system transformability.

MAFF was very negatively valued for all resilience capacities. The robustness of the agricultural systems is affected by the EU requirements and procedures but also by the slow decision processes. The bureaucracy, the delay of implementation of new ordinances and the lack of cooperation between stakeholders constrain the adaptability and transformability of the Bulgarian system.

In a similar way, the Labour Office and the SFA - Paying agency also limit the last two capacities. The Labour Office is not positive mainly because of the low motivation for working in agriculture, the lack of connection to current employments, and policy and administrative issues, whereas the SFA - Paying agency is due to the rigid policy and legal frameworks. However, these two actors contribute positively to robustness.

Insurance services also play an important role in the resilience. The contribution to robustness is positive due to they work in market conditions, but is negative to adaptability mainly because there are no specialised insurance products and the low access to agricultural insurances in small towns. It is also negative the role of this actor to the transformability because the lack of interest in the sector (is not a competitive market).

Finally, the financial institutions enable in a strong way the three resilience capacities. This sector is well structured and there is a high knowledge, contributing to the robustness of the system. Besides, the flexibility and liquidity of sources to clients, and the innovation and competition reinforce the adaptability and transformability, respectively.

3. The case of extensive beef cattle in Bourbonnais, France

The Bourbonnais region (coinciding more or less the department of Allier) is the CS region and is located in Central part of France and traditionally dominated by extensive beef production systems. The agricultural branch reaches 5.1% of the workforce of the region (being 2.5 % the value at the national scale). About 10,000 people work in farms in the department of Allier, and the beef sector is the main activity of the region (42%), followed by the crops (16%) and the goat/sheep production (12%). 483,000 ha are available for agricultural activities. There are 5,523 farms in Bourbonnais, among which 3,102 beef farms (200,000 cows Charolais breed), mainly specialized breeder system. The average total size of the beef farms is 88 ha, which is quite big for the region. The number of farms decreased with 25% between 2000 and 2010: -33% for dairy cows, -17% for beef farms, -52% for beef & dairy farms, -41% for the other herbivores, -42% for polyculture. The region (which is part of the Bassin Charolais) traditionally sells the weanlings (male and female) to Italian butchers: 75,518 weanlings were sold in 2014. Due to competition with Burgundy and Limousin (two regions that produce meat), many farms produce "off season": early calving (autumn) to sell the weanlings before the other region, which enables maintaining a higher price but involves higher production cost (concentrated feed).

3.1 Challenges and strategies

The main challenges assessed by French participants were: "Reduction of CAP payments", "Increase in extreme weather events", "Increased administrative complexity and increasing burden of administrative tasks on operations", "Appearance and/or explosion of diseases, pests and bio-aggressors", "Market prices will always be low". Then, participants selected the four main strategies to focus the subsequent analysis: "Improving food self-sufficiency", "Limiting debts", "Changing the practices to meet social expectations", and "Improving life quality at work".

3.2 Risk management improvements

Sixteen actors were identified in total, but not all of them present in each strategy. Concerning the first strategy the roles played by the actors were related to the organization and planning along the value chain (e.g., consumers that express their preferences and commercial relationship of feed suppliers with farmers) and promoting innovation of new technologies and practices (farmers can welcome and experiments new technologies supported by feed suppliers, farm

advisors, policymakers and researchers). Participants suggested that, in general, the role of actors could be improved by a better coordination within the whole value chain and by being closer to farmers' needs. Farmers should be more willing to experiment new practices, consumers should be more willing to pay higher prices for local food, and policymakers should do something more for allowing farmers to access public local markets.

Concerning the strategy of limiting debts, the roles of actors are about the ability to organize and plan activities (farmers, with the assistance and support of advisors) and providing financial support to farmers (mainly by banks and cooperatives). Participants highlighted the need of a better organization with other actors, being closer to farmer needs and, for policymakers, to commit in formulating a better tax policy.

Concerning the strategy of changing practices in order to meet social expectations, the roles assigned to actors were about concretely changing current practices (farmers, with the assistance of advisors) and getting to a better definition of prices (this starts from the farmers that know the production costs and is done with the collaboration of cooperatives, retailers, and farm advisors). Roles can be improved if actors take responsibility and are willing to pay higher prices (especially the consumers) in order to better remunerate the transition of the sector. In particular, participants highlighted the importance of contractualisation, which can be a good strategy for guaranteeing fair prices to farmers.

Concerning the strategy of improving the life quality at work, roles were about facilitating the exchanges among farmers and other actors (by farmer themselves and cooperatives), organizing work and making investment for improving labour quality (by farmer themselves with assistance of advisors), and monitoring farmers (by listening and systematic monitoring and warning by banks, insurance companies, advisors, and cooperatives). Participants highlighted the need of committing to invest in the improvement of working conditions (farmer themselves) and in being closer to farmers' needs. In particular, this was strongly advised to Social Security, whose performance in its role of listening farmers was considered very bad.

3.3 Risk management contribution to resilience

In relation to the contribution of different actors to resilience the role of each actor was discussed. Consumers are considered to have a different role compared to the other actors. They basically constitute at the same time an external challenge and able to affect the dynamics of the system, through the expression of their preference and their consumption choices. If the consumers' expectations can undermine robustness in the short term, they can trigger adaptability, and, even more, transformability in the long term.

Cooperatives were considered very positive for robustness as they can advance payments and were mentioned to be beneficial to farmers in situations of need. In addition, they act as buffers for farmers as they are less vulnerable to shocks than farmers alone and they assist the farmers in the process of contractualisation, securing a part of the market to farmers and making them less vulnerable to market fluctuations. They promote adaptability by providing advice to farmers and by contributing in organizing the value chain around farmers' needs and in better define prices. Also, cooperative promote adaptability by encouraging and assisting farmers in official label programs.

The role of accountants was considered very weak in robustness and adaptability. Basically, accountants were considered as intermediary between farmers and policymakers and they can provide a good help in formulating advantageous policies for the farmers.

The research and education actors potentially play an important role in developing new technologies and conceiving new practices adapted to farmers' needs. However, participants highlighted that they are poorly proactive and far from the true needs of farmers. Therefore, they do not play an important role in robustness nor in adaptability (even though they could potentially contribute). Same applies to equipment suppliers (not explicitly discussed in the resilience aspects).

Insurance companies play the important role of guaranteeing economic viability to farmers in spite of negative event. This is a fundamental contribution to robustness. Some services provided by insurance companies were considered useful for adaptability and transformability. Replacement service insurance and mutualisation were considered to foster the adaptability of the system, while the development of brokerage was considered to foster transformability.

Banks were considered in general well performing in their roles, in robustness and in adaptability, and they are considered as doing a good job in taking balanced risks and in supporting the changes of the farmers. In addition to that, during the focus group, participants highlighted the positive roles of banks in listening to farmers especially in relation to financial problems and in monitoring their situations.

Although not explicitly discussed in relation to resilience aspects, by using information provided by participants in other phases of the focus group, we can say that farmers are kind of reluctant to changes and to step back to question their current practices. They should be the ones that, in first person, promote the changes in the system. We expect them not to have a very high score in robustness and in adaptability. However, it seems that they are strongly dependent by the rest of the actors, and they are often constrained by a system that lacks coordination and does not

always sustain them by promoting fairer prices in the value chain. The general lack of support discourages them to take action.

Policymakers were not explicitly discussed in relation to resilience aspects, however in more than one part of the focus group participants highlighted their bad performance in more than one role. Policymakers were considered reluctant to improve the tax policy, reluctant to protect farmers from foreign markets and, in addition, participants stated that the Common Agricultural Policy impoverished farmers. We expect policymakers to perform negatively in the three aspects of resilience, although they have the potential of improving all of those aspects in the Bourbonnais.

According to the participants, the roles of actors were stronger in robustness than in adaptability and, even more, than transformability. Robustness is mostly about helping farmers and the whole sector in particular situations (temporary debts or droughts) and for these situations actors can play individually without a strong need of coordination. Concerning adaptability and transformability, more and more coordination is needed between actors, and for this reason, performance of actors is more modest.

4. The case of arable farming in Altmark, Germany

The region of the German CS is called "Altmark". It is located in the North of the German federal state "Sachsen-Anhalt," which is in the East of Germany, and consists of the two districts "Stendal" and "Altmarkkreis Salzwedel". The structure of the agricultural production system reflects the large-scale agricultural structures of East German agriculture but also comprises small farm structures. Thus, farm size is heterogeneous. Most of the utilized agricultural area is used by mixed farms, while the highest number of farms belongs to the arable farms. In average the mixed farms are lager farms compared to the arable farm. In terms of utilized agricultural area, cooperate farms have the highest share but in terms of the number of farms, the family farms comprise half the share. This is reflected in the fact that most of the cooperative farms have a large farm size. Compared to other districts in the federal state, the Altmark has with 27% a high share of grassland, the soils are rather poor, and the yields of the arable crops are rather low. Altmark also comprises almost half of the cow population of the federal state.

4.1 Challenges and strategies

The challenges which farmers in the Altmark mainly face comprise economic aspects such as their financial viability, environmental aspects, particularly increasing extreme weather conditions and soil degradation, as well as institutional ones, especially the high degree of bureaucracy and frequent policy changes. The six main assessed challenges by this focus group were: "Strict regulations (e.g. environmental, animal welfare, or competition)", "Persistently low market

prices", "Low societal acceptance of agriculture", "Low bargaining power towards processors and retailers", "Public distrust in agriculture", and "Persistent extreme weather events (e.g. floods, droughts, frost)".These main challenges have been reflected by the participants' selection of RM strategies which represent immediate responses to these challenges and more future-oriented ones. Among the strategies proposed the most important were: "Increase farm efficiency", "Farm diversification", "Climate change adaptation", "Financial security and coverage", and "Improvements of information flow".

4.2 Risk management improvements

There are key actors which assume central roles in each of the strategies. Next to the farmer, who obviously is involved in every strategy concerning his or her farm, local governments, financial service providers, and consultants are the most important actors. In the region of the Altmark, cooperatives rarely exist and are not strongly organized. Hence, private consultants assume the role of giving advice and spread expertise information. They support farmers with decision-taking, assist during the process of implementation, particularly through monitoring and evaluation, and if needed give advice for adjustments. The discussions pointed to the central role consultants play in the agricultural system of the Altmark. In general, consultants' performances receive best scores among all actors, thus there is little that could be improved by this actors' group. If anything, a lack of deeper trust has been highlighted and the fact was stressed that, in order to achieve best results, a sound, trustful, and transparent relation between farmer and consultant is of pivotal importance. In sharp contrast, the second most important player, local government, received the worst ratings, and a high potential of improvement has been identified here. Particularly, its inefficiency in the process of allocating important permissions was an aspect that appeared as a red line throughout the whole focus group. The complex bureaucracy was described as very hindering for the implementation of several RM strategies and, therefore, decentralization of decision-making power to the lower administrative levels asked by participants. Local governments should also support farmers with improved information on specific programs and measures and include more professional stuff to the allocation of permissions. Furthermore, the need for an improved inclusion of latest findings from R&D in the administrative system was highlighted. Thereby, R&D also has to assume more responsibility. Not only towards its support of local governance but also in general regarding the public accessibility of its findings, R&D should improve its outreach activities by putting more emphasis on the dissemination of results out of the scientific community. Similarly, financial service providers and insurance companies also have to put more effort in improving the transparency of their information systems, particularly regarding newly introduced instruments which seek to respond to recent challenges and developments in the sector.

4.3 Risk management contribution to resilience

In relation to resilience, the general contribution to robustness is the highest whereas for transformability is the lowest. In general, the contributions to the three resilience dimensions are regarded to be rather low. The most positive contribution is allocated to the knowledge generating and disseminating actors (R&D and consultants), where consultants received the highest scores in all three dimensions. As already became clear in the above discussions, local government receives lowest scores for all three dimensions.

5. The case of hazelnut farming in Viterbo, Italy

The province of Viterbo, located in Lazio (central Italy), is the first Italian province in terms of hazelnut production (*Corylus avellana*), with a harvest of 48,400 tons in 2017 according to the Italian National Statistics Institute. The CS includes most of the Viterbo province, excluding the coastal zones. The main cultivar in the area is the "Tonda Gentile Romana", which is registered under the PDO (Protected Denomination of Origin) scheme. The cultivar "Tonda di Giffoni" is also used in smaller percentages. Hazelnut production is a major economic resource in the province, and it is a traditional activity: the area does not offer favourable conditions for farming; therefore hazelnut cultivation has allowed agriculture to survive, providing an income to farmers. Traditionally, hazelnuts used to be cultivated together with other species (e.g. olive trees, chestnuts, vineyards), in the south-east area of the province and particularly around the Vico lake. In the last few years, the increased market demand and competition (especially with Turkey) has led to an expansion of the cultivated area and to a modernisation of the production, with growing levels of specialisation and expansion to new areas of the region. Therefore, most of crops are currently hazelnut monocultures, with high planting density of trees.

5.1 Challenges and strategies

The five main tackled challenges for the Italian focus group were: "Negative price trend", "Diversification of production and activities (generic, marketing, transforming processes, added value)", "Improve the productivity (mechanization, market, farm's agricultural surface, and innovation)", "Climate change", and "New pests and diseases".

The main results of the focus group is that already applied strategies were confirmed by participants as the most significant for the sector (i.e., being member of producer organisations (POs) and/or cooperatives, maintaining financial saving for buffering hard times, and being up-to-date about challenges through farmers group, training, networking), together with the potential expansion of insurance as a pivotal instrument for future developments and challenges of the agricultural system.

5.2 Risk management improvements

The actors involved in the selected strategies are those that significantly participate along the hazelnut supply chain, namely the farmers, the financial sector (e.g., banks and other credit institutions), insurance companies, public administrations (from local to the EU level), POs and cooperatives, research institutions and technical assistance, and downstream industrial processors. Agricultural producers play a role in all the four selected strategies: they supply the product and represent the core and the main stimulus of the POs; they give economic value to knowledge, feeding the agricultural network with new strategies and cooperating; they plan savings for hard times, participating to CAP payments and managing risk; finally, they invest in consultancy for selecting the right insurance instrument according to the risks they face. They showed a significant gap in planning cash flows and investments to maintaining financial savings, and suggestions for improvement relate mainly to continuously training and relying upon trustful and competent consultants. Regarding the strategy of learning about challenges, farmers should be more open to sharing their experiences and fostering cooperation and collaboration with others, to provide more stimuli to learn and boost the formation of groups of farmers and farms.

Public administrations take an active part in two strategies, that involving the participation to POs and cooperatives, and learning about challenges. Regarding the former, their role is to facilitate the formation of POs, translating the stimulus coming from the stakeholders and translate them into a broader public objective, pursuing and supporting product valorization, R&D, and providing structural investments in rural areas. They should ease the bureaucratic apparat surrounding the supply of structural funds (i.e., Pillar 2 measures), and provide more resources to researching, for obtaining useful and needed insights from investigation and retrieve them in a reasonable timing for being fruitful. This would ameliorate their role in supporting POs and cooperatives for technical and structural developments and research. Furthermore, concerning the learning process of challenges by farmers, again the bureaucratic apparat hindering changes should be abated, and a digital revolution should take place to facilitate communication with stakeholders in a quick and efficient way. They should act as coordinators among diverse institutions, unifying procedures and regulations, and eliminate superfluous offices freeing more resources.

Industrial processors play an active role when dealing with POs and cooperatives, particularly they give value to the product, employing a code of practices and pursuing quality, and should apply more conscious corporate social responsibility policies and do not interfere too much with POs. Indeed, regarding the improvements, they should reduce their power on the supply chain, particularly with respect to POs, for better and more effective functioning of the latter. However, in light of their importance within the chain and in the final (domestic and international) market, they should support the valorisation of the local PDO, adding value to their final product and

providing a fairer value chain. Lastly, they should adhere to interprofessional contracts, guaranteed by the public administrators, for a fairer distribution of value and a more balanced bargaining power.

Research institutes and technical consultants active participate into learning strategy and the maintenance of a financial buffer; within the former strategy, they promote competences, valorise the territory and the products via consultancy, and exploit synergies between the research and the farmer, providing new knowledge and support modernization. With regards to the latter strategy, they support the design of new dedicated financial tools, support the producers in choosing the right instrument, helping out in cost and resource optimization and the diffusion of results and solution. However, they also have manoeuvre to improve, especially in regard to the maintenance of a financial buffer for hard times: indeed, they should guide the farmers, providing high quality and competent consultancy, and separating marketing from consultancy, providing tailored solutions to all kind of situations.

Financial services participate all enlisted strategies but one, namely the learning new challenges. Regarding POs and cooperatives, they supply economic resources that are pivotal for the development of the system, facilitating resources to producers and POs, also via anticipation of CAP funds, and dedicating departments to agricultural activities. Of course, their central importance for the financial saving strategy translates into furnishing easy access to credit to farmers, guaranteeing all the financial services, the promotion of specific financial products, and supporting, ethically, agricultural producers in their investment. Of course, they are not extent of improvement, and, as expected, especially when financial saving-strategy came to a hand: their presence in rural areas, constituting the backbone of the agricultural system, is scant, and their will to provide facilitated credit and anticipation to farmers is quite weak. Participants called for more responsibility for banks and credit institutions within development programs.

POs and cooperatives valorise the product, aggregate the supply, gathering producers and translate their needs and requests into objectives, providing technical assistance, supporting the marketing of the product, and promoting their mutualistic nature. They also actively play a role in buying insurance instruments: they provide training to farmers, proposing or requesting ad-hoc insurance tools, increase the bargaining power of hazelnut growers with respect to insurance companies, and offer support when choosing insurance profiles and offering mutual funds. Moreover, they provide reliable data to insurers, evaluate risks and act as intermediaries, and provide clients to insurance companies. They should provide formed and dedicated personnel for supporting farmers in their choices regarding insurance profiles, building a comprehensive analysis of farmers' needs and risks they face, organize workshops and training sessions for farmers and other stakeholders dedicated to insurance and RM, and push for the development of

income stabilization tools specifically tailored on the needs of the hazelnut sector. Besides, they should gain back their mutualistic scope.

Finally, insurance companies provide risk diversification, covering particular risks (i.e., qualitative risk), working ethically. They should provide a more structured offer of tailored instruments on the specific needs of hazelnut growers, especially considering quality-related risks when dealing with downstream processors and lowering premia.

5.3 Risk management contribution to resilience

Concerning resilience and its three dimensions, the diversity of participants and their point of views and personal experiences drew a very scattered picture of each actor's contribution, turning quite difficult reaching a consensus. Farmers contribute strongly to the robustness of the system, a bit less when adaptation is considered, and extremely negative regarding transformability. Indeed, participants found very unlikely agricultural producers can switch to different crops or business, also because of the currently high profitability of the sector that fuelled the financial buffer. Adaptations, however, are possible. The financial sector does not significantly enhance the robustness, as farm-gate level already relies upon significant financial savings and does not count on credit institutions. However, they can contribute to the adaptation of the system by means of anticipations of CAP funds and credit. Due to their absence on the territory and the lack of specific tools, transformability would be hindered by financial institutions. With respect to insurance companies, their nature of covering unexpected and adverse events may enhance both robustness and adaptability, while there is no significant role they can exert on transformability. Industrial processors seem to constrain robustness because of their market power exertion that can weaken other stakeholders. On the other hand, there is a significantly higher contribution to adaptability, since they may read beforehand changes in the final demand of products and prompt a quick response, pushing the whole system to adapt. However, concerning transformability, their contribution would be negative, as they should go through time and resource expensive re-organization of their activity, given their high dependency from the hazelnut production. Public administrations are the most resilience-constraining actors, as they scored negatively in all three dimensions. As outlined above, heavy bureaucracy and significant delays in providing CAP funds, together with lacking investments and support in investigations, do not facilitate any of the resilience dimensions. On the contrary, both POs and cooperatives, and research institution and technical consultants scored positively, being resilience-enhancing actors. The former, thanks to their role in aggregating farmers and increasing their bargaining power, stabilizing the price and quality requirements, enhance robustness significantly, while their support to research and development and the mutualistic nature they embed, positively impact on both adaptability and transformability. Finally, the latter actor, by providing quality and competent technical support,

aiming at quick re-organization and multifunctionality, boost all the three dimensions of resilience.

There is a clear need for coordination and discussion within the system, which should be carried out by public administration, to set common goals and shared strategies for win-win strategies. Indeed, most of the improvements suggested by participants could be tackled by constituting a common ground of discussion, guaranteed by public actors. The latter is probably the most problematic elements of the chain, since, by definition, changing public figures require time and further political actions that are not easy to implement, and their successfulness guaranteed. However, the efficient functioning of public authority could solve many of the bottlenecks individuated by stakeholders, from the structural investments to the involvement of credit institutions in development projects, passing by the exertion of market power by downstream big processors. On the other hand, upstream chain, such as farmers and their aggregative forms (i.e., POs and cooperatives) can easily perform better by means of a more coordinated supply chain and collaborative spirit among diverse groups of farmers.

6. The case of arable farming in Veenkoloniën, The Netherlands

The Veenkoloniën is a rural region in the North-East of the Netherlands. More than 60% of its area of almost 80,000 ha is dedicated to agriculture. The soils in the Veenkoloniën are mainly peat soils mixed with sand, which makes them very suitable for growing starch potato. More than half of the agricultural land is dominated by farms that cultivate starch potatoes, typically in a rotation of 1:2 to 1:3 with other crops, which are mainly sugar beet and winter wheat. In general, with the current typical crop rotation, profit per hectare is low compared to other regions with arable farming. For the cultivation and processing of starch potatoes, farmers are organized in a cooperative (AVEBE), which provides certainty of income, but also co-dependency between farmers and the cooperative. Arable farms in the Veenkoloniën are often medium-sized farms run by a family. Apart from arable farms, there are also dairy farms, intensive livestock farms and horticulture. Farmers and the farming system in Veenkoloniën face multiple challenges and the number of farms has gone down (Bijttebier et al., 2018). Over the years, remaining farms have increased in size (economic output and area), and different farmers have diversified by including new crops in their rotation (onion, carrot, flower bulbs), by becoming mixed farms (currently about 10% of agricultural land), and by developing activities outside agriculture. Over time, also the intensity of land use has increased (i.e. more output per hectare).

6.1 Challenges and strategies

The participants of our focus group had a diverse background. Insurers, herbicides and pesticides traders, policy makers, and arable farmers were present, providing a good overview of the

relevant actors in Veenkoloniën. The most severe risks in Veenkoloniën are adverse weather events (droughts), societal acceptance of agriculture, and new and increasingly stricter regulations. Generally speaking, participants indicated that the most severe risks shifted from an operational character towards structural and strategic risks that have a long-term impact on farm businesses. These risks require cooperation with other farmers or supply chain partners to facilitate learning about these risks.

The two most relevant RM strategies were selected to cope with the most severe risks. The selected strategies were "learning about challenges in agriculture (including designing a risk profile of the farm)" and "cooperation with others to secure production". These selected RM strategies had a non-economic/financial character and were not primarily targeted towards operational risks. Due to time limitations, we only investigated how farmers could improve their learning capacity.

6.2 Risk management improvements

Key actors facilitating farmers' learning capacity are 'Agenda voor Veenkoloniën', farmers, banks, insurance companies, and cooperatives. Banks and insurance companies scored relatively low with respect to their current role in enhancing learning. Currently, bankers and insurers focus too much on the financial aspects of their service. Possible improvements include (i) providing non-financial and more structural information about farming, (ii) informing farmers about non-insurable and upcoming risks, and (iii) collecting farm data and provide feedback about the interpretation of these farm data. Farmers and cooperatives scored best on their current role. How successful farmers can learn will depend on the regional and geographical context and the farmer's personality. Also, distance to meetings was an important factor and it was recognized that meetings do not always have to be in a face-to-face setting as social media – e.g. WhatsApp groups, Facebook, e-mail lists – were found to be useful as well. Finally, 'Agenda voor de Veenkoloniën' will play a key role in facilitating future learning. Learning facilities include Innovatie Veenkoloniën, in which experimentation, innovation, and research come together. However, farmers were often unaware of these learning opportunities as the ideas and meetings had a hard time to ground in the arable farming sector. 'Agenda voor de Veenkoloniën' could enhance farmers' future learning capacity by raising awareness about their activities among farmers, service providers, and supply chain partners.

7. The case of fruit and vegetable farming in Mazovian, Poland

Mazovian region (org. EUFADN "Mazowsze i Podlasie") located in Central-East part of Poland includes two NUTS2 regions: PL92 (Mazowieckie) and PL81 (Lubelskie). Mazovian region is traditionally dominated by horticulture, determined by its diversified landscape. Depending on

particular area, the key hard fruits are: apples, pears, plums, cherries, sweet cherries, and to less extent peaches and apricots. Among the soft fruits there are strawberries, raspberries, currants (black and red), and gooseberries. Most popular vegetables chosen for cultivation by farmers are onions, carrots, cabbages, cucumbers, tomatoes, and sugar beets.

7.1 Challenges and strategies

At the beginning of the workshop group have been familiarized with the project as well as with the objectives of the workshop. After the presentation group have been given list of 10 strategies for RM and told that they can add extra strategies. Group took a vote to choose 4 most important strategies, selecting following: 1) "Invested in technologies (e.g. irrigation or hail nets) to control environmental risks"; 2) "Used market or weather information to plan my farm activities for the next season"; 3) "Improved cost flexibility (e.g. renting land instead of buying temporal labour contracts instead of permanent contracts)"; and 4) "Diversified in production (e.g. mixed livestock and crop farming or a combination of several crops or animals)".

7.2 Risk management improvements

After selecting the most important strategies group discussed and identified 6 different actors which, according to them, play important role in those strategies: farmers, suppliers of goods, suppliers of financial services, legislators and administration; clients and consumers, and advisors. Having identified actors, the group continued discussion in order to list actors' particular roles in selected strategies. Listed roles were very diversified and very often they overlapped and intertwined between different actors.

Ideas for improvement of actor roles in chosen strategies were also very diversified. In case of farmers, improvement of roles was directly related to their knowledge and trainings but also to limiting the usage of not-environmentally friendly means of production. Suppliers of good and suppliers of financial services should provide more personalized offers and propose trainings related to their products. They also should use a language which is understandable for the farmer. Legislators and administration need to have special instruments in place so they can quickly act when natural disaster happens. They also should introduce more preventive measures in order to mitigate environmental-related risks. When it comes to the agricultural land legislators and administration should facilitate process of a land lease and purchase. Clients and consumers roles improvement is strongly related to the awareness regarding real products quality (not just looks) and food waste. Advisors roles, similarly to the suppliers can be improved by using a language which is understandable to farmers. They should also take many targeted trainings to be "first to know" in the sector, so they can provide farmers with the newest knowledge.

7.3 Risk management contribution to resilience

Average resilience capacities very diversified. Higher scores in robustness were assign to farmers, suppliers of good and advisors (score 2), followed by suppliers of financial services and clients/customers (score 1). The last actor in robustness were legislators and administration with score 0. The higher scores in the adaptability were assign to the advisors, supplier of good and clients/customers (score 2), farmers and suppliers of financial services received score 1. Legislators and administration were assigned with the score 0. The higher score in transformability was assign to the advisors (score 2). The lowest scores were received by legislators and administration (score -2) and farmers (score -1).

8. The case of mixed farming in North-Eastern Romania

The CS in Romania consists of small-size, mixed family farms in the North-East region (NUTS2 area "RO21"). The last Farm Structural Survey (2016) shows that 73% of the Romanian farms are mixed, 22% of them are located in the North-East region. In terms of utilized agricultural area, 98% of the farms in North-East have less than 10 ha and 95% less than 5 ha. The livestock is composed of bovines (42%, mostly dairy cows), poultry (19%), sheep (15%), pigs (12%), and equids (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 North-East region. Romanian FADN data do not include the very small-size farms (less than 1 ha UAA, which are not eligible for CAP support). These very small-size farms represent 53% of the total number of farms (at national level), and 56% of the total number of farms in region North-East.

8.1 Challenges and strategies

The Romanian CS concerns small mixed farms which represent the majority of the Romanian farms. The five main challenges assessed by the Romanian focus group were: "Climate change (drought)", "Marketing (lack of markets, low prices)", "Business increase / development", "Lack of available labour", and "Old age, illness, succession problems". From the 10 strategies for RM selected by the CS team based on previous research in the project, the participants to the focus group chose to analyse the following four: 1) "Technological and managerial change (improvement)"; 2) "Marketing"; 3) "Cooperation / association", and 4) "Diversification".

8.2 Risk management improvements

Nine different actors were identified to play important roles in the selected strategies to be discussed: small mixed farmers; producers' associations / cooperatives, processors, distribution,

banking-financial system, insurances, technical assistance / consultancy, and government / public administration / EU.

Ideas for improvement the actors' roles were many and rather diversified. The small farmers play a central role in three of the four strategies selected. The improvement of their role is directly linked to increasing their interest and participation in training and specialization courses, and its openness and proactive search for information and new knowledge, in order to be able to initiate technological and managerial changes so much needed in the development of their farms.

They need to change negative mentality and reluctant attitude towards establishing associations and cooperatives which are the only option in increasing their bargaining power against other more concentrated and organized actors upstream and downstream the supply chains.

The major problem of the small farmers, resulting from the discussions in the present workshop, as well as from previous research (interviews, survey, etc.) is their low capability to sell their products, in terms of availability of markets, and of ability to enter these markets. To face this major challenge, two important and easily available solutions (but not the only ones) are their organization in associations / cooperatives and diversification. The farmers' associations / cooperatives, although not very frequent in the Romanian agriculture, can improve their role in the small farms system by representing models for development, for supply aggregation, thus overcoming the lack of market access of individual farmers. In this regard, diversification can be a strong instrument.

Currently, the banking-financial system has a reduced role in the small farms system, since it does not (yet) offer credit instruments adapted to the needs of small farms, and also does not seem very interested in working with small farms due to high transaction costs and rigidity of present banking regulations.

The current insurance system is not friendly to the agricultural sector in general, and to small farms in particular. Although weather risks are major in Romania (mainly severe droughts and floods), the insurance and reinsurance companies avoid working with farmers, unless they are large companies with significant financial availabilities.

Technical assistance and consultancy still have a modest role in technological and managerial changes needed by the small farms, as well as in marketing and diversification. They can improve their role and become a real support for small farmers if the consultants will enhance their specialty education and experience and by providing good practices examples, technological, economic and financial consultancy and training on diversification.

Government and public administration can significantly improve their role in development of small farms. The improvement of their role relates to improvement of legislation, issue of clear, uncomplicated and non-contradictory regulations, and targeted facilities (various types of support and local tax reductions) for small farms in their effort for development.

Last but not least, the research and development sector can improve its role in supporting the small farms through new technologies suitable for small farms, new hybrids and varieties adapted to climate change, and market research to the benefit of small farms to help them diversify and penetrate new markets.

8.3 Risk management contribution to resilience

Concerning the resilience capacities, the diversity of the participants' opinions resulted in a not very diversified picture. Small farmers contribute positively to the system robustness, as well as to adaptability; on the other hand, their influence on transformability is slightly negative, because such a process involves funding sources to which they have no access. Farmers' associations/cooperatives have also a positive contribution to robustness. They also possess a certain degree of flexibility that allows them to contribute to adaptability of the system and even to its transformability. On the other hand, processors have a slight positive influence on robustness and adaptability, but, in the opinion of the participants, almost no influence on transformability.

According to the participants, the banking-financial system contributes mostly to robustness of the system, mostly through their lack of involvement with the small farms. They represent a constraint to the system transformability since they do not offer adapted funding instruments that would allow investments for transformation. Technical assistance/consultancy is seen to have a slight positive influence on adaptability (average score 1.5), and almost no influence on transformability.

Government and public administration have also, in the participants' opinion, a modest influence on the resilience capacities of the small farms system, due to their promotion of the policy of "low involvement" in relation to small farms.

The participants in the focus group pointed out that non-reimbursable funding strengthens dependence, whereas diversification strengthens independence, and thus resilience.

The research-development sector was scored as having a modest positive influence on all three resilience capacities, but can bring high-added value in the system if the information is properly disseminated among farmers, thus contributing positively to robustness and adaptability, and much less to transformability.

Small farms are important in the Romanian agricultural system, not only due to their prevalence, but also because of their role in the survival of the rural family and rural household. Although modest in terms of income, it is a sure and mostly unsubsidized resource in the local food supply (though on-farm consumption and outside sales), thus contributing to a certain stability and possible development of the rural communities in short, to the resilience of the rural area.

9. The case of extensive sheep in Huesca, Spain

The CS region is in the North East of Spain in the province of Huesca. Agriculture accounts for the 12% of the gross added value of the region, percentage much higher than that at national level (3%). The extensive sheep sector is a traditional agricultural practice that is strongly decreasing. 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) to 491,621 (2015). The size of farms (600 - 2,300 ewes) is increasing mainly due to lack of new generation of farmers and the exit of the smaller farms. The actors belonging to the farming system are: the farmers, farmers' associations, cooperatives, local distributors, veterinarians, Research Institutes/Universities and public administration.

9.1 Challenges and strategies

The Spanish focus groups conclude that the most important challenges of the extensive sheep farming system are the low profitability, threatened mainly by decreasing lamb meat demand and the lack of skilled labour due to a loss of interest in working long hours performing demanding work and living in remote and depopulated areas. The challenges were classified as "Low profitability", "Remaining lamb prices", "Increasing costs", "Quality of life (intense labour demanding)", and "Changing policies and bureaucracy". The main strategies identified were clearly focused to deal with these main challenges to make the sector more profitable and appealing: Improve investment and financing capacity and insurance", "Promote lamb meat consumption", "Value extensive livestock contribution to environmental conservation and population retention", and "Training and knowledge transfer". During the activity, almost every stakeholder identified in the farming sector actively participated in the selected strategies to deal with the challenges (improving the strategies requires considering all the stakeholders involved in the strategy implementation).

9.2 Risk management improvements

There is a large room for improvement the strategies performed in the sector, mainly in the participation of the financial institutions, cooperatives and public administration. Banks have to reinforce their knowledge about the sector and farmers' profile. Thus, banks are called to design improved long-term financing products (including grace payments, payments linked to cash flows

and longer terms). Insurance companies are asked to improve grasslands insurance based on satellite data; to invest in improving data collection and modelling to better cover farmers' risk exposures. New products with disease's widespread insurance coverage are also claimed by the farming system. Besides, cooperatives appear as one of the main actors of the farming system. They have to be more transparent with the aim of building farmers' trust. Cooperatives have to initiate actions that clearly focus on valuing the provision of public goods by sheep extensive farming. Actions towards providing more labelling information (block chain) are also necessary to be performed. On the other hand, the Public sector must develop a rescue plan for the sector: assessing the region vulnerability and implement vulnerability adapted measures and creating a land bank to improve access to land. Online applications also need to be developed to simplify bureaucracy and documentary control. Finally, farmers need to be more pro-active in communication and awareness campaigns and interested in training courses and applying knowledge.

Promising public-private collaboration opportunities have arisen from the discussion to improve RM strategies. Among those ideas are found: the implementation of loan collateral programs supported by public sector and offered by banks, and guarantees that allows farmers to access long term financing that better fits their needs; the reinforcement of research on extensive farming and impact on the environment and health issues; the creation of an entrepreneur hub to make the sector more appealing and draw attention of new entrants; and the development apps of to support transfer of knowledge.

9.3 Risk management contribution to resilience

Regarding the contribution of different actors to resilience, farmers and cooperatives enable robustness to the greatest extent (3-strongly enabling). On the one hand, farmers invest most of their savings, and provide family work and extra-time as a result of their commitment and attachment to the sector. Famers enable robustness capacity of the farming system by providing the sector with reserves. On the other hand, cooperatives enable this mainly because they provide local services that allow farmers to remain in rural areas and ensure the sale of the entire production and provide training. Cooperatives also enable robustness by providing sector with reserves, diversity, openness and tightness of feedbacks. However, Public sector constrains robustness (-1-weakly constraining) which is explained by de fact that aids are insufficient and not adapted to extensive farming needs and bureaucracy and controls are getting complicated.

All the actors, with the only exception of the public sector, enable adaptability in the same manner (2-moderately enabling) mainly explained by: the investment and financing plans carried out by farmers and banks; the development of new products and trade channels; and the design of

training courses developed by associations and cooperatives. In general, actors are weak enablers of transformability. Banks moderately enable it because they are interested in more profitable sectors and encourage farmers to initiate new activities. Improvements in RM strategies better the extent to which farming system actors enhance robustness and adaptability resilience capacities.

10. The case of egg and broiler production in Southern Sweden

Historically, poultry farms in Sweden have been developing in the plain districts in the southern and the central part of the country. In these areas, most of the country's cereal production is located, and cereals are a key input in poultry production. The CS comprises five (out of eight) of Sweden's NUTS-2 regions: SE11 – Stockholm, SE12 – Östra Mellansverige, SE21 – Småland med öarna, SE22 – Sydsverige, and SE23 – Västsverige. The region "Southern Sweden" is recognised for its agricultural activity. While it occupies one third of the country's area, in 2016, 85% of the utilised agricultural area, and 75% of the agricultural holdings registered in Sweden were situated in this region, employing 80% (in 2013) of the regular labour engaged in agriculture. The contribution to the gross agricultural output was 88%. Although the landscape and the soil quality are heterogeneous, the region is highly recognised for its fertile plain districts, especially in the NUTS-2 SE12, SE22 and SE23, with dominating cereal production (45% in 2018). Private person/family farms are most common, owning/managing about 90% and 85% of the total agricultural land, respectively. Corporate farms own/manage only about 5% of the total agricultural land. The average farm size in 2016 was 53 ha. Compared to Southern Sweden, farms in the remaining parts of Sweden as a whole were significantly smaller, with an average holding size of 28 ha. The respective average farm size at country level was 41 ha. Three typical farm types were identified by local experts (Bijttebier et al., 2018): TFT1: Medium sized farms with 50-100 ha, run as family farms with arable land (field crops, cereals); TFT2: Medium sized farms 50-100 ha, run as family farms with cattle (meat and grazing, around 100-150 animals); TFT3: Medium sized farms 50-100 ha, run as family farms with cattle farms (dairy farms, around 100-150 cows).

10.1 Challenges and strategies

The five main challenges assessed by the Swedish group were: "Generate sufficient farm income/profitability", "Environmental conditions/climate change", "Consumer demand for produce (quantity and quality)", "Farm succession", and "Find good staff/labour". In this case, only two main strategies were selected for the subsequent analysis: "High profitability" and "Respond to market/consumer preferences". The focus group confirmed and complemented earlier research in SURE-Farm for the Swedish CS. While hygiene, animal health and welfare were frequently mentioned as important RM strategies, they do not pose a substantial future challenge

to farmers who already keep up with very high standards (Sweden is frequently cited as the showcase of high animal welfare standards, low antibiotics use etc.). The farmers in Sweden are very well trained and highly aware in this respect, and, thus, do not perceive animal health as a major future risk. Although standards are expected to increase further, the challenge herein lies more specifically in the adoption of new technologies and standards and to train and educate staff. In this respect, input suppliers also have some impact on farmers, as the quality of fodder can critically affect animal health. As mentioned in other SURE-Farm activities, farm profitability is a key concern, as upstream market power puts high pressure on farm gate prices. The sector witnessed some rather drastic changes over the last decades: the demand for poultry meat increased but is still quite erratic; organic chicken meat plays only a very minor role.

10.2 Risk management improvements

Achieving a sufficiently high profitability plays a major role for farmers. Most farmers work with very low returns on investments and have to ensure economic survival. Low profitability also strongly affects farmers' risk exposure, as liquidity and financial buffers more generally determine opportunities to invest. In some instances, the return on total capital is positive, but the farming businesses cannot realize sufficiently large profits (because of relatively high interest in some instances). A low rate of return in the agricultural sector must not be seen as normal. Businesses can work with internal efficiency such as productivity and resource efficiency, but overall such operational improvements do not provide sufficient margins to justify the risks. In addition, most upstream players pass on volatility to the farms who end up with the greatest risks which are not adequately reflected in their profits. During the discussion, it turned out that the processing industry plays a major role by setting prices, qualities (also related to product development and consumer preferences), branding strategies etc., and there are increasing concerns about market power at this level of the value chain in particular. Venture capitalists have acquired processing companies for chicken meet and can exert market power, although, at the same time, processors may face upstream market power from food retailers which we did not discuss much during the focus groups. Other relevant actors are input suppliers, branch organizations, employees and banks.

Overall, the performance of the actors and their roles was quite low. With high gaps in general, there is plenty of room for improvement. Having well-educated staff, a level playing field in price negotiations with processors, strong branch organizations to deal with activists/civil society, and banks that are responsive to farmers' needs where among the most discussed issues.

It was especially emphasized that poorly motivated and poorly educated staff and employees who do not work proactively or deal with deviations in production directly (anticipation of problems)

pose a major risk to the farms. The impression is that banks are losing skills in the agricultural sector. A reduced competence could mean greater risks and potentially higher interest rates or fewer opportunities to invest for the farms.

Due to time constraints, we discussed only two roles (staff development and leadership, fair and simple bargaining). With respect to staff development and leadership the mentioned points were "having a positive attitude and see employees as a valuable resource not a burden," "engage in constant training and skill development," "straight-forward and clear communication," as well as the "development of processes and routines/habits." The single most important point that came up from several participants regarding the processing industry are growing concerns of market power and price dumping. This discussion may have been driven by recent events. A large slaughterhouse has been acquired by financial investors on the presumption that prices paid to farmers can be further reduced.

As a second RM strategy, we discussed "being responsive to consumer preferences." The sector is strongly affected by long-term and short-term trends and changing consumer preferences such as an increasing demand for organic eggs and an increase in the demand for chicken, drops in the demand following food scandals (often aggravated by media coverage), erratic demand for organic chicken, increasing demands on farmers in terms of quality management, labeling etc. In the perception of the participants, civil society actors and media (animal rights activists, newspapers, social media "influencers" and stars) often convey a negative image of the industry as a whole. At the same time, media and civil society are instrumental in shaping long-term preferences (moving from red meat to the healthier chicken/eggs, highlighting the lower carbon footprint of chicken and eggs as a source for animal protein in light of climate change, stirring demand for organic products etc.). Finally, consumers decide what to buy at which prices. But the retail sector also has some leverage over consumers with different offers and promotions. Marketing is strong for products with a good margin.

Due to time constraints, we discussed only two roles (openness on the farmer side and communication aspects on the media side). Farmers can improve their role by being more open and showing a greater effort in educating the public about certain issues such as wing injuries etc. Often, these issues are miscommunicated in the media. On the media side, a more holistic view of sustainability aspects, lifecycle assessments (e.g., pointing out the relatively low carbon footprint of chicken compared to other animal protein), health and lifestyle aspects where among the mentioned aspects where improvements could be made. In the long run, the media may be instrumental in stirring a stable demand for high quality, high value animal products. Showing no overreaction and communicating problems carefully and responsibly can protect farmers and the

industry from being wrongly accused of misbehavior and from short-term drops in demand and revenue.

10.3 Risk management contribution to resilience

As the concepts were quite abstract, there were some deviations between the group discussion and the average individual assessments/scores. We discussed only four actors: farmers, processors, branch organizations, and the media. It is notable that farms are very robust due to their low debt-to-equity ratios (although this may change over time). Branch organizations offer very good short-term support in terms of crises (drought/diseases) and negotiate good emergency payments and other support for instance from authorities. At the same time, farms have low profitability, and it is common to work with negative returns on investments (to live from the substance/equity). Due to upstream market power farmers can be exploited and must accept prices set by processors (at times below competitive market prices and marginal or average cost), and the problems are expected to further aggravate. On the other hand, there is – at least to some extent – the possibility to collaborate with the processing industry and to adapt innovations/new technology, which can contribute to larger revenues and profits.

The media were viewed to have an overall negative contribution, as they often would portray the industry rather negatively. They can aggravate short-term scandals and may also have a negative impact on future demand for meat, although there may be some opportunities to adapt and transform towards high quality products. However, it remains uncertain whether at the end of the day consumers are willing to pay more for quality produce.

11. The case of arable farming in Eastern England, UK

The CS of the United Kingdom (UK) investigates resilience and sustainability of large-scale arable farming. The CS region is in the East of England region where this type of agriculture prevails due to fertile and extensive agricultural surface, which results in high production of arable and horticultural crops (Bijttebier et al., 2018). These elements make the East of England the region with the most impact on the country's agricultural value, as it is responsible for one third of the country's cereal production. Wheat and barley are the main cereals cultivated in the region. Other non-cereal crops are grown as well, such as potatoes, mustard and squash. As a combined effect of population concentration in cities (and thus, a desertion of the countryside) and the local large flat open area, the farms are large-scale family or corporate farms. In the last ten years the size of farms grew considerably as the number of farming businesses decreased by more than 40%, while the farmland surface area remained the same. In Deliverable 3.1 of the SURE-Farm project (Bijttebier et al., 2018), three main farm types were identified: 1) large cereal farms with an increasing frequency of side specialisation of sheep and cattle production for the provision of

manure. These farms have high labour requirements at the end of the growing season for harvest and land preparation for the next season. 2) Large general cropping farms, which are usually specialised in root crops. These farms have also high labour necessities at the end of the growing season. In addition, these farms have a need for more labour during the rest of growing season than the large cereal farms. 3) Smaller horticultural farms, which, despite their smaller surface compared to the abovementioned farm types, have a high economic output. These family or corporate farms are highly specialised, even within their own sector.

11.1 Challenges and strategies

In terms of the expected challenges facing farmers in the next 20 years, focus group participants broadly agreed with the list of top challenges (including Brexit, agrochemical regulations, labour supply, climate change) extracted from the T2.1 farmer survey, though participants were keen to point out that individual challenges are in reality interdependent, citing Brexit as an example of an overarching challenge that encompasses several of the other challenges listed.

Participants also approved the list of 10 RM strategies extracted from the T2.1 survey prior to the workshop, though all agreed that an additional strategy – that of moving out of farming altogether – should be added to the list. Participants selected four strategies for discussion and analysis during the focus group: Financial stability, increasing efficiency, Non-agricultural diversification, and Engaging in learning and knowledge exchange activities.

11.2 Risk management improvements

The focus group participants identified a total of 12 actors/stakeholders across the four selected RM strategies. As the main decision-maker and owner/manager of a farm business, farmers naturally play a role in each of the RM strategies. Their attitude to change and willingness to engage with new ideas and networks is a key driver. Bankers/funders play an important role in three of the four RM strategies as they service the financial needs of farmer, though not all farmers will require the support of a banker/funder. Business advisers are present in all four RM strategies, as they have a wide portfolio of work and can potentially advise on any aspect of a farm business, both in terms of agricultural and non-agricultural business streams. They also act as a conduit/facilitator for networking and learning and knowledge exchange activities. The role of traders is primarily the sharing of market information and data (i.e. pricing and grain markets). Co-ops also share information and data and can drive efficiency gains in a farm business though collaboration, resource sharing and group-buying (economies of scale). Agronomists provide a range of services and support across agronomy that can drive efficiency and they also play an important role as communicators and sharers of information and knowledge. Generating and sharing information an important role of research/education institutes across the RM strategies,

as well as providing training and leadership. Policy actors are present in each of the RM strategies as they provide the strategic agricultural policy framework that informs and steers decision-making in a farm business and develops policies that can facilitate and support change and long-term planning. Planners only play a significant part in the non-agricultural diversification RM strategy where they have an important role in interpreting and implementing local and national government planning policy. The wider economy provides the market, supply chain and provides skills/skills development for arable farm businesses, and the behaviour of consumers drives the demand for produce, which can affect a farm's bottom line. Finally, NGOs provide and facilitate education and knowledge transfer and can act as a both a challenger to diversification and as a facilitator of links to diversified markets.

During a group discussion, focus group participants discussed how each of the actors were currently performing their roles in each of the four RM strategies. Actors were scored on a scale of 1 to 5 where 1 = very poor current performance and 1 = very good current performance. Farmers received an average score of 3 across the different RM strategies, largely due to the perceived variability of their performance. Similarly, traders and co-ops received an average score of 3, as, like farmers, their performance covers a spectrum from those that excel to those that perform poorly. Bankers and business advisors received the highest average score (each with 4) – perhaps not surprising as the focus group was comprised almost entirely of individuals from finance and business support. Research/education institutions, planners, and the wider economy actors performed worst, and were therefore considered to have the most potential for improvement.

The following actor-strategy pairs were then selected for detailed discussion by the group on how their roles might be improved: 1) the role of policy actors within the financial stability RM strategy; 2) the role of farmers within the increasing efficiency RM strategy; 3) the role of planners within the increasing non-agricultural diversification RM strategy; and 4) the role of research/education institutes within the increasing engaging in learning and knowledge exchange activities RM strategy.

Discussion on how to improve the role of policy actors within the financial stability RM strategy highlighted the need for more long-termism and the development of policies that enable long-term business planning and tools to deal with fluctuating markets and other shocks. Other suggestions such as fostering wider and more effective engagement with farmers, better international trade relations and improving public awareness of food production were also put forward.

Ideas for improving the role of farmers within the increasing efficiency RM strategy included improving opportunities for networking/participating in groups and engagement in learning and knowledge exchange activities.

The group suggested that the role of planners in the non-agricultural diversification RM strategy might be improved by more joined-up thinking in terms of rural development/sustainability and the development of national policies that considers the diversity of agriculture and localities/regions. The development of a national, integrated planning portal was another idea that was strongly supported by the group.

Suggestions for improving the performance of research/education institutes within the non-agricultural diversification RM strategy included promoting the status of agriculture in the school curriculum, learning from current best practice, and developing better ways of communicating research/knowledge (i.e. less scientific).

11.3 Risk management contribution to resilience

The final focus group activity involved participants (via a group discussion) assessing the extent to which each of the actors contribute to the three resilience capacities (i.e. robustness, adaptability, and transformability) across the RM strategies.

Agronomists enable robustness to the greatest extent as their role is essentially focussed on helping farmers deal with and adjust to shocks and stresses. Farmers, bankers/funders and NGOs also enable robustness, but to a less extent due to the greater variability in the performance of these actors. Business advisers are constrained by time in terms of helping farmers deal with short-term stresses, and the role of the wider economy can be both positive and negative - these actors were given a neutral score. Traders, planners and policy actors strongly constrain the robustness of the farming system. Traders are too focussed on their own profits, planners lack the confidence to react and make timely decisions, and there is too much uncertainty in terms of policy.

Furthermore, business advisers and agronomists have the most positive influence on adaptability as both actors' roles involve reviewing performance and advising on/promoting new strategies. Bankers also perform well, though they may prefer to support wholesale transformational changes to business rather than smaller-scale adaptations. Farmers, traders, co-ops, research/education institutes, wider economy, and NGOs all enable adaptability but to a lesser extent – variability in the performance of some of these actors and constraining factors hold them back. Again, there is too much uncertainty in policy, and planners are constrained by biophysical factors, so these actors received the lowest scores.

Finally, business advisers have the most positive impact on the transformability resilience capacity as they can share best practices from their experience across a range of businesses. Farmers can respond well to 'tipping points' and many have proven capable of transforming into other agricultural specialisations in response to major triggers, while bankers are open to sea-changes provided there is a good business plan. The wider economy also has a positive impact on transformability as it drives new markets and co-ops have helped farm businesses to transform (though some have failed). The lack of timely decision-making amongst planners means they have a negative impact of transformability, as do traders who benefit from maintaining the status quo. Research/education institutes and policy actors have the most negative impact on this resilience capacity - they both have the potential to drive change but are currently underperforming.