SUSTAINABLE RESILIENT EU FARMING SYSTEMS

SURE Farm

An integrated assessment of the sustainability and resilience of EU farming systems

& next steps in research

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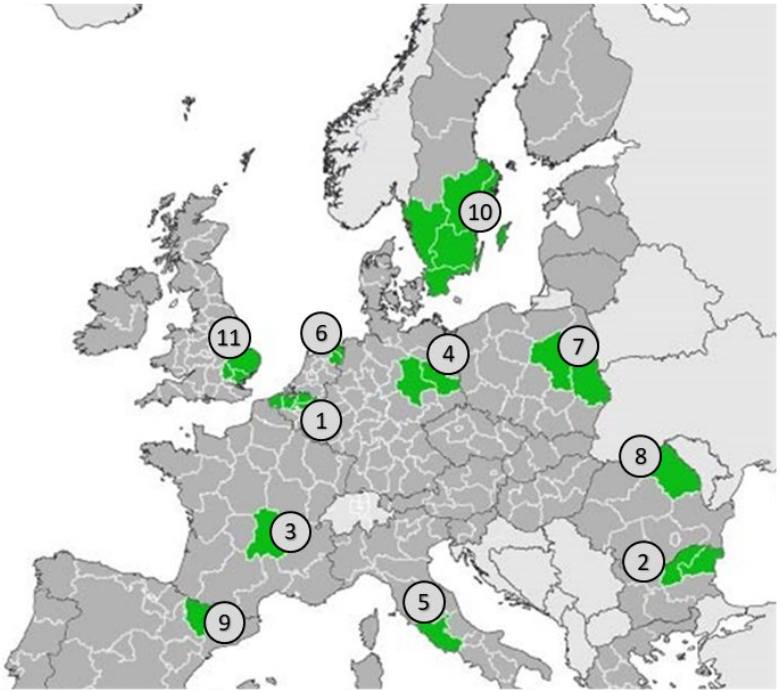
This project has received funds from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 727520

Farming systems face different challenges



1. Intensive dairy farming in Flanders, Belgium
2. Large-scale arable farming in Northeast Bulgaria
3. Extensive beef cattle system in the Massif Central, France
4. Large-scale corporate arable farming with additional livestock activities in the Altmark in East Germany
5. Small-scale hazelnut production in Lazio, central Italy
6. Intensive arable farming in Veenkoloniën, the Netherlands
7. Fruit and vegetable farming in the Mazovian region, Poland
8. Small-scale mixed farming in Northeast Romania
9. Extensive sheep farming in Northeast Spain
10. High-value egg and broiler farming in Southern Sweden
11. Arable farming in the East of England, UK

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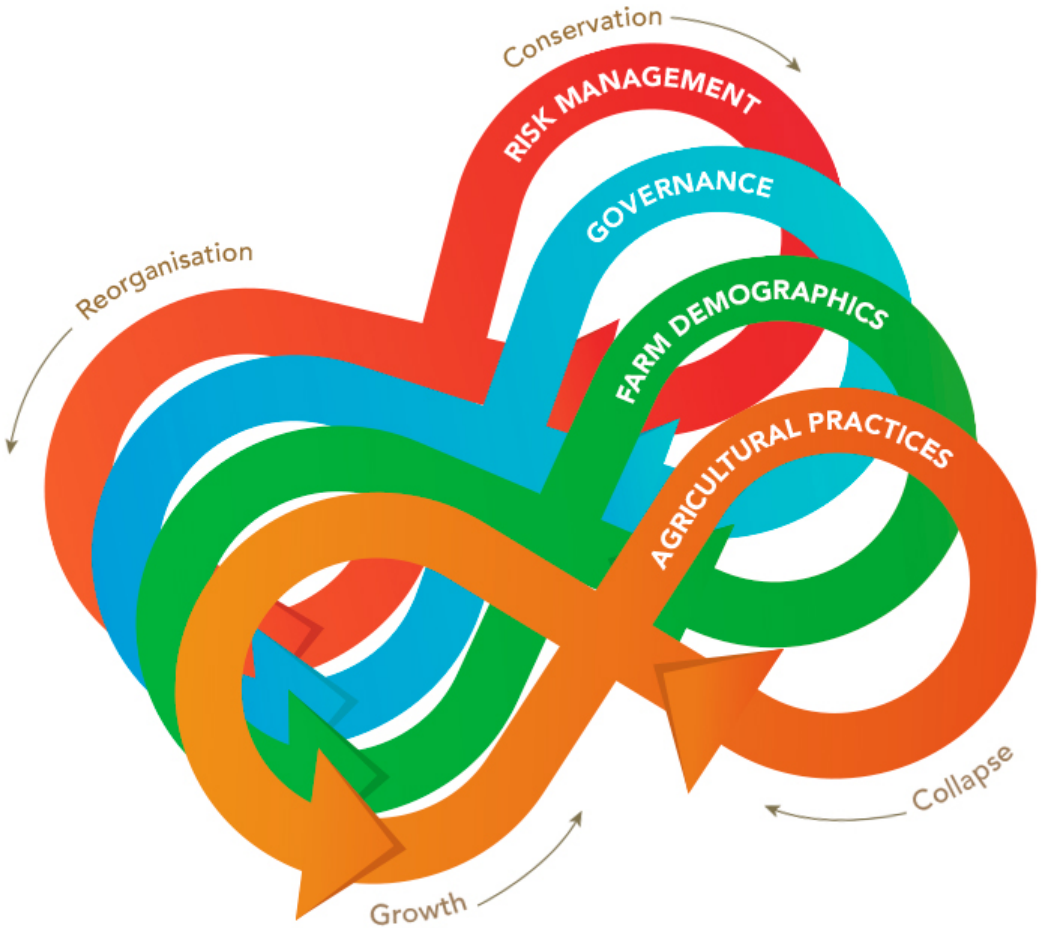
Der Laden


GEBRUIK JE VERSTAND
BEHOUD
BOEREN ONS LAND
NO FARMERS
NO FOOD
NO FUTURE!

Four processes in adaptive cycle



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Integrated assessment

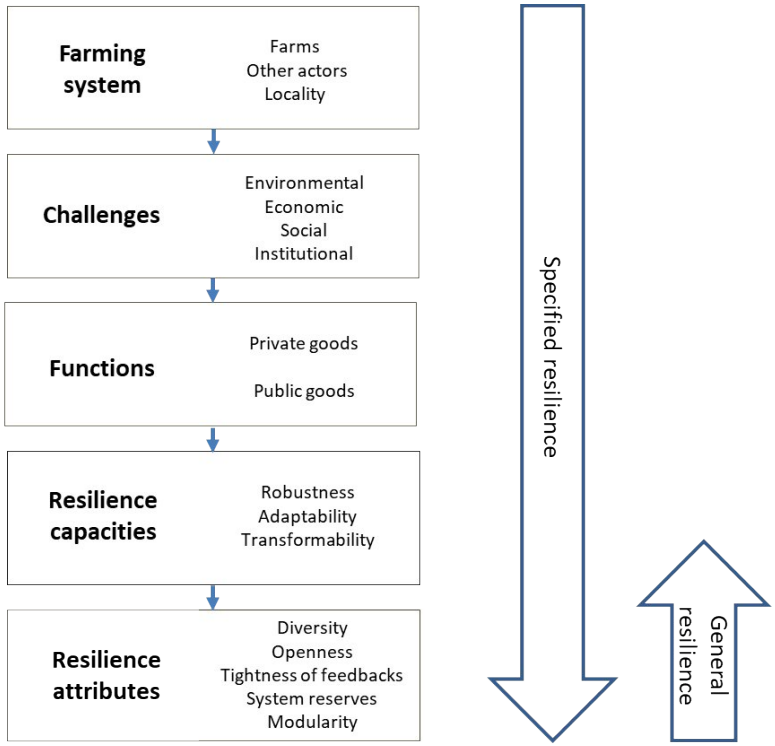
1. Resilience *of what*?

2. Resilience *to what*?

3. Resilience *for what purpose*?

4. What *resilience capacities?*

5. *What enhances* resilience?



* **Qualitiative methods:** workshops, interviews
* **Quantitative methods:** system dynamics modelling, ecosystem services assessment, farm structural change modelling

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Meuwissen et al., 2019, Agricultural Systems

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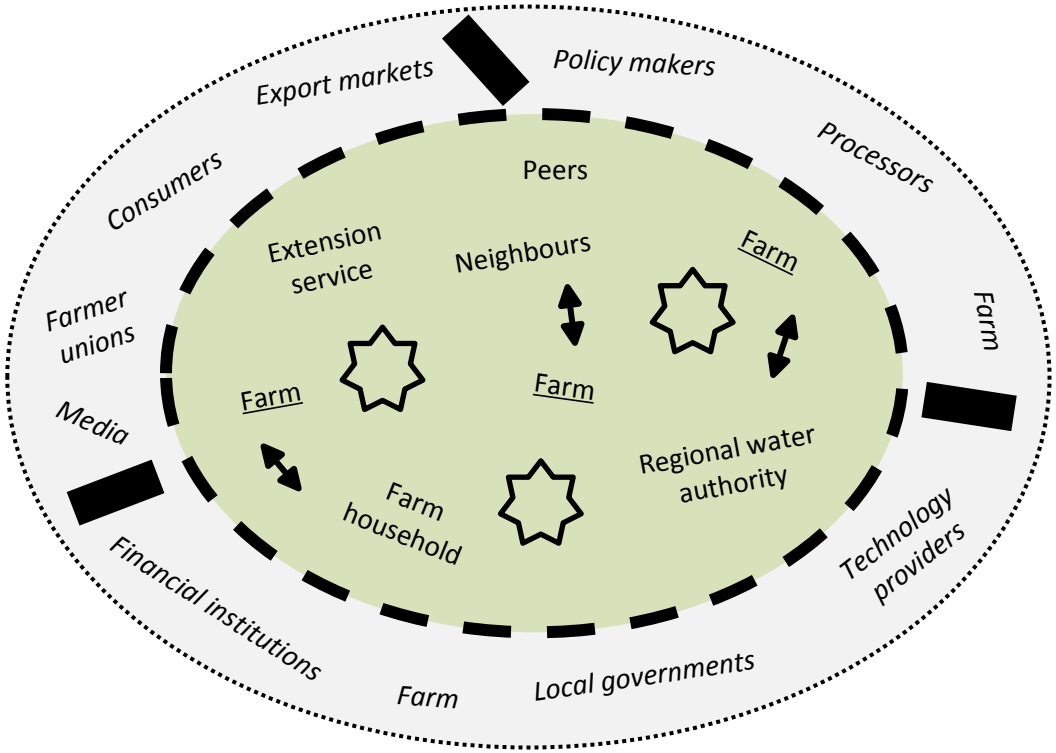
Methods employed in SURE-Farm

Method	No. of FS (and total no. of participants)	Steps of the SURE-Farm framework covered[3]				
		1	2	3	4	5
Qualitative methods						
1. Scenarios linked to Eur-Agri-SSPs[6]	-		X	X		
2. Survey (F)	11 (996)		X	X	X	X
3. Learning interviews (F)	11 (130)		X	X	X	X
4. Narratives (F)	5 (46)	X	X		X	
5. Interviews with households (F, HH)	11 (169)		X	X	X	X
6. Focus groups on risk management (FS)	11 (78)	X	X		X	
7. Workshops on current resilience (FS)[7]	11 (184)	X	X	X	X	X
8. Assessment of policy instruments (FS)	11 (56)	X	X	X	X	
9. Bottom-up analysis of policy (FS)	5 (135)		X	X	X	X
10. Co-design of policy options (FS)	7 (71)		X		X	X
11. Workshops on resilience in future (FS)	9 (130)	X	X	X	X	X
12. Qualitative system dynamics (FS)	5	X	X	X	X	X
13. Digital co-creation platform (F, FS)	- (27)	X	X	X	X	X
14. Workshops on the enabling environment	11 (tbd)	X	X	X	X	X
Quantitative methods						
15. Data analysis of ecosystem services (FS)	10			X		X
16. Modelling of ecosystem services (FS)	11		X	X	X	
17. Quantitative system dynamics (FS)	2	X	X	X	X	X
18. Statistical analysis of capacities (F)	Europe				X	X
19. Statistical analysis of functions (F)	1		X	X	X	X
20. Simulation of structural change (FS)	2	X	X	X	X	X

Meuwissen et al., 2022, Ch1 book

Step 1. Resilience of what? Farming system



Farming system (FS)

Farm — Main farms in analysis

Actors — Other FS actors

Locality (agro-ecological context, infrastructure, public goods, identity, ..)

Context

Actors — Context actors

Distinction between 'other FS actors' and 'context actors':

Mutual influence with farms

Unilateral influence with farms

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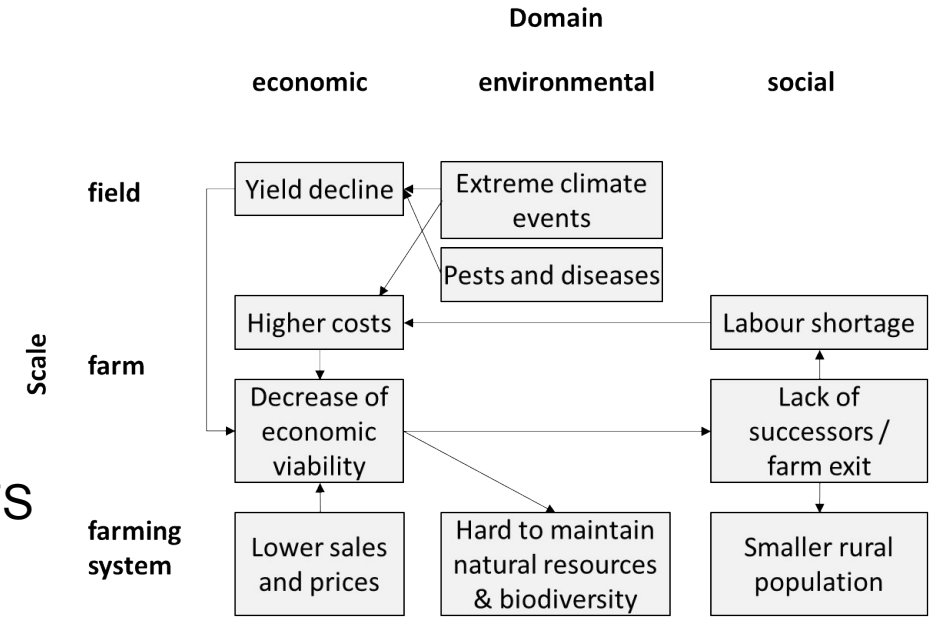
Accumulating challenges cause farming systems to approach critical thresholds

* Many FS are perceived to be close to critical thresholds
  - low economic viability leading to farmer exits, making it hard to maintain the social fabric, natural resources and biodiversity
  - E.g., extensive sheep production in Huesca, Spain

  - aws & regulations critical in 5 out of 11 FS



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Paas et al., 2021, Journal of Rural Studies;
Paas et al., 2021, Ecological Indicators

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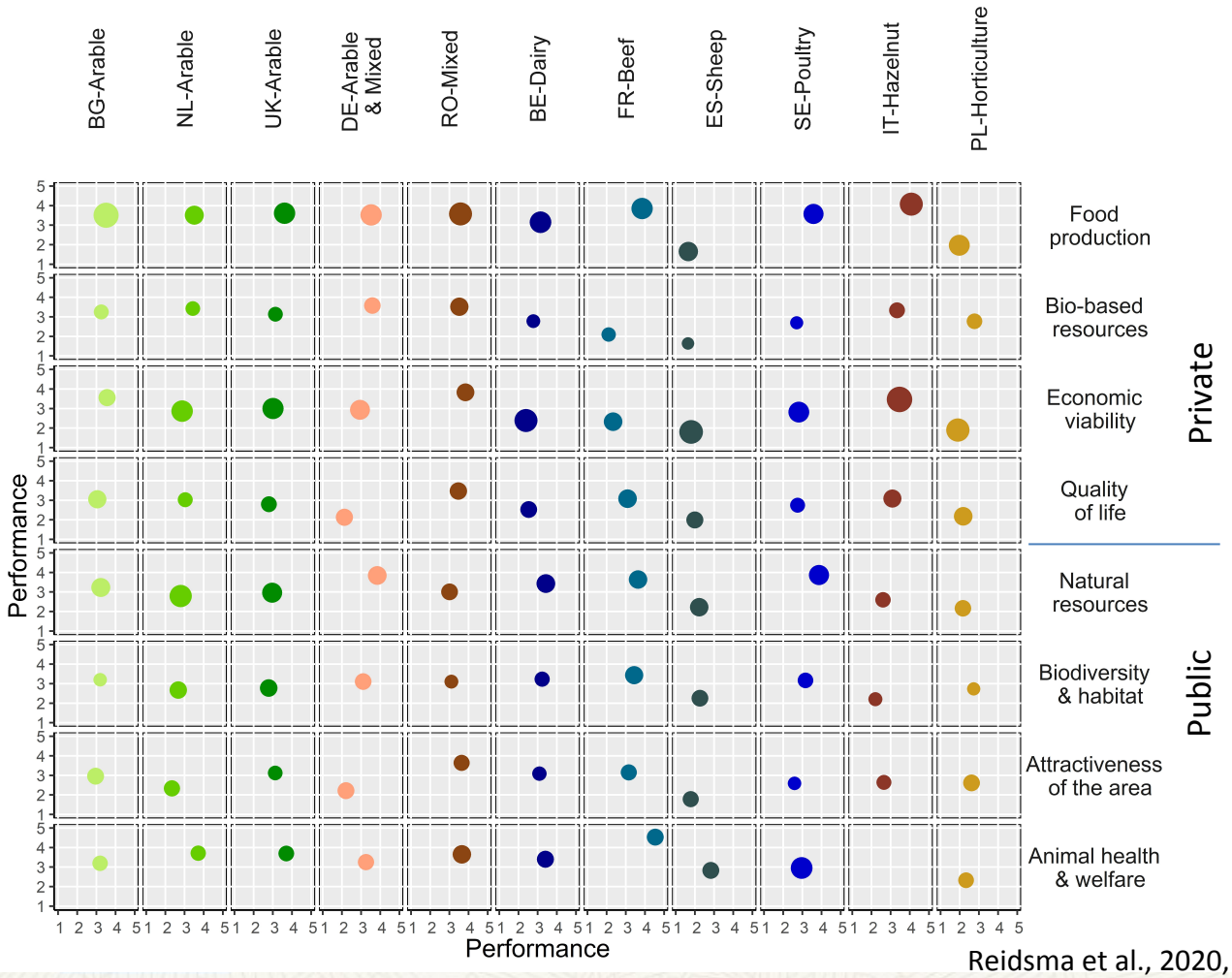
Past strategies mainly focused on remaining economically viable, leading to a decline in the provision of public goods



* Importance (size):
  - Economic viability (farmers)
  - Food production (all)
  - Natural resources (other stakeholders)
* Performance (level)
  - Food production high
  - Economic viability moderate
  - Public goods lower
  - Variability among FS & stakeholders

Reidsma et al., 2020, Eurochoices

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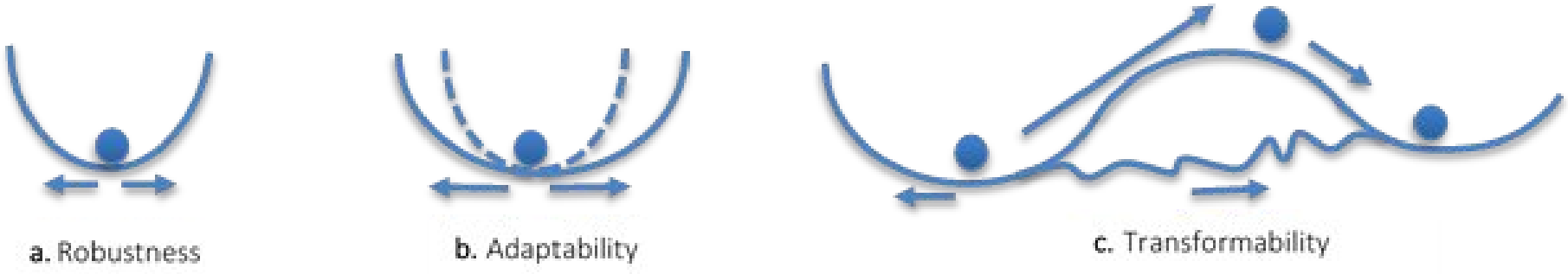
The resilience of the farming systems is perceived as low to moderate, with robustness prevailing over transformability



* Presence of resilience attributes & historical dynamics of main functions
  - FS generally robust (although close to critical thresholds)
  - trade-offs with transformability (into desired directions)
  - adaptability mostly employed for keeping stability and realizing (slow) incremental improvements
* However, adaptation or even transformation is necessary

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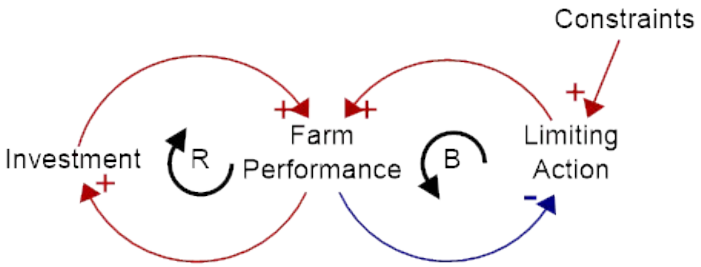
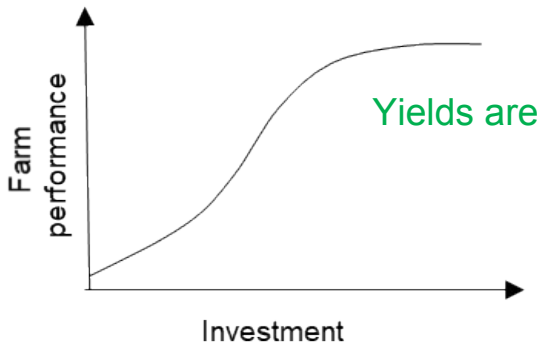
Reidsma et al., 2020, Eurochoices

Strategies from the past are not sufficient to bring the desired social, economic and environmental change

* Past strategies
  - kept farming systems robust, but adaptation and transformation are required
  - have led to the erosion of the social fabric and reduced the maintenance of natural resources and biodiversity
  - have **limits to success** (e.g., increasing farm size and intensity)

Farm enlargement is limited





Yields are close to exploitable yield

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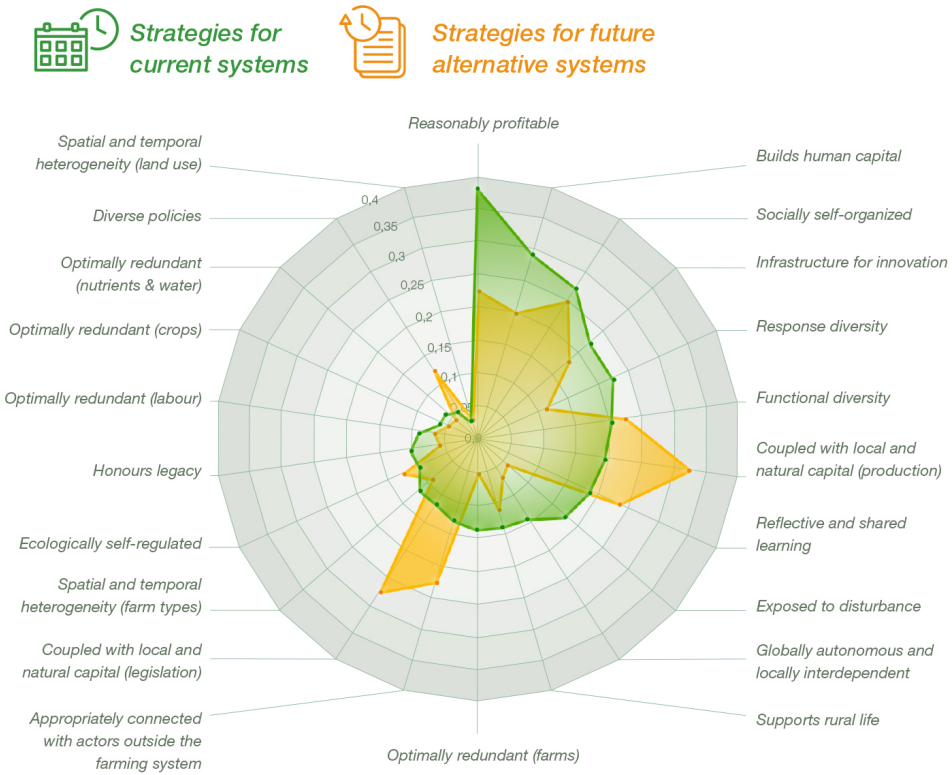
Desired alternative systems: actor-driven and -supported

	Case studies										
Category	BG-Arable	NL-Arable	UK-Arable	DE-Arable&Mixed	RO-Mixed	ES-Sheep	FR-Beef	SE-Poultry	PL-Horti-culture	IT-Hazelnut	Total[1] (n)
Intensification				Intensification		Semi-intensive		Large farms			3
Specialization					Commercial specialization of family mixed farms		Only-for-export production		Horticulture farming		3
Technology	Innovation and technology	Precision agriculture				Hi-tech extensive		Robots	Shelter farming (under cover)	Technological innovation	6
Product valorization	Processing and increasing added value						Production only for the French market			Product valorization	3
Collaboration	Collaboration	Collaboration & water			Cooperation / multifunctionality						3
Attractive countryside				Better societal appreciation			Development of tourism			Sustained demand (high and stable prices)	3
Diversification	Crop diversification	Alternative crops	Likely system		Alternative crops / livestock			Self-sufficiency fodder			5
Organic / nature friendly		Nature-inclusive	Desirable system	Organic farming	Organic agriculture				Local organic farming	Eco-friendly agriculture	6
Total (n)	4[2]	4	2	3	4	2	3	3	3	4	32

Paas et al. in D5.5 Accatino et al., 2020; D5.6 Reidsma et al., 2020; Meuwissen et al., 2022 book

Sustainability and resilience can be improved when strategies improve multiple functions and attributes at once



* From strategies
  - enhancing mainly ‘reasonably profitable’
  - to ‘coupled with local and natural capital’
* Strengthening
  - ecological processes
  - stakeholder collaboration
  - institutional environment
  - while ensuring ‘reasonably profitable’

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D5.6 Reidsma et al., 2020;
Attributes adapted from Cabell and Oelofse, 2012

Desired alternative systems are diverse but only compatible with the sustainability scenario

		Average compatibility score				
Category future systems	Future systems [#]	SSP1 "Sustain-able"	SSP2 "Established"	SSP3 "Separated"	SSP4 "Unequal"	SSP5 "High-tech"
Status quo	9	0.55	0.31	-0.59	0.15	0.29
Intensification	3	0.67	0.48	-0.29	0.21	0.28
Specialization	2	0.50	0.36	-0.67	0.24	0.37
Technology	6	0.63	0.32	-0.50	0.22	0.26
Product valorization	2	0.68	0.26	-0.80	0.01	0.22
Collaboration	3	0.63	0.26	-0.76	0.16	0.24
Attractive countryside	2	0.48	0.44	-0.59	0.28	0.50
Diversification	5	0.72	0.26	-0.47	0.07	0.15
Organic / nature friendly	6	0.72	0.37	-0.74	0.11	0.21
Average[1]		0.63	0.33	-0.59	0.15	0.26

* EU and national policies

- should be directed at “unfolding” the “agriculture on sustainable paths” scenario
- while stimulating macro-level institutional, social, economic and technological developments that seem lacking in this specific scenario

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Paas et al. in D5.5 Accatino et al., 2020; D5.6 Reidsma et al., 2020

Policies should be based on a long-term vision, ensuring economic viability of farming systems that ensure the provision of public goods

* All involved actors inside and outside the farming system need to collaborate in order to make a change towards business models that tackle long-term challenges
* A matter of perspective: it should be clarified that such policies are also ‘for’ farmers

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Lessons learned (1/2)

* Resilience capacities must include anticipation
    - besides robustness, adaptability and transformability
* While resilience is a latent characteristic of a system, resilience attributes and critical thresholds are good predictors of resilience
    - diversity, system reserves, openness, adequate feedbacks, modularity
    - 22 FS specific attributes, with few core attributes
* Vision, leadership, shared learning and experimentation, and agility are important resilience attributes
    - specifically for transformability

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Meuwissen et al., 2021, in Agricultural Systems

Feindt et al., 2022 (Ch20) in Meuwissen et al., 2022

Lessons learned (2/2)

* General resilience in farming systems requires more than financial buffer resources
    - which has been and is main focus of FS actors
* Non-resilience is difficult to study
    - ceased farm operations, supply chains, etc. can n longer be studied
* Resilience is context-specific, and so are resilience needs
    - required capacities differ across locations and over time
* Resilience capacities, needs and strategies differ across scales
    - farm, farming system, enabling environment

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Feindt et al., 2022 (Ch20) in Meuwissen et al., 2022

Limitations requiring further research (1/2)

* Scope limited to farming systems, while an even broader approach is needed
* Framework could strengthen the critical assessment of the functions provided by farming systems
    - perceived importance and level of performance assessed; in most desirable way?
* Not yet a definitive set of a small number of indicators to measure the resilience of farming systems
* The concept of the adaptive cycle turned out to be difficult to apply to a system marked by fragmented (polycentric) agency and resources
    - many FS in conservation phase:
    - is next phase collapse and reorganization
    - OR can deliberate transformation be achieved by smaller, shorter and more manageable cycles?

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Feindt et al. 2022 (Ch20) in Meuwissen et al. 2022

Limitations requiring further research (2/2)

* The resilience concept requires further methodological integration
  - mixed methods needed to understand multi-faceted concept
  - quantitative methods have difficulty to consider all aspects
* There is a need to reflect and address more systematically how actors understand resilience
  - robustness > adaptability & transformability
* There is a need to develop more thorough foundations of resilience governance, at least with regard to farming systems
  - an enabling environment is needed to supervise the system's direction of development and create suitable context conditions

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Feindt et al. 2022 (Ch20) in Meuwissen et al. 2022

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Policy brief D5.7:
https://www.surefarmproject.eu/wordpress/wp-content/uploads/2021/03/D5.7-Policy-Brief-Resilience-of-FS-under-current-conditions-and-future-scenarios.pdf

Book: Meuwissen et al. (2022), on-line, open access

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IRWIR PAN Polish Academy of Sciences Institute of Rural and Agricultural Development

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