ASSESSING SOLUTIONS FOR RESILIENT DAIRY FARMING IN EUROPE

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Academic paper

Abstract

The EU-project Resilience for Dairy (R4D) deals with the challenges for the future facing the sector (https://resilience4dairy.eu). The overall objective is to develop and strengthen a self-sustainable EU Thematic Network on "resilient and robust dairy farms" designed to stimulate knowledge exchanges and cross-fertilisation on the topic of resilience among a wide range of actors and stakeholders. This article focusses on those solutions (practices, techniques, and tools) that are assessed to contribute to a resilient dairy farm sector. In this study, three key contributing fields/levers are included: the need for economic and social resilience, an efficient use of local resources, and the need to adapt systems to address environmental and animal welfare standards. The main criterium is resilience, but, additionally, attractiveness and readiness of the solutions are also considered.

Keywords: Solutions, Practices, Techniques, Expert analysis, Workshops, Future of Dairy

Introduction

The European dairy sector is facing major challenges. Milk production represents the highest proportion of EU agricultural output by value and has the potential to be a key driver of future economic growth. The dairy sector plays a significant role for the maintenance of human population in many rural areas thanks to economic activities, such as production, processing, marketing, technical and economic support, and to their support for the local economy: trade, utilities, tourism, production of traditional and/or high-quality food products, etc. Dairy farming is also crucial for the provision of key ecosystem services for the society: nutrient cycling for crop production, conservation of biodiversity, fixing carbon in the soil, etc.

However, to achieve this potential, growth must be delivered from sustainable production systems, which provide viable incomes and an adequate quality of life to dairy farmers, which impact less on the environment and are valued by consumers and the wider society. These challenges and opportunities have been brought into sharp focus by the ending of milk quotas in the European Union in 2015, which removed regulatory constraints to expansion in milk production. The abolition of milk quotas coupled with a reduction in direct market support has been associated with increased uncertainty in the marketplace, more extreme price volatility, and shifts in relative competitiveness between different milk producing regions of the EU (Thorsøea et al., 2020; Kuipers et al., 2021).

This new production background has also created major changes in livestock farming: many dairy farmers are committed to increasing working hours with deteriorated working conditions and work/life balance, and interest in farm succession. This situation is linked to the increased

size and intensity of the farms which farmers have had to undertake alleviating the effects of the cost/price squeeze they have faced over the last 25 years. Moreover, the societal demands from citizens and consumers put farmers under pressure as they are questioning their production systems and techniques often through an uninformed lens that is nurtured by social media rather than science. The great challenge for dairy farming is to achieve economic and environmental objectives within the current context of climate change, market trends and societal demands. This must be done under a set of EU-regulations concerning, among other, Water Quality directives, Nature 2000 areas, and recently the EU Green Deal.

Several studies dealt with the structure of the cattle and dairy sectors in Europe (Gorton et al. 2008); Kuipers et al. 2014) and elsewhere (Dairy Australia, 2013; Dooley et al., 2018 about New-Zealand; Britt et al., 2017 worldwide), and strategy formulation for individual farms (Malak-Rawlikowska et al., 2018; Ruska et al. 2023). However, few work has been done on picturing the route forward to a resilient and robust dairy farming sector.

Darnhofer (2010) addressed the framework of resilience as follows (citation):
"Resilience thinking offers a framework to emphasize dynamics and interdependencies across time, space and domains. It is based on understanding social–ecological systems as complex, and future developments as unpredictable, thus emphasizing adaptive approaches to management."
The global concept of resilience applied to agriculture was also described by Miranda Meuwissen et al. (2021) (citation):
"*Resilience is a latent property of a system. The concept denotes a potential which is activated – and can be observed – only when a system is hit by stress or shocks. It can thus be understood by learning from past trajectories and discussing future scenarios, and from assessing how actual shocks are dealt with".* Van Dijkshoorn (2024) explains the concept of resilience from the viewpoint of a herd of animals or the individual animal.

The EU-project Resilience for Dairy (R4D) deals with the challenges for the future facing the sector (https://resilience4dairy.eu). The overall objective is to develop and strengthen a self-sustainable EU Thematic Network on "resilient and robust dairy farms" designed to stimulate knowledge exchanges and cross-fertilisation on the topic of resilience among a wide range of actors and stakeholders. This article focusses on those solutions (practices, techniques, and tools) that are assessed to contribute to a resilient dairy farm sector. In this study, three key contributing fields/levers are included: the need for economic and social resilience, an efficient use of local resources, and the need to adapt systems to address environmental and animal welfare standards. The main criterium is resilience, but, additionally, also attractiveness and readiness of the solutions are considered.

Material and methods

The R4D project encompasses 15 EU-countries and 16 partners (see Figure 1).

Figure 1. Resilience for Dairy (R4D) partner countries

The workflow of the project is illustrated in Figure 2. Main discussion fora are the international expert meetings and the national dairy AKIS (NDA) workshops. Experts in the three key contributing knowledge fields were recruited by the R4D participating universities, research institutes, innovation centers and extension services. The participants in the NDA workshops varied from 15 to 30 persons, including the R4D pilot farmers in each country (from 4 to 12 farms per country; thus, in total around 100 farmers) and extension and educative workers.

Farmer needs were captured in the international experts' meetings and in the NDA workshops, held in 2021. This resulted in a list of 43 more widely defined farmer needs, such as work/life balance, income, effective communication, improvement of animal welfare conditions, energy efficiency, reducing environmental losses, etc. These needs could be rated by using a GOOGLE questionnaire (needs were rated from no interest to very interested). In total 535 stakeholders (of which 70% farmers and 30% other stakeholders) in the 15 participating countries filled in this questionnaire by scoring the pre-printed list of needs. Missing needs could be added. The results of the questionnaire were discussed in the national dairy AKIS meetings (one or two per country) and in a European expert workshop, which was organized during a consortium meeting in 2022. These discussions resulted in prioritizing the needs, and as follow up the formulation of 190 solutions, i.e. practices, techniques, tools, systems, selected for assessment in 2022. Part of the chosen solutions which were assessed as possibly not yet ready for practice or raised questions about content, were monitored in the field for better understanding.

The final step of the R4D project is to disseminate the accepted solutions in fact sheets and practice abstracts, and as videos.

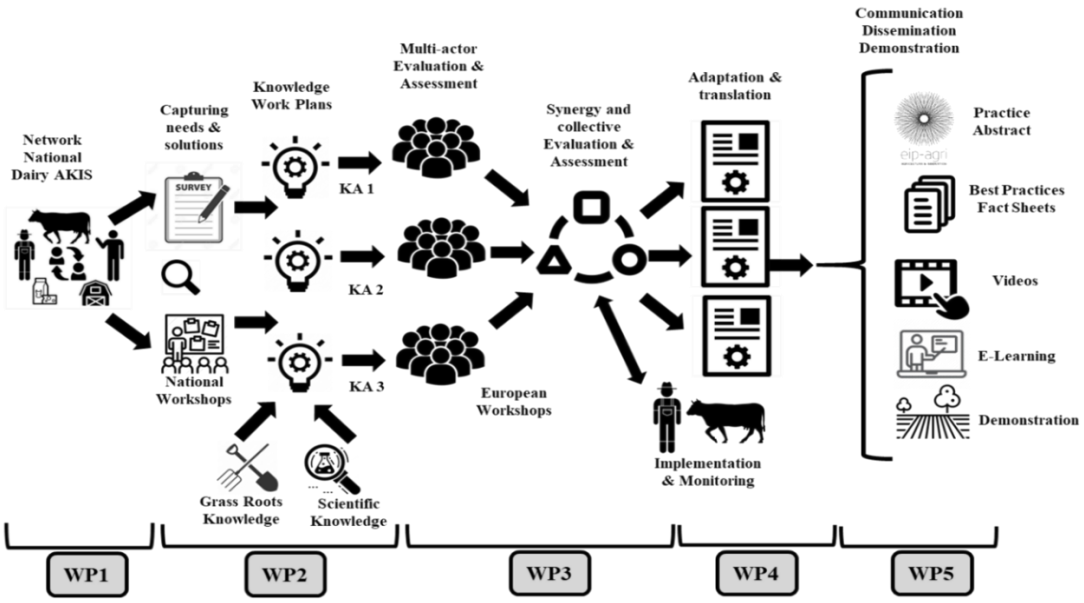

Figure 2. Organisation scheme Resilience for Dairy (R4D)

This article deals with the assessment of the solutions. The 190 solutions were divided in three knowledge areas (KA1, KA2 and KA3), being the three key know-how fields thought to contribute to a resilient farming system: economic and social resilience, farm technical resilience, and environmental & animal welfare/health resilience.

Experts' input

Expert assessments of the 190 solutions were organised. An online survey was prepared to evaluate each solution separately. The composition of the survey is illustrated in Figure 3. For this study, 32 of the total of 57 survey questions were used (indicated in red colour), belonging to knowledge areas KA1, KA2 and KA3. As guideline was stated: "To answer the question about the impact of the solution on resilience, take the average dairy farm in your region where this solution would be applicable and attractive as reference to assess the impact you expect".

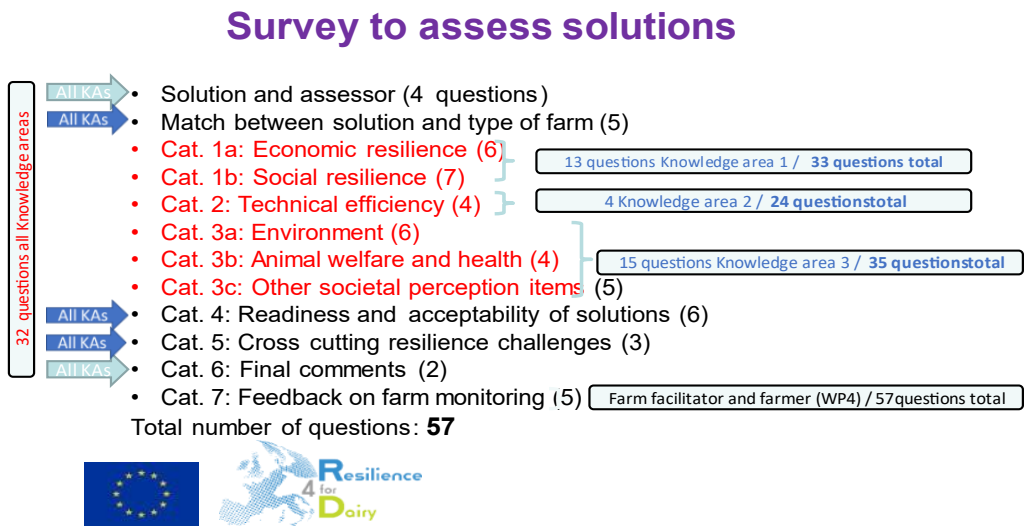

Figure 3. Survey to assess solutions

All questions had 5 pre-printed answers and an the answer “no idea”. A total of 66 expert assessors, selected by the participating partner organizations from the 15 European countries did perform 3329 assessments with focus on resilience. Thus, on average, about 53 solutions per assessor were done. The number of assessments per solution ranged mostly between 15 and 30 evaluations. Solutions with less than 15 assessments were excluded from this study. More attractive solutions were in general evaluated more times than less interesting solutions. The expert performed his/her assessments within their area of know-how. Therefore, different groups of experts were involved in the assessments in the three knowledge areas, implying that the comparison of the scores of solutions should preferably be done within each knowledge area.

An example of one category of questions, i.e. related to economic resilience, is shown in Figure 4. The answers are ranked from low to high or less to more (or not important to very important) and coded from 1 to 5. However, for some questions, like questions 10 and 14 in Figure 4, the scores had to be reversed because in general a low investment and less risk are seen as favorable compared to a high investment and more risk.

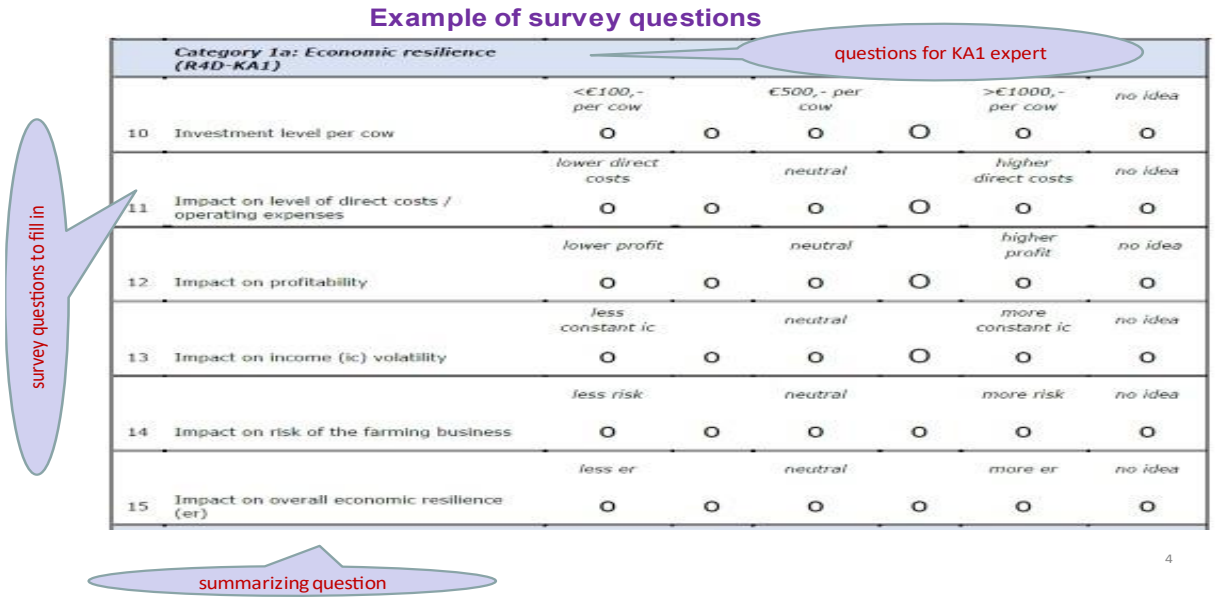

Figure 4. An example of survey questions

National Dairy AKIS (NDA) meetings’ input

Two National Dairy AKIS (NDA) meetings in 15 countries were held to discuss the expert scored solutions. Each meeting had from 15 to 30 participants, usually including the R4D pilot farmers and some other stakeholders, mostly extension workers and consultants. Focus was on the criteria attractiveness and readiness for practice, but also resilience was again included in the evaluation. The NDA group was asked to select the 20 solutions with highest attractiveness. Next, this sample of solutions was scored from 1, least attractive, to 20, most attractive. The same procedure was followed for resilience and readiness for practice. The scores were transformed to percentages by dividing the accumulated score of all countries involved through the maximum possible score.

A data base was prepared to contain all data derived from the expert group meetings and from the NDA workshops.

Results

Expert assessments of solutions

The results of the experts' assessments of the 190 solutions are presented separately for the three knowledge fields, i.e. socioeconomics, technical efficiency, and animal health, welfare, and environment. Only the result of the assessments by the knowledge area experts for each field are presented because the number of assessments by other knowledge area experts was for some solutions rather limited.

Table 1. Experts' choice and scores of the top six and two low scoring socio-economic solutions in relation to resilience

Title of solution	Economic resilience		Social resilience		Economic + Social resilience	
	mean	SD	mean	SD	mean	SD
Lean management	4.17	0.48	3.70	0.57	3.97	0.41
Reparceling of land	3.86	0.31	4.03	0.41	3.95	0.29
Manage cash flows, Investment, and risks to increase mental health and resilience of farmer	4.12	0.30	3.50	0.67	3.81	0.42
Improve quality consultancy services, engage advisory in farm management	3.84	0.48	3.50	0.60	3.65	0.50
Tools to make business plans to support strategic decisions	3.76	0.53	3.53	0.51	3.64	0.39
Peer groups of farmers to share knowledge using facilitation methods	3.78	0.43	3.46	0.42	3.62	0.34
On-farm dairy heifer valorization	3.43	0.59	2.50	0.49	2.96	0.51
Exploring on farm milk-processing	3.20	0.36	2.54	0.38	2.87	0.27

Table 1 shows that the reparcelling of land is an urgent need in several countries where history has caused the present farms to be composed of a whole set of small parcels spread over a large area. Lean management was available as a learning package in the R4D project, without doubt affecting the scoring upwards. Solutions that require additional labour like on farm milk-processing and fattening of heifers score low on the social component of resilience.

Table 2. Experts' choice and score of the top six and two low scoring technical solutions in relation to resilience

Title of solution	Technical efficiency	
	mean	SD
Strategic hoof trimming	4.72	0.40
Calf colostrum management	4.46	0.60
Sensors monitoring insight in health and fertility	4.17	0.54
Manure application tailored to needs plant	4.13	0.82
Early detection of diseases	4.11	0.59
Cross-breeding with beef cattle	4.06	0.80
Conservation tillage to reduce erosion	3.36	1.01
Combining efficient grazing with robotic milking	3.13	0.74

Table 2 shows a high interest for hoof trimming, calf management and monitoring and detection of health and fertility characteristics of individual cows. Although considered surely of importance in some regions of Europe, tillage to reduce erosion and grazing combined with automatic milking was rated relatively low.

Table 3. Experts' choice and score of the top six and two low scoring environmental, animal welfare & health and societal perception solutions in relation to resilience

Title of solution	Environment		Animal welfare and health		Societal perception		Welfare/ health, + Environment, + Perception	
	mean	SD	mean	SD	mean	SD	mean	SD
Improvement of health, fertility and longevity in herds	3,41	0.40	4,30	0.62	3,88	0.46	3,90	0.44
Freewalk farming system	3,68	0.56	4,26	0.51	3,54	0.46	3,84	0.41
Agroforestry on dairy farms	3,81	0.44	3,46	0.57	3,74	0.39	3,95	0.38
Barns for more animal welfare with access to outside	3,15	0.43	4,31	0.51	3,55	0.50	3,69	0.32
Biodiversity implemenatation package for dairy farms	3,94	0.41	3,38	0.55	3,43	0.50	3,60	0.27
Apply sand as deep bedding in cubicles to improve health, welfare and productivity	3,20	0.30	4,12	0.56	3,48	0.36	3,60	0.31
Use solid part of slurry as bedding material in cubicles	3.59	0.35	3.20	0.27	2.91	0.24	3.22	0.18
Feed additives to reduce rumen methane production	3,51	0.42	2,96	0.54	3,00	0.32	3,17	0.26

Table 3 shows a great interest in practices related to housing of the animals and to improving health and fertility. Biodiversity has become a societal and political topic of attention and is expressed as a challenge to work on. Contrarily, feed additives to reduce rumen methane and dried manure as bedding are considered animal unfriendly and are expected to receive a low appreciation from society.

National Dairy AKIS groups evaluating solutions

Figure 5: Discussions in stakeholder groups about attractiveness, resilience and readiness of solutions

The three criteria attractiveness, resilience and readiness were discussed in the stakeholder (NDA) groups In each of the NDA meeting in the 15 partner countries (Belgium had two NDA groups), the 20 most preferred solutions were chosen and ranked from 1st to 20th place. Of the total of 190 solutions, 123 solutions were chosen to be discussed at least in one NDA meeting, of which:

53 solutions were discussed in only 1 NDA meeting; 21 solutions were discussed in 2 NDA meetings; 23 solutions were discussed in 3 NDA meetings, and 17 solutions were discussed in 4 to 9 NDA meetings. The outcomes were split up into results from North & West Europe and from South & East Europe. In figures 6, 7 and 8 are the outcomes presented of the farmers' opinions about attractiveness, resilience and readiness of the solutions.

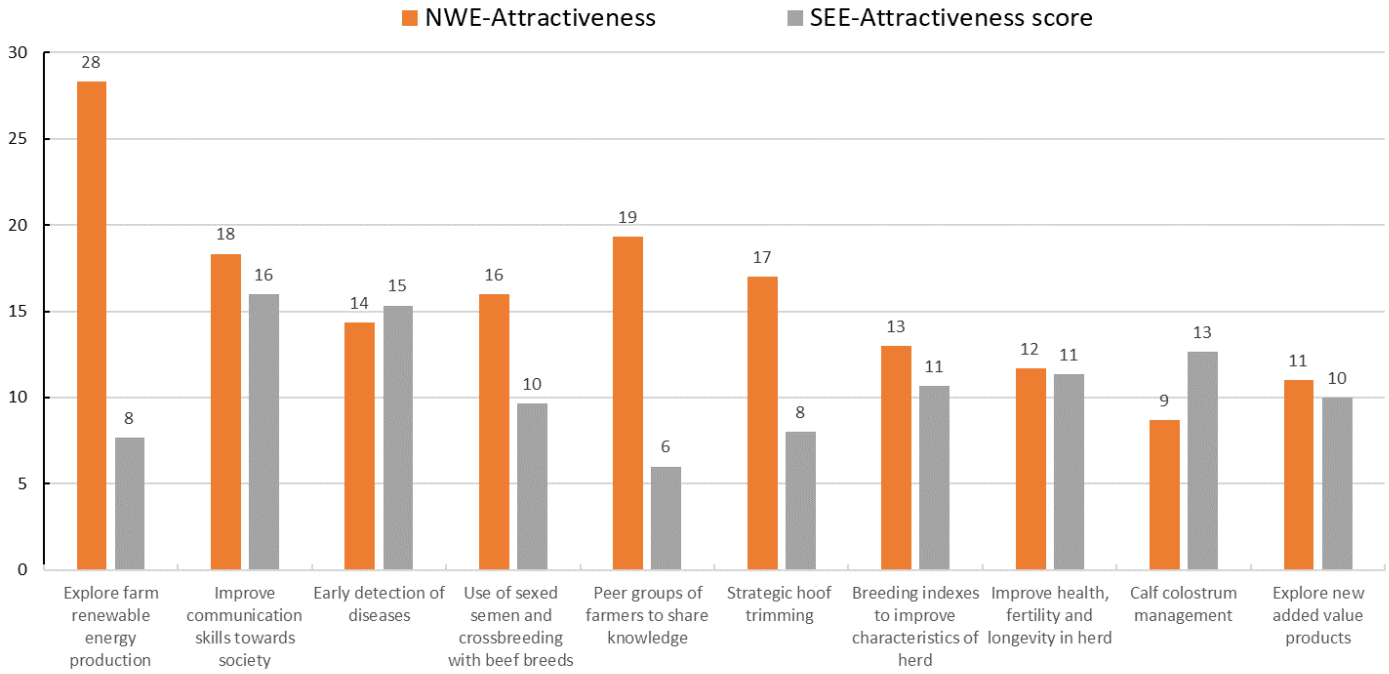

Figure 6. Scoring by stakeholder groups of the 20 solutions with highest attractiveness; this sample of solutions was scored from 1, least attractive, to 20, most attractive; the percentage illustrated in graphic is the accumulated score of all countries involved divided by the maximum possible score (NWE = North&West Europe and SEE = South&East Europe)

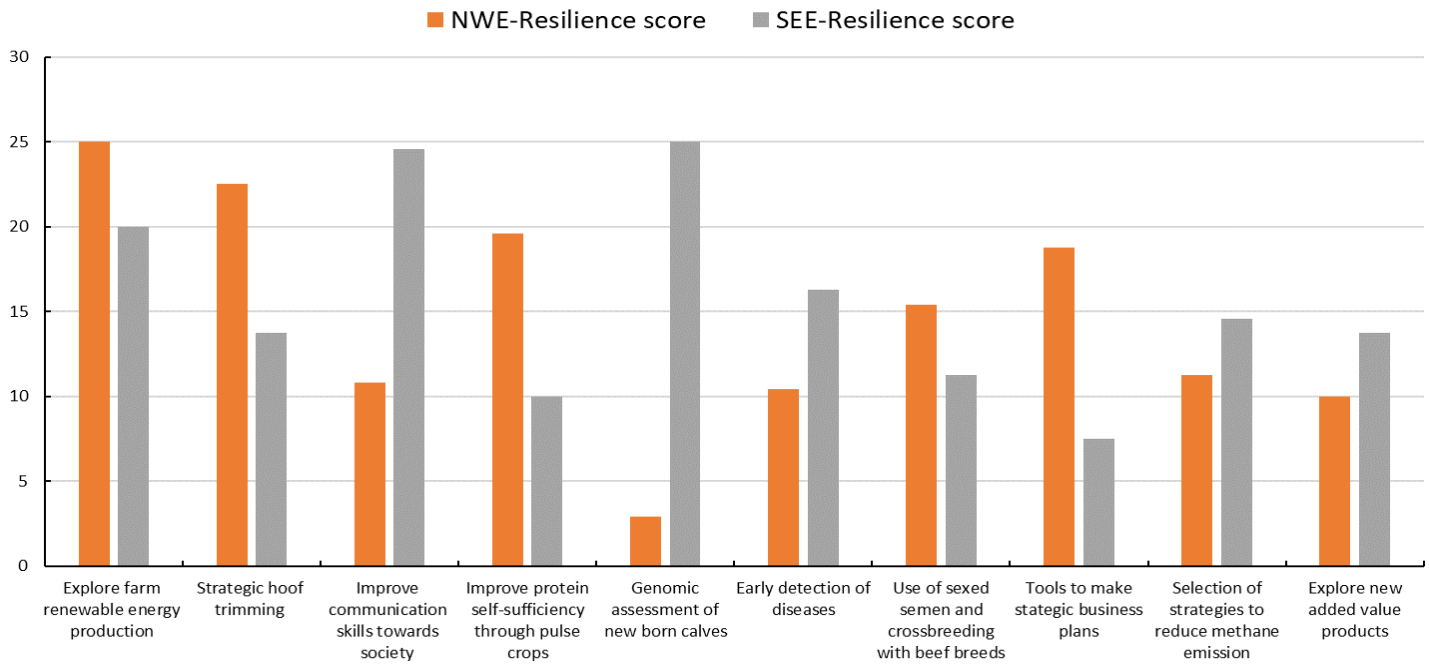

Figure 7. Scoring by stakeholder groups of the 20 solutions with highest contribution to resilience; this sample of solutions was scored from 1, least resilient, to 20, most resilient; the percentage illustrated in graphic is the accumulated score of all countries involved (NWE or SEE) divided by the maximum possible score

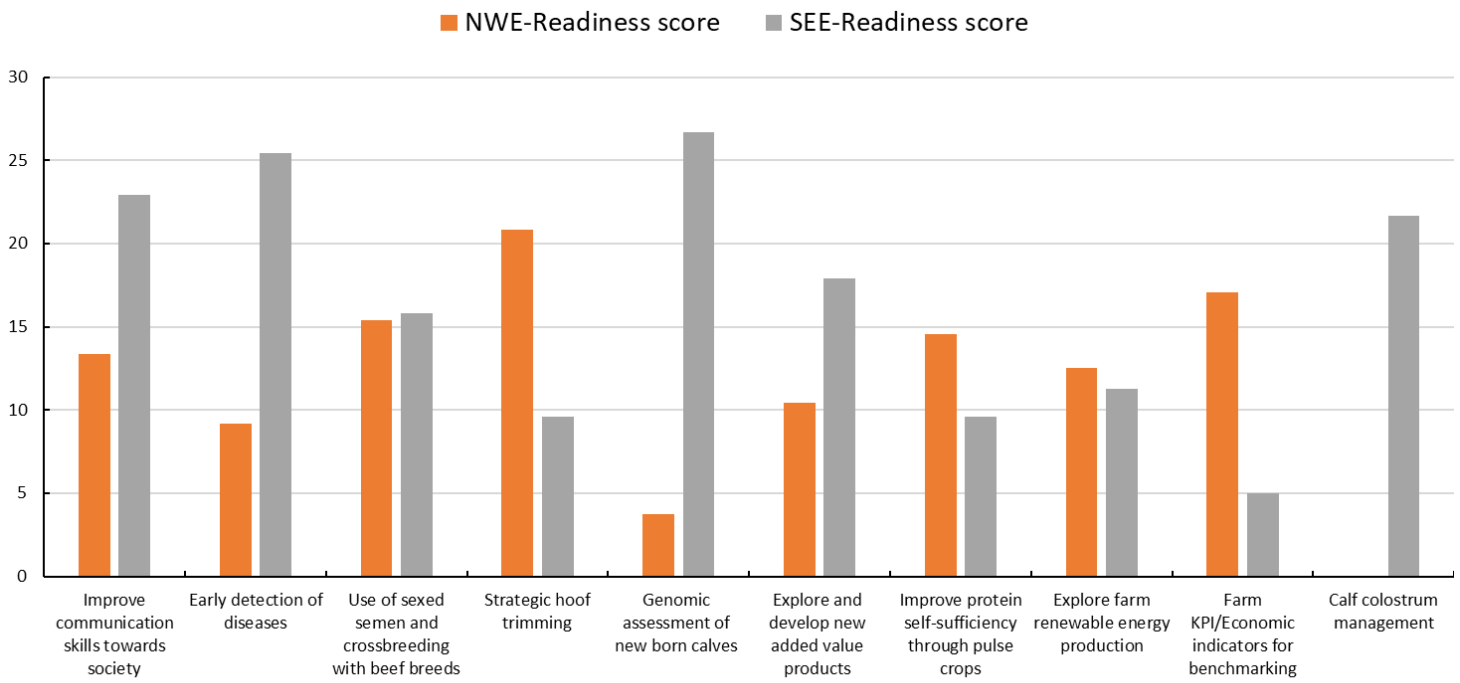

Figure 8. Scoring by stakeholder groups of the chosen 20 solutions most ready for implementation; this sample of solutions was scored from 1, least ready, to 20, most ready for implementation; the percentage illustrated in graphic is the accumulated score of all countries involved (NWE or SEE) divided by the maximum possible score

Exploring the implementation of renewable energy equipment and practices, working with peer groups of farmers and strategic hoof trimming were more targeted as attractive activities by the groups of farmers and stakeholders from North-Western Europe than by the farmers from South-Eastern Europe. The improvement of communication skills and the genomic assessment of calves were thought to contribute more to the farm and farm family resilience by the farmers in South-Eastern Europe than those in North-Western Europe. It is somewhat curious to see that genomics seems to be of high interest in this part of Europe. Colostrum management and genomics receive a high applicability and readiness level from the farmers from Southern and Eastern Europe. Those farmers seem to be overall somewhat more positive about the applicability of the most favoured solutions.

Conclusions

- It was a challenging process to collect and assess the series of solutions from the 15 countries;
- Choices of solutions were likely affected by facilitation, choice of farmers, etc.
- There are differences in focus over Europe (especially East versus West)
- Expert' and farmer / stakeholder' opinions appeared to be not the same
- Technical efficiency is a leading strategy at farm level
- Communication with society, renewable energy production, hoof trimming, early detection of diseases and calf rearing are much mentioned topics of interest.

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