Reinforcement of animal resilience: survey and network development of experts

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Abstract

The European Partnership on Animal Health and Welfare (EUPAHW) is by far the most ambitious research and innovation initiative the European Commission (EC) has funded to control infectious diseases of animals and to promote animal welfare (https://eupahw.eu). The objectives of the EUPAHW align with the European Green Deal and its associated Farm to Fork strategy for a fair, healthy, and environmentally friendly food system. The Partnership has brought together 90 entities (research-performing institutions, funding organizations, and ministries), including EFSA and EMA, from 24 countries (19 EU Member States and five countries associated with Horizon Europe). The Partnership is based on a Strategic Research and Innovation Agenda (SRIA), which has been developed over two years and involves all relevant actors. The Partnership includes 17 three-year research projects carried out internally, which start in 2024, and plans to launch research calls reaching out to additional research-performing organizations beyond the Partnership. One of the 17 research projects is SOA16, planned by sixteen research performing organizations (RPO), and its main objective is to develop the necessary knowledge and tools, which are still missing, to - integrate resilience traits in selective breeding and - develop truly integrated animal health management systems and interventions. The specific objectives of the project are to 1) identify resilience indicators and their relation (trade-offs) with health, welfare, and production traits; 2) decipher the effects and interactions of genetics, feeding, and management practices on resilience and health traits 3) develop new models to improve resilience and health at the population level, and – assess the potential of these new tools in breeding. The project is organized into six tasks, and task 1 aims to establish a pan-European network of “resilient” experts in genetics (breeding), feed additives including pre- and probiotics, applied ethology, stress physiology, and immunology.” As the first result of this task, connections with experts in some other internal partnership projects have been identified, and an online survey has been developed to spread it out and collect information about experts’ involvement in resilience traits studies at different levels. The final long-term objective is to fulfill a network among people who share knowledge and applications on this topic in livestock species.

Introduction

The issue of animal resilience is becoming increasingly critical due to the increasing challenges posed by climate change, the intensification of livestock production, environmental pressures, and societal expectations for animal welfare. Animals' capacity for adaptation allows them to remain healthy and productive in the face of biological stressors and shifting environmental conditions (Colditz and Hine, 2016). A multifaceted strategy combining expertise from behavioral biology, veterinary medicine, breeding, genetics, and production systems management is needed to increase this resilience effectively.

At this point, it would be appropriate to introduce the concepts of resilience, robustness, and resistance:

An animal's resilience is its ability to cope with short-term disturbances, including those caused by pathogens, through response and rapid recovery to its original state. The concept implies the survival of the stressor and active regenerative and adaptive mechanisms. Resilience is dynamic and refers to adaptive capabilities developed over time, as opposed to passive immunity.

The robustness of an animal in production is the ability to maintain its functionality under a wide range of conditions and stresses without substantial change. This suggests that even though the organism is exposed to a variety of environmental conditions, it does not show any appreciable changes from its reference state. This trait is often desirable in breeding practice and is characterized by better stability.

The resistance of an animal is its capability to avoid or mitigate the negative effects that any challenge might cause to it. Unlike resilience, which focuses on response and recovery, resistance refers to limiting the impact of the stimulus itself. It is a form of "first-line defense" whose effectiveness can be foreseen the need for active response.

Therefore, building an integrated network of experts is one of the most essential factors in developing creative solutions in resilience field. Such a network aims to identify research gaps, collaboratively establish research priorities, launch extensive interdisciplinary projects, and exchange best practices and knowledge.

The successful application of innovations in practice depends on establishing long-lasting collaborations between research units, industry, professional associations, and regulatory bodies, which is made possible by the growth of expert networks. In addition to facilitating quicker responses to global issues, the integration of research communities from various nations and fields boosts the competitiveness of the European livestock industry.

The European Partnership on Animal Health and Welfare (EUPAHW) project, funded by the European Commission (EC) program, was launched in 2024. The initiative represents the most significant European research and innovation partnership on animal health and welfare. It comprises 90 entities - scientific institutions, research funding organizations, and ministries - from 24 countries (19 EU member states and five associated countries). The Partnership operates based on the Strategic Research and Innovation Agenda (SRIA), which was developed in cooperation with stakeholders over two years of preparation.

EUPAHW has 17 three-year research projects, including the SOA16 project, whose main objective is to develop knowledge and tools to integrate immune traits into breeding programs and develop integrated animal health management systems. A consortium of 16 research institutions is carrying out this project, including six research tasks.

The SOA16 focuses on integrating knowledge and data on three key traits – resilience, robustness, and resistance – in the context of livestock. Project activities include collecting primary and secondary data and modeling the complex relationship between these traits and animal health, welfare, and production. The goal is to establish a

scientific basis and analytical tools for integrating these traits into livestock breeding practice and animal health management.

Task 1 of the SOA16 project aims to establish a pan-European network of experts specializing in genetics and breeding, feed additives (including pre- and probiotics), applied ethology, stress physiology, and immunology. This paper aims to present the assumptions and preliminary results of the SOA16 (EUPAHW) task 1.

Initial activities have identified potential links to other projects under the Partnership, and an online survey has been developed and launched to identify individuals and institutions working on animal resilience. These activities aim to create a sustainable network of experts to share knowledge, experience, and joint research activities in livestock..

Methods

As part of Task 1, an online survey was developed and launched to gather information from researchers and practitioners working on animal resilience issues. The survey was distributed to EUPAHW partners and outside the project to identify potential members of a future thematic network.

The scope of the survey included:

- identification of the types of animal traits whose resistance status affects their performance values;
- identification of stress factors analyzed in the study;
- respondents' areas of specialization;
- willingness to participate in the cooperative network.

The data collected will be used for:

- mapping the scientific community;
- defining key concepts;
- literature review and current research activities;
- initiate joint projects and further develop the collaborative network.

Survey link for expert participation:
https://ec.europa.eu/eusurvey/runner/97cabefe-08cb-426d-a6cf-d7d87f585bf7

The development of the network of experts under Task 1 of the SOA16 project has been planned as a gradual process involving successive stages of broadening participation:

In the first step of the project, activities are focused on identifying and activating internal partners, i.e., institutions directly involved in the SOA16 project.

Next, it plans to open the network to EUPAHW affiliates and other partner projects implemented within its framework. The goal is to expand the network's territorial and thematic coverage while maintaining methodological consistency.

Finally, it is envisaged that the network will be fully opened up to include academics, experts, and practitioners outside the EUPAHW partnership. The integration of research

results and the development of joint educational, implementation, and project initiatives are also envisioned at this stage.

Summary

Due to the ongoing and open survey system for researchers worldwide, the summary of results refers to respondents who submitted their applications by March 31, 2025.

Representatives of various European scientific institutions participated in the survey, with the most significant participation from research units in France, Poland, Spain, Italy, Germany, and international organizations. The largest group consisted of researchers from institutions described as “other,” indicating a broad spectrum of involvement beyond the central partner units (Figure 1).

From the standpoint of position, most respondents were scientists (researchers, 67%), followed by professors (25%) and others (8%) – suggesting the operational, research, and development nature of the community centered around the topic of animal resilience (Figure 1).

Respondents represented two main scientific fields: life sciences (52%) and agricultural sciences (48%) – confirming the interdisciplinary nature of the topic (Figure 1).

In terms of major research areas, the most frequent were genetics (33), ethology (13), animal husbandry (13), animal biology (13), and veterinary science (7). Fewer areas included immunology, microbiology, biomathematics, and agricultural engineering (Figure 1).

The majority of respondents (more than 75%) declared familiarity with the concept of animal resilience, and the vast majority of them expressed their willingness to participate in the expert network being established (Figure 2). This relationship was consistent regardless of position (scientist, professor, other) and scientific field, confirming the broad interest in cooperation.

It is worth noting that among those unfamiliar with “resilience,” the willingness to participate in an expert group was significantly lower. This relationship was present among scientists and professors, which may indicate the need for additional communication and education about the definition and practical meaning of the concept.

The acceptance of the definitions of three key terms was also analyzed: “resilience,” “ robustness, “ and “resistance.” For the first two, the level of acceptance was above 80%, indicating a consensus in the scientific community (Figure 3).

An analysis of the relationship between familiarity with “resilience” and agreement with the definitions showed that those declaring familiarity with the term were significantly more likely to agree with the proposed definitions and express willingness to participate in the expert group (Figure 4). This suggests that a clear understanding of the terminology promotes a more proactive engagement in the process of network development.

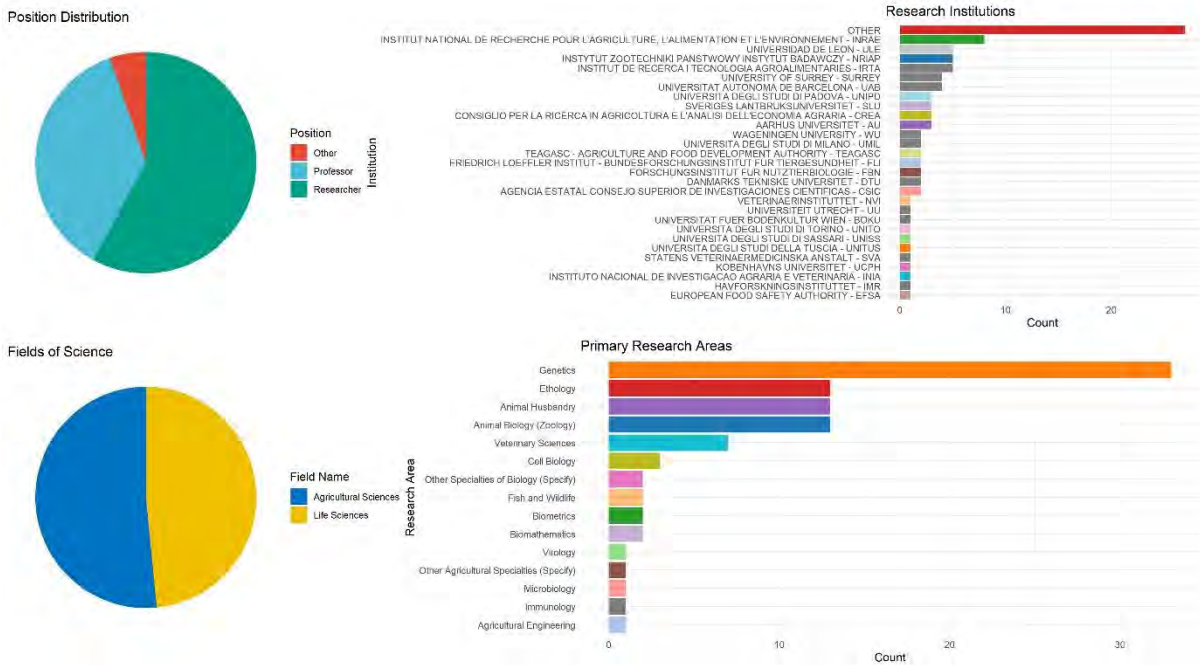

Figure 1. Profile of respondents, scientific fields, and research areas.

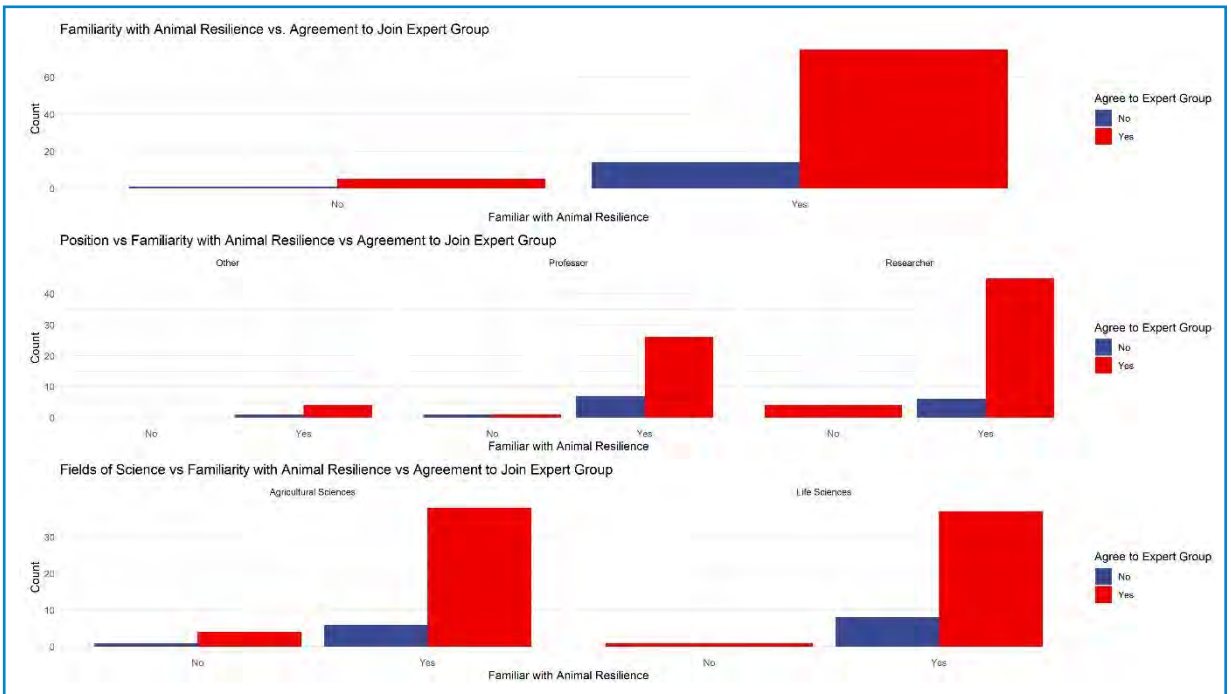

Figure 2. Familiarity with the concept of resilience and willingness to participate in an expert network.

Figure 3. Agreement with the definition of resilience, robustness, resistance.

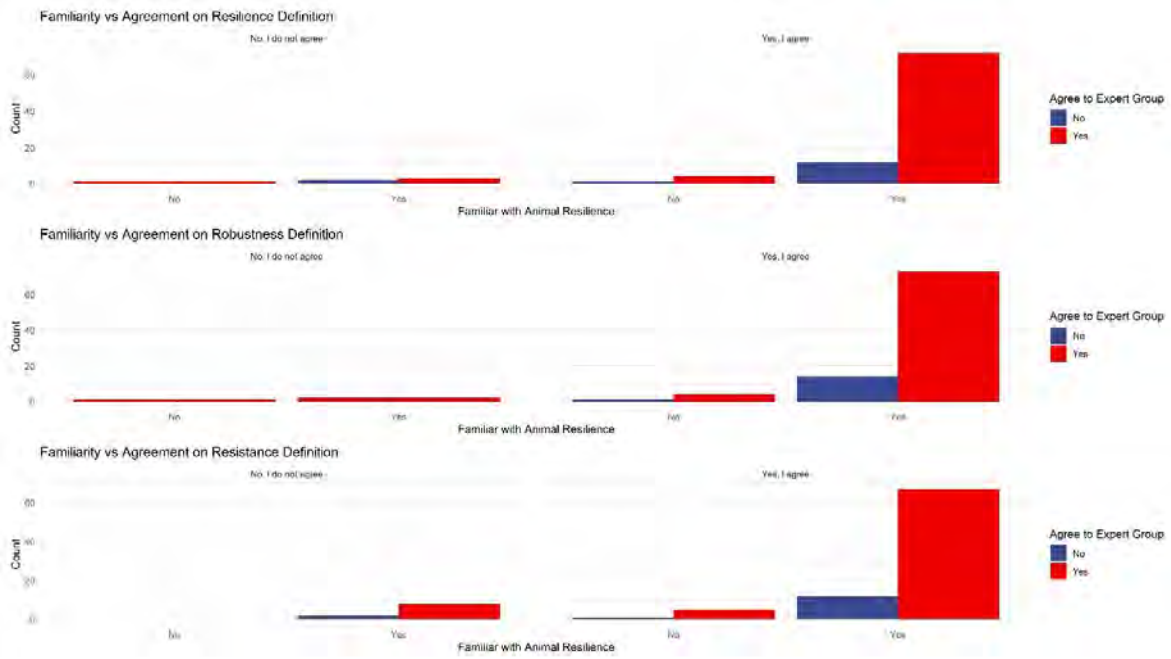

Figure 4. Links between knowledge of concepts and willingness to participate.

Discussion

The survey's preliminary results confirm the growing interest in animal resilience in a broad and diverse scientific community. Participants in the survey represented both the life and agricultural sciences, with an almost even distribution. Specialties such as genetics, ethology, animal husbandry, biology, and veterinary science are dominated, reflecting the interdisciplinarity needed to understand and fully implement the concept of animal resilience. Such a cross-section of competencies is consistent with building the network as a structure that integrates knowledge from different disciplines.

The institutional diversity of respondents - from large research units to smaller-scale organizations - suggests that the potential network could encompass a wide range of audiences and partners. On the other hand, the high representation of scientists indicates the practical dimension of SOA16 activities, with a strong focus on implementing solutions..

The very high level of declared familiarity with the concept of resilience and the almost unanimous agreement on its definition indicate that the idea is already well established in the research community. A similar trend occurred with the concept of robustness, which may suggest a common language and conceptual framework for future cooperation.

One of the survey's key findings is the clear relationship between familiarity with the concept of resilience and willingness to participate in the expert network being established. Those familiar with the term expressed more interest in participating, suggesting that the knowledge and awareness directly translate into a willingness to engage. This observation may have practical implications for further stages of network building, as it points to the need for outreach and educational activities, especially for those communities that may be potentially interested but do not yet have sufficient terminological knowledge.

The data obtained also allows the identification of so-called strategic areas - those in which competencies are well developed (e.g., genetics, ethology) and those that may need further strengthening (e.g., immunology, microbiology, biomathematics). This knowledge can be used to plan targeted activities to support the development of less-represented fields in the context of animal resilience.

Conclusions

The creation of a network of experts in the field of animal resilience is a key step toward increasing the synergy between basic research and practical applications. The initial activities of the SOA16 project enabled the identification of relevant research areas and the initial connections between experts. The following steps will include further data collection, organizing workshop meetings, and the development of joint research initiatives.

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