Workshop Report

23rd October 2023 in Brussels

How to Ensure Strategic Investment in Breeding to Enable the Green Transition

Background

Breeding is the basis of our agri-food systems. Starting with domestication, human civilisations have constantly adapted plants and animals around them to better suit their needs. Continuous breeding efforts have enabled us to feed a growing population, while reducing the amount of resources needed (e.g., land, animals, feed). At the same time, this has led to increased animal health and welfare and a reduction of external inputs (e.g., fertilisers, antimicrobials).

As Europe moves towards more sustainable agri-food systems, the types and characteristics of terrestrial and aquatic plants and animals, need to be adapted to better support the transition. As the starting material to all production systems, any improvements in e.g., farming practices, processing or diets, will be limited by the quality and quantity of the harvested material for food, feed and the broader bioeconomy.

A broad range of essential areas are currently addressed under Horizon Europe (HE) Cluster 6 partnerships and missions, including biodiversity, water, primary production, food systems, animal health and welfare, data and soil, with the aim of achieving the goals of the EU Green Deal's Farm to Fork and Biodiversity strategies. While these efforts can drive the short and medium term transition to more sustainable agri-food systems, their long term impact will be limited if novel, diverse and more robust and resilient terrestrial and aquatic plants and animals, adapted to diverse production systems, are not developed simultaneously.

The workshop described in this report aimed to

1. Identify gaps in the current R&I landscape for breeding resilient terrestrial and aquatic plants and animals for diverse production systems.
2. Discuss the benefits of investing in cross-sectoral research and breeding efforts, as well as knowledge and technology transfer to achieve the EU Green Deal goals.
3. Describe the challenges limiting private investment and the translation of research outcomes into practical solutions.
4. Identify appropriate mechanisms (e.g., Strategic Plan, Partnership, Intersectoral Programme) for strategic EU-wide investment in developing a broad range of resilient and adapted varieties of terrestrial and aquatic plants and animals across different regions and climates, in the short, medium and long term.

Setting the scene

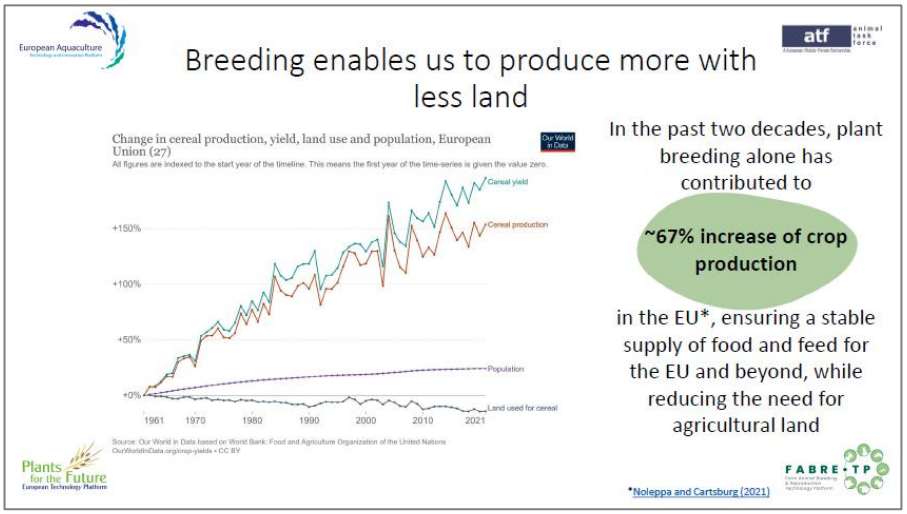
A **keynote speech** from **Max Schulman**, an arable farmer from Finland and advisor to the Finnish Central Union of Agricultural Producers and Forest Owners (MTK), highlighted the current challenges farmers face in maintaining agricultural production under increasing weather volatility and pest pressure due to climate change, while at the same time reducing inputs (e.g., fertiliser, antimicrobials, plant protection products), and diversifying rotations.

"*Most importantly, Europe needs to support global food security*" was the message highlighting the importance of keeping the big picture in mind, and that Europe does not exist in isolation. Any reduction of agricultural production in Europe will affect agri-food systems globally. R&I was highlighted as being essential to support the transition towards more sustainable agri-food systems, while maintaining production. The quality of the starting material available to farmers (e.g., seeds, breeds) determines the maximum yield and quality that could be attained by farmers. Therefore, special attention needs to be given to optimising these resources, to better respond to future challenges in diverse production systems.

Finally, Max stressed that more basic research is needed, as well as the importance of strategic planning backed by scientific evidence, ensuring that breeding can continue to support future agricultural production.

The keynote speech was followed by a presentation from Amrit Nanda, from Plants for the Future ETP, on behalf of the organisers, "*Breeding is the pillar of our agri-food systems and the future of a circular bioeconomy*" (pdf available here). It was highlighted that most of the terrestrial plants and animals, as well as some of the main species of aquatic plants and animals, consumed or used by humanity are the product of breeding.

While in the past century the focus of breeding efforts was mostly on increasing global food security (i.e., yield), the last decades have seen a much broader range of breeding goals, such as improving animal health and welfare, increasing food security and safety, reducing environmental impacts, better use of resources and better quality of products[1].

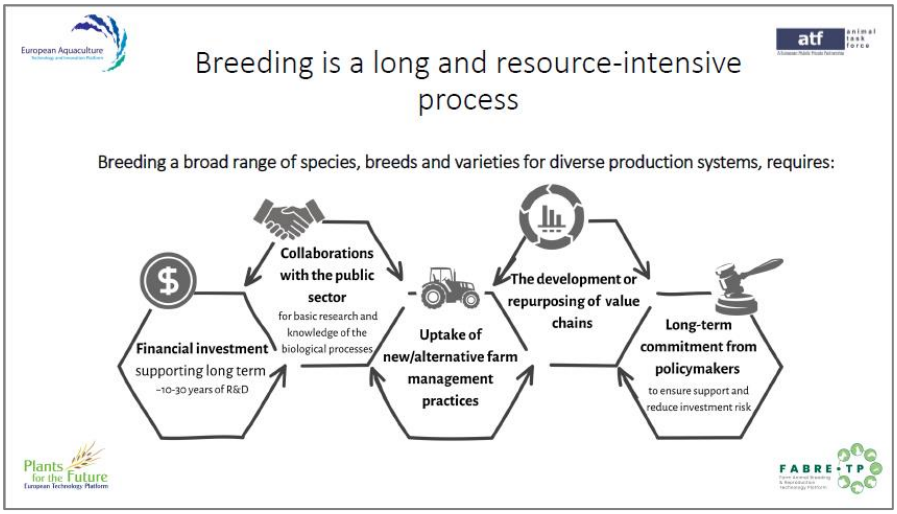


[1] CODE EFABAR Code of good practices for responsible and balanced breeding

This range of new traits and characteristics, as well as their inclusion in breeding programmes have been possible because of advanced and better knowledge of genetics and the emergence of new technologies (e.g. genomics).

In the last two decades, breeding alone has contributed to ~67% increase in crop production in the EU[2], ensuring a stable supply of food and feed for the EU and beyond, while reducing the need for agricultural land.

However, breeding is a long and resource-intensive process taking anywhere from 5 to 25+ years depending on species/breeds and the complexity of the desired breeding goals. **Therefore, breeding for a wide range of species, breeds and varieties for diverse production systems requires substantial financial investment supporting long term goals, collaborations with the public sector to generate and harness further knowledge** on biological processes gained through basic research, uptake of new/alternative farm management practices and tools, the development and repurposing of value chains to ensure circularity, and long term commitment from policymakers to ensure support and to reduce investment risk.



The contribution of breeding toward the green transition is mostly limited by economics. The long and uncertain return on investment is difficult to manage for the private sector, especially for SMEs, which make up the majority of players in the EU. This uncertainty, combined with the reality that it is often cheaper to import from third countries than to produce it in the EU (e.g., soy, poultry meat), provides little incentive for further investment to improve agricultural production through breeding.

In conclusion, critical-mass investment, together with long-term (10 years minimum) commitment and coordination across the EU, is needed to ensure strategic investment and efforts, supporting basic and applied research, with a strong focus on translation, and involving both the public and private sectors and key stakeholders (e.g., academia, breeders, farmers). At the same time, dedicated efforts are also needed to improve societal awareness of the importance of biological research and breeding for our agri-food systems, and the benefits to human health, social wellbeing, and the environment.

[2] Noleppa and Cartsburg (2021) The socio-economic and environmental values of plant breeding in the EU and for selected EU member states.

Discussions – Breakout groups

Funding landscape for terrestrial and aquatic plants and animals

To the questions "*Do you think plant (forestry, terrestrial and aquatic) breeding is sufficiently funded?*" and "*Do you think animal (aquatic and terrestrial) breeding specifically is sufficiently funded?*", there was general agreement that the funding landscape differs considerably between Member States (MS). While countries like France and the Netherlands demonstrate some extent of sufficiency through mostly private and public-private funding, southern and eastern European regions were pointed out to be lagging in breeding efforts. Funding for breeding efforts at the EU level was generally deemed insufficient, with a gradual reduction being observed since FP7. While breeding is mentioned in some of the partnerships in Horizon Europe cluster 6, it is not the main focus and it is unlikely that sufficient resources will be dedicated to it. This is partly because partnerships address entire systems, which can include breeding, but not breeding itself. In addition, very few calls in Horizon Europe are specifically aimed at supporting integrated, cross-sectoral, breeding efforts, while the ones that are dedicated to breeding foresee a budget that is insufficient for longer term projects.

A consensus emerged among workshop participants that breeding overall, including biological research, is currently insufficiently funded to reach the Green Deal policy goals. Participants from countries including France, Spain, the UK, Germany, Denmark, expressed the urgent need for increased financial support and long-term investments, particularly for basic and exploratory research, as well as breeding for agrobiodiversity. Participants flagged concerns about **a reduction in investment**, citing instances of successful public-private partnerships, but lamenting their lack of extension or continuation. The need for longer projects to ensure sufficient progress was a recurring point, as breeding efforts require long term (minimum 10 years) investment. Concerns were also voiced about the limited financial support for minor, novel or underutilised crops and local animal breeds, as well as the **limited translation of breeding-related research to actual on-the-ground impact**.

In animal genetics and genomics, there is a greater reduction of funding compared to plant breeding. This is partly due to misconceptions about the impact of breeding on animal health and welfare, as exemplified by the lack of breeding foreseen in the partnership on the topic. According to the FAO, growth in global consumption of meat proteins over the next decade is projected to increase by 14% by 2030[3]. In Europe, and higher income countries, this trend is likely to see a move towards consumption of higher value meat cuts.

A combination of EU level and national level breeding efforts was deemed the most appropriate to balance big EU-wide collaborative projects, with smaller national-level projects ensuring uptake by relevant actors. The importance of coordination across EU was also highlighted. For example, coordination of R&I efforts across Europe, or even globally, around a specific topic/theme (e.g., drought tolerance, disease resistance)

[3] OECD/FAO (2021), OECD-FAO Agricultural Outlook 2021-2030

or species/breeds (e.g., soy, trout), would provide better momentum and result in faster progress from basic and applied research to concrete breeding programmes, while reducing investment risks.

The **shortage of skilled personnel** in breeding emerged as a significant challenge, with a majority of the workforce employed by private companies. Workshop participants stressed the necessity of initiatives addressing this skills gap, aligning them with market needs and the strategic goals of the EU Green Deal.

Overall, there is a **call for more substantial and diversified funding, coordinated at the EU level, but tightly interconnected with the national level funding throughout Europe.**

This view is in line with the outcome of a survey that was sent out to invited participants and relevant stakeholders, prior to the workshop (Annex I).

Strategies for Collaboration

While acknowledging existing joint research outlets, participants underlined the need to expand collaborations to further propel breeding initiatives, especially through public-private partnerships that involve animal and plant breeding sectors, both terrestrial and aquatic. Knowledge-sharing on accessing funding opportunities were deemed essential, with a call for organisations such as European Technology Platforms (ETPs) to disseminate this information widely throughout their networks.

While in national projects, researchers often work closely with stakeholders, such as private breeding companies or farmers, this is less so in EU projects. Some reasons for this include the administrative burden associated with participation in EU projects, as well as the limited budgets for calls, which is often not sufficient to include participation of key stakeholders. Synergies with other funding mechanisms and networks (e.g., CAP, GAIA, EIP-AGRI operational groups) should be explored to support farmer participation in research projects, thereby ensuring on-the-ground testing, meeting end-users' needs and increasing uptake. It was highlighted that involvement of farmer organisations is often more practical for the farming community.

Possible EU-level funding mechanisms

A substantial portion of the workshop was dedicated to discussions on the need for a **well-defined European funding mechanism dedicated explicitly to breeding, including basic and applied research on biological processes**. In the beforementioned survey, respondents indicated their preferred options, which were used as a starting point for the discussions.

Partnerships

Participants recognised the potential of partnerships to provide coordinated medium to long term focus and funding, and facilitate knowledge exchange, capacity building and networking. Considering its narrower scope, but wide impact of breeding, questions were raised about whether a **partnership would be the most appropriate mechanism for this topic.** Nevertheless, the necessity for longer-term funding programs spanning at least 10 years was emphasised.

If a partnership would be the aim, the topic would need to be addressed in a wider context, e.g., "Genetic adaptation for sustainable agri-food systems". The type of partnership, whether co-programmed, co-funded or institutionalised, would also affect the scope and overall context, as well as which stakeholders would be involved and how. In Horizon Europe Cluster 6, all partnerships but one are co-funded, with the partnership of Circular Bio-based Economy being institutionalised.

Several MS representatives, while interested in funding breeding and biological research, were reluctant to commit to another partnership until the success of the current ones can be determined. If a partnership becomes the mechanism of choice, this will be aimed at the next Framework Programme (FP10).

Intersectoral Programmes

Since the outcomes of breeding efforts will have cross-cutting impacts, an intersectoral programme was highlighted as a relevant mechanism to complement and connect relevant partnerships from Horizon 2020 (e.g., PRIMA), Horizon Europe (e.g., Agroecology, Biodiversa, Animal Health and Welfare, Food Systems), and relevant missions (Soil and Water), around the topic of breeding.

Since intersectoral programmes are funded by the partnerships or missions they connect and complement, no new funding would be needed from the EU or national level. However, it would require coordinators and funders of the different initiatives to agree to re-allocate some of their funds to such efforts. In addition, how to coordinate the calls for these intersectoral programmes remains an open question. The possibility of setting up a Coordination and Support Action (CSA) to manage the operational aspects of such a programme was suggested. This would be a desirable option for MS, since the administrative burden would be greatly reduced.

While this could be an interesting avenue to ensure breeding activities, including biological research, are better funded and support the partnerships and missions, it will be a few years until the gaps between the partnerships and missions become apparent. Meanwhile several players already exist in this space (e.g., Joint Programme Initiatives, CSAs like the Green ERA Hub). In addition, not all MS are involved in the different partnerships. Therefore, such an approach risks the exclusion of some MS and/or regions, which should therefore be considered before moving forward.

Adding a heading to work programmes

In the short to medium term, it was suggested to add openings in the strategic plan for the second half of Horizon Europe, to allocate more substantial funding for breeding, including biological research. This could be done by adding a new heading to relevant destinations and/or groups of topics under existing headings. Some agreed with this approach as a short term solution to support breeding efforts. However, others cautioned that such an approach would not result in a coordinated and integrated approach for breeding efforts.

The discussion emphasised a preference for keeping headings as wide as possible, using effective channels, including the **Standing Committee on Agricultural Research (SCAR),** and incorporating dedicated headings, linked to policy goals, to better leverage the diverse aspects of breeding and biological

research. The focus on opportunities in HE Pillar I (excellence and professional training) and Pillar III (innovation, transfer, scale-up) was suggested for harmonising public and private interests. There was a collective call to reframe the concept of breeding, especially for policymakers, potentially through the production of a white paper or engaging in awareness-raising activities.

Coordination and Support Action (CSA)

Participants highlighted the relevance of aligning with country-specific priorities, although challenges were noted in gaining consensus, especially with uncertainties regarding support from certain national ministries. Concerns were raised about potential fragmentation in research when introducing new Horizon Europe headings, which is why attendees expressed a preference for broader funding schemes to avoid fragmentation. Participants expressed a desire for increased representation of breeding-related topics in the HE work program and suggested that a **Coordination and Support Action (CSA**) could help establish a multistakeholder community of public and private players spanning life, and social-economic sciences, serving as a foundation for further research initiatives in the field. Reference was made to the need for a roadmap and early preparation for **Framework Program 10 (FP10)** to advocate for a more comprehensive and focused inclusion of breeding-related topics. However, some also cautioned against such a CSA, citing several cases of CSAs from Horizon 2020 that were tasked with providing roadmaps, which have unfortunately not been taken up yet by the EU Commission in their strategic planning for the next (frame)work programmes (e.g., CropBooster-P, GenRes Bridge).

Other mechanisms

The workshop discussions extended to the crucial need to align breeding efforts with climate change challenges, ensuring that breeding targets are intricately linked with overarching sustainability goals. The importance of **bilateral, trilateral, and EU connections to national levels**, advocating for collaborative research and training initiatives was acknowledged. The looming deadline of 2030 within the context of the Farm to Fork and Biodiversity strategies, was highlighted as a critical juncture, with participants expressing concerns about potential decreases in European agricultural production. Participants explored **interdisciplinary connections** and considerations for agronomy and socio-economic aspects. Questions were raised about how impacts are defined and measured, mapping information in the public and private sectors, and the role of the Common Agricultural Policy (CAP), the European Agricultural Fund for Rural Development (EAFRD) and the European Maritime, Fisheries and Aquaculture Fund (EMFAF). Potential integration of breeding-specific elements, including biological research, in HE's Cluster 6 work programmes, addressing discrepancies between species, and exploring innovative funding options, such as the EU Innovation Council, were also pointed out.

The concept of European Joint Programs (EJPs), inspired by successful examples like One Health or Soil was discussed, aiming to identify and align with political goals related to climate, biodiversity, water management, alternative protein sources, fertiliser use and food security.

Funding platforms supporting translational research and higher Technology Readiness Levels (TRLs) research, such as EIC accelerator, Pathfinder and EIT Food, were also discussed.

A link to the initiative on Genetic Resources for Europe, was also highlighted. Although it still needs to be adopted by the EU.

Conclusions

The workshop concluded with a strong emphasis on the need for strategic alignment of breeding objectives with sustainability, including addressing climate change concerns and ensuring the sovereignty of EU agri-food systems. Recognising that breeding is a slow, complex and gradual process, coordination of stakeholder needs and research institutions was deemed essential for developing impactful programmes.

Balancing the three pillars of sustainability (environmental, societal and economic) was identified as a critical consideration in prioritising future funding. While some participants suggested to start with plants only and include animals at a later stage, others recommended to advance these sectors simultaneously, thereby enabling knowledge and technology transfer, and ensuring that integrated breeding efforts will support entire agri-food systems.

The question of whether breeding, including biological research, or "Genetic adaptation for sustainable agri-food systems" is a **wide enough topic for a partnership** remains, suggesting the need for **gap analyses across the sectors.** In addition, while involvement of stakeholders was considered key, how to best do this remains an open question, with each suggested funding mechanism presenting its pros and cons.

The need for improved communication to raise awareness of the importance of breeding came up multiple times when discussing societal needs, as well as the support from policymaker and funders. The neutral or even negative perception often associated with breeding, greatly limits the appreciation of what breeding can achieve and how it can support the green transition. While ETPs, such as the organisers of the workshop, strive to increase awareness of the importance of breeding, further communication efforts are needed. It was suggested to take up a communication campaign similar to the Soil mission.

In conclusion, there is a clear call for EU-wide collaboration among players from different fields, promoting interdisciplinary approaches to enhance the effectiveness of breeding efforts. Recognising the contextual nature of breeding programs, participants highlighted the necessity to tailor efforts based on the specific type of breeding and environmental conditions. The workshop discussions offered a nuanced and detailed exploration of the challenges and potential pathways forward in plant and animal breeding, providing a fertile starting point for future initiatives and policy considerations.

Next steps

The organisers will take the learnings from this workshop and explore the different options for EU strategic funding mechanisms, reaching out to additional relevant organisations, policymakers and funders, to further build its recommendations for ensuring breeding efforts are supported in order to contribute to the EU Green Deal goals.

Organisers

Plants for the Future European Technology Platform (Plant ETP) is a multistakeholder platform representing the plant sector from fundamental research to crop production and distribution. Plant ETP brings stakeholders from the plant sector together to consider the challenges and opportunities of agricultural value chains in a holistic way, while developing a vision for future systems spanning food, feed, and biobased raw materials.

Amrit Nanda, Executive Manager, amrit.nanda@plantetp.eu, www.plantetp.eu

The **Farm Animal Breeding and Reproductive Technology Platform** (FABRE TP) is a forum led by knowledge institutes and academia in collaboration with the private sector. It provides a platform to define research priorities for animal breeding, genetics and reproduction sector to accelerate sustainability and resilience of all animal farming systems. The Platform is also active promoting research and innovation in Aquaculture and Livestock Breeding and Reproduction.

Ana Granados Chapatte, General Secretary, ana.granados@effab.info, https://www.fabretp.eu/

The **European Aquaculture Technology and Innovation Platform** (EATIP) is an industry led multi actor platform comprising representatives across the aquaculture value chain and including from primary production, supply services, academia, the research sector and NGO / civil society groups. Operating to an agreed strategic research and innovation agenda, EATiP seeks to support and promote the sustainable development of a resilient European aquatic food and aquaculture sector.

David Bassett, General Secretary, david@eatip.eu, www.eatip.eu

Animal Task Force (ATF) is a European Public-Private Partnership. ATF promotes a sustainable and competitive livestock sector in Europe. ATF is a leading body of expertise, representing key stakeholders from industry, farmers and research from across Europe. ATF is a knowledge based organisation working on the forefront of livestock related issues in Europe. Our members are representatives from knowledge providers, industry organisations and farmer organisations. They have expertise of every aspect within the livestock value chain; from feeding and breeding to production and processing.

Laurent Journaux, Secretary General, laurent.journaux@animaltaskforce.eu, www.animaltaskforce.eu

Annex

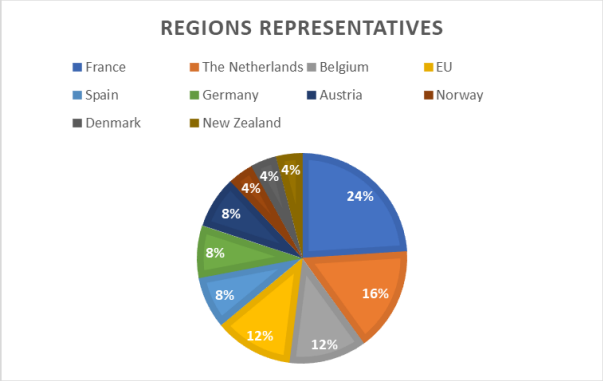
Preliminary Survey for the Workshop 23/10: How to Ensure Strategic Investment in Breeding

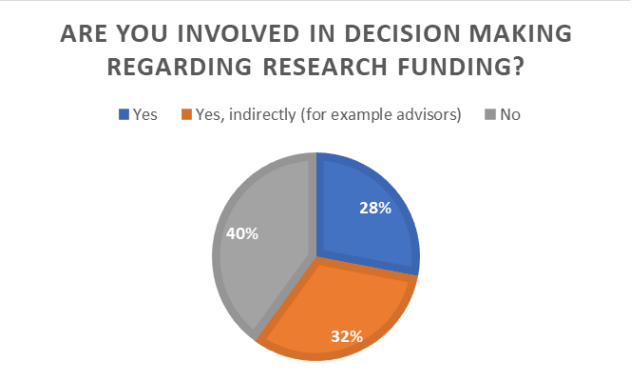
In order to prepare the workshop, invitees were asked to answer the below survey.

Disclaimer: It is important to note that this survey provides only a qualitative overview of the topic from the perspectives of a limited group of stakeholders. The results should therefore not be interpreted as providing concrete data on trends in the EU funding landscape.

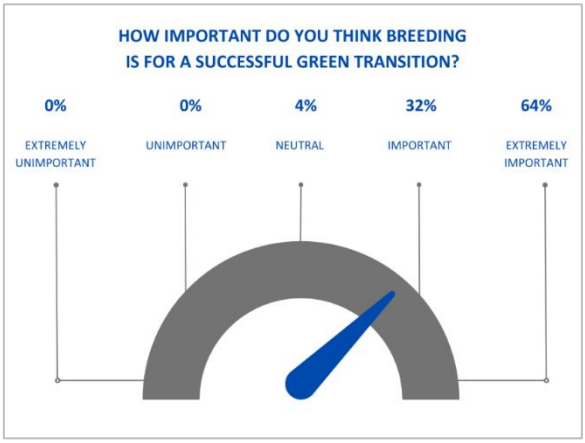
All of the invitees were relevant stakeholders from the sectors of animal and plant breeding, either representing industry, farmers, policymakers or academics.

The survey was filled out 24 respondents, from different EU and non-EU countries, with 2/3 being directly or indirectly involved in decision-making regarding research funding.



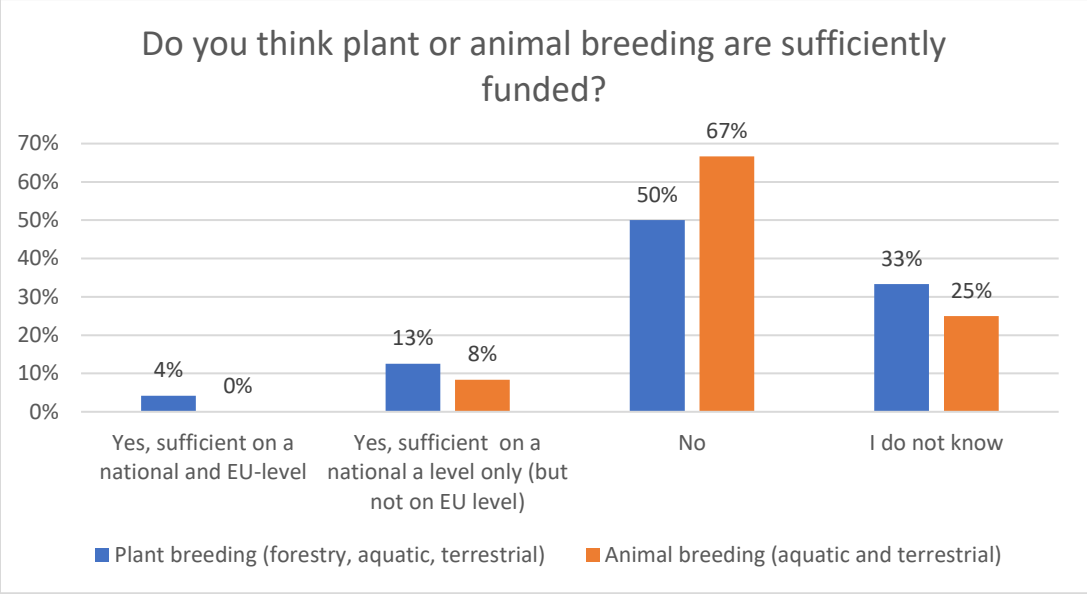


Most respondents indicated breeding as either important or extremely important for a successful green transition.



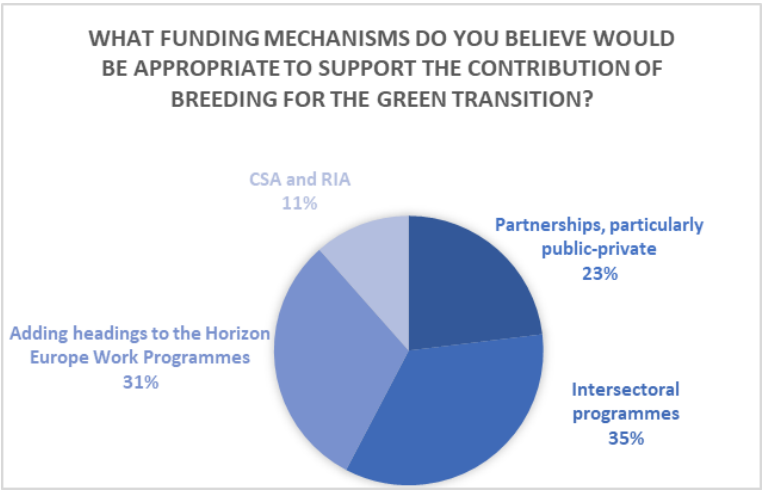
Half of the respondents thought that plant breeding (forestry, aquatic and terrestrial) is not sufficiently funded, while a third did not know. Twelve percent, considered plant breeding to be sufficiently funded at national level, but not at EU level, with a small percentage (1 respondent) considered it sufficiently funded on both levels.

In the case of animal breeding (aquatic and terrestrial), 2/3 considered it insufficiently funded, while a quarter did not know. Two respondents thought it is sufficiently funded at national, but not EU, level.



Respondents indicating that breeding was sufficiently funded, were asked to specify through which specific mechanism that was the case. The following funding sources where highlighted: private funding by breeding companies, institutional funding for strategic research centres, mitigation an adaptation strategies, national level funding.

When asked what funding mechanisms would be appropriate to support the contribution of breeding for the green transition, opinions were distributed among the different options with "Intersectoral Programmes" and "Adding headers to Horizon Europe Work Programmes" the most popular, followed by public-private partnerships. The option of a Coordinated Support Action (CSA) or



Research and Innovation Action (RIA) was the least popular.

In addition to the responses on specific point, respondents also shared general comments and perspectives on breeding efforts in Europe. As these are individual perspectives, they will not be summarised here. However, many were discussed during the workshop and are highlighted in the above report.