Plants for the Future
European Technology Platform

STRATEGIC RESEARCH & INNOVATION AGENDA

Plants for the Future ETP

Executive Summary

Plant breeding is the heart of our agri-food systems, enabling the development of plant varieties that are more productive, resilient, and resource-efficient. From early domestication to today's precision breeding, research and innovation (R&I) has driven progress in understanding plant biology and plant genetics, leveraging genetic diversity to meet evolving societal and environmental needs and challenges. In the last two decades, plant breeding alone contributed to a 67% increase in agricultural productivity in Europe[1]. As Europe faces increasing pressure to ensure food and nutritional security, while transitioning to more sustainable agri-food systems, plant breeding offers concrete solutions to deliver high-performing, multipurpose crops, that provide food, feed and biobased raw materials for the wider bioeconomy.

Europe has always been considered a front-runner in developing groundbreaking innovation thanks to its high level of scientific excellence. However, the continent now risks falling behind global competitors due to its innovation gap and the regulatory burdens that impede the translation of scientific discoveries into practical applications[2]. To regain its competitive edge, Europe must realign its R&I framework to better support the flow of innovation to the market and ensure the development and retention of scientific talent.

This Strategic Research and Innovation Agenda (SRIA) outlines the sector's vision for leveraging plant biology and breeding to its fullest potential in Europe. It presents the three key drivers for success:

- **Target – Content of R&I:** Focused on scientific priorities for R&I in plant biology and breeding
- **Framework – Process of R&I:** Addressing systemic barriers to innovation and improving the research-to-market pipeline.
- **Foundation – Communication, Engagement, and Education:** Enhancing societal awareness of the importance of plant biology and breeding, and building a skilled workforce for tomorrow.

STRATEGIC R&I PRIORITIES

1. Enhancing Plant Resilience and Productivity

To address climate change, resource scarcity and disease and pest pressures, plant breeding must integrate fundamental and applied research. Key areas include:

- Disease and Pest Resistance: Developing durable resistance through advanced breeding and biotechnological tools.
- Environmental Stress Adaptation: Improving tolerance to e.g., drought, salinity, temperature extremes, while enhancing water and nutrient use efficiency.
- Nutritional Security: Enhancing the nutritional profiles of crops for both human and animal

1 Steffen Noleppa and Matti Cartsburg (2021) The socio-economic and environmental values of plant breeding in the EU and for selected EU member states

2 Mario Draghi (2024) The future of European competitiveness Part A | A competitiveness strategy for Europe

consumption, including improving micronutrients, bioavailability, biofortification, digestibility and reduction of anti-nutrients, allergens and unhealthy components.

- Bioeconomy Optimisation: Breeding multipurpose crops and improving biomass quality and processability, to support a more circular bioeconomy and reduce our reliance on fossil fuels.

2. Leveraging Technological and Systemic Innovation

To accelerate breeding cycles and improve precision and process efficiency, Europe should invest in:

- Plant Breeding Innovation, such as New Genomic Techniques (NGTs), and AI-driven breeding to reduce time and cost.
- Public-private partnerships to bridge the innovation gap and ensure rapid deployment of new plant varieties.
- Science-based policymaking, to leverage innovation in commercial settings.
- Cross-sectoral collaboration, to learn from other sectors and fully reap the benefits of plant breeding across diverse agri-food value chains and for society.

3. Building a Strong Foundation for the Future

A thriving plant sector requires societal support and a skilled workforce. The SRIA calls for:

- Improved communication and outreach, to increase public understanding and appreciation of plant breeding and plant biotechnology.
- Educational reform, to integrate soft skills, critical thinking, and interdisciplinary knowledge into curricula.
- Career development initiatives, to attract and retain talent, including exchanges between academia and industry.
- Support for start-ups and SMEs, to foster innovation and entrepreneurship in the plant sector.

CONCLUSION

This SRIA provides a roadmap for aligning European R&I with the strategic needs of the plant sector, in order to fully leverage its contribution to agri-food systems. It is intended to guide the development of the last Horizon Europe Work Programme (2026/27), as well as the next Framework Programme (FP10). We acknowledge that R&I in plant breeding is not sufficient to address all the challenges related to climate change and the transition to more sustainable agri-food systems. However, our SRIA focusses on this field, as we see a gap between the policy goals of the EU Green Deal and the public investment in and coordination of plant breeding R&I across Europe. By investing more strategically in plant biology, plant genetics and breeding, establishing public-private partnerships, fostering innovation ecosystems, and strengthening communication and education, Europe can pave the way for more resilient, competitive and sustainable agri-food systems and a more circular bioeconomy.

Introduction

Plant breeding is the heart of our agri-food systems. From domestication millennia ago, to precision breeding in today's 21st century, plants have constantly been adapted by humans to increase performance in different environments, to adapt and better tolerate different stresses (e.g., disease, pest, drought) and be ever more nutritious, tastier and convenient. Research and innovation (R&I) has been crucial in advancing our knowledge and understanding of basic plant biological processes and how a plant's genetics determine its characteristics and performance. At the same time technological development has enabled us to better leverage this knowledge and understanding, to target variation in a plant's genome more precisely and efficiently. Thanks to these advancements, plant breeding has become less resource-intensive and able to address a wider combination of challenges and market needs.

Since the middle of the 20th century, advancements in plant breeding, coupled with the availability of fertilisers and plant protection solutions in Europe, have enabled agricultural productivity to increase, while reducing the area of agricultural land needed[3]. In the past two decades, plant breeding alone is estimated to have contributed to a 67% increase in agricultural productivity[4].

Agri-food systems play an essential role in society and continue to evolve to become even more sustainable. Like all other sectors, the agri-food system contributes to climate change, but can also mitigate this. Especially plant breeding offers a key opportunity to develop varieties which need fewer resources and are tolerant to biotic and abiotic stresses. Through innovation and improved practices, agri-food systems can support improved biodiversity ecosystems, water conservation, soil health and many other aspects. However, balancing environmental and socio-economic dimensions is extremely challenging and great care must be taken to avoid focussing on one dimension at the expense of the others. R&I plays a crucial role in addressing trade-offs between these three dimensions e.g., by developing knowledge and solutions to reduce the environmental impact of plant production, while maintaining yield stability, safeguarding farmers' income and food and nutritional security.

Europe has always been considered a front-runner in developing groundbreaking innovation thanks to its high level of scientific excellence. However, over the past decades Europe has started to lag behind its main competitors, the United States (US) and China[5]. Initially, this was mainly due to the innovation gap that exists in Europe and which still limits Europe's capacity to translate research outcomes into products, services or other benefits for society. An additional regulatory burden has also negatively impacted the valorisation of scientific discoveries. However, we are now observing increased, high quality, scientific output from these same competitors, indicating that Europe's standing in scientific excellence has also started to lag behind. In order for Europe to regain its competitive edge, it is essential that a shift is made in the goals and framework of European R&I, to better balance the needs

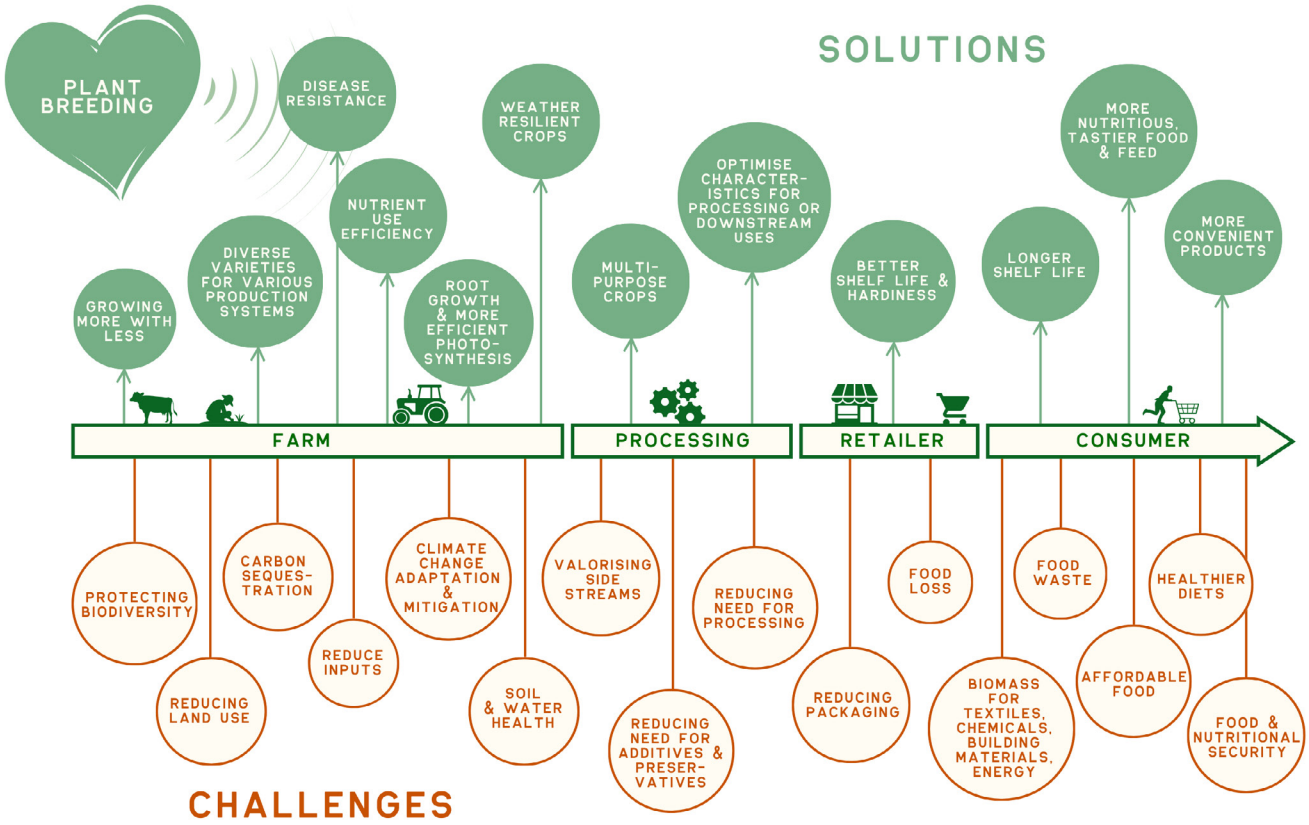
3 Our World In Data based on data from Food and Agriculture Organization of the United Nations (2023); HYDE (2023); Gapminder (2022); UN WPP (2024)

4 Steffen Noleppa and Matti Cartsburg (2021) The socio-economic and environmental values of plant breeding in the EU and for selected EU member states

5 Mario Draghi (2024) The future of European competitiveness Part A | A competitiveness strategy for Europe

of the different sectors and match policy objectives. At the same time, it is essential to ensure Europe continues to develop, attract and maintain talent for today and tomorrow.

Among policymakers and society, there is a general lack of awareness of the crucial role plant breeding plays in our agri-food systems, as well as how plant breeding contributes by addressing many of their challenges. Plant breeding is a high-proficiency field and the outcome of a wide range of disciplines within, but also outside, plant sciences.



Overview of the challenges and potential solutions across the agricultural supply chain, from farm to consumer, highlighting the role of plant breeding. Targeted innovation in plant breeding can address pressing issues such as biodiversity, climate resilience, resource efficiency, and food security, while delivering benefits throughout the value chain.

In this strategic research and innovation agenda (SRIA), we outline the R&I needs of the plant sector, with a specific focus on plant breeding, from fundamental research on basic plant biological processes, and how plants react to environmental stimuli or fight pests and diseases; to the development of new plant varieties for the market, encompassing food, feed and non-food uses, including ornamentals and raw materials for the bioeconomy. We acknowledge that R&I in plant breeding is not sufficient to address all the challenges related to climate change and the transition to more sustainable agri-food systems. However, our SRIA focusses on this field, as we see a gap between the policy goals of the EU Green Deal and the public investment in and coordination of plant breeding R&I[6], which is essential to compensate for yield losses due to less input and less available plant protection solutions. In addition, other equally relevant and complementary themes are already addressed by the current and upcoming EU R&I partnerships[7] and the [8] under Horizon Europe. These include biodiversity, water, primary

6 Plant's for the Future ETP (2024) – Trends in European Public Investment in Plant Breeding R&I

7 EU Commission website - European Partnerships in food, bioeconomy, natural resources, agriculture and environment

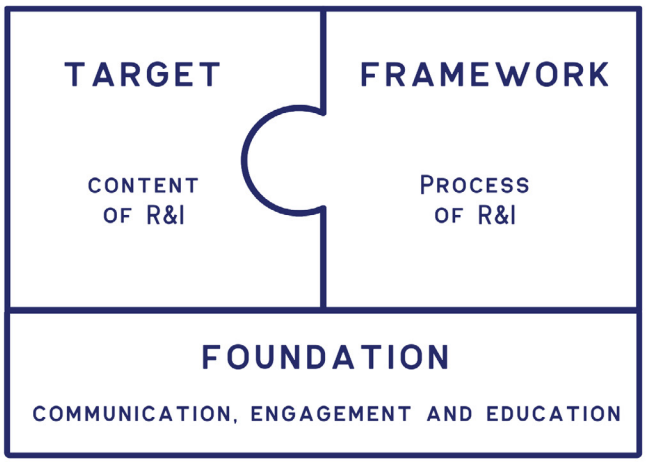
8 EU Commission website - EU Missions in Horizon Europe

production, food systems, agroecology, soil health, forestry and data management.

We welcome the acknowledgement from the Strategic Dialogue for the Future of EU Agriculture[9], as well as the Vision for the Future of Agriculture and Food[10], on the importance of plant breeding innovation, as well as the identification of plant breeding as a key strategic research area in the Strategic Plan for the second half of Horizon Europe[11]. We also appreciate the emphasis placed in both the strategic dialogue report and the EU competitiveness report on the importance of public-private partnerships. These partnerships are crucial for addressing the research and innovation gap and for rapidly transferring innovations into practical applications.

We propose that this SRIA is used to guide the upcoming discussions on the development of the future Work Programmes for Horizon Europe, and especially when developing the next Framework Programme, FP10. This SRIA should be used for scoping future R&I investment in plant breeding, from fundamental research on basic biological processes to variety development and registration, considering the three key drivers:

- **Target – Content of R&I:** outlines specific R&I topics that are crucial to reach several priority goals
- **Framework – Process of R&I:** outlines how the R&I framework should be improved to reduce the research and innovation gap and ensure the translation of research outcomes
- **Foundation – Communication, engagement and education:** outlines how to increase awareness and appreciation of the plant sector, while ensuring the next generation workforce is fully equipped for the future



Target - Content of R&I

1. Vision

The performance of a plant variety, or crop, is impacted by an array of external factors, including

9 Strategic Dialogue on the future of EU agriculture (2024) - A shared prospect for farming and food in Europe: final report

10 A Vision for Agriculture and Food - Shaping together an attractive farming and agri-food sector for future generations

11 EU Commission (2024) - Horizon Europe strategic plan 2025-2027

mounting disease and pest pressure, climate change, weather volatility and declining soil health. All these can adversely impact plant production potential and therefore food and nutritional security, as well as the availability of plant biomass for the wider bioeconomy. To maintain or increase plant production, constant productivity gains are needed. A comprehensive, multidisciplinary approach, addressing a wide range of challenges, is essential. For this, it is vital to integrate fundamental and applied research into a holistic framework. This will drive new and innovative solutions for plant adaptation, supporting both the competitiveness and resilience of European plant production, as well as the transition to more sustainable agri-food systems.

In this section we will mostly focus on the R&I needs in plant biology and breeding, as this is where we see the biggest gaps and opportunities to support the transition to more resilient, competitive and sustainable agri-food systems. We acknowledge the important role other essential areas (e.g., biodiversity, farm management, water, soil, microbiome) play in the delicate balance, that are fundamental to our diverse agri-food systems. However, as mentioned in the introduction, these are already addressed by ongoing or upcoming initiatives, and we will therefore focus on how plant biology and breeding R&I can complement these initiatives to ensure that the ambitious Green Deal goals are met.

2. Plant research and breeding

BACKGROUND

Plant variety performance is an outcome of the Genotype x Environment x Management (GxExM)[12] equation. In this equation, **G** refers to the **plant's genetics**, **E** refers to the **environment** it is faced with, and **M** refers to the **farm management practices** used to cultivate it.

These factors are interdependent and impact each other. As climate change results in a more volatile environment, with higher risk of extreme weather conditions (E), and restrictions on the use of external inputs (e.g., fertilisers and plant protection solutions) increase (M), the weight of the variety's genetic component (G) gains more importance to compensate for these factors. In this context, plant research and breeding is essential to maintain resilient and competitive EU agri-food systems, that balance environmental and socio-economic sustainability. This includes the need to deepen fundamental plant research in model and crop species, while better translating these results from basic to applied research on crop breeding.

For this, four key areas in plant research and breeding have been prioritised that, when addressed in combination, can have the greatest impact:

- **Plant disease and pest resistance**
- **Adaptation to environmental stress and resource use efficiency**
- **Nutritional security for human and animal health**
- **Optimised plant materials for the bioeconomy**

12 Cooper et al., (2022) Predicting Genotype × Environment × Management (G × E × M) Interactions for the Design of Crop Improvement Strategies

a. Plant Disease and Pest Resistance

CHALLENGES AND OBJECTIVES

Agricultural losses due to pests and diseases have significant economic impacts. Globally, pests and diseases cause up to 40% of crop losses annually, amounting to a value loss of approximately $290 billion[13]. Plant breeding enables the development of plant varieties with durable resistance to support farmers maintaining productivity and quality, whilst dealing with reduced plant protection solutions, increased disease and pest pressure and invasion by new pests that are favoured by climate change.

KEY STRATEGIC R&I AREAS AND INFRASTRUCTURE NEEDS

Disease control

Key research and innovation topics in plant disease resistance span from fundamental to applied research. Fundamental research is needed to identify and better understand the basis of contrasting plant resistance mechanisms. Fundamental research focuses on understanding the genetic and molecular mechanisms of disease resistance, including the identification of pathogen effectors and plant resistance genes, as well as the role of plant microbiomes in enhancing immunity. Fundamental research efforts focused on developing pest- and pathogen-resistant plants should encompass model species, bridging species and agricultural crops (both staple and underutilised / niche crops). Applied research aims to develop disease-resistant crop varieties through advanced breeding techniques and biotechnological approaches. Applied research should focus on how to integrate multiple resistance genes to avoid pathogens overcoming resistance, as well as assess the acceptable level of susceptibility versus full resistance (the latter drives overcoming a resistance gene). Additionally, innovations in precision agriculture and integrated disease management are crucial for effective disease control.

To address the challenge of pathogens developing resistance, research must also focus on developing durable tolerance. This involves identifying and incorporating multiple resistance genes to develop crops that can withstand evolving pathogens irrespective of farming practice.

Pest control

Key research and innovation topics in plant pest control regarding arthropods and nematodes, encompass both fundamental and applied research. Fundamental research focuses on understanding the biology and ecology of insect pests, including their life cycles, behaviours, and interactions with host plants. Fundamental research should support the identification of plant traits that represent mechanisms for host plant resistance, or reduced susceptibility to pests, exploring the physiological and genetic basis of plant defences against these pests. Fundamental research should prioritise investigation on agricultural crops and crop wild relatives and/or non-domesticated species. Based on such research outputs, applied research aims to

13 FAO (2022) FAO's Plant Production and Protection Division

develop effective control strategies, such as breeding pest-resistant crop varieties and utilising biocontrol agents.

Advanced breeding techniques, such as New Genomic Techniques (NGTs), offer unprecedented opportunities for plant improvement aimed at developing pest-resistant plants. For example, genomic approaches can be used to modify volatile compound blends emitted by the plants, in order to disrupt host-plant localisation, thereby making plants less attractive or repellent to pests. The manipulation of plant morphological features can also represent an area of improvement for pest-resistant crop that could be less attractive for herbivore arthropods and hence are less susceptible to pest attacks. Innovations in genetic biocontrol and precision agriculture are also crucial for managing insect pests sustainably.

Integrated pest management based on the integrated use of multiple pest control strategies will remain the foundation of sustainable crop protection in Europe. In this context, new pest-resistant crops should be used in conjunction with other innovative pest control solutions. In particular, the strong reduction of plant protection solutions that European agriculture has been facing these last decades, poses a severe risk for the selection of pesticide-resistant pest populations. To overcome this, it is essential to identify active ingredients for plant protection solutions, which have new modes of action (i.e., how plant protection solutions affect pest survival at the molecular and physiological level). Research should be aimed at the development of active ingredients with new modes of action that, on one hand, are highly effective against specific pests, and on the other hand, are harmless to beneficial organisms such as pollinators and natural enemies. A promising area of research is represented by the development of products based on bio-inspired technologies (e.g., RNA interference RNAi, novel insecticidal peptides)[14,15]. By discovering new modes of action, researchers can develop novel strategies that target pests in different ways, reducing the likelihood of developing resistance.

OTHER COMPLEMENTARY R&I AREAS AND INFRASTRUCTURE NEEDS

Advanced computational techniques (including Artificial Intelligence and Machine Learning) for target discovery and functional prediction are needed, specifically to complement plant breeding R&I to increase efficiency in creating more resistant and resilient plants. One example of how to gather knowledge on and identify genes conferring disease and pest resistance, would be to characterise natural diversity, first at genome level (pan-genome projects) and then to interrogate Gene bank materials both molecularly and phenotypically. Large-scale gene expression analysis can identify patterns of functional resistance genes for complementary exploitation through introgression strategies for genes from e.g., plant wild relatives or the use of new breeding methods (genome editing), to transfer resistance sources precisely from wild relatives into crop varieties. These advanced computational approaches will also benefit from the genome sequence availability of plant genomes and large strain collections (both for diseases and pests), enabling the acceleration of translational research and building a deeper understanding of host-pathogen interactions.

14 Yan et al., (2024) The new kid on the block in insect pest management: sprayable RNAi goes commercial

15 Xue et al., (2023) Plant and insect virus-like particles: emerging nanoparticles for agricultural pest management

New molecular tools, including the enablement of gene editing using NGTs with a proportionate and science-based regulation, are essential to speed up the research, development and market release of more adapted plant varieties to counteract the fast spread of newly appearing pests and diseases.

Integrated Pest Management (IPM) also remains essential and should aim to maximise and ensure yield stability. Several initiatives are already underway to develop precision agriculture, in order to optimise the application of plant protection solutions and improve economic efficiency, while reducing environmental impact to soil, water and biodiversity. Early warning systems and other Decision Support Solutions should be developed, with the aim to make them available at farm level.

Advancing biologicals solutions and improving the approval process should also be supported, as described in our recently published Policy Brief: Paving the Way Towards an Innovation-Friendly Environment in the EU: A case Study on Enabling R&I for Biological Solutions[16].

Infrastructure needs include advanced laboratories, field testing facilities, and robust data management systems to support these research activities, whilst complying with biosafety requirements e.g., for activities with quarantine insects higher-risk pathogens.

SUMMARY OF PRIORITY R&I AREAS FOR PLANT RESEARCH AND BREEDING

1. Support fundamental research including the translation of knowledge about plant defence mechanisms across a broad range of plants including staple crops and using their wild relatives), underutilised / niche crops, and the development of molecular tools to support plant breeding.
2. Develop crops with broad-spectrum and durable genetic resistance to pests and diseases through breeding to compensate for the reduced availability of plant protection solutions.
3. Implement advanced infrastructure and technologies such as remote sensing, drones, and AI for early detection and monitoring pest and disease outbreaks in glasshouses and farmer's fields, and decision-support systems.
4. Develop sustainable and environmentally friendly Integrated Pest Management (IPM) strategies that combine biological, physical, and chemical and newly developed solutions (e.g., resistant/tolerant varieties, DSS, early-detection tools and bio-inspired products) in pests and diseases control strategies for sustainable agriculture.

b. Adaptation to environmental stress and resource use efficiency

BACKGROUND

Improving plant adaptation to environmental stress, as well as improving resource use efficiency (e.g., nutrients), is crucial for enhancing crop resilience and ensuring food security. Envi-

16 Plants for the Future ETP (2024) - Paving the Way Towards an Innovation-Friendly Environment in the EU: A case Study on Enabling R&I for Biological Solutions

ronmental stresses are often compounded, such as drought, heat and extreme temperatures, and are closely interlinked with the uptake of essential resources, like water and nutrients. Therefore, a more holistic view is needed on how environmental stresses, individually as well as in combination, impact plant development and, ultimately, yield stability. Diverse tailor-made breeding strategies are needed, and more research is required to provide European farmers with more resilient plant varieties. In the following paragraphs, we highlight the priority R&I topics for ensuring adaptation to environmental stresses, as well as increased resource use efficiency (i.e., optimising the use of e.g., water, nutrients and sunlight).

KEY STRATEGIC R&I AREAS AND INFRASTRUCTURE NEEDS

Plants face various environmental stresses such as drought, salinity, extreme temperatures, and waterlogging. At the same time, access to essential resources, especially water and nutrients, is decreasing. To survive and thrive, they have developed complex mechanisms at the cellular, molecular, and genetic levels. Therefore, improving plant adaptation to environmental stress and increasing resource use efficiency, requires a multifaceted research approach including:

- **Genetic and Molecular Research**

This involves identifying and studying genes responsible for stress tolerance, as well as for efficient water and nutrient use. By pinpointing these genes, researchers can develop targeted breeding strategies to produce plants better equipped to handle environmental stress and better equipped to manage water and nutrients effectively. Additionally, transcriptomics and proteomics play a crucial role in understanding how plants respond to stress at the molecular level. By studying gene expression and protein profiles under stress conditions, scientists can gain insights into the mechanisms that enable plants to survive and thrive in challenging environments, as well as providing insights into the mechanisms that enable efficient resource use.

- **Physiological and Development Studies**

Investigating how plants physiologically respond to stress is essential for improving their adaptation. This includes examining changes in water use efficiency, photosynthesis and respiration. For example, in the case of water uptake and loss, this includes examining mechanisms like stomatal control, which regulates gas exchange and water loss, and root architecture, which influences water absorption. Similarly, nutrient use efficiency involves understanding how plants absorb, transport, and utilise nutrients. Understanding essential physiological responses to stresses and resource deficiencies helps researchers develop strategies to enhance plant resilience and incorporate them into breeding programs.

- **Plant Tissues and Architecture**

The structure and function of plant tissues play a crucial role in how plants respond to environmental stress and in resource use efficiency. Root systems, for instance, are vital for water and nutrient uptake. Deep and extensive root systems can help plants access water from deeper soil layers during drought conditions. Leaves are another critical component, as they are the primary sites for photosynthesis, where light energy is converted into chemical energy. Leaf

morphology, including size, shape, and thickness, can influence a plant's ability to capture light and perform photosynthesis efficiently. Modifications in stomatal density and behaviour can help plants optimise water use and maintain photosynthesis under stress conditions.

- **Metabolomics**

This field focuses on analysing the production of stress-related metabolites, such as osmolytes and antioxidants. These compounds play a significant role in helping plants cope with environmental stress. Osmolytes, for instance, help maintain cell turgor and protect cellular structures, while antioxidants mitigate oxidative damage caused by stress. By understanding the metabolic pathways involved in the production of these compounds, researchers can develop strategies to enhance their synthesis in plants, thereby improving stress tolerance.

- **Microbiome Research**

Exploring plant-microbe interactions is another crucial aspect of improving plant adaptation to environmental stress and especially resource use efficiency. Beneficial microbes, such as mycorrhizal fungi and rhizobacteria, can enhance plant stress tolerance by improving nutrient uptake, promoting growth, and inducing stress-responsive pathways. Additionally, microbiome engineering involves developing microbial inoculants that can be applied to plants to improve their resilience. By harnessing the power of beneficial microbes, researchers can create sustainable solutions to enhance plant adaptation to environmental stress.

By combining genetics, physiology, biochemistry, metabolomic, microbiome research and integrated approaches, researchers can develop strategies to adapt plants to varying environmental conditions and thrive with limited resources.

SUMMARY OF PRIORITY R&I AREAS FOR PLANT RESEARCH AND BREEDING

1. Identify and study genes responsible for stress tolerance and efficient resource use to develop targeted breeding strategies and precision breeding approaches.
2. Investigate physiological responses to stress, such as alterations in water use efficiency and photosynthesis, to enhance crop resilience in plant species.
3. Examine the structure and function of plant tissues, like root systems and leaves, to improve resource uptake and photosynthesis efficiency.
4. Develop strategies to regulate the synthesis of stress-related metabolites in plants, with a view to improving their tolerance to stress.
5. Identify and explore plant-microbe interactions that enhance crop resilience and resource use efficiency.

c. Nutritional security for human and animal health

BACKGROUND

Nutritional security ensures that everyone has access to a sufficient, safe, and nutritious diet to meet their needs for a healthy and active life. Plant science and breeding plays a pivotal role in developing plants with improved nutritional and sensory profiles, both for human consumption and animal feed. This requires expanding our understanding of the biochemical pathways and molecular mechanisms that determine the nutritional composition of plants, including both macronutrients (proteins, carbohydrates, etc.) and micronutrients (phytochemicals, (pro)-vitamins, trace minerals, etc.). It also includes knowledge about anti-nutrients and allergens, and how these can affect human and animal palatability, digestion and health.

KEY STRATEGIC R&I AREAS AND INFRASTRUCTURE NEEDS

- **Increasing plant nutritional quality for human food and health**

Research is needed to develop plants with improved nutritional and sensory profiles. As a basis, we need to expand our knowledge of the biochemical pathways and molecular mechanisms determining nutritional composition and allocation not only for macronutrients (proteins, carbohydrates, calcium, etc.), but importantly for micronutrients such as phytochemicals (carotenoids, flavonoids etc.), (pro)-vitamins and trace minerals (e.g., iron and zinc). With this we can better facilitate the improvement of the nutritional value and sensory profiles of e.g., cereals and vegetables (through increasing existing micronutrients and through biofortification). Research on lower-acreage or underutilised / niche plants suitable for direct human consumption should be accompanied by improving their economic performance and further increasing their nutritional quality and palatability. This must be complemented by research on bioavailability of beneficial as well as non-beneficial nutrients for human health.

- **Increasing plant nutritional quality for animal feed and forage plants**

Nutritional quality is equally important for animal feed and health, both in regards of animal welfare as well as economic profitability. More knowledge is needed to increase our understanding of the key factors affecting the quality of feed materials, including nutrient profiles, content of anti-nutrients and digestibility. Research is required towards a better understanding of the biochemical pathways and molecular mechanisms determining nutritional composition mainly for macronutrients (proteins, carbohydrates, etc.) and as appropriate for micronutrients (phytochemicals, (pro)-vitamins and trace minerals). In addition, research on anti-nutrients (bitter compounds, toxins) and digestibility is crucial to also include potential novel plant candidates, suitable for use as animal feed.

- **Improving alternative plant species**

Low-acreage and alternative plant species (e.g. Crambe, Calendula, lupines, buckwheat) can offer different balances of key nutritional ingredients and can also contribute to improving biodiversity. Approaches must include the development of economically sustainable European protein plants, including research on effective yield increase and stability and improvement of protein quality of e.g. peas, faba bean, lupine and soybean for both food and feed use. This should include improving nutritional content, removing undesirable components (e.g., off-taste, bitterness, toxins), texture and improving general palatability of food and feed products,

while optimising e.g., plant architecture and seed shattering tolerance, to increase harvestable yield to reach commercially viable levels.

OTHER COMPLEMENTARY R&I AREAS AND INFRASTRUCTURE NEEDS

Reducing food loss and waste

Currently, extensive food loss and waste occurs at all steps of agri-food value chains. Plant research and breeding should focus on characteristics for better storability and transportability, as well as extended preservation of appropriate post-harvest nutritional and sensory properties throughout processing and storage. This will increase the overall shelf life of harvested products. R&I is needed to identify and quantify those components linked to quality and storage-related losses and degradation and the development of e.g. off-flavours or toxins. Making food more attractive and nutritious for longer, by introducing added benefits, such as the presence of health-beneficial compounds (e.g. vitamins, antioxidants), or more stable pigmentation, will also help reduce the tendency to waste food at consumer level. Research is needed to identify target compounds, their related biosynthetic pathways and their underlying genetic elements. Such approaches should cover all agricultural and horticultural plants, including cereals, vegetables, fruits, herbs and spices, all of which contribute to a nutritious, varied and flavoursome diet.

SUMMARY OF PRIORITY R&I AREAS FOR PLANT RESEARCH AND BREEDING

1. Focus on **enhancing the nutritional profiles and sensory perception** of low to high acreage plants, **for human consumption**. This should include macronutrients (proteins, carbohydrates) and increasingly micronutrients (phytochemicals, vitamins, trace minerals). Understanding biochemical pathways and molecular mechanisms is vital. Bioavailability of beneficial compounds needs to be better understood and enhanced.

2. **Enhance nutritional quality for animal feed to improve** animal health and welfare. Research is needed to understand factors affecting feed quality, including nutrient profiles, anti-nutrients, and digestibility.

3. Research on **anti-nutrients** (bitter compounds, toxins) and **allergens** and their impact on health is crucial. Efforts should aim to reduce these in food and feed plants without compromising crop resilience. For feed plants, digestibility needs to be improved.

4. Developing **Alternative Crop Species**. Low-acreage and alternative plant species (e.g., Crambe, Calendula, lupines, buckwheat) can offer different balances of key nutritional ingredients and contribute to biodiversity goals. Research should focus on economically sustainable European protein plants, improving yield, protein quality, and removing undesirable components.

5. Extensive **food loss and waste** occur at all steps of agri-food value chains. Plant research should focus on better storability, transportability, and extended preservation of post-harvest sensory properties. Identifying components linked to quality and storage-related loses,

and introducing health-beneficial compounds, can help reduce food waste.

d. Optimise plant materials for the bioeconomy

BACKGROUND

It has been projected that by 2050 we will likely face a gap of 40–70% between supply and demand for biomass for food, feed, and raw materials[17]. As we move away from the use of fossil fuels, the challenge will be to balance the different needs of the bioeconomy through providing sufficient qualitative and/or nutritious food, feed, biobased raw materials and high value compounds. Plant breeding R&I will play an ever increasing role in maintaining this careful balance by **1) optimising plant biomass composition for different purposes**, thereby reducing the need for processing and transformation; and **2) the development of multipurpose plants**, from which different parts of the same plant can be used for food, feed and/or the wider bioeconomy. Such breeding targets are extremely complex and require much investment in plant research and breeding.

KEY STRATEGIC R&I AREAS AND INFRASTRUCTURE NEEDS

- **Ensuring sufficient bulk biomass for a wide range of uses**

The development of high yielding and high quality plants is essential to produce the large quantities of biomass needed to phase out fossil fuels, while supporting resilient, competitive and sustainable value chains around the wider bioeconomy. To minimise competition with food and feed production, research is needed to develop plants that can achieve maximum yields with minimal inputs, even under unfavourable climatic or soil conditions (e.g., in marginal or water-limited environments). As a further win-win, these plants should be optimised to sequester carbon in both their biomass and in the soil.

- **Avoiding competition between food, feed and raw materials**

Developing new and improving current multipurpose plants will ensure sufficient food, feed and raw materials, with no or limited competition, as they will be grown on the same area of land. Such multipurpose plants will be key to achieving a circular bioeconomy, while increasing the resilience, sustainability and competitiveness of our agri-food systems and its players. As such plants will be complex to develop, hence, research is needed to determine how to balance different traits, as well as identify the trade-offs between them. Research will also be needed to increase the value and usability of currently unused or low value plant biomass.

- **Optimising plant quality and composition to reduce the need for processing**

The quality and composition of plant biomass is the first limiting factor in its usability for the bioeconomy. This is compensated for through different processing methods requiring e.g., energy or chemicals. Research into optimising the quality and composition of specific plant tissues will be essential to tailor biomass towards lower processing requirements. This will reduce costs

17 Material Economics, 2021. EU Biomass Use in a Net-Zero Economy – A Course Correction for EU Biomass

and ultimately support scaling up of new solutions, as costs are usually the biggest barrier to their success.

- **Plants as factories for producing a variety of compounds**

Plants produce valuable natural products that can be used in a variety of products, including pharmaceuticals, fragrances, flavours and fine chemicals. They also have huge potential as factories to produce tailored high value compounds and molecules. This is the case for several algae species, grown in close circuit environments. As many sectors are looking for competitive and more sustainable sources of compounds and molecules to replace current ones, plants can offer viable substitutes. Research into the best combinations of molecules or compounds and plant species is needed, as well as on optimising processing and extraction methods.

OTHER COMPLEMENTARY R&I AREAS AND INFRASTRUCTURE NEEDS

Developing new business models supporting a more circular bioeconomy

The development of innovative agri-food produce is accelerating. The resulting products are expected to form the basis of an increasingly circular bioeconomy. New value and supply chains, such as biorefineries producing protein feed, biochemicals, biofertilisers, and bioenergy, are expected to play an ever-increasing role. Unlocking and effectively sharing knowledge in different parts of agri-food value chains will be a key prerequisite. Novel business models, co-created by key value chain actors and fostered by supportive policies, will be necessary to reward farmers and other actors for their participation in advancing agri-food sustainability and circularity.

SUMMARY OF PRIORITY R&I AREAS FOR PLANT RESEARCH AND BREEDING

1. Improve yield, composition and processability of current and new non-food plants
2. Develop new and improved multipurpose plants
3. Develop new systems and optimise current ones, to produce different compounds and molecules in plants
4. Developing new business models supporting a more circular bioeconomy

3. Cross cutting topics

BACKGROUND

As described in the introduction, plant research and breeding will be essential to ensure more sustainable, resilient and competitive EU agri-food systems. However, its impact will be limited if it is not accompanied by adapted farm management practices, increased soil health, functional biodiversity, water management, and many more aspects that are currently supported by the EU's R&I Framework Programme Horizon Europe. Therefore, this section is focused on some key cross-cutting topics, that will need to be advanced hand in hand with the development of new plant varieties, to ensure compatibility and that the sum of the parts become bigger than the whole.

a. Technology developments

BACKGROUND

Plant breeding has relied on technological advancements for almost a century, to enhance the efficiency and effectiveness of developing new plant varieties. Technological advancements through science have enabled better, quicker, and more efficient genetic progress resulting in improved varieties[18]. However, research and development (R&D) of new plant varieties remains a complex and time-consuming activity relying on the principles of genetics and high investment needs. The entire process, from performing research to the necessary crosses, testing, and eventual marketing of new varieties, can take from 8 to more than 25 years, depending on the plant species.

KEY STRATEGIC R&I AREAS AND INFRASTRUCTURE NEEDS

The primary objective is to leverage technological developments to accelerate the breeding process, making it more efficient and less resource-intensive. This includes:

Reducing Time and Costs: Utilising tools such as e.g., New Genomic Techniques (NGTs) or artificial intelligence (AI) in predictive breeding to shorten the breeding cycle.

Enhancing Precision: Improving the accuracy of genetic modifications via targeted breeding or otherwise to develop plant varieties that better meet the needs of farmers, processors, and consumers.

Encouraging Innovation: Addressing regulatory challenges to foster a more conducive environment for innovation in plant breeding.

b. Supporting diverse plant production systems

BACKGROUND

With the exception of the use of genetic modification, which is excluded from organic farming, the process of plant breeding is the same regardless of the targeted production system. Instead, the targeted plant characteristics or biological pathways investigated will vary, as different production systems face different conditions and challenges. In addition, it is not unusual for plant traits or varieties developed for a specific production systems (e.g., organic), to be re-integrated into breeding programmes targeting other production systems. The fact that most, if not all, breeding programmes are so closely interlinked presents a win-win situation for all and promotes a mutually beneficial flow of traits between different streams.

KEY STRATEGIC R&I AREAS AND INFRASTRUCTURE NEEDS

Adapting plant varieties for different production systems

18 Noleppa (2016) The economic, social and environmental value of plant breeding in the European Union

There is an urgent need to tailor plant varieties for a diverse range of productions systems, including sustainable intensification, extensive farming, regenerative agriculture, agroecology, organic agriculture, vertical farming, carbon farming, agroforestry, agrivoltaics and many more. This requires extensive research into both the challenges and requirements of each system, as well as the impact of each system on the performance of different plant species and varieties. The identification of commonalities between the different production systems and/or their impact on plant performance, will enable the identification of common breeding goals.

Research is therefore needed to

- **Expand our basic knowledge on how best to tailor different plant species to specific farm management practices** (e.g., intercropping) across growing seasons, to ensure greater yield stability and mitigate climate-associated risks to productivity, thus preserving the global competitiveness of European agri-food systems and stimulating biodiversity and associated ecosystem services.
- **Understand the cost-benefit and logistical challenges of integrating locally alternative, low-acreage or underutilised / niche, plants alongside existing staple plants**, ideally through holistic impact assessments and identifying trade-offs. This should also include post-harvest infrastructure requirements for new production chains to ensure agronomic feasibility and retain the competitiveness of European agri-food systems.

Framework - Process of R&I

1. Vision

Advancing plant science and innovation in EU agri-food systems is crucial for their competitiveness, resilience and sustainability. The EU R&I Framework Programme, organised around **Excellent Science, Global Challenges and European Industrial Competitiveness**, and an **Innovative Europe**, offers a powerful framework for driving innovation in these sectors. To strengthen Europe's position in fundamental research and ensure that scientific breakthroughs lead to tangible advancements for agri-food systems, enhanced collaboration among these different disciplines is essential.

Synergies Between Framework Programme (FP) Funding Pillars Collaborative efforts in and across FP pillars can significantly amplify research and technological advancements. By linking Excellent Science with Global Challenges and an Innovative Europe, fundamental research can more directly address critical agri-food issues, leading to high-impact solutions. This approach fosters comprehensive problem-solving, particularly in areas like climate change and sustainable farming, enhancing competitiveness and resilience across agri-food systems.

Elevating Europe's Fundamental Research Output Europe must increase investment in individual and collaborative fundamental research to stay competitive globally, especially in plant science and agriculture. Enhanced support will attract top scientists and foster international collaborations, driving groundbreaking discoveries and elevating Europe's research quality. This will ensure that scientific

breakthroughs translate into tangible advancements for agri-food systems.

Simplifying Regulations and Reducing Bureaucracy Simplifying the EU's complex regulatory environment is crucial for accelerating agri-food innovation. Adopting a pragmatic and science-based approach to regulation will speed up the development and deployment of new technologies. Openness to NGTs and precision agriculture approaches is essential for improving systems resilience, competitiveness and sustainability.

Empowering Policymakers to Drive Innovation Policymakers play a key role in shaping the future of plant science and agri-food systems. By setting clear objectives rather than prescriptive processes, they can provide strategic direction while allowing flexibility in achieving outcomes. Supporting bottom-up R&I encourages diverse solutions and drives progress from the ground up.

Initiating a Future-Focused Paradigm Shift To maintain competitiveness, Europe must embrace a transformative approach to R&I in plant science. Building an innovation ecosystem that nurtures collaboration, experimentation, and entrepreneurship will drive continuous improvement. Aligning innovation efforts with sustainability goals will ensure long-term viability and global relevance.

2. Enabling the Flow of Innovation from Fundamental Research to the Market

a. Increasing Collaborative Fundamental Research

Collaborative fundamental research forms the backbone of innovation, particularly in addressing global challenges like food and nutritional security, climate change, and sustainability. Europe must boost investment in fundamental collaborative plant research to pave the way for future-proof plants. Research actions in the Framework Programme should fund studies on basic biological processes critical to plant improvement and sustainability.

One example involves dissecting biological processes in plant-microbiome interactions to enhance current market products. Another focuses on regulating vitamin biosynthesis in plants to improve plant vitamin content for healthier diets. A third example is developing a comprehensive view of photosynthesis, from individual plants and their specific needs throughout their life cycle to the canopy and plant system level, integrating research across molecular biology, physiology, biochemistry, microbiology, ecology, and bioinformatics/AI.

b. Translational Research: Addressing the Valley of Death

Fundamental research is essential, but alone it is insufficient for market innovation. To overcome the "Valley of Death" in plant innovation, Europe needs to focus on detailed knowledge of plant species and align public research with commercial needs. Stimulating instruments that bring together actors across the R&I cycle to address the specific needs of translational research will be crucial. In addition, regulatory alignment between research and commercial settings is necessary to facilitate the efficient translation of new technologies.

Technologies like genome editing are indispensable tools for public research, and many key findings and early-stage technologies rely on the application of these tools. The regulatory burdens limiting the use of the same tools in a commercial setting in Europe, is preventing the efficient translation of newly identified technology options. In addition, a conductive technology protection system needs to be in place.

c. Driving More Public-Private Collaborative Research

Effective agricultural innovation requires multidisciplinary collaboration across research, industry, and government. Public-private partnerships should be strengthened to encompass the entire cycle from public research to commercial applications to ensure that new knowledge and technologies are generated in a fundamental research phase and effectively adopted and exploited by industry in applied and innovation phases. Balancing fundamental and applied research through early and sustained involvement of all stakeholders will ensure a faster and seamless innovation cycle from research to market. For fundamental research this can be achieved by a Stakeholder Group, while for applied research and innovation the multi-actor approach should be used as appropriate.

A good example is the EU-funded TOMRES project, aimed at improving the water and nutrient efficiency of tomato plants through a combination of innovative breeding, agronomic practices, and advanced sensor technology. By integrating multi-actor collaboration between researchers, farmers, and industry stakeholders, the project's outcomes included the development of new tomato varieties with enhanced resilience to water and nutrient stress, in combination with innovative farming techniques that reduced resource input without compromising yield or quality. These results contribute to more sustainable farming practices, helping to mitigate environmental impacts and improve plant resilience in the face of climate change.

d. Supporting High-Risk Research and Frontrunners

Frontrunners, as highlighted in the recent report on the future of European competitiveness[19], Europe must continue to support its top scientists in pursuing high-risk, high-gain research. This research is the foundation for future applied science and innovation. The European Research Council (ERC) has been instrumental in this regard and should be further supported. Ensuring that ERC grantees play a key role in translating their research into marketable innovations will enhance Europe's overall research capacity.

Investing in high-risk, innovative research is essential for groundbreaking advancements in agriculture. Europe must continue to fund new technologies like genome editing and AI-driven plant design and selection, which require multidisciplinary teams and long-term investment. These innovations have the potential to revolutionise agriculture and are essential to enable us to maintain Europe's competitive edge.

Fostering Start-Ups and SMEs is crucial for driving innovation towards the market. To strength-

19 Mario Draghi (2024) The future of European competitiveness Part A | A competitiveness strategy for Europe

en Europe's R&I landscape, a vibrant start-up ecosystem must be cultivated. Establishing strong networks and financing instruments at all levels will support the growth of dynamic start-ups and ensure their contribution to the innovation pipeline.

e. Leveraging Data for Innovation

FAIR data to accelerate innovation. Europe must ensure that large datasets adhere to FAIR principles (Findable, Accessible, Interoperable, and Reusable). Encouraging the sharing and availability of research data will enable more efficient and effective outcomes, driving progress in plant science and agricultural innovation. For more information, we refer to our chapter on Agri-Data published in a previous report[20].

Foundation – Communication, engagement and education

1. Vision

The plant sector is an essential pillar of our society. Thanks to research in plant sciences, plant breeding efforts and the work of European farmers, the EU has, over the past decades, significantly increased agricultural production to feed the growing population, while reducing agricultural land use and greenhouse gas (GHG) emissions in the last 20 years[21]. The output of the agricultural sector in the EU was valued at € 537.1 billion in 2023, of which just over half (51.3 %) came from plants[22]. Despite this, there exists a disconnection between society at large, mostly living in cities, and farmers, mostly living in rural areas, resulting in a lack of understanding of how agri-food systems function. This is also the case for the resource-intensive research and innovation that goes into developing high performing and better adapted plant varieties. As a result, citizens are often unaware of the benefits and opportunities in the plant sector, and policymakers may undertake counterproductive policy decisions which can lead to unintended consequences. Stability in current and policy directions is essential for stakeholders to feel confident to invest in the long term.

To ensure a secure foundation for the plant sector, it is essential to increase communication and engagement with a wide range of different audiences from researchers, farmers and other agri-food stakeholders to policymakers and society at large. In the case of the latter, all age groups should be targeted, with a specific focus on the youth. This will allow us to build a stable foundation that bridges the gap between the plant sector and society at large and increasing the appreciation and attractiveness of the many opportunities of pursuing a career in the plant sector.

The plant sector provides a wide range of positions ranging from low to very highly skilled jobs. To ensure the workforce of today and tomorrow, it is essential to balance basic education and training

20 Plants for the Future (2021) Plants for the Future's Perspective On Sustainable Agriculture – R&I Recommendation Report

21 Noleppa and Cartsburg (2021) The socio-economic and environmental values of plant breeding in the EU and for selected EU member states. HFFA Research

22 Eurostat (data from May 2024) Performance of the agricultural sector

for the next generation, with capacity building, re- and up-skilling and lifelong learning opportunities for the current generation. This will ensure the plant sector remains solid and that it can continue to provide high quality and more sustainable plants and raw materials for food, feed and the wider bioeconomy.

2. Communication and engagement

Key aspects of communication and engagement will be essential to increase societal awareness and appreciation of the plant sector and plant sciences, including plant breeding, while informing policy-makers and supporting more translation of research towards benefits for society.

- **Strengthen public engagement and outreach** to increase visibility and awareness of the plant sector. More opportunities should be provided and encouraged to increase engagement between the plant sector and society, for example open-day visits to companies, farms or research institutes, as well as science outreach and engagement events (e.g., Fascination of Plants Day, Open Farm Day, Researchers Night).
- **Enhance Science Communication and Training** by incorporating communication skills into education programmes as well as highlighting the benefits to research and academic institutions on the importance of good communicators to share their work and results through public engagement.
- **Shift mindsets through science communication**, from a neutral or negative perception of the plant sector towards an appreciation of the essential role it plays in providing safe and high-quality food, feed, raw materials and high value compounds for the wider bioeconomy.
- **Incorporate science outreach activities in research projects** when appropriate and provide dedicated funding by leveraging funds from the European Social Fund (ESF), to ensure pro-active citizen engagement.
- **Measure and Evaluating Impact** by establishing KPIs to track effectiveness of communication and engagement effort.

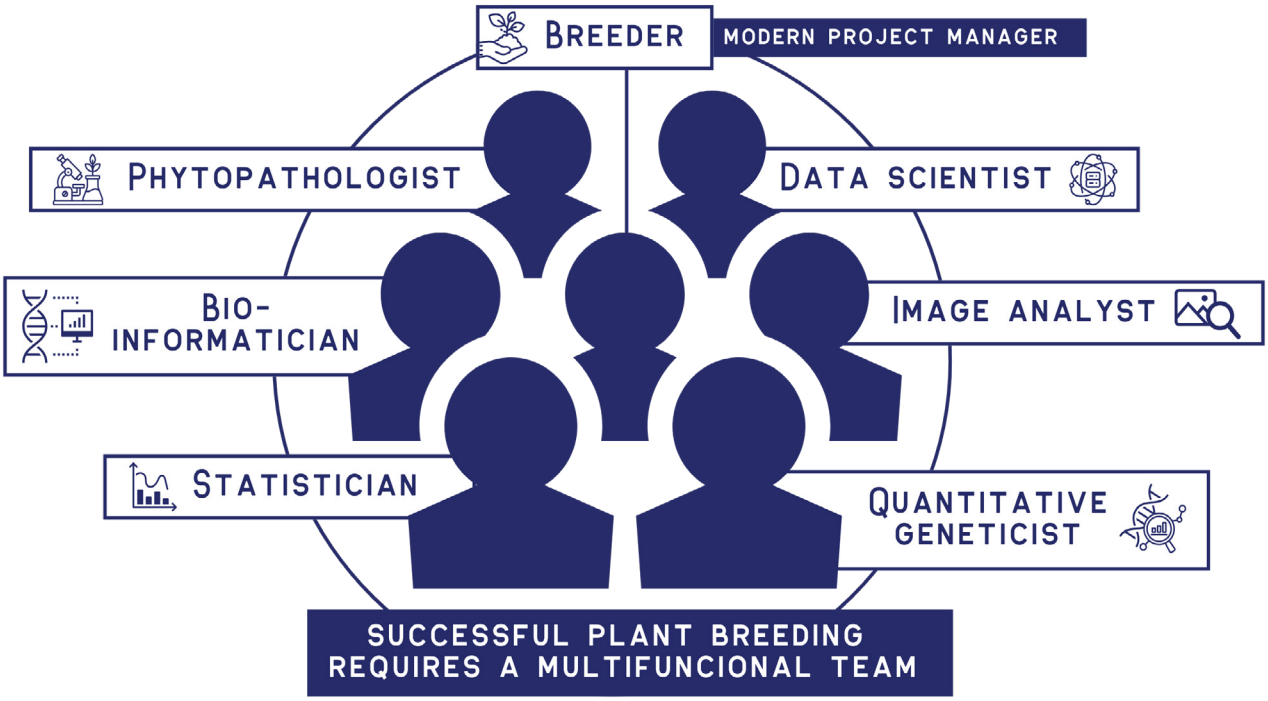
3. Increasing the attractiveness of the sector

To ensure the foundation of the plant sector, it is essential to first increase its attractiveness. In the case of primary production, farming is perceived as a challenging job that requires a high level of commitment, while reaping limited rewards. In the case of research in plant sciences and breeding new plant varieties, plant research remains less attractive and visible compared to other fields, such as biomedical research. Disproportionately restrictive legislation on plant breeding innovation, such as genetic modification and gene editing, together with misinformation and agri-bashing, has contributed to a negative perception of the plant sector. Change is needed here.

- **Teach critical thinking to discern fact from mis-disinformation**, from an early age (primary or secondary school level). Misinformation and disinformation, particularly through social media, can paint a negative or distorted picture of different sectors, including the plant sector. Incorporating the history of science into curricula, could help demystify complex topics. A specific

focus on increasing understanding of plants and plant production in an easy-to-understand manner can also encourage future scientists, as well as farmers and breeders to the sector in the future.

- **Showcase the many career opportunities provided by the plant sector** throughout the educational curricula, through e.g., farm and agri-food company visits; lectures by invited farmers, researchers or breeders; or career days that include a focus on the plant sector. This should include showcasing the wide variety of types of careers: from highly technological and data-driven to the very applied activities.
- **Stimulate and support young talent** through the organisation of challenges such as dream-teams or hackathons, to promote development of entrepreneurial and team-building skills.
- **Amplify the voices of young researchers, breeders and farmers**, by raising their visibility and network creation at EU level.
- **Ensure access to lifelong learning, capacity building, training, and re- or up-skilling** throughout one's career path.
- **Automation** of dull, repetitive or dangerous tasks can also help increase the attractiveness of the sector.



Visual representation of the diverse and interdisciplinary roles essential for successful plant breeding. This infographic underscores the importance of showcasing the wide range of career opportunities in the plant sector, from breeding and data science to bioinformatics and project management, as part of broader efforts to increase the sector's attractiveness, improve education, and support lifelong learning.

4. Improving formal education for the plant sector

Ensuring the foundation of the plant sector also requires ensuring formal education curricula are aligned with the future needs of the sector. While this section is focused primarily on formal education, mostly at university level, many other ways to learn exist. Informal education, lifelong learning,

training, capacity building, up- and re-skilling opportunities can complement formal education throughout one's career.

- **Integrate more soft skills into typically hard skills curricula**, complementing more traditional knowledge on e.g., genetics, agronomy, biology etc. with more versatile knowledge on e.g., leadership, adaptability, management and problem-solving.
- **Include civic studies for better understanding** of the plant sector in the wider socio-political landscape
- **Encourage development of transferable skills** to enable movement towards the plant sector from different interdisciplinary fields and majors e.g., bioinformatics, IT, robotics.

5. Enabling transfers between academia and industry, and between countries

This section is particularly focused on establishing bi-directional exchanges of knowledge, know-how and staff between academia and industry and across borders. This would enable closer collaboration between the public and private sectors, increase career opportunities for highly skilled researchers beyond public research, and support the seed and breeding sector in identifying, training and recruiting tomorrow's workforce.

- **Provide more opportunities for conducting part(s) of educational curricula in companies**, to gain hands on experience, build soft skills and develop insights into the opportunities available in the private sector, as well as its needs in terms of research outputs. By better understanding the priorities of the private sector, academic research can better tailor their own research and outputs to increase their translational potential, thereby narrowing the innovation gap. Some examples through Marie Skłodowska Curie fellowships or Erasmus programmes already exists, but opportunities should not be limited to university education and should benefit secondary education curricula as well.
- **Facilitate the exchange of researchers between the private sector and academia**, to foster exchanges between the public and private sector and enable the public sector to benefit from knowledge, know-how and soft skills from the private sector. For this, it will be essential that researchers are assessed for their knowledge, skills and experience, rather than on their publication metrics only.
- **Promote interactions between the public and private research sector**, through for example, guest lectures on relevant research topics and career talks.
- **Retain and attract talent in plant breeding (back to Europe)** from across different countries to increase knowledge exchange and improve opportunities for collaborations.

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What is Plants for the Future ETP?

Plants for the Future ETP promotes the flow of innovation to the market for the benefit of society. We are a multi-stakeholder platform representing the plant sector from fundamental research to crop production and distribution. We bring stakeholders from the plant sector together to consider the challenges and opportunities of agricultural value chains holistically, while developing a vision for future systems spanning food, feed, and biobased raw materials.

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