
Plants for the Future ETP input to the EC consultation on Horizon 2020 Societal Challenge 2, WP 2018-20

Challenges for Europe and globally such as food- and nutritional security, climate change, human health and sustainable agriculture can be addressed by an integrated approach towards increasing crop productivity, quality and sustainability by joint actions of the sectors involved. For the first time in the modern history, middle-income countries invest more in public agricultural R&D than high-income ones. Moreover, industry investment in this area increased and reached on average 52.5% of overall spending in high-income countries and 35.5% in middle-income regions in 2011 [1]. It is therefore essential to provide more and sustained public funding for agricultural R&D to complement private investments, especially that plant science and breeding has already strongly contributed to European economy, environment and society at large. According to a recent study [2], since 2000 EU plant breeding has largely improved global food supply - enough to additionally feed 160 million people with kcal. Thanks to innovation in plant breeding over the last 15 years the EU's wheat harvests have grown by more than 22 million tons, which is enough for 64 loaves of bread for every person in EU. Additionally, it allowed EU farmers to grow an extra 10 million tons of potatoes every year, which is more than the annual potato output of the whole of Poland. Without the last 15 years of plant breeding, prices at international agricultural commodity markets would have been 3 to 10 % higher they are at present and the EU would have become a net importer in all major arable crops, including those that are currently exported – potatoes, wheat and other cereals. In the future, European plant scientists and farmers hope to achieve even more, increasing the harvest of main crops by 76 million tons using plant breeding by 2030 [2]. The scientific and technological advances in the plant sector have the potential to enable further contributions:

1. Addressing Climate change and resilience on land and at sea (2.1. in the Draft Scoping Paper)

Addressing climate: Building a climate and global change-resilient primary production system (Food 2030 initiative; DG RTD)

Addressing priority 1: resource management (notably soil, water, biodiversity) and 2: healthier plants and animals (Strategic approach to EU agricultural research and innovation; DG AGRI)

[1] Pardey et al.: Agricultural R&D is on the move, Nature 303, 301-303, 2016, www.nature.com/polopoly_fs/1.205711/menu/main/topColumns/topLeftColumn/pdf/537301a.pdf

[2] The economic, social and environmental value of plant breeding in the European Union. An ex post evaluation and ex ante assessment, HFFA Research GmbH (2016), <http://bit.do/plantetp-HFFAResearch>

- 1.1. Improving plant health by tackling ongoing diseases and resistance to pests with major impact in Europe and strengthening efforts anticipating emerging diseases.
 - a) The resources, information and tools required to reducing the incidence of plant pathogens in seeds and major crops will be established (closer to market).
 - Developing IPM strategies to prevent or ameliorate both existing and emergent plant diseases.
 - Efficient identification and/or design of new resistance alleles to be used by the seed industry, as well as methods to forecast durability of resistances when deployed in the field.
 - b) Develop knowledge and technology relevant to plant health and the defence against current and new threats and on breeding improved plant varieties with resistance to plant pathogens and on management practices (closer to research).
- 1.2. Improving yield and securing reliable harvests for increased resilience in dynamic environments; (including tolerance to abiotic stress in changing climate).
- 1.3. Improving the efficiency of plants for the use of nutrients.

2. Addressing functional ecosystems, sustainable food systems, healthy lifestyles (2.3. in the Draft Scoping Paper)

Addressing nutrition: Reducing hunger, malnutrition, diet-related illnesses, fostering sustainable diets and healthy lives (Food 2030 initiative; DG RTD)

Addressing priority 2: healthier plants and animals (Strategic approach to EU agricultural research and innovation; DG Agri)

- 2.1. Develop plants for human nutrition and health.
 - a) developing plants with improved composition for human nutrition and health – increase understanding of which phytonutrients promote health and protect against chronic diseases; increasing (biofortification) or decreasing the content and bioavailability of certain ingredients in plants which can help fight obesity, allergies, cholesterol, diabetes and other chronic diseases. Examples are increasing the content of antioxidants (fruits, vegetables) or changing the fatty acid composition for healthier vegetable oils (oilseed rape, sunflower); Plants for human nutrition and health.
 - Provide tailored plant raw materials for specific health benefits;
 - Develop and use model foods for phytochemical bioactive compounds to reduce the risk of chronic non-communicable diseases (R&I);
 - Improve cross-sectorial approach to nutritious food as a driver for food security (CSA).
 - b) Plants for human nutrition and health – Improving and promoting diverse crops for diverse diets: Improving the economic performance (incl. resistance to diseases) and value of underutilised and often nutritious crops in Europe and globally. Modern varieties have a better shelf life and in some cases they are designed to avoid discarding edible parts.
- 2.2. Develop plants with improved composition for animal nutrition, animal husbandry and farmed fish production.

- a) Develop and use plants as animal feeds to improve the quality of animal products and human health.
- b) Plants for fish feed – collaborate with CAN (transatlantic coop) (replacing fish oil, fish meal, antioxidants).
 - Create a sustainable source for farmed fish feed by improving / modifying plant secondary metabolites to benefit fish nutrition and human nutrition.
 - Investigate and validate these novel plant-made products as being appropriate substitutes for oceanic-derived materials.

3. Addressing the transition towards a circular Bioeconomy (2.2. in the Draft Scoping Paper)

Addressing sustainability: Implementing sustainability and circular economy principles (Food 2030 initiative; DG RTD)

Addressing priority 1: resource management (notably soil, water, biodiversity) and 2: healthier plants and animals (Strategic approach to EU agricultural research and innovation; DG AGRI)

- 3.1. Improving resource use efficiency and resource stewardship – through new varieties with improved tolerance to extreme weather conditions or improve the nutrient and water use efficiency;

4. Addressing boosting major innovations on land and sea – new products, value chains and markets (2.4. in the Draft Scoping Paper)

Addressing Innovation: Boosting market creating innovation and investment, while empowering communities (Food 2030 initiative; DG RTD)

Addressing priority 3: Integrated ecological approaches from farm to landscape level and cross-cutting issues: systems approaches; enabling research and infrastructures (Strategic approach to EU agricultural research and innovation; DG AGRI)

- 4.1. Production of plant secondary metabolites for chemicals /materials, as well as production of high value plant made pharmaceuticals for human health: green bioactive molecules - secondary metabolites & green proteins (reinforcing and strengthening the support started in WP 2017)
 - a) Small green molecules - Expanding the range of bioactive natural compounds for industrial application.
 - Small molecule compounds already identified for specific uses: take them further to be available for industrial use [bring closer to market];
 - Identify new small molecule compounds or new functions of known molecules [early stage];
 - Modulate biosynthetic pathway by synthetic biology approaches to improve productivity and to create new molecules [early stage];
 - Increase productivity by optimizing plant cultivation and downstream processing.
 - b) Green proteins – innovative plant molecular farming approaches’.
 - Establish translational projects to bring plant-produced proteins to clinical trials and the market [bring closer to market];
 - Identify suitable target proteins for plant molecular farming [early stage];
 - Modulate plant cells by synthetic biology approaches to improve performance and productivity [early stage];

- Increase productivity by optimizing plant cultivation and downstream processing.
- 4.2. Enabling technologies.
 - a) Further improve NBTs (e.g. CRISPR-Cas by establishing efficient marker-free gene editing technology in crop species and provide proof of concept for agronomically beneficial traits);
 - b) Develop and share knowledge and data, identifying typology of approaches and making progress toward an equitable use of pre-breeding.
 - 4.3. Full assessment of the potential of NBTs (e.g. the CRISPR-Cas system) and supporting adequate regulatory framework enabling development, uptake and use of next-generation plant breeding techniques to drive innovation for a wide range of plant species, including minor crops and speciality markets.
 - 4.4. Creating and implementing knowledge with the multi-actor approach by integration across the entire agri-food/non-food value chain.
 - a) Contractual Public Private Partnership for Integrated Crop Production in Europe (ICP-cPPP) to establish a collaborative, EU-wide Public-Private Partnership in the agri-food/non-food value chain, integrating all relevant research disciplines, technologies and farming management practices, aligning stakeholder agendas, company commercial goals and government policy objectives in order to define and deliver sustainable improvement of EU crop production systems. Such an industry driven European framework is needed to improve production in competitive and sustainable cropping systems and to fill the existing gaps to establish fully integrated agricultural value chain.

5. Addressing developing smart, connected territories and value chains in rural and coastal areas (2.5. in the Draft Scoping Paper)

Addressing Innovation: Boosting market creating innovation and investment, while empowering communities (Food 2030 initiative; DG RTD)

Addressing priority 4: new openings for rural growth and cross-cutting issue: Information and Communication Technologies (ICT) as an enabler (Strategic approach to EU agricultural research and innovation; DG AGRI)

- 5.1. Enabling Digital Farming Practices – improving methods and management of farming and production systems.

6. As horizontal measures underpinning the contributions mentioned above, Europe urgently needs to:

- 6.1. Incentivise outreach activities of scientists (public and private) across Europe and above: stakeholders should be encouraged to initiate and coordinate snowball-principle bottom up activities at European or even global scale, incentivised by competitive European funding to support the central coordination and core resources.
- 6.2. Drive agricultural research and innovation with / for developing countries (reinforcing and strengthening the support started in WP 2016).
- 6.3. Facilitate advancement of and access to state of the art infrastructure for research and innovation in the plant sector highly relevant to FNS: Perform a gap analysis (build on the example of phenotyping via the EMPASIS project) and advance the

issues of data management and standardisation (as recently initiated by ERA-CAPS).

6.4. Have the entire collaborative Research and Innovation Cycle in the Societal Challenges, composed of basic research, applied research, demonstration and innovation actions. Currently SCs include applied research, demonstration and innovation actions. Missing are:

a) Basic collaborative research which can be included through a combination of:

- collaborative basic research as intrinsic part of R&I projects;
- collaborative basic research as focus of collaborative projects: basic biological processes relevant to crop improvement e.g. on plants & microbiomes; plant health; photosynthesis; plants for human nutrition and health;
- collaborative basic and applied research via broader ERA-Nets COFUND (e.g. like ERA-CAPS).

b) Research-innovation interface (bi-directional) which can be included as virtual centre for translational research (slim form of current cPPPs) – e.g. on Integrated Crop Production.

Contact

Aleksandra Malyska, Executive Manager ETP 'Plants for the Future'

Tel: +32 2 743 28 65

Email: aleksandra.malyska@plantetp.eu

About ETP Plants for the Future - www.plantetp.org

The European Technology Platform 'Plants for the Future' (Plant ETP) is a stakeholder forum for the plant sector that brings together members from industry, academia and the farming community. The industrial sector is represented by the European Seed Association (ESA) which represents itself the totality of the European seed industry (more than 7000 companies, 90% of which are SMEs) active in research, breeding, production and seed marketing. A certain number of individual companies are also direct members of Plant ETP. The academic sector is represented by the European Plant Science Organisation (EPSO), an independent academic organisation with over 220 research institutes, departments and universities as institutional members and 3.200 Personal Members, representing over 28 000 people working in plant science. The farming sector is represented by Copa-Cogeca, the European organisation for farmers and their cooperatives. Copa represents over 13 million farmers whilst Cogeca represents the interests of 38,000 agricultural cooperatives.