

# Plant for the Future's contribution to A Call for Evidence for the initiative Towards a Circular, Regenerative and Competitive Bioeconomy

## Harnessing plant breeding for a more circular bioeconomy

It has been projected that by 2050 we might face a gap of 40–70% between supply and demand for biomass for food, feed, and raw materials<sup>1</sup>. 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 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 both plant research and breeding.

Below are some examples of how plant breeding can further support more sustainable and circular bioeconomy.

### Ensuring sufficient bulk biomass for a wide range of uses

The development of high yielding and high quality plants will be essential to produce the large quantities of biomass, that will be 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, the development of plant varieties, that can achieve maximum yields with minimal inputs, even under unfavourable climatic or soil conditions (e.g., in marginal or water-limited environments), will be essential. As a further win-win, these plants should be optimised to sequester carbon in both their tissue and in the soil, thereby contributing to mitigating climate change and increase soil health.

### Avoiding competition between food, feed and raw materials

Developing new, and improving current, multipurpose plants will ensure sufficient food, feed and raw materials, while limiting 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,

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<sup>1</sup> [Material Economics, 2021. EU Biomass Use in a Net-Zero Economy – A Course Correction for EU Biomass](#)

sustainability and competitiveness of our agrifood systems and its players. As such plants will be complex to develop, research involving the collaboration between the public and private sectors will be needed to determine how to balance different traits, as well as identify the trade-offs between them. This includes increasing 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 wider bioeconomy. This is compensated for through different processing methods requiring e.g., energy or chemicals. Breeding fit-for-purpose plant varieties that have been optimised in the quality and composition of their specific plant tissues will be essential to tailor biomass towards lower processing requirements. This will reduce costs and ultimately support scaling up of new solutions, as costs are one of the biggest barriers to their success.

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

Plants produce valuable natural compounds that can be used in a variety of products, including pharmaceuticals, fragrances, flavours and fine chemicals. They also have huge potential as small 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. Investment in breeding the best combinations of molecules or compounds into different plant species is needed, as well as in optimising processing and extraction methods.

### **Developing new business models supporting a more circular bioeconomy**

The development of innovative agrifood 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 agrifood value chains will be a key prerequisite, while new connections between previously siloed value chains will be needed. 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 agrifood sustainability and circularity.