

## **Joint Call Text description of thematic area:**

### **“Food Crops and Biomass Production Technologies”**

#### **Context**

Against a background of changing global climate and shifting arable land ranges, plant and soil sciences play an increasingly important role in finding solutions to the internationally shared challenges of ensuring stable, safe and sustainable agricultural and biomass production. Moreover, there are growing demands for high-value agricultural products with substantially improved quality or novel functionality. In order to effectively meet these challenges and demands however, knowledge obtained from basic plant and soil sciences must be connected to innovative application in agriculture and plant cultivation. Specifically, it is necessary to foster the development of sophisticated – and environmentally-adaptive – plant breeding and cultivation technologies by collecting and analysing various data from a new perspective, incorporating molecular biology, chemistry, genetics, synthetic biology, ecology, pedology, engineering, ICT, statistics and information sciences with basic plant and soil sciences. By analysing “big data” such as various omics data enabled by advances in sequencing and measurement technologies, quantitative phenomics data obtained via smart imaging techniques, as well as quantified environmental factors, it is possible to build predictive models of various plant phenotypes such as growth, metabolism, soil and micro-organism interactions, and environmental responses and to create systems for plant design on the foundation of these models for improved breeding and cultivation technologies verified and demonstrated in the field. If we can achieve this goal of enabling the design of food and biomass plants that are adaptable to environmental changes, have increased yields and quality or even novel functionality, it would contribute significantly to achievement of sustainable and highly productive agriculture.

## Scope

The overall aim of this call is to support scientific research to further our understanding of the various phenotypes of useful food crops and biomass (including also algae biomass) plant species under a variety of environmental conditions towards improved yield and quality/functionality of those species under changing global climate.

Research proposals selected for funding in this call are expected to produce outcomes that will contribute to improved design, control of growth and increased production and quality of important food and biomass plants (solanaceous, cruciferous, leguminous and gramineous plants, etc., including also algae biomass), based on a comprehensive and either ex situ (mesocosms) or field-verified understanding of their various phenotypes enabled by advanced sequencing and measurement technologies as well as agricultural technologies taking into account the soil functioning.

Intensive research is required, for example, in: 1) Comprehensive omics analysis of plant and algal growth, metabolism and responses to environmental factors and biotic/abiotic stresses; 2) Better understanding of plant/soil/atmosphere interactions including nutrients transfers, importance of soil pedology and soil associated biodiversity; 3) Development of more sophisticated and high throughput quantitative analysis techniques (including imaging and sensing technologies) for plant and algal phenomics; 4) Construction of predictive models of various plant and algal phenotypes based on the combination of omics and phenomics data using bioinformatics and statistical approaches; 5) Development and advancement of plant and algal modification and cultivation techniques, agricultural practices and design systems (i.e. genetic engineering and cross-breeding to realise desired phenotypes in response to certain environments) and demonstration in the field or with ex situ controlled conditions experiments.

This Joint Call in the field of Food Crops and Biomass Production Technologies is not exclusive to the above mentioned research issues, but is also open to any other issues addressing progress in this field of research. Proposals that are oriented towards emerging technologies and ideas based on unique and innovative concepts are encouraged.

*N.B. each of the participating funding agencies reserves the right to exclude any particular aspect of this thematic description – such as the industrial use of biomass – from what they are able to fund.*

*Applicants should thoroughly check the relevant national/regional regulations of the Joint Call Text to confirm the precise eligible research scope for their country/region.*

**List of Keywords:**

1. Plant sciences
2. Plant secondary metabolism
3. Metabolomics in plants
4. Plant omics (genomics / epigenetics / transcriptomics / proteomics / metabolomics)
5. Gene expression
6. Plant physiology
7. Plant cell signaling
8. Plant phenomics and systems biology
9. Plant (bio)informatics
10. Soils, transfers and interactions
11. Microbial ecology and microbial interactions
12. Biogeochemistry
13. Measurement of environmental conditions
14. Environmental adaptability
15. Biological indicators (Biomarkers)
16. Cultivation technologies
17. Predictive plant models
18. Plant environmental response mechanisms
19. Field-verification
20. Environmentally-adaptive plant design
21. Stress tolerance including biotic and abiotic stress
22. Plant breeding/cross-breeding
23. Functional foods
24. High-nutrition crops
25. Biomass yield and quality
26. Algae biomass production
27. Food crop yield and quality
28. Biotechnological and conventional plant breeding methods
29. Field-based plant research
30. Omics analysis in the field
31. Economic crops