

## Short description of project funded by CORE Organic II partners in the second call of CORE Organic II

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| <p><b>Project short name and title</b></p> <p>COBRA: Coordinating Organic Plant Breeding Activities for Diversity</p>  |
| <p><b>Project summary</b></p> <p><i>Organic plant production is currently challenged by several pressure factors. Along with perennial problems such as weed control, climate change is threatening to affect crop production through increasing weather variability. Plant breeding is a crucial factor in creating organic crop production systems that can better cope with such interacting stresses and producers need crop varieties with (a) good resistance against pests and diseases, esp. seed borne diseases; (b) the ability to react to environmental, esp. climatic variability; and (c) high competitiveness against weeds. COBRA aims to support and develop organic plant breeding and seed production with a focus on increasing the use and potential of plant material with High genetic Diversity (Hi-D) in cereals (wheat and barley) and grain legumes (pea and faba bean) through coordinating, linking and expanding existing breeding and research. Although Hi-D-based systems have shown promising results in organic systems and are currently subject to intensive research, their benefits can at present not be exploited, due to agronomic, regulatory and other hurdles. Also, it is currently unclear which plant breeding approaches, Hi-D-based or else, are most efficient to breed varieties for organic agriculture. Therefore, COBRA aims (1): To improve methods ensuring seed quality and health; (2) to determine the potential to increase resilience, adaptability, and overall performance in organic systems by using crop diversity at various levels; (3) to improve breeding efficiency and to develop novel breeding methods to enhance and maintain crop diversity; (4) to identify and remove structural barriers to organic plant breeding and seed production; and (5) to improve networking and dissemination in organic plant breeding. COBRA's strength is its focus on coordinating, linking and expanding ongoing organic breeding activities in cereals and grain legumes across Europe, drawing together experts from previously fragmented areas.</i></p> |
| <p><b>Aim, objectives and hypotheses</b></p> <p><i>Aims and objectives: COBRA aims to support and develop organic plant breeding and seed production in Europe with a focus on increasing the use and potential of plant material with High genetic Diversity (Hi-D), such as Composite Cross Populations (CCPs) and other genotype mixtures through coordinating, linking and expanding existing breeding and research in cereals (wheat and barley) and grain legumes (pea and faba bean). Specific objectives are (1): To improve methods to ensure seed quality and health; (2) to determine the potential to increase resilience, adaptability, and overall performance in organic systems by using crop diversity at various levels; (3) to improve breeding efficiency and to develop novel breeding methods to enhance and maintain crop diversity; (4) to identify and remove structural barriers to organic plant breeding and seed production; and (5) to improve networking and dissemination in organic plant breeding.</i></p>   |

*Main hypotheses: (1) The yield, resilience and quality of organic field crops can be improved by a targeted and coordinated research and breeding effort; (2) The potential of Hi-D in terms of delivering high productivity and resilience in organic farming can be increased through improved seed health and quality tools and breeding strategies; (3) Hi-D-based breeding and breeding of pure lines for organic farming benefit from each other.*

### **Expected results and their impact/application**

The COBRA network constitutes a unique opportunity to link up existing organic breeding initiatives via coordinated research and development across the whole sector. COBRA aims to achieve a breakthrough with regard to organic plant breeding in Europe by removing or lowering several technical and structural barriers in the sector. This includes, for the first time, (1) a large-scale multi-partner coordinated approach in Europe to tackle seed borne diseases in grain legumes and major cereals, using cutting edge technologies; (2) a systematic approach to improve plant breeding efficiency in an organic context including legal issues pertaining to Hi-D breeding; and (3) the identification of grain legume accessions with high resilience to climatic fluctuations. Highlights of novel methods include (1) the development of non-destructive NIRS-based single seed diagnostics to make seed screening faster and less expensive; (2) the use of evolutionary breeding to increase tolerance for climate variability and (3) to use composite cross populations for selecting for early vigour and root growth.

**Farmers:** New wheat, barley and grain legume varieties better adapted to organic conditions available with (1) resistance to seed borne diseases (incl. *Tilletia*, *Ustilago* and others); (2) higher competitiveness and early vigour; (3) resilience against climatic fluctuations; and (4) high stability in yield and protein content; tools and recommendations available for safer seed saving (reducing input costs); increased knowledge about optimal management of plant genetic resources on-farm; empowerment and capacity building.

**Seed producers:** Quicker or cheaper tools for seed health diagnostics and for seed quality improvements; better varieties with fewer seed health problems.

**Breeders:** Increased availability of breeding material resistant to seed borne diseases; increased knowledge on most efficient breeding tools and methods; improved efficiency of selection and evaluation tests on plant and seed level; easier access to information on breeding material; improved training of potential recruits in organic plant breeding; increased knowledge on most successful organizational and financial models to fund organic plant breeding; strengthening of the whole organic breeder sector through networking.

**Processors and traders, consumers:** Benefit through higher quality and more choice of organic produce; improved linkages with breeders. Higher commercial competitiveness of organic products.

**Policy makers:** Clear information on current legal, institutional and socio-economic drivers hurdles, and potential incentives for the organic breeding and seed sector.

**Society:** Improved stability in yield performance through climate resilience and Hi-D contribute to food security. Larger diversity in breeding strategies, and new alternatives for cooperation between breeders,

processors, traders and consumers.

### **Coordinator, partners and countries involved**

#### **Coordinator:**

Dr Bruce Pearce. The Organic Research Centre, UK

#### **Partners:**

Aegean Agricultural Research Institute, TU

Aalborg University, DK

Agrologica, DK

Associazione Italiana per l'Agricoltura Biologica, IT

Aarhus University, DK

Bioforsk Organic Food and Farming, NO

University of Natural Resources and Applied Life Sciences, AT

University of Copenhagen, DK

Centro di Ricerca p. l. Produzioni Foraggere e Lattiero-Casearie, IT

Centre de Recherche Public-Gabriel Lippmann, LU

INAGRO, BE

National Institute for Agricultural Research, F

Technical Institute of Organic Farming, F

Institute for Sustainable Development, SI

Knudsen Plant Breeding, DK,

Kassel University, DE,

Lantmännen SW Seed, SE

MTT Agrifood Research Finland, FI

Nordic Seed, DK

SRUC, UK

Sejet Plantbreeding, DK

Swedish University of Agricultural Sciences, SE

Technical University of Denmark, DK

Technische Universität München, DE

Knowledge Centre for Agriculture, DK

Bayer. Landesanstalt für Landwirtschaft, DE

University of Udine, IT

University of Maribor, SI

University College Ghent, BE

Oikos - Organic Norway, NO

Forschungsinstitut für Biologischen Landbau, CH

Graminor, NO

Jõgeva Plant Breeding Institute, EE

Organic Seed Producers, UK

State Priekuli Plant Breeding Institute, LV

State Stende Cereal Breeding Institute, LV

Agricultural Institute Hungarian Academy of Sciences, HU

Saatzucht DonauGesmbH & CoKG, AT

Nordic Genetic Resource Center, SE

Louis Bolk Instituut, NL