

Expression of Interest: Centre/network of Excellence - GENCROPIMP

EoI short document: Centre/network of Excellence "Genetic Crop Improvement"

Need and Relevance

Background

European agriculture and food industry operates in environment with increased consumer demands for safer and healthier food, sustainable and secure use of agricultural products resulting from climate change, and production of renewable bio-resources. It is therefore important to use new and innovative techniques of genetic crop improvement to increase the competitiveness and environmental sustainability of the crop sector as well as to exploit new and emerging research opportunities that address social and economic challenges. The set of techniques commonly referred to as biotechnology has introduced a new dimension to such technology and is used by plant breeders within Europe. However there is need to integrate all efforts of European research institutions in use of biotechnology in genetic crop improvement.

Key core technologies are needed to supply the appropriate crops and ultimately food products for changing consumer demands and attitudes toward food. The benefits of biotechnology for the crops sector and consumers are far-reaching. Biotechnology brings cost savings by better understanding of the biology of pests, diseases and other threats, sustainable pest management tools to improve plant health. In addition, it helps to obtain premiums for crops with improved traits. Biotechnology also offers the opportunity to minimise environmental risks by lowering the need for agricultural chemical applications and will be of benefit to the consumers by making food products safer (diet related diseases and disorders), more nutritious, longer lasting and less costly.

The complexity of biological systems coupled with the explosion in gene sequence information mandates the need for multidimensional methods for gene expression analysis. This type of knowledge is crucial for effective genetic crop improvement and close co-operation between European research institutions resulting in creation of European Research Area in genetic crop improvement is needed. Plant genome scientists increasingly employ DNA chips in research, and functional analysis of the genome through such approaches as gene knockout. Such tools are essential for genome researchers to move beyond sequencing and into the next phase of research where they conduct enormously large-scale gene discovery surveys and gene expression analyses. To realise these objectives an integration of multidisciplinary research groups is required. These research groups should cover a broad range of specialities found throughout Europe: (1) cytogenetics, genetics and genetic diversity, (2) biotechnology and molecular biology, (3) resistance to biotic and abiotic stresses, (4) breeding and production technology, (5) seed science and seed production, (6) transfer of information on biotechnological methods to European society.

Lack of sufficient verified information and inadequate transmission of available information on adherent goods and risks, on control and protective measures of recent developments related to transgenic plants create hostile environment for biotechnology and constitute serious barrier to introduction this technology and its product to the market for the benefit of the society and the sustainable environment. Communication with society and raising public awareness, building trusts and acceptance are therefore critical factors in this respect. Democratic society has every right to the sound and unbiased information in order to be able to communicate its choices, preference and desires. Acceptance and understanding provides important incentives for biotechnology developments thereby constitute important factor in economic development but at the same time facilitate greatly all processes at the governance level.

Undertaking collaborative research within Europe on the socio-economic impact of enhanced awareness at various levels of the society through improved generation and distribution of

information, provide basic understanding and required knowledge to address difference in perception and reception of the biotechnology, transgenic organism and the products. It is essential as input to a common policy and in providing measures optimising environment for the biotechnology as a tool of genetic crop improvement and its products in Europe.

Creation of network of excellence "Genetic Crop Improvement" will be used as a possible basis for integrating and strengthening the European Research Area of genetic improvement of major European crops.

Proposed network of excellence will be implemented by a joint programme of research activities and capacities of the participants in the area of genetic crop improvement to attain a critical mass of expertise and European added value.

In pursuing its objective, the network will carry out:

* Research activities on Genetic Crop Improvement integrated by its participants.

* Integration activities which will comprise in particular:

- adaptation of the participants' research activities in genetic crop improvement in order to strengthen their complementarity;
- development and utilisation of electronic information and communication means, and development of virtual interactive working methods;
- short-, medium- and long-term exchanges of personnel, the opening of positions to researches from other members of the network, or their training;
- development and use of joint research infrastructures, and adaptation of the existing facilities with a view to a shared use;
- joint management and exploitation of the knowledge generated on Genetic Crop Improvement, and actions to promote innovation.

* Activities of spreading of excellence on genetic crop improvement which will comprise, as appropriate:

- training of researchers;
- communication concerning the achievements of the genetic crop improvement network and the dissemination of knowledge;
- analyses of science/society issues related to the genetic crop improvement research carried out by the network.

Objective

The overall aim of the proposal is to integrate research efforts within European Research Area to create an Network of Excellence "Genetic Crop Improvement" in 6 major areas: (1) cytogenetics, genetics and genetic diversity, (2) biotechnology and molecular biology, (3) resistance to biotic and abiotic stresses, (4) breeding and production technology, (5) seed science and seed production, (6) transfer of information on biotechnological methods to European society.

Following subjects will be addressed by co-operating institutions:

* **Cytogenetics, genetics and genetic diversity:**

- The identification of genetic sources of the important agronomic characters, studies on their genetic control, and methods of utilisation,
- Collection of crop genotypes exposed to genetic erosion, initial evaluation and long - term storage, research on the genetic variability of ecotypes and wild forms related to field crops,

- Documentation of genetic resources,
- Investigation of genetic systems of male sterility and possibilities of using these systems for breeding of hybrid cultivars of cereals.

*** Biotechnology and molecular biology:**

- Application of biotechnological methods in plant breeding,
- Research on plant micropropagation methods,
- Cell fusion and selection procedures on the cellular level,
- Selection using molecular markers and gene transformation.

*** Resistance to biotic and abiotic stresses:**

- Research on the mechanisms controlling crop resistance to diseases, pests and environmental stresses, Genetic basis of differences in effective utilisation of mineral nutrients in cereals,
- Genetic control and physiological mechanisms of aluminium tolerance in cereals,
- Identification of genetic sources of resistance and development of methods of evaluation and selection for their utilisation in breeding programs.

*** Breeding and production technology:**

- Development and utilisation of biological potential in the breeding of field crops,
- Development and improvement of breeding methods, including methods for evaluation of initial and advanced breeding materials under field and laboratory conditions,
- Development of biotechnological methods reducing the time of breeding process,
- Development of initial materials essential for breeding programs, development of new crop varieties adapted to diverse production conditions and utilisation technologies,
- Breeding and maintenance breeding of field crops.

*** Quality and end use:**

- Create new forms or discover among already existing varieties and breeding materials with functional and nutritional quality of grains that determines their suitability for specific end-uses at present and even in the future,

*** Seed science and seed production:**

- Economy of breeding and seed production,
- Studies on varietal progress and economy of seed production,
- Research on methods of enhancement of biological, technological and storage value of the seed,
- Improvement of the evaluation methods of the pre-sowing value of seed,
- Research on potato storage technologies

*** Transfer of information on biotechnological methods to European society**

- Generation of knowledge and transmission to the stakeholders,
- Analysis of the socio-economic impact.

This proposal meets several major goals of Framework Programme 7. within 2nd thematic priority, **Food, Agriculture and Biotechnology**, especially:

Activity 1: Sustainable production and management of biological resources from land, forest and aquatic environments

1. Enabling research ('omics', converging technologies, biodiversity) for micro-organism, plants and animals
 - Exploitation of biodiversity
 - Integration of 'omics' in systems biology

2. Sustainable, competitive and multifunctional agriculture, forestry, aquaculture and rural development
 - Biosafety, coexistence and traceability of novel plants systems and products
 - Better understanding of the biology of pests, diseases and other threats, sustainable pest management tools to improve plant health

Activity 3: **Life sciences and biotechnology for sustainable non-food products and processes**

1. Improved crops, feed-stocks, marine products and biomass for energy, environment, and high added value industrial products; novel farming systems:
 - Strengthen the knowledge base and develop advanced technology for terrestrial biomass application in energy and industry
 - Exploitation of natural or enhanced terrestrial organisms as novel sources of new valuable products (specialty chemicals, pharmaceuticals etc.)
 - Improve chemical and biochemical productivity of biomass for production of high added value products etc.

4. Environmental remediation and cleaner processing:
 - Exploit the potential of biotechnology to detect, monitor, prevent and remove pollution
 - Treating, upgrading and/or recycling wastes and industrial by-products

List of possible participants

Agricultural Research Institute Kroměříž	Czech Republic
Agricultural University, Kraków	Poland
Agricultural University, Lublin	Poland
Agricultural University, Poznań	Poland
Agricultural University, Siedlce	Poland
Agrifood Research Finland (MTT)	Finland
Austrian Research Center (ARC)	Austria
Applied Plant Research (PPO)	The Netherlands
Biologische Bundesanstalt für Land- und forstwirtschaft (BBA)	Germany
British Potato Council (BPC)	United Kingdom.
Bundesamt und Forschungszentrum Fur Landwirtschaft	Austria
Danish Institute of Agricultural Sciences (DIAS)	Denmark
Danish Potato Breeding Foundation (LKF)	Denmark
Federal Centre for Breeding Research in Crop Plants (BAZ)	Germany
Forage Research Institute	Bulgaria
Gate Agricultural Research Institute	Hungary
Grassland Research Institute	Czech Republic
Institut National de la Recherche Agronomique (INRA)	France
Institute Agrophysics Polish Academy of Sciences Lublin	Poland
Institute for Ecological Development	Poland
Institute for Molecular Biology and Biotechnology	Belgium
Institute for Potato Research	Czech Republic
Institute of Agricultural and Environmental Engineering (IMAG-DLO)	The Netherlands
Institute of Agricultural Engineering	Germany
Institute of Agriculture	Russia
Institute of Crop Science	Germany
Institute of Molecular Biological Sciences	The Netherlands
Institute of Plant Genetics, Polish Academy of Sciences	Poland
Institute of Soil Science and Plant Cultivation (IUNG)	Poland

Instituto di Miglioramento Genetico Vegetale	Italy
Instituto Sperimentale Per Le Colture Foraggere Lodi	Italy
John Innes Centre	United Kingdom
Leeds Institute for Plant Biotechnology and Agriculture	United Kingdom.
Max Planck Institute for Plant Breeding Research	Germany
Max Planck Institute for Molecular Plant Physiology	Germany
Norwegian Centre for Ecological Agriculture	Norway
Norwegian Crop Research Institute (NCRI)	Norway
N. I. Vavilov Research Institute	Russia
Plant Research International	The Netherlands
Plant Protection Institute (IOR)	Poland
Plant Protection Institute (PPIHAS)	Hungary
Plant Research International B.V. (PRI)	The Netherlands
Polish Academy of Science –Institute of Philosophy and Sociology	Poland
Pomorsko-Mazowiecka Potato Breeding Co. Ltd.	Poland
Potato Research Institute	Czech Republic
Potato Research and Breeding Institute (VSUZ).	Slovak Republic
Queen’s University Belfast (QUB)	United Kingdom
Research Institute of Crops Production	Czech Republic
Research Institute of Fodder Crops	Czech Republic
Research Institute of Oilseed Crops	Czech Republic.
Research Institute of Plant Production	Slovak Republic
Scottish Agricultural College (SAC)	United Kingdom
Scottish Crop Research Institute	United Kingdom
Servicio de Investigacion Agraria-Deputacion General de Aragon.	Spain
Smolice Breeding Co. Ltd..	Poland
Strzelce Breeding Co. Ltd..	Poland
Swedish University of Agricultural Sciences (SLU)..	Sweden
Swiss research Institute of Organic Agriculture..	Switzerland
Syngenta Crop Protection AG...	Switzerland
Technische Universität München....	Germany
The Institute of Biochemistry and Biophysics, Polish Academy of Sciences..	Poland
The Lituianian Institute of Agriculture..	Lithuania
The University of Gdańsk..	Poland
University of Göteborg (UGOT)..	Sweden
University of Hohenheim..	Romania
University of Kassel....	Germany
University of Paderborn...	Germany
University of Technology and Agriculture, Bydgoszcz...	Poland
University of Wales, Bangor (UW)...	United Kingdom
Wageningen University (WU)...	The Netherlands
Warsaw Agricultural University (SGGW)...	Poland
Zamarte Breeding Co. Ltd..	Poland