

MEMORANDUM OF UNDERSTANDING

This Memorandum of Understanding (MOU) is entered into between the **Centre for Agricultural Research, Hungarian Academy of Sciences**, a research organization, with principal offices at 2462 Martonvásár, Brunszvik u. 2., Hungary, represented in this MOU by its Director General, Dr. Zoltán Bedő and hereinafter referred to as **MTA ATK**, and the **Plant Breeders' Sub-Union of Turkey**, with principal offices at Adakale Sokak, 22/12, Kızılay, Ankara, Turkey, represented in this MOU by its Vice Chairman Dr. Vehbi ESER, and hereinafter referred to as **BISAB**.

The **Centre for Agricultural Research, Hungarian Academy of Sciences (MTA ATK)** covers an integrated spectrum of crop research ranging from basic and methodological problems to applied research. **MTA ATK** is a national organization owned by the **Hungarian Academy of Sciences**, has the primary goal of developing new plant genotypes based on the Eastern and Central European plant gene pool on wheat, maize and some other field crops, accumulated over the last half century in Martonvásár and using genetic, physiological, cell and reproduction biological, functional genomic, biotechnological, plant breeding methods. MTA ATK carries out its mission by:

Plant genetics research

- Use of functional genomic methods in studies on the expression of genes influencing the regulation of abiotic stress adaptation in cereals, aimed at gene isolation and gene mapping,
- Gene expression studies,
- Demonstration of DNA sequences occurring in the wheat genome in small numbers of copies by means of fibre FISH and PCR in situ methods,
- Mapping and fine mapping of the QTLs of properties responsible for early spring adaptability in cereal species,

Plant cell and reproduction biology research

- Molecular cell biology studies on *in planta* and *in vitro* fertilisation and early embryo development in cereals using the functional genomic approach,
- Investigations on the mechanism of egg-cell activation; development of plant clones from egg-cells,
- Investigations into the molecular regulation of *in vitro* androgenesis using various ultrastructural and immunocytochemical methods,
- Development of dihaploid plants of microspore origin for breeding purposes,
- Micromanipulation of wheat egg-cells,

Plant physiology research



- Investigation of physiological and biochemical processes involved in the abiotic stress adaptation of cereals, and studies on how defence mechanisms develop,
- Studies on interactions between heavy metal (Al,Cd,Zn,Hg) tolerance and phytochelatin synthase activity in crops,
- Analysis of the flowering biology and physiological effects of UV-B radiation in maize,

Cereal gene bank research

- Collection, preservation and maintenance of the genetic pool of maize,
- Morphological description and agronomic testing of the sources, varieties, populations, synthetics and lines collected and studies on how they are related to each other,
- Broadening the collection of wheat and related species,
- Determination of the diversity available for major morphological and agronomic traits and of how these are inherited,
- Incorporation into cultivated wheat of gene complexes responsible for agronomically useful properties from related species in order to create new basic breeding stock (pre-breeding),

Molecular breeding research

- Molecular marker-assisted selection for the incorporation of new genes ensuring biotic stress resistance,
- Association studies on cereal species to determine the allele frequency of genes influencing adaptation,
- Incorporation of certain storage protein genes from the wheat variety Bánkúti 1201 into modern genotypes using marker-assisted selection,

Research on cereal chemistry and quality

- Research on the storage protein composition of old Hungarian wheat varieties, Determination and isolation of new and mutant genes,
- Biochemical, technological and molecular genetic studies on factors determining the endosperm structure of wheat grains,
- Improvements in the yellow pigment content of durum wheat. Increase in the efficiency of whole plant utilization in feeding by improving the chemical quality and digestibility of maize,
- Breeding of maize hybrids for various end-uses (sweetcorn, cornflakes, waxy),




Plant stress resistance research

- Studies on the host plant – pathogen relationship, the genetic background of resistance and the efficiency of resistance genes,
- Incorporation of new, effective resistance genes into genotypes with good agronomic properties,
- Development of basic maize breeding stock resistant or tolerant to abiotic and biotic stress factors,
- Research on the chilling tolerance of maize,
- Research into genotypes resistant to the toxin-producing *Fusarium* spp. prevalent in Hungary in order to improve production and food safety,
- Utilization of haploid cultures and in vitro cell selection for the development of cereals tolerant of heavy metal and oxidative stress,

Maize breeding research

- Increase in the frequency of dominant genes responsible for favourable agronomic properties in source populations using recurrent selection methods,
- Use of exotic gene sources to select inbred lines with excellent specific combining ability,
- Improvement in the harvest index and grain filling period and rate of maize without a change in the length of the vegetation period by increasing the durability of the leaf area,
- Development of maize genotypes tolerant of environment-friendly herbicides effective in microquantities by incorporating resistance genes,
- Breeding of silage and grain maize hybrids competitive on Hungarian and export markets,
- Development of maize hybrids which can be grown using cost-saving, environment-friendly technologies and which use ecological sources efficiently,

Cereal breeding research

- Breeding of winter wheat varieties with excellent milling and bread-making quality and which can be successfully grown under agro-ecological conditions similar to those in the Carpathian Basin,



- Breeding of winter-hardy, high quality winter durum wheat varieties which can be marketed both in Hungary and abroad and provide satisfactory raw material for pasta-making,
- Breeding of spring and winter oat genotypes suitable for human consumption and animal feeding,
- Research on triticale and barley genotypes for various end-uses,

Crop production research

- Use of growth analysis, ecophysiological studies and stability analysis in long-term experiments to achieve the sustainable development of maize and wheat production,
- Use of growth models for yield prediction and to investigate the spatial variability and time processes of yield formation,
- Research on the agronomic responses of maize hybrids and wheat varieties at the plant stand, individual plant and plant organ levels,
- Site-specific measurement and regulation of major yield-determining factors in field crop production experiments,
- Analysis of phosphorus effects and after-effects in long-term fertilization experiments set up on chernozem soil with forest residues,
- Improvement in the efficiency of N fertilization by analyzing the N utilization of maize hybrids and wheat varieties,

Agro-ecological research

- Research into hulled diploid and tetraploid wheat suitable for organic farming,
- Studies on the effect of the most important components of global climate changes on the yield components, abiotic and biotic resistance and chemical quality of cultivated plants,
- Investigations into the potential environmental effects of genetically modified plants,
- Testing and selection of cereal varieties and genotypes with durable resistance, making them suitable for organic farming,

Plant Breeders Sub Union (BISAB) of Turkey is one of the seven professional organizations as a legal public entity, established in 2008, based on the Seed Law no. 5553. The aim of BISAB is to bring together plant breeders, consisting of real or legal persons operating within the seed sector, in order to facilitate professional solidarity and




activities, to ensure protection of the economic and social rights of those carrying out plant breeding activities and to carry out further duties assigned by legislation.

BISAB is the only legal professional organization of plant breeders. Real and legal persons operating in the fields of plant breeding within the seed sector, plant genetics and variety development are obliged to become member to BISAB. Organizational structure and main duties are defined by seed law. Organization of BISAB consists of Steering Committee as the managing body, Supervisory Committee as the auditing body and Disciplinary Committee as the discipline controlling body. BISAB carry out its activities with the finance accumulated through the collection of annual membership fees and the commissions as the 0,3 % of total annual income of members.

The duties of BISAB, as defined by seed law, are as follows:

- To provide communication and solidarity among the members,
- In order to improve the professional knowledge and experience of its members and others whose are involved in seed sector to organize conference, panel, course, seminar and similar activities, and publish books, periodicals or other such materials,
- To do research and invest in order to further development of plant breeding capacities of members,
- To join Turkish Seed Union as a member in order to contribute to the development of seed sector,
- To prepare reports and generate recommendations and provide to Turkish Seed Union in order to help to the formation of the decisions on plant breeding and seed sector,
- To fulfill the duties those have been given in the Seed Law and will be given by further legislations,

BISAB with a mandate on plant breeding carries out its mission by:

- help setting priorities for plant breeding in the country and allocate the available resources to the programs and projects in accordance with the priorities,
- helping the members to improve the productivity and quality of plant breeding through research and in order to help improving the incomes of members;
- following technological developments, around the world and adapting to country's conditions,
- improving the scientific capacity of the plant breeders, in collaboration with scientists in research and universities at national and international level,



- improving the capacity and productivity of members through investment on infrastructure, breeding material and research facilities, and
- forming research partnership with international and national research organizations.

MTA ATK and BISAB Turkey ally desire to promote collaborative activities. Both parties:

- believe that this collaboration is beneficial to achieving their overall goals;
- have already established collaborative linkages with other international and non-governmental organizations, international research centers, and centers of higher learning and research throughout the world;
- desire to increase their existing knowledge base; and
- wish to develop mutually beneficial processes of cooperation and exchange.

Objectives

This MOU is intended to facilitate the collaboration in wheat and maize research and development, exchange of genetic material, more specifically in the areas of biotechnology, crop improvement research on wheat and maize, integrated natural resource management, and capacity building and training. Both parties, therefore, desire to formalize their relationship by agreeing to the following:

- a. to act as a partner with MTA ATK for wheat and maize research activities, organization and joint researches needed for improvement of new lines and cultivars;
- b. to work together in both countries and in third countries to introduce the lines and varieties of both party,
- c. each party will protect and follow the other's rights in their countries, and a mutually agreed mechanism will be established to be implemented in both and third countries,
- d. to use MTA ATK facilities such as marker-assisted selection laboratory, green house and fields to transfer resistant genes to the current varieties by reducing breeding cycle,
- e. to arrange and implement joint theoretical and/or practical plant breeding courses in both and third countries,
- f. to arrange and implement jointly scientific and/or applied seminars, conferences and other such meetings,



- g. to develop, design, and implement specific joint projects when the resources of both organizations can be utilized more effectively through cooperative efforts;
- h. to put their efforts together to get financial support to the joint research projects from international organizations or funds;
- i. to share resources, as well as responsibility for management of joint programs and projects;
- j. to promote and facilitate public and private cooperation through specific activities that will enhance both organizations' capabilities;
- k. to exchange genetic and other research material through internationally operational material transfer agreements. The exchange of the material will be subject to observance of quarantine regulations of Hungary, Turkey, and any other country involved;
- l. to organize activities of mutual interest including conferences, workshops, and training courses in fulfillment of their missions;
- m. to publish the results of research and collaborative work by the related persons from both parties;
- n. to promote visits by scientists/experts and exchange of documents and scientific information between the two organizations;
- o. to conduct joint research projects or implement training programs and courses in third countries; and
- p. detailed work plans will be developed for the execution of agreed activities by both parties.

Funding of Projects

The Parties specifically acknowledge that this MOU does not entail any funding obligation, nor does it constitute a legally binding commitment by any Party. It is understood that:

- a. either party may decide to provide financial or in-kind support to individual projects on a case-by-case basis;
- b. both parties will jointly and separately seek funding from third parties to support activities to be carried out under this MOU;



- c. both parties agree to assist one another with applications to funding sources for financial support of this cooperation and exchange; and
- d. implementation of specific collaborative programs will depend upon the availability of funds.

Implementation of Activities and Joint Projects

To achieve the purposes of this MOU, the Parties, individually and subject to the availability of funds, will jointly cooperate on training of plant breeders, organizing meetings, introduction of improved lines and varieties and research collaboration. The Parties agree:

- a. work plan of each specific will be prepared at least one year prior to the activity by the appointed persons from both Parties and the work plan will be implemented after approval by the governing bodies of both Parties,
- b. breeding material and germplasm exchange including introduction of improved lines and varieties in both countries and third countries will be promoted by both Parties through a mechanism approved by the governing bodies of both Parties,
- c. the Party of host country will be responsible to provide accommodation, meeting facilities and fields or green houses for the activities to be carried out jointly,
- d. the expenses of experts for the training programs will be covered from the budget of the training program and the host Party will carry out the duty,
- e. introduction of improved lines and varieties will be under the responsibility of host Party,
- f. that joint projects, including projects in third countries, pursuant to the that are supplemental to this MOU,
- g. subject to funding being available, to provide staff support and institutional services and materials necessary to implement and achieve the objectives of each cooperative project agreement supplemental to this MOU,
- h. to be responsible for maintaining its own records of activities undertaken subsequent to the MOU, with any special conditions to be stipulated in the terms of each supplemental agreement,
- i. mutual exchange of information and data on specific sectorial activities,
- j. support for the adoption of technologies and practices,



- k. coordination of technical assistance, research, and other activities,
- l. publish books and/or scientific papers and other documents jointly or with the contribution of others from third countries or international organizations,
- m. meeting periodically at the request of either Party to share experiences and lessons learned, prepare work plans, and facilitate the exchange of best practices, and
- n. sharing information on opportunities that may arise for collaboration with other partners, donors, and other entities that may leverage resources invested by the Parties.
- o. other activities or projects those are not listed here can be carried out with the approval of governing bodies of both Parties, between both party or with third parties or international organizations,

Publications and Intellectual Property Rights

1. Intellectual Property Rights of each Party due to material transfer or publications will be protected mutually in both countries by the Parties and a mechanism approved by the governing bodies of both Parties will be prepared and implemented in third countries,
2. Results of the collaborative research will be jointly published in the public interest as mutually agreed upon,
3. All research materials used in the collaboration will be transferred using Material Transfer Agreements (MTA). Further, the transfer of biological materials, including breeding materials and germplasm, will be subject to pertinent biosafety and bioprospecting laws, rules, and regulations. Either party may use such materials, but will give full credit to the source of the materials,
4. It is also agreed that all outcomes of the MTA ATK, BISAB joint research activities, including all intellectual property rights (IPR), shall be jointly owned by both parties according to their contributions. As such, they shall remain publicly accessible and shall be available to the partners of MTA ATK and partners and members of BISAB and to end-users,

Settlement of Disputes

Any dispute between the Parties arising out of the interpretation or execution of this agreement shall be settled by mutual agreement.



Duration

This MOU shall be in effect for five (5) years, commencing from the date of execution of this agreement. It can be amended and/or extended for further period(s), with the approval of both Parties, by means of exchange of letters through the authorized officials at each institution.

Termination

Either Party may terminate this MOU by giving written notice of the intent to terminate the MOU. Such termination shall not affect the execution and conclusion of specific activities in effect under terms of this MOU, nor publication and dissemination of results of research in progress. Insofar as possible, such notice will be given three (3) months in advance of the desired termination date.

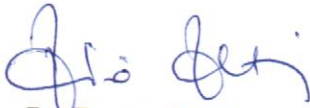
IN WITNESS WHEREOF, the Parties have agreed and executed this Memorandum of Understanding in two originals in English.

For the

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**Centre for Agricultural Research,
Hungarian Academy of Sciences
(MTA ATK)**

**Plant Breeders' Sub-Union of Turkey
(BISAB)**



Dr. Zoltan BEDO
Director General

Date: June 25 2014.

Place: Martonvásár, Hungary

Dr. Vehbi ESER
Vice President



Date: June, 25, 2014

Place: Ankara, Turkey