

Position Paper on Organic Plant Breeding

Based on the results of an expert workshop on March 2, 2011 in Frankfurt/Main

Organic plant breeding is embedded into the general **principles of organic farming**. According to the International Federation of Organic Agricultural Movements (IFOAM), the persons acting in organic farming take care of the preservation and improvement of soil fertility, promote the genetic diversity of plants, animals and other organisms of the agro-ecosystem, conserve natural resources and strive for a stable ecological equilibrium. They take social responsibility and stand up for justice and equality. In organic farming, special responsibility is taken for the protection of the environment and for safeguarding the livelihood for present and future generations (www.ifoam.org).

Cultivated plants are the basis for our food. For thousands of years, plant breeding has been intrinsically tied to our culture. It is therefore of vital importance for our future that farmers have access to seeds and vegetative propagation material of a wide range of locally adapted crop species and varieties. Genetic diversity within and between species allows plants to adapt to changing environmental conditions, and it enables us to improve our crops through breeding according to our needs.

Hereby the **dignity of creatures** has to be taken into account. Like all living organisms, plants have an intrinsic value independent of human interests. Organic plant breeding respects the genetic integrity of a plant, its crossing barriers and regulatory principles and is committed to safeguard the fertility, the autonomy and the evolutionary adaptation of our crop plants. This means that when varieties are chosen for organic farming, not only their suitability for cultivation but also their breeding history has to be considered. Given the multitude of breeding methods and techniques presently applied to develop future varieties, this is not an easy task. To meet this claim and to send appropriate social and political signals, specific criteria were defined and ranked that allow a transparent evaluation of breeding methods and derived varieties.

Aims of Organic Plant Breeding

- The breeding goals match the respective crop species and the needs of the complete value chain of the organic sector (producers, processors, traders and consumers). The breeding goals are aiming at the sustainable use of natural resources and at the same time account for the dynamic equilibrium of the entire agro-ecosystem.
- Organic plant breeding supports sustainable food security, food sovereignty, secure supply of plant products (e.g. fibre, medicine, timber), and the common welfare of society.
- Organic plant breeding sustains and improves the genetic diversity of our crops, and thus contributes to the promotion of agro-biodiversity.
- Organic plant breeding makes an important contribution to the development of our crops and their adaptation to future growing conditions (e.g. climate change).

Ethical Criteria

1. The genome is respected as an indivisible entity and technical/physical invasion into the plant genome is refrained from (e.g. through transmission of isolated DNA, RNA, or proteins).
2. The cell is respected as an indivisible functional entity and technical/physical invasion into an isolated cell on growth media is refrained from (e.g. digestion of the cell wall, destruction of the cell nucleus through cytoplasm fusions).
3. The ability of a variety to reproduce in species-specific manner has to be maintained and technologies that restrict the germination capacity of seed-propagated crops are refrained from (e.g. Terminator technology).
4. A variety must be usable for further crop improvement by other breeders. This means on one hand that the breeders' exemption is legally granted and patenting is refrained from, and on the other hand that the crossing ability is not restricted by technical means (e.g. by using male sterility without the possibility of restoration).
5. The use of genetic diversity takes place within the plant specific crossing barriers through fusion of egg cell and pollen. Forced hybridization of somatic cells (e.g. through cell fusions) is refrained from.

6. In complementation to the presently widely used hybrids, non-hybrid varieties shall be bred in order to give farmers the choice to produce their own seeds (farmers' privilege).
7. The principles of organic farming (the principles of health, ecology, justice and care) form the guidelines for breeding activities.

Criteria concerning breeding strategies

8. The environment in which selection takes place is in accordance with organic cultivation methods in order to account for the plant-environment interaction, to accelerate the selection gain, and to benefit from possible epigenetic effects. This means, that selection takes place under organic farming conditions.
9. The phenotypic selection in the field can be supplemented by additional selection methods (e.g. analysis of natural compounds or molecular markers for diagnostic purposes).

Socio-economic criteria

10. The exchange of genetic resources is encouraged and any patenting of living organisms, their metabolites or gene sequences is refrained from.
11. The breeding process, the starting material (e.g. used crossing parents, starting populations), and the applied breeding techniques will be disclosed to enable producers and consumers to choose varieties according to their values (e.g. clear declaration of varieties derived from mutation breeding).
12. Participatory breeding programmes involving all stakeholders (producers, processors, retailers and consumers) are promoted.
13. A plurality of independent breeding programs with different types of crops to increase agricultural biodiversity is aspired.

Choice of varieties in organic farming

All varieties for which seeds or propagation material have been propagated under organic growing conditions are currently allowed in organic agriculture, provided they are not declared as genetically modified varieties (Council Regulation (EC) No 834/2007 of 28 June 2007 on organic production and labeling of organic products). According to a derogation rule, untreated, non-organically propagated varieties are only permitted, if no suitable varieties from organic propagation are available. Among the varieties the following categories can be distinguished:

- I. Varieties derived from conventional plant breeding that are suitable for organic farming with the exception of genetically modified varieties (conventional breeding, organically propagated, or, if necessary, conventionally propagated but untreated),
- II. Varieties derived from plant breeding programmes with a special focus on the breeding goals or selection environments for organic farming, and organic seed propagation (product-oriented breeding for organic farming, organically propagated), and
- III. Varieties derived from organic breeding programmes, which have been bred under organic farming conditions considering to the above mentioned criteria (process-oriented organic plant breeding, organically bred and propagated).

According to the achieved minimal consensus, varieties, which were bred using techniques that violate the integrity of the genome (e.g. transgenic plants) or the integrity of the cell (e.g. cytoplasm fusion), have to be excluded from the choice of varieties for organic agriculture. For future acceptance of varieties of Category I and II in organic farming, the above criteria (especially criteria 1-5) have to be taken into account. Thus, the above mentioned criteria provide also guidelines for breeding programmes for organic farming.

Varieties that are currently available for organic farming are mainly derived from conventional plant breeding programmes. This spectrum needs to be urgently supplemented or replaced, as for certain crops, such as cotton, soybeans, and corn, genetic engineering (violation of the first criterion) is frequently applied, while in other crops, like e.g. in broccoli or cauliflower, breeding is exclusively focused on male sterile hybrids originating from cytoplasm fusion (violation of the second criterion). In these cases, the choice of varieties for organic farming is already today severely limited. In addition, the strong monopolization on the seed market, the concentration of breeding efforts

on a few major crops, and the dominance of conventionally propagated seeds lead to further restriction of the range of varieties for organic farming. Seeds and vegetative propagation material are one of our most important resources. It is therefore essential that varieties of Category II and III are promoted actively.

Additional information:

- Dossier on description and evaluation of breeding methods for organic agriculture

This position paper was developed by Monika Messmer¹ and Klaus-Peter Wilbois² in cooperation with the participants of the workshop and was adopted by maturity consensus on the October 28, 2011. This paper is intended (i) to accomplish a high degree of transparency concerning the criteria for the evaluation of breeding techniques for organic farming, and (ii) to serve as a baseline for further discussions within and across label organizations, but also for cross-linking discussions at national and international level.

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This project was supported by the Mercator Foundation Switzerland

The project was supported and funded by the Mercator Foundation Switzerland.

2009-0286: Modern breeding methods: an opportunity for organic farming?

The Mercator Foundation Switzerland is committed to safeguard the natural resources of livelihood and promotes the more conscious and careful utilization of these resources. The methods and products of organic agriculture serve these goals.

For organic farming to be an effective alternative for long term soil conservation and resource-efficient food production, the availability of organic seed must be enlarged. By utilizing modern breeding methods the development of organic varieties could be accelerated and more efficient. However, modern breeding methods can only be used in organic farming to the extent to which their suitability is carefully checked and accepted by farmers as well as by consumers. Therefore, a comprehensive evaluation of new breeding methods is of great importance for organic farming.

The Mercator Foundation Switzerland supports the study "Opportunities and potentials of different breeding methods for organic farming" of the Research Institute of Organic Agriculture (FiBL). The project aims at the evaluation of modern breeding techniques such as in vitro reproduction or marker technology and assesses their suitability for organic farming. The goal is to provide a basis for unbiased factual discussion and to elaborate a rational decision-making tool for the evaluation of breeding techniques for organic farming.



Stiftung Mercator Schweiz

**List of Participants of the
Workshop on the evaluation of breeding methods for organic agriculture
2nd March 2011, in Frankfurt/Main**

TEILNEHMER	ORGANISATION	ARBEITSGEBIET
Christine Arncken	FiBL Schweiz	Breeding research
Peter Doleschel	Bayrische Landesanstalt für Landwirtschaft (LfL)	Breeding research
Dora Drexler	FiBL Ungarn	Initiating FiBL Hungary
Friedemann Ebner	Sativa Rheinau AG	Vegetable breeding
Karsten Ellenberg	Biolandhof Ellenberg	Heirloom potatoe
Michael Fleck	Kutursaat e.V. & Assoziation biologisch-dynamischer Pflanzenzüchter e.V.(ABDP)	Vegetable breeding
Florian Gadermaier	FiBL Österreich	Rye breeding
Heinrich Grausgruber	Uni BOKU, Wien	Breeding research
Jürg Hiltbrunner	Agroscope Rechenholz-Täniken (ART)	Variety trials
Johannes Kotschi	AGRECOL e.V.	Participatory breeding in
Peter Kunz	Getreidezüchtung Peter Kunz e.V. (GZPK)	Cereal breeding
Henrik Maass	Bioland e.V.	Label organization
Monika Messmer	FiBL Schweiz	Breeding research
Karl-Joseph Müller	Gesellschaft für goethenistische Forschung e.V. (GfgF) & ABDP	Cereal breeding
Ulrich Quendt	Getreidezüchtungsforschung Darzau	Cereal breeding
Eckhard Reiners	Bioland e.V.	Label organization
Matthias Ristel	Uni Kassel, Witzenhausen	Student
Gebhard Rossmanith	Bingenheimer Saatgut AG	Vegetable breeding
Barbara M. Rudolf	Saat:gut e.V.	Plant breeding
Inde Sattler	Arbeitskreis ökologische Obstzüchtung (FÖKO)	Fruits
Walter Schmidt	KWS SAAT AG	Maize breeding
Mirko Schuster	Julius Kühn Institut (JKI) Dresden	Stone fruits breeding
Ann-Kathrin Spiegel	FiBL Deutschland	Breeding research
Hartmut Spiess	F&E LBS Dottenfelderhof e.V.	Cereal breeding
Peer Urbatzka	Bayrische Landesanstalt für Landwirtschaft (LfL)	Breeding research
Jan Velema	Vitalis	Vegetable breeding
Werner Vogt-Kaute	Naturland e.V.	Label organization
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Klaus-Peter Wilbois	FiBL Deutschland	Breeding network
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