Coordinating Organic Plant Breeding Activities for Diversity

COBRA

Breeding for diversity
– political implications and new pathways for the future

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CONTENTS

Introduction

At present, around 95% of organic production is based on crop varieties that were bred for the conventional high-input sector, lacking important traits required under organic and low-input production conditions (Lammerts van Bueren *et al.*, 2011. Populations with a high level of genetic diversity are promising for OA (organic agriculture) conditions due to their adaptation, resilience and performance stability in different environments. Organic farming will benefit from cultivars (populations, varieties) that can cope with multiple stresses such as weeds, diseases, pests, climate change and low nitrogen input from manure.

In the COBRA project (Coordinating Organic Plant Breeding Activities for diversity), plant genetic diversity and its potential have been investigated from both an agronomic and a legal point of view. This booklet aims to give insight into the socioeconomic and legal aspects of organic plant breeding including High Diversity breeding.

COBRA is a three year (2013-16) European project under the Core Organic II program. It has linked up existing organic breeding activities by a multi-partner coordinated approach. The pillars of the COBRA project are:
- Seed health
- Response of crops to multiple stresses
- Breeding efficiency for organic systems
- Networking and coordination
- Socioeconomic and legal issues related to organic plant breeding

Through case studies, several COBRA partners investigated how different quality requirements can be imbedded in local breeding initiatives and promote organic seed use and production. They also studied how different barriers affect organic seed production and breeding. Case studies from UK, Denmark, Slovenia, Italy and the outputs of the COBRA workshop “Financing of organic plant breeding” (Freising, Germany, 2015) are presented in this booklet.

On behalf of the COBRA network
Tove Pedersen and *Frédéric Rey*

The varieties challenge
Organic farming will benefit from varieties that can cope with multiple stresses such as weeds, diseases, pests, climate change and low nitrogen input from manure. The organic sector has been relying on varieties made for conventional farming, where the breeding goals are not the same or even sometimes contradicting.

Plant genetic diversity, farmers' rights and the European seed legislation

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Plant genetic resources for food and agriculture represent a vast reservoir of fascinating tastes, smells, colours, nutrients – as well as stories and possibilities. It consists of all the plant species, varieties and populations that are used for food and agriculture as well as their genetic components. This treasure constitutes the genetic basis of all food production. It provides the essential pool from which plant traits can be found that meet the challenges of crop pests and diseases, drought, marginal soils and changing environmental conditions. This is probably more important for farming than any other environmental factor, simply because it is what can enable adaptation to shifting environmental conditions, such as climate change. Plant genetic diversity is also central in the fight against poverty in rural areas, as diversity between and within crops is an effective means of spreading the risks of crop failure and access to crop varieties that can adapt to such conditions are crucial.

Rapid genetic erosion

Plant diversity has been disappearing at a rapid rate over much of the globe. In 1998, FAO reported that some 80% of the diversity estimated 100 years ago in important cultivated plants like wheat and maize had vanished from the countries generally deemed the centres of their historical origin. Major losses have been reported for many other crop species. This is mainly due to the modernization of agriculture, with high yielding varieties and production systems which enabled radical and most necessary production increase, while, however, at the same time wiping out untold varieties of crops.

Moreover, legislation and regulations are making crop genetic resources less available in many countries, thereby limiting the possibilities of their utilization:

- In many countries, plant breeders' rights have been introduced in order to stimulate innovation in plant breeding. In practice, however, more and more countries are placing restrictions on how and to what extent the seeds of protected varieties from the farmer's own harvest may be saved, used and exchanged.
- Regulations on plant variety release and the marketing of seed and propagating material have been introduced to ensure plant health and seed quality. Although their provisions vary, the result is increasingly that traditional varieties are excluded from the market, by prohibiting the exchange or sale of seeds from such varieties.

This presents us with a serious dilemma. Rules intended to stimulate innovation by plant breeders may reduce the genetic foundations of plant breeding; and rules intended to ensure plant health may actually compromise plant health because the diversity that could provide genetic robustness in the future is reduced precisely because of such rules.

How can this development be explained? During the last decades of the previous century a privatization wave rolled over western countries. Plant breeding that used to be a public responsibility, have been increasingly privatized on the initiative of public authorities. The private sector responded by demanding conducive conditions for private investments in plant breeding. This is the background for the current legislation in the seed sector, including in international regimes. It constitutes a serious threat to our crop genetic diversity for food and agriculture.

The Plant Treaty

The International Treaty on Plant Genetic Resources for Food and Agriculture (Plant Treaty) is the first legally binding international agreement devoted solely to plant genetic resources for food and agriculture. It is probably the most important international instrument we have to halter the development described above and to promote the further development of crop genetic diversity.

The objectives of the Plant Treaty is to ensure that crop genetic diversity is preserved and used in a sustainable way, as well as ensuring the equitable sharing of the benefits accruing from the utilization of these resources (Art 1).

The Plant Treaty provisions on the conservation of crop genetic diversity (Art. 5) deal with, inter alia, survey and inventory of crop genetic resources under threat or of potential use, and support to farmers' efforts to conserve crop genetic diversity in their fields. The Plant Treaty provides that countries are to minimize or, if possible, eliminate threats to crop genetic diversity.

The Plant Treaty also provides that the countries are to promote the sustainable use of crop genetic diversity (Art. 6) by developing and maintaining policy and legal measures to strengthen such practices. Several types of measures are suggested. For example, countries may promote diverse farming systems as well as breeding to enhance utilization of crop genetic diversity. It is also noted that participatory plant breeding may prove useful: this involves farmers and plant breeders working together to develop plant varieties with a view to achieving best possible adaptability to the environment in which the plants are to be cultivated, as well as other considerations important to farmers. In general, it is recommended that more species and varieties should be utilized, especially as regards locally adapted varieties. It is further suggested that countries should review, and, as appropriate, adjust their breeding strategies and regulations concerning variety release and seed distribution in line with the provisions of the Plant Treaty.

Farmers' Rights under the Plant Treaty

In Article 9 of the Plant Treaty, recognition is expressed of the enormous contributions made, and still being made, by the world's farmers in conserving and sustainably using crop genetic resources, noting that these contributions constitute the foundations for food production around the globe. It is further stated that responsibility for implementing farmers' rights lies with the national governments. Countries are free to choose the measures they deem necessary and suitable, in cognizance of their own needs and priorities. While farmers' rights are not explicitly defined in Article 9, measures are suggested for protecting and promoting these rights, such as:

a) protection of traditional knowledge relevant to plant genetic resources for food and agriculture
b) the right to equitably participate in sharing benefits arising from the utilization of plant genetic resources for food and agriculture
c) the right to participate in making decisions, at the national level, on matters related to the conservation and sustainable use of plant genetic resources for food and agriculture

It is further stipulated that nothing in the Plant Treaty shall be interpreted as limiting the rights of farmers to save, use, exchange and sell seed and propagating material from their own fields, subject to national legislation (Art. 9.3). The cautious wording here reflects the immensity of the problems facing the negotiators in achieving consensus in this area, because these rights have such a strong effect on the rights of plant breeders to newly developed varieties. At the same time, however, it is of decisive importance to enable farmers to keep on contributing to the conservation and sustainable use of plant genetic diversity. As is highlighted in the preamble of the Plant Treaty, these rights are fundamental to the realization of farmers' rights, and must be promoted both nationally and internationally. The fact that farmers' rights have been addressed with an own chapter (Part III) in the Plant Treaty reflects the importance of normative power in international negotiations.

European seed legislation

The European seed legislation covers all plant varieties, whether they are protected by intellectual property rights or not. It provides that only authorized seed shops are allowed to market seed and propagating material, and the farmers are not allowed to market seed and propagating material unless they establish an authorized seed shop. Furthermore, only seeds can be marketed, which have been released on the EU common list of plant varieties or the lists of EU-countries. To be released, the vari-eties must comply with strict criteria. The fact that trade between farmers is taking place anyway, is due to the civil courage of farmers engaged in the development of food crop diversity.

In 2008 the EU adopted a directive on conservation varieties which entered into force 30 June 2009. The directive seeks to ensure the conservation and sustainable use of 'conservation varieties', and were thus meant to somewhat soften the strict seed legislation. Conservation varieties may be cultivated and marketed even when they do not meet the general requirements for recognition of varieties and sale of seeds and propagating material (art. 2). Instead, the directive sets out its own guidelines for the recognition and inclusion of such conservation varieties in the national list of varieties and the production and marketing of the seed material.

Negotiations preceding the adoption of the directive were difficult because of competing interests. Key players in European seed industry were pushing for a very tight regime; the liberal rules on conservation varieties would 'skew competition', they argued. Farmers' organizations and NGOs, on the other hand, wanted the widest possible legal manoeuvrability in the conservation and sustainable use of crop genetic diversity. Economic interests clashed with the public interest over conservation and sustainability; the former interests had a major impact, however.

These are the basic features of the directive:

Basic requirements: Landraces and varieties which are naturally adapted to the local and regional conditions and threatened by genetic erosion (art. 1) and are of interest for the conservation of plant genetic resources (art. 4.1) may be approved in accordance with the directive.
Compliance with DUS criteria: Varieties must meet the normal requirements of distinctness, uniformity and stability for approval (art. 4.2). But in some cases (off-types), the uniformity requirement may be relaxed somewhat.
Genetic restrictions: Approved varieties must be conserved in such a way as to ensure continued varietal identity and varietal purity, and shall be inspected in accordance with given provisions to verify compliance (art. 19).
Geographical restrictions: A conservation variety shall only be cultivated and marketed in its region of origin, and seed may only be produced here (art. 11 and 13). The region of origin shall be identified prior to approval (art. 8) and can include more than one country.
Certification requirements: The usual certification requirements apply here, with an exception of the requirement on minimum varietal purity. Nevertheless, the directive stresses that the seed shall have sufficient varietal purity (art. 10).
Marketing requirements: Seeds may only be marketed by authorized seed shops in the seeds' region of origin with exceptions for cases in which a Member State approves additional regions in its own territory for such marketing (art. 13). The prohibition on seed exchange between farmers remains in place under the new directive. In order for farmers to be able to sell seed they must establish authorized seed shops.
Quantitative restrictions: The quantity of seed marketed shall not exceed 0.5% of the seed of the same species cultivated in the country in one growing season, or alternatively a quantity necessary to sow 100 ha, whichever is the greater quantity (art. 14). This is the general rule. For certain named species, stricter provisions apply. The total quantity of seed of conservation varieties marketed in each country shall not exceed 10% of the seed used yearly of the species involved. If this leads to a quantity lower than necessary to sow 100 ha, the maximum amount of seed of the species concerned may be increased to a quantity necessary to sow 100 ha.

... creating the greatest possible legal space for farmers to perform conservation and sustainable use of crop genetic diversity is of utmost importance.

Although these rules were designed to soften the previous regulations that were obviously hindering the conservation and sustainable use of crop genetic diversity in agriculture, they are nonetheless very restrictive. They run counter to customary practices among farmers for whom we can thank for the plant genetic diversity we have today. Clearly, the rules are unlikely to encourage farmers to continue this work. This despite the fact that the EU has ratified the Plant Treaty.

To summarize: under the directive on conservation varieties, (1) seed exchange among farmers is still prohibited; (2) only approved conservation varieties may be marketed; (3) requirements on genetic uniformity remain rigorous; (4) marketing and use of conservation varieties are forbidden outside of the region(s) of origin; (5) there is a quantity restriction on the marketing of seed of such varieties; and (6) the varieties if they have developed them further.

A comprehensive revision process to change the EU seed legislation stranded in 2014 on powerful forces in the EU pulling in different directions (see next column). Currently we are left with the legislation described above. How individual countries act when implementing existing directives will be of great importance for the further development of the EU legislation, and creating the greatest possible legal space for farmers to perform conservation and sustainable use of crop genetic diversity is of utmost importance.

What can we learn?

Legally, the Plant Treaty and the EU seed legislation are coherent. In terms of their political effects, however, they are obviously conflicting. Breeding for diversity and breeding for conformity represent opposite breeding aims: There is a need to ensure legal space for each. Furthermore, the distribution of responsibilities between public and private actors engaged in crop genetic diversity needs rethinking and restructuring. The Plant Treaty is our most important international instrument to change the situation. Whether it will succeed depends on how it is used by involved actors.

Seed marketing in Europe: an opening for diversity?

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SUMMARY *In 2013, the Commission (formerly DGSANCO and now DGSANTE) submitted a proposal to the European Parliament after five years of negotiations trying to update the overall framework of the European seed legislation. In March 2014, the European Parliament rejected the initiative, and at the moment the situation is still unclear: will the Commission try to make a new proposal or will the whole matter be definitely put aside?*

Status of the European seed legislation

Not many stakeholders are arguing for a new proposal and the main agricultural unions have already pointed out their preference for the status quo. It also seems that many Member States prefer the old system, with different directives and more space for national implementation instead of a new horizontal regulation as stated in the Commission proposal from 2013. Only few voices, mainly from the side of organic agriculture, are asking for a new system for certification and registration of varieties, giving more space to diversity and recognizing the importance of a good balance between formal and informal seed systems.

Despite all the technical problems in the text, that led to the rejection by the EU Parliament, in 2013 the Commission suggested to introduce more flexibility in the seed marketing. It is important to analyse all the different provisions in order to keep them as cornerstones of the new proposal.

Exclusion of conservation activities

For the first time a regulation on seed marketing excluded all the conservation activities from its scope. The proposed legislation explicitly did not apply to plant reproductive material that was maintained and exchanged in networks of ex situ and in situ on farm conservation of genetic resources following national strategies on conservation of genetic resources.
Moreover the proposal tried to define seeds' exchange as being outside the scope of the regulation, affirming that plant reproductive material exchanged in kind between two persons – other than professional operators – was also excluded.

Niche market reproductive material

Secondly, the proposal defined a new category of varieties, the so called “niche market reproductive material,” that is plant material marketed only by small professional operators. Such material would have been exempted from the requirement of belonging to a registered variety, undermining one of the pillars of the old system where only varieties listed in the European Catalogue can be marketed. This material could be freely commercialized following specific rules on labelling and packaging defined by the EU Commission.

Conservation varieties

Thirdly, the current legal framework for conservation varieties would have been revised to have less strict requirements. Old traditional varieties would have to be registered on the basis of an officially recognized description without an obligatory DUS examination. The officially recognized description would only need to describe the specific characteristics of the plants, which are representative for the variety concerned and make the variety identifiable, including the region of origin. The quantitative restrictions present in the previous EU Directive would have been abolished. The production of commercialized seed would be limited to regions of origin, but the reproduced material could have been marketed without geographical limitations.

Heterogeneous material

The last point regards the concept of uniformity. In this case the proposal of the Commission was quite revolutionary. In the proposal the possibility of marketing seeds of heterogeneous material (i.e. populations) was suggested, seeds which did not fulfil the uniformity requirements at all. This issue was mainly raised by the organic movements asking for more diversity in organic varieties. The problem was that almost all of the stakeholders and many Member States didn’t know anything about heterogeneous material at the time the text was negotiated. For this reason 23 May 2013, the Standing Committee on Seeds organised an expert meeting on populations inviting people from COBRA and SOLIBAM projects and the ECO-PB consortium to present their activities and views.

These changes to the existing norms would have represented a step forward in creating a more flexible regime; taking into account different interests and needs. They could be a good basis for a new negotiation and a better proposal of change.

Temporary experiment

Even if the proposal was rejected, the opening on populations found its way through a temporary experiment set up by the Commission Decision on 18 March 2014 *providing for certain derogations for the marketing of populations of the plant species wheat, barley, oats and maize pursuant to Council Directive 66/402/EEC.* This experiment is allowing limited marketing of populations in order to investigate the conditions under which heterogeneous material can be put on the market. It will define the principles and rules for a future specific regulation on populations. Any Member State may participate in the experiment, but they shall inform the Commission accordingly.

The challenge of organic plant breeding

Abandoning the totem of uniformity in seed legislation cannot only open the way to more diversity in farmer’s fields but also undermine the legal system of intellectual property rights (IPRs), where uniformity is the basis for guaranteeing protection of a specific variety. How can we imagine new tools for promoting innovation without uniformity? How can new breeding for diversity be supported without the old IPRs system? The answers are not easy at the moment, but it will be a challenge for organic plant breeding in the future.

It is important to note that the proposals are not made in the name of free trade, but of public recognition of different models of development in agriculture that calls for adapted policies. It is time to have new seed and agricultural policies in Europe, that will support diversity and integrated seed systems, giving adequate legal recognition to informal seed systems.

Progress in breeding for organics: impacts of the seed derogation system

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SUMMARY *EU organic Regulations stipulate the use of organically certified seed; however there is frequently a shortfall between supply and demand. To address this problem, the seed derogation system was introduced to provide a means by which the use of non-organic seed is permitted on condition that certain criteria are met. Within the EU, national organic control bodies are responsible for granting derogations, although the system and decision processes to determine the outcome of applications vary widely between countries. For example, some have defined a list of crops for which no derogations are granted (so-called Category 1), while others have no such list. Furthermore, the existence and extent of seed availability databases differ considerably between countries, hence there is no common baseline reference between member states. Whilst many in the organic sector still rely on these dispensations, the derogation system can, paradoxically, also act as a disincentive to seed companies to develop this area of their business. Ways in which the system could be modified to support greater investment in organic breeding at the same time as encouraging the use of varietal diversity are discussed in this case study.*

The derogation paradox

The derogation system involves a number of different actors (breeders, seed companies, seed producers, farmers and growers, organic control bodies and regulators) and it is the way in which they interact that determines whether the system serves to support or impede development of the organic seed sector. This is coined the 'Vicious versus Virtuous Circle' by Döring *et al* (2012) (Fig 1). All parts of the circle are inter-related, but the main driver which determines availability and choice of organic seed is the push-pull between investment by breeding and seed companies and the ease with which organic control bodies grant derogations which is impacted by both national and EU-wide policy.

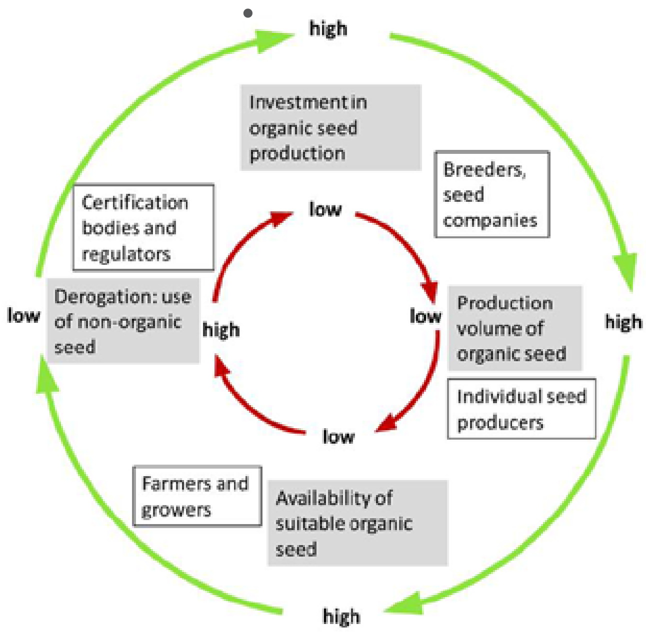


Fig 1: Vicious versus Virtuous Circle of the Organic Seed System (from Döring et al 2012)

An UK example set within an EU context

Data on the numbers of non-organic seed derogations granted in the UK are published in annual reports from the UK government. The decision criteria used by UK control bodies to grant derogations are shown in the box. In 2014, nearly 300 derogations were given for cereals, which represent a reduction of 21% on 2013; however, the organic land area for cereals also fell during this period by 27%. The official database of information on organic seed availability used in the UK is called OrganicXSeeds, developed

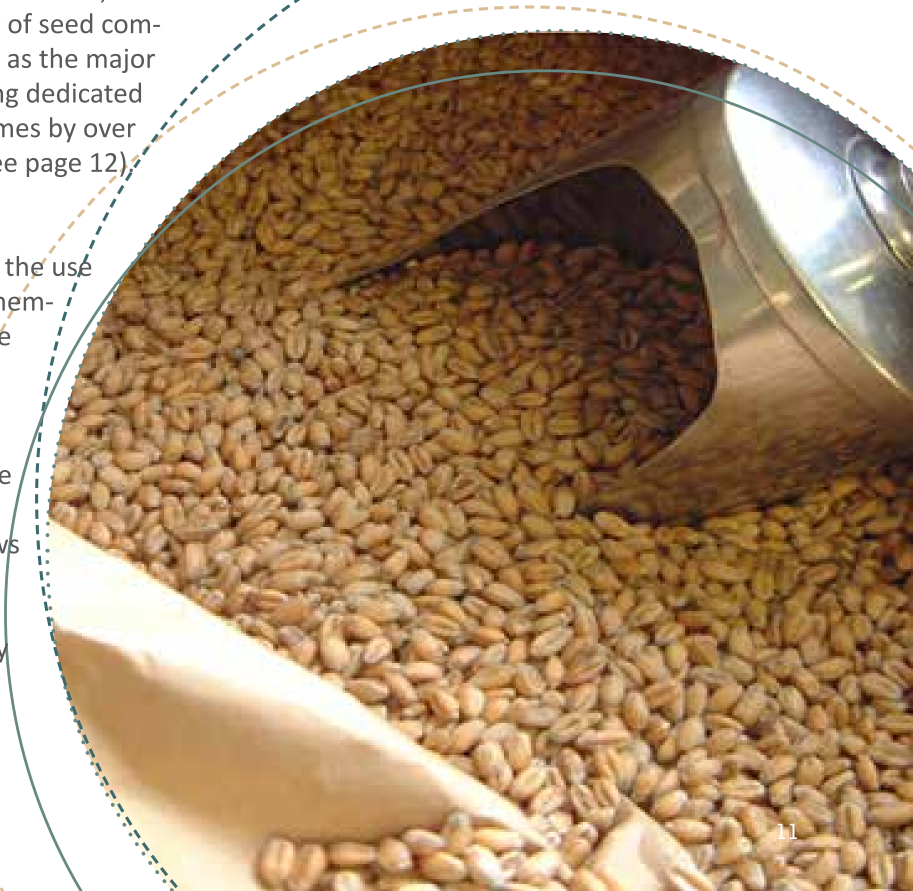
Criteria for granting derogations (UK)

- *No variety of the species is registered on the UK organic seed database (organicXseed.co.uk)*
- *Seed supplier unable to deliver despite being ordered in reasonable time*
- *Variety not registered and it can be shown that none of the registered alternatives are appropriate*
- *Seed is for research, small-scale trials or variety conservation*
- *Seed is part of a grass/forage mix containing at least 70% organic seed*

by FiBL. Seed companies are encouraged, although not obliged, to enter their offers on such databases. Were they widely used they could serve as an excellent tool to assist in derogation decisions; unfortunately they are far from complete. In the UK, of the 32 seed companies registered on OrganicXSeeds, only 2 offer organically certified winter wheat and a number of known suppliers are not registered at all. The scenario is similar for other databases throughout the EU and at this level the widely cited explanation is the perceived lack of return on the time required to enter and keep supply information updated on multiple differently constructed databases when derogations are relatively easy to obtain (ECO-PB 2013). Concerns have also been reported that the system is open to misuse when organic seed is deliberately ordered late after supplies have run low, in which case a derogation for cheaper, non-organic seed is almost guaranteed. These difficulties in the derogation system act as barrier to both breeding for and the production of organic seed, which was underlined in a survey of seed companies where it was stated as the major limiting factor to developing dedicated organic breeding programmes by over half of the respondents (see page 12).

Future perspectives

Whilst there is a discord in the use of derogations across EU member states as a whole, there are positive aspects from individual countries that, if brought together, could provide harmonization. The Netherlands implements a 'flexibility' rule which allows new non-organic varieties that show 'substantial improvement' to be grown by organic producers for a limited time period, benefiting the producers through having access to high performing varieties, but not leaving organic breeders at a disadvantage because of the deadline imposed. Another useful strategy in France is to have a 'warning list' of candidate varieties that are likely to be moved to category 1 (no derogation) to encourage seed companies to build up supplies in advance of the derogation cut-off date. A number of additional suggestions were put forward by participants from across the sector at an ECO-PB workshop on Organic Seed Regulation in Oct 2011. One example is payment of a premium for non-organic seed that has been granted a derogation which would be re-invested into organic breeding initiatives, an idea put into practice with good effect in Switzerland. Such refinements could help to develop the derogation system in the future to simultaneously support its original intention - namely to expand the diversity, quantity and quality of organic seed availability - and at the same time stimulate investment in breeding initiatives focused specifically on the organic sector.



Organic seeds and plant breeding from the seed companies' perspective

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SUMMARY *Many organic agricultural systems suffer from a lack of plant cultivars adapted to organic production. Within the framework of the European projects SOLIBAM (Strategies for Organic and Low-Input Breeding and Management) and COBRA (Coordinating Organic Plant Breeding Activities for diversity) a study was undertaken to provide an overview of the seed companies' breeding strategies for the organic sector and their viewpoints about the organic seed production.*
Results highlight that the organic seed market has grown significantly in some countries (mostly in Northern Europe) in the last three years. This growth is however hampered by an easy granting derogation policy in some countries and technical difficulties in the field multiplication. Several companies surveyed are currently carrying out organic breeding programmes but they still remain relatively few because of the lack of return on investment and the absence of rules adapted to the registration of these varieties bred for the organic sector.

Seed company survey

Within the framework of the European projects SOLIBAM and COBRA a study was undertaken to provide an overview of the seed companies' breeding strategies for the organic sector and their viewpoints about the organic seed production. This study based on an online questionnaire was launched in September 2013 and supported by the projects' partners who allowed a wide and efficient dissemination across Europe. The preparation of the 7th European Workshop on Organic Seed Regulation (Oct. 13) by the European Consortium for Organic plant breeding (ECO-PB) provided a great opportunity to involve organic stakeholders in this study.

Contributors' description

Almost half of the 36 contributors came either from France or the United Kingdom, where the study had probably been more efficiently forwarded. Other responses came from The Netherlands, Austria, Denmark, Switzerland, Germany, Latvia and Bulgaria. Most of the responders were companies producing vegetable and cereal seeds engaged both in conventional and organic seed production.

Organic seed sales

According to the 36 contributors, it is in France, in the UK, in Germany and in Austria that their sales of organic seeds have increased the most over the last three years. The majority of the responders also estimated that the organic seed market will continue to grow in the near future, but quite slightly (Fig. 1), mainly because of the easy granting of derogations for conventional untreated seeds. Technical difficulties and the lack of market opportunities were also cited as limiting factors (Fig. 2).

Fig. 1: A positive growth of the organic seed market in the near future?

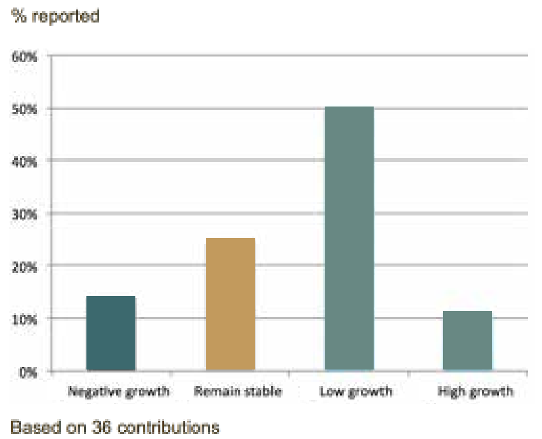
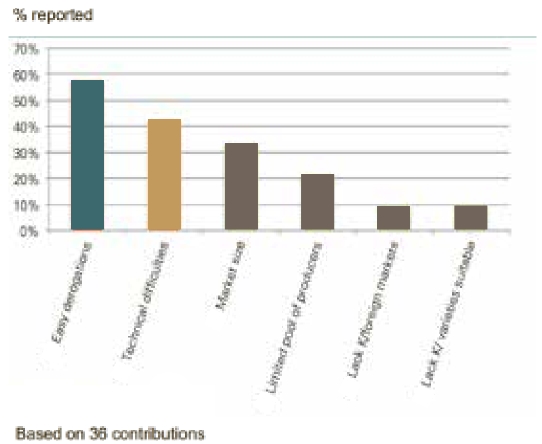


Fig. 2: Main limiting factores: derogations, technical difficulties and market size.



Plant breeding for organic

We can bring out 3 different breeding strategies for organic systems (Fig. 4): 1) Programmes that are organic from the very beginning of the breeding process; 2) Programmes starting with a conventional approach and switching to organic in later stages; 3) No dedicated organic breeding programmes (entirely conventional). For 54% of the companies, the main limiting factor to further development of dedicated organic plant breeding programmes is economic (Fig. 3). 22 % of the responders have also cited the lack of adapted rules for organic seed registration as a major impediment.

Fig. 3: Breeding for organic, limiting factors.
... economic reasons for 54%

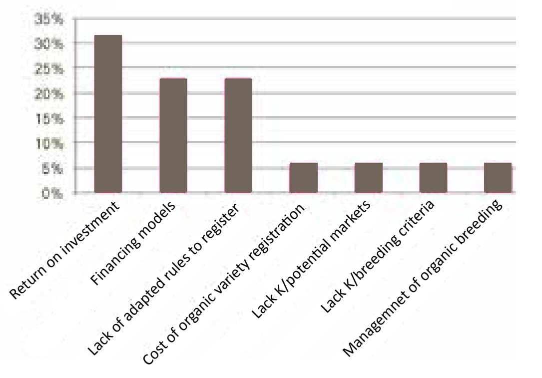


Fig. 4: Plant breeding for organic

Various strategies:

- 8 companies are developing organic breeding programs from the beginning to the end
- 7 start in common with conventional
- 4 don't make separation

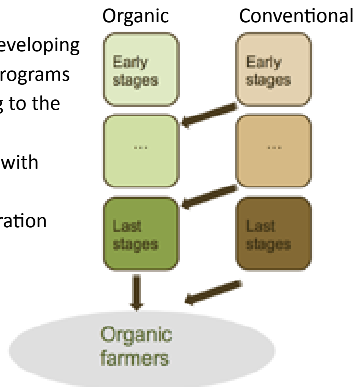
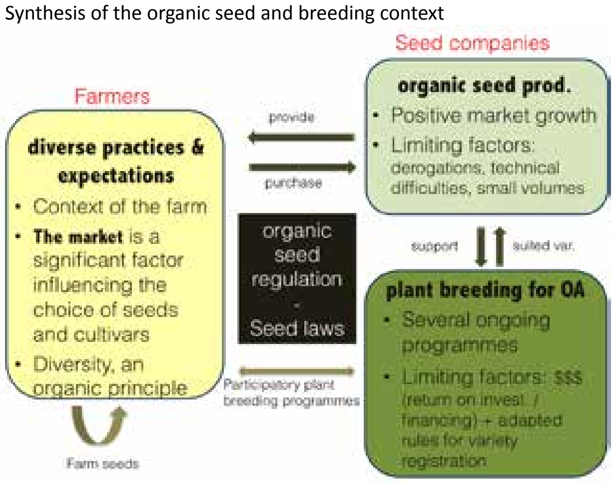


Fig. 5: Synthesis of the organic seed and breeding context



A synthesis of the seed company survey results are presented in figure 5 showing drivers and barriers in the breeding context.

Implementation of populations (CCPs) in the Netherlands

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SUMMARY *As efforts in spring wheat breeding for organic farming are limited, organic farmers rely on varieties developed by conventional breeding. Evolutionary breeding may be an alternative approach to diminish this dependence. In the Netherlands, two spring wheat CCPs were grown by several farmers in 2014 and 2015. Lessons were learned on cultivation, baking and regulations aspects.*

Background

Up to today little effort is being made in breeding spring wheat for organic farming. Hence, organic farmers rely on varieties developed by conventional breeding. To diminish this dependence an alternative approach is evolutionary breeding. It is a cost effective breeding method aimed to create high levels of genetic diversity in so-called composite cross populations (CCPs). This diversity results in improved yield stability. Farmers can propagate the seed of populations developed by breeders. In doing so, the populations can adapt to local conditions. Various aspects need to be better understood for successful implementation.

Observations of two spring wheat CCP's

In the Netherlands, two spring wheat CCPs were grown by several farmers in 2014 and 2015. These two CCPs were developed by Hartmut Spiess (organic breeder at Dottenfelderhof in Germany). In both years various traits were observed, such as yield, disease resistance and baking quality. The involved farmers like the idea of growing CCPs, amongst others, because they look nice in the field and they fit well to the concept of organic farming. An involved baker (Consequente Biobacker) did the baking tests. With the NAK (Dutch seed regulations authorities) aspects related to seed law were looked into, in the context of the EU experiment on heterogeneous materials. See page 8.

Lessons learned on cultivation and baking quality

- The populations appeared to have advantages on sandy soils because of their taller plant height and hence better weed suppression. On clayey soils in the western part of the Netherlands, where yellow rust pressure is very high, their resistance to yellow rust requires improvement.
- A short chain is successful if farmers and bakers share ideas and vision on agriculture. For example, if scores for baking quality are considered relative. In 2014

there appeared to be little relationship between protein content and baking quality (Figure 1).
- For farmers it is important to work with bakeries who want to work with wheat that can vary in quality. A baker needs to be prepared to adapt the baking process to the quality of the wheat, as differences in baking quality between the produce of different fields can occur.

Lessons learned on regulations
- Rethinking is required by authorities: they are used to work with uniform material. Working with heterogeneous material requires a different approach.
- A different approach is needed to describe CCPs: can agronomic and baking quality traits be used instead of morphological traits? However, in farmers' fields the differences found between the two CCPs appeared to be relatively small. Morphological traits appeared to be rather unstable.
- Guidelines are developed to reduce the risk of mixture of the CCPs. In case of accidental mixture farmers can buy seed from fellow farmers, for which special regulations for seed replacement apply. For that adjusted rules for seed production apply. It is also useful if the seed testing authority has samples of the CCPs available for comparison.

Future perspectives for CCP's
It seems that for now the concept of CCPs fits well to farmers working on sandy soils in the eastern part of the Netherlands. They have different variety requirements compared to the large scale farmers in the 'optimal' clayey soils in the western part of the Netherlands. Measures to distinguish populations need to be further studied.

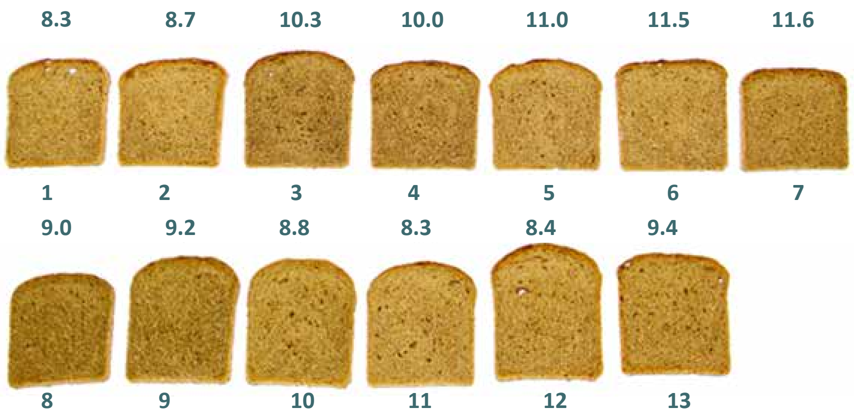

Fig. 1: Slices of the baked breads of the populations with the pure line varieties Lavett (nr 5) and Heliaro (nr 10) for comparison. Protein contents are printed on top.

Bottom photo: Population (left) and a pure line (right) of spring wheat.

The situation of composite cross populations in Denmark

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SUMMARY *Denmark is participating in the temporary experiment for marketing of populations (CCPs) (see also page 9). Activities of developing and testing CCPs are still rare. One Danish breeder, Anders Borgen, has however, since 2007, developed a number of cereal populations. He is cooperating with two farmers on selection strategies and testing the populations. The CCPs have not yet caught the interest of larger groups of farmers, but cultivation and baking experiences of some of the CCPs have been promising and motivate the people involved, to continue the work.*

Seed for organic farming on the political agenda

In 2010, the Danish organic sector lobbied for political and financial support for the development of better seeds for organic farming and for changes in the seed marketing regulation. This resulted in 2,7 mill. Euro being reserved from the national finances for activities aimed at developing seed for organic farming, as well as political support to change the EU seed directives to legalize marketing of plant propagation material that does not meet current DUS requirements. To discuss how the EU seed marketing regulation can be changed to allow production and marketing of less uniform varieties, the Danish public authorities initiated a 'Dialogue Forum' in 2013. A broad spectrum of stakeholders in the seed business including organic farmers, seed savers and other NGOs were invited to join this Dialogue Forum. Today, 23 people are members of the Dialogue Forum. The meetings reflected the different interests of established breeders and the ones challenging the existing regulation, but the dialogue resulted in a mutual understanding and a compromise position. This led to some changes related to the seed marketing rules and that Denmark participates in the Commission's temporary experiment for the marketing of populations.

Danish spokespersons for CCPs

Only few people work with CCPs in Denmark. Anders Borgen has been an advocate for more diversity in agricultural crops and has suggested CCPs as one way to achieve this. The idea is that more genetic diversity will facilitate a crop that can better cope with variable growing conditions, such as nutrient and water availability and temperature. An increase in diversity is also seen as a possible strategy against crop diseases and for a higher competitiveness against weeds. Anders Borgen has been in the organic movement for more than 30 years. He worked at the University of Copenhagen for several years specializing in seed-borne diseases, and this work led him into plant breeding. Today, he has his own company, Agrologica, where he does development activities in the area of maintaining and developing agriculture's plant genetic resources, mainly in cereals. He cooperates closely with two certified organic farmers, Niels Foged and Per Grupe, both of them having farm mills and direct sales of their locally produced flour. Both of these farmers are interested in crops with high baking quality, as well as robust agronomic field performance. Anders Borgen carries out crossings and does initial multiplications in his own trial facilities before the plant material is grown in trials on Per Grupe and Niels Foged's farms and quality tested. Anders Borgen's CCP breeding activities has, over the past 10 years, been

partly funded by public and private support programs.
In 2014, Anders Borgen decided to participate in the Commission's temporary experiment for the marketing of populations. The aim was to continue a constructive dialogue with the authorities in regard to developing better rules, and to gain approval for marketing diverse populations such as CCPs. In the spring of 2015, Anders Borgen submitted 6 applications to the public authorities with reference to the temporary experiment.

The 6 CCPs and their qualities

The 6 CCP's cover 2 spring wheats, 1 winter wheat, 2 spring barleys and 1 winter oat. All of the CCPs are young from a breeding perspective – the 'oldest' crossings were done in 2007 and the most recent ones in 2012. Due to the youth of the breeding programs of the 6 CCPs, few yield trials and quality tests have been done. The amounts being tested and multiplied are still small and the qualities of the CCPs are still being developed. The winter and spring wheats, as well as naked spring barley, aim to meet the small millers demand for crops with a high baking quality, or other interesting qualities for consumption. For example, one of the spring wheats is selected for purple grain color. The covered spring barley and winter oat aim more broadly at providing competitive, robust organic crops for feed.
In July 2015, the public seed certification authorities visited Anders Borgen and inspected the CCP trials. One issue was how to proceed with the control process. Anders Borgen and the authorities agreed that both the multiplication and testing of the 6 CCPs at this stage meet the definition of trial and research and, hence, is legal under the existing seed regulation. However, the authorities also acknowledge the interest in preparing rules for a potential sale of CCPs in larger amounts. The authorities will not restrict the distribution of the CCPs (as hardly any takes place). Also, the authorities have received samples of the 6 CCPs and these have been included in 27 observation trials for diseases and growth habit at different locations in Denmark, which is a part of the standard set-up of VCU tests of cereals. This is done in order to get more experience with the CCPs and their performance.

Photo: 16 July 2015: the seed certification authorities together with colleagues responsible for plant genetic resources and DUS examination visited Anders Borgen (person to the left) in order to see the 6 CCPs and discuss further activities in regard to the Commission's temporary experiment for the marketing of populations.

Future perspectives of CCPs

The idea of introducing CCPs in organic farming is supported by ecological studies and theories that document and explain the robustness of diverse crop systems. As such, CCPs are in tune with important principles of organic farming. Increased crop failure due to widespread diseases in susceptible varieties or extreme weather conditions also support continued interest in CCPs as a potential and less vulnerable alternative to genetically uniform varieties. However, very few breeders and farmers have been convinced that CCPs are a valuable strategy for developing better seeds for organic farming, possibly influenced by the fact that the marketing of seed of populations has, so far, been illegal. EU has now provided an opportunity to explore possible new rules for CCPs. Since rather small amounts of CCP's are being developed, tested and circulated, it is a challenge to exploit this opportunity and achieve results that are strong enough to support permanent derogations of the rules. More trials and experiences are needed to catch the interest of more people, and new breeding methods need to be developed which are able to improve selection within populations without losing the diversity. Resources are needed for such trials. Time will show whether or not organic farmers, companies and consumers will be motivated to take a more active role in funding such breeding activities.

The challenge of how to finance plant breeding for organic farming

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SUMMARY *The breeding industry has become centralized in few large breeding companies within the last couple of decades. Breeding costs have increased rapidly due to the adoption of new breeding techniques and increased costs. The organic seed market, although increasing, is still considered niche size by many breeders and breeding exclusively for organic farming is often not profitable. The lack of profitability in breeding for small markets has resulted in a lack of suitable varieties for organic farming and also in a lack of regional breeding initiatives in some crop groups furthermore resulting in lack of varieties with adaptation to local conditions. Organic farming is thus challenged by a need for new models of organization and financing for organic plant breeding.*

Background

Organic breeding or breeding for organic farming take place in established private breeding companies, micro scale breeding companies, public institutions, non-profit or membership organizations, and in the context of different types of cooperations between breeders, scientists and farmers.

Varieties for organic farming can be derived from everything between pure organic breeding programs to conventional breeding programs with only organic variety testing and seed multiplication.
The outcome of the breeding process varies between pure line varieties, populations, OP varieties, heterogeneous varieties etc. The varieties can be protected by Plant Breeders Rights or be open source. Breeding techniques vary between simple crossing techniques and traditional selection to modern techniques as marker assisted selection. Breeding approaches may vary from a single trait breeding approach to a system breeding approach.
Market conditions can also be diverse depending on the market size, farm size in the region, sale on local to global scale, sale of specialized products to mainstream products and consumers can have different requests.
Each country/region may have different interpretation of regulations, cultural traditions and possibilities for organic variety testing and different financing options.
Different types of organization and financing models must be seen in the context of this diversity of underlying conditions.

Financing models

Most large scale private breeding companies rely on royalties and seed sales more or less exclusively; this model requires a certain market size to finance breeding costs.
Instead of having pure organic breeding programs, some private breeding companies combine conventional and organic breeding programs to different extents to minimize the costs and still provide varieties that have traits of interest for organic farming.

Small scale breeding companies and micro scale breeders have much lower costs for a breeding program and can have an interest in smaller specialized markets, and therefore it is interesting to promote this type of breeding initiatives. The challenge is the financing of the initial breeding activities before actual varieties are developed and the setup is very dependent on individual enthusiasts.

Public breeding institutions rely on state grants and public funding, which is highly dependent on governmental policies, and is thus always in the power of political winds.

Some of these initiatives are more oriented towards research and have cooperation with professional breeders and yet other institutions breed new varieties.

In some countries there are enthusiasts that can act as drivers in the community. This is an important prerequisite if breeding is to rely on private foundations and donations or membership funding, where the community becomes engaged in the breeding.

Chain based funding with shared responsibility among breeders, food producers, processors, retailers and consumers require a large degree of commitment from all chain partners. An example with spring wheat breeding in the Netherlands is given on page 20 in this booklet.
Participatory breeding is another example of breeding with shared responsibility, where farmers and breeders/scientists cooperate in the breeding process with decentralized selection of heterogeneous varieties, or population adapted for local conditions and with specific breeding criteria as baking quality.

New organisation models needed

Breeding for increased diversity calls for new models of financing. Return of investment in these varieties is expectedly lower and breeding activities will have to be financed by other means than the traditional seed royalties.

New organizational and financing models are evolving across Europe in the organic sector. Based on the diversity of breeding initiatives and underlying conditions in different regions; barriers and possibilities may differ significantly from one breeding initiative to another. It is important to identify these barriers and possibilities specific to each breeding initiative and take these into consideration to have success with a certain organization and financing model.

Breeding pure line varieties of spring wheat for organic agriculture in the Netherlands

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SUMMARY *The availability of spring wheat varieties for organic farming is very limited. Efforts have been made to find ways to obtain more suitable varieties and make their future availability more reliable. A consortium of farmers, bakers and a trader has been set up to stimulate this development, in cooperation with breeders. A number of key elements have been identified to make such an approach feasible.*

Breeding spring wheat in the Netherlands

The availability of suitable spring wheat varieties for organic farming is very limited. For Dutch organic farmers baking quality is important, which is not important for conventional farmers and breeders. Only one conventional Dutch breeder is breeding spring wheat and is not breeding for baking quality. The Dutch organic wheat sector is too small to make a breeding program profitable. For new varieties, Dutch farmers rely on breeding programmes in other European countries. As a result, new suitable varieties are only found by chance.

Designing a strategy to stimulate breeding

How can the organic wheat sector have more reliable access to suitable spring wheat varieties? Meetings have been set up by the Louis Bolk Institute with farmers, breeders, millers, traders and bakers. In 2009 an idea was proposed to set up a breeding program aimed at breeding new varieties suited to the needs of Dutch organic farmers. Through a levy on the bread it is possible to collect this amount each year, and it is not a drastic increase of the bread price, unlike raising a licence fee for farmers (Table 1).

Table 1: The alternatives to finance spring wheat breeding

OPTIONS	EFFECT	WHO
Raise licence fee	3.1% increase in production costs	Farmers
Acreage Levy	Too expensive	Farmers
Levy on meal / flour	2% increase in flour price	Bakeries
Levy on bread	1% price increase per loaf	Consumers

All partners signed a consortium agreement, making their commitment visible. The next step was to link up with existing breeding expertise. To set up a breeding program, material from three breeders was tested in 2009. Because of suboptimal field conditions (low N), none of the materials appeared to be promising. When the subsidy for the facilitator was also cut, the consortium came to a standstill.

Variety screening instead of breeding programs

In 2013, the question was raised how to continue. All consortium members still showed commitment: The farmers and the trader because yellow rust resistance became an even more important issue; the bakers because they wanted to use more regionally produced wheat. Instead of a breeding program, it was proposed to screen varieties and potential lines for registration, increasing the chances of success. Variety screening trials were set up in 2014 and 2015 to see which varieties showed potential. Varieties were chosen based on information from the trader and closely involved breeders. Lessons learned are described in the box.

Future perspectives

The next step will be to include breeding lines in the evaluation trials. A smart approach with low costs for adjusted VCU-testing for organic farming needs to be developed. Ideally, in the future in particular advanced breeding lines that show potential for organic agriculture will be tested. One issue is how to pay the extra costs for variety registration if such breeding lines are not of interest for conventional farming.

Lessons learned

To make a chain based approach feasible, several key-elements are important.

- *A problem needs to be urgent for involved stakeholders, a recognised need is not enough*
- *Alternative financing models can trigger the chain partners to believe in the possibilities and show commitment*
- *A (neutral but well-informed) facilitator to keep common commitment is important, as stakeholders have diverse interests*
- *Complexity of the market chain and differences in business culture influences the rate of success*
- *Governmental policy and support, and economic importance of a crop are beneficial*

Breeding for improved weed competitiveness in spring barley

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SUMMARY *Weeds are a well known challenge in organic farming, and there has been a request from the Danish organic sector for varieties with higher weed competitive ability and adaptability to the conditions of organic farming. To find solutions to this issue a dialogue with the Danish breeding companies was initiated to identify barriers and possibilities in order to develop varieties better adapted for the conditions of organic farming. A number of activities were initiated.*

Background

Weeds can cause harvest difficulties and low yields in organic farming and this is a reason for some farmers to give up organic farming. In Danish organic field trials 1999 – 2006 it has been found that each percentage of weed cover roughly causes 0,5 pct. yield loss. The weed challenge can be influenced at different levels in the organic production system, and it is important to solve the problem at the right level. When crop rotation, management and choice of crop are in place then choice of variety can be important to meet weed challenges.

Spring barley is a popular cereal in Denmark due to its good feeding and malting quality, but compared to oat or rye it is not a good weed competitor. In 2014 the organic area with spring barley was 14.300 ha. Two Danish breeding companies Sejet Plant Breeding and Nordic Seed breed varieties of spring barley.

Dialogue between breeders and the organic sector

Before a dialogue was initiated breeders stated that the organic market was too small and the best conventional varieties were also the best varieties for organic production. But during the dialogue with the breeders it became clear that they needed specific information on which organic breeding goals to prioritize and how to select for these specific traits.

The organic sector stated that not only yield and disease resistance are important breeding goals for organic farming, but also weed competitiveness and nutrient efficiency, and that varieties that may do well in organic farming can be discarded in the conventional breeding programs. A mutual understanding was reached during the process and activities were initiated.

Identification of barriers and possibilities

First of all barriers for breeding varieties better adapted to the conditions of organic farming were identified. One barrier was a knowledge gap and breeders requested information about organic seed markets, seed databases, VCU testing, variety trials and trading companies in Europe in order to increase the market share. On the other side the organic sector needed to understand the complexity of the breeding process.

Breeders also requested characteristics of weed competitive varieties and easy methods to register this in organic variety trials and in their conventional breeding programs. Another barrier was the lack of organic trial fields for selection.

Screening in organic fields

Screening in organic fields allows breeders to select breeding lines that are suited for organic conditions, that otherwise might be discarded under conventional conditions. Trials were set up under organic management (farmers fields) and at low nutrient supply. In the screening trials interesting material with a combination of high yields and high weed competitive ability has been observed.

Improvement of organic variety trials

In order to better describe differences between varieties concerning weed competitiveness, a number of methods are being tested. Methods must be reliable, non-destructive, simple and inexpensive to implement, in both organic and conventional variety trials. Methods should be able to explain variability in coverage of weeds at earing stage in different varieties. Methods are being tested and analyzed in close coordination between SEGES, scientists and breeders. A promising method is crop coverage of ground at early growth stage, evaluated by photos taken in the field and analyzed by a computer program (”IMAGING crop response analyser” developed by Copenhagen University), combined with plant height before harvest.

New Crossings of spring barley

New plant material from low input conditions with interesting characteristics has been collected. And crossings of new material have been made with existing material aiming to combine the most important characteristics. New varieties will be tested in 2016.

Future perspectives

Breeders have taken up an interest in breeding for organic farming, opinions have shifted and breeders now state that the organic market has a size of interest for marketing varieties targeted for organic production. The value of screening programs under organic conditions is acknowledged and new varieties are under development. Lasting financing models for screening programs under organic conditions will have to be developed.

In a future perspective easy and efficient measures to assess weed competitive ability should be integrated in breeding programs and testing protocols for VCU trials and organic variety trials. A promising method could be photos of trial fields taken from drones, and analyzed with regard to crop coverage, allowing many plots to be evaluated at the same time.

This method will undergo a preliminary test in 2016 in organic field trials.

Conventional vs. organic soybean production in Northeast Italy

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SUMMARY *Compared to maize, soybean is by nature a low-input crop. Some points are discussed to foster organic soybean in NE Italy, a well-established area under conventional agriculture. Crop yield and quality are affected by soils and climate, management, pests and diseases. Apart from weeding and fertilization, conventional and organic farmers adopt similar crop management techniques. Particularly for weed management, non-chemical strategies are crucial in organic soybean production, whereas at least for NE Italy, breeding does not appear to play a pivotal role.*

Background

Soybean is the top oilseed crop and top agricultural commodity traded at global level. Five countries (USA, Brazil, Argentina, China and India) concentrate 90% of global soybean production. Only 2% of the global soybean acreage is in Europe. In industrial agriculture, soybean meal is the main protein source for the livestock farming sector. After the spread of GM soybeans exhibiting herbicide resistance, GM varieties are grown on 82% of the total acreage. Unfortunately, for the livestock farming sector in most EU countries, GM soybean seeds and/or meal are irreplaceable raw materials. As certified organic soybean production covers less than 1% of acreage in EU countries and non-GM soybean breeding is dwindling, there is an increasing demand for organic soybean, particularly for soyfood manufacturing.

Italy presently ranks 15th in the world among soybean producers, with approx. 40% of the EU-27 acreage. Northeast Italy accounts for approximately 75% of the national crop production, but crushing industries are still largely dependent upon imported (i.e. > 90% GM) soybean seeds. A better understanding of the crop responses to organic management (for example: non-chemical weeding) could hopefully encourage new farmers to enter into organic production systems.

Food-grade varieties in low-input conditions

In 2013 and 2014, four potentially food-grade varieties (large seeds, pale hilum, high protein) were tested in three locations of Friuli Venezia Giulia (FVG), NE Italy. Three MG I and one MG 0 soybean varieties were grown under low-input or organic management. Weeds were controlled by non-chemical methods only. Planting dates spanned from early May to early July. From a farmer's standpoint, grain yields on average were barely adequate (2.78 t DM ha-1), due to very low yields at Udine, 2013.

Weed pressure at Udine, 2013 was increased by late planting, coupled with an insufficient crop density. Seed protein content, a key trait in food-grade production, was in the range 410-440 g/kg. Indeed, the delayed planting at Udine, 2013 was linked to higher seed protein content, which in turn caused seed quality degradation (Figure 1). In summary, grain yields and quality of soy-

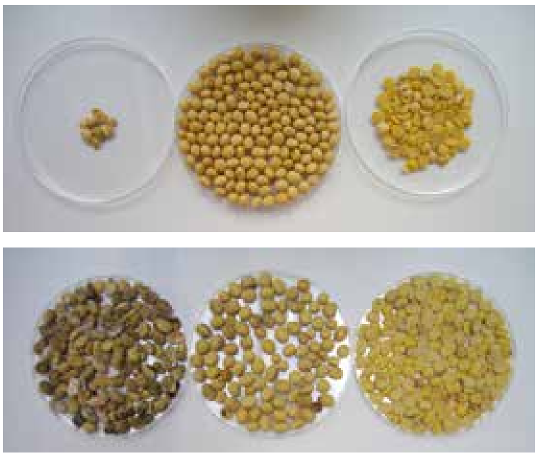

Fig. 1. Soybean seeds (cv. Energy) harvested in two locations (Fossalon, left - Udine, right panel). Sound seeds, usable for food-grade production, are in centre dishes. Late planting at Udine impaired grain yields and visual seed quality.

bean seeds were adequate under low-input conditions, provided planting was in early May to early June.

Major differences in conventional and organic crop management

By means of a questionnaire supplied to both conventional and organic farmers, major crop management choices (rotation, rainfed vs. irrigated, weed management, etc.) were compared between the two groups of 16 organic and 21 conventional farmers respectively. Not surprisingly, many choices were common to the two groups. Approximately 75% of farmers in both groups grew soybean as main crop, i.e. planted in May; 2-year or 3-year rotations were chosen by 80% of conventional and 67% of organic farmers respectively. Almost 50% of organic and 43% of conventional farmers use no irrigation at all, which is consistent with the relatively abundant rainfalls in July and August. No major problems from fungi or pests were declared by either group. Organic farmers in particular were satisfied by crop rotation in controlling soybean pests and diseases. Conventional and organic groups understandably diverged in weed control methods.

Eight out of ten conventional farmers rely on herbicides as the only strategy, with small percentages using chemicals combined with non-chemical weeding. Conversely, multi-step strategies (delayed planting, rotations, mechanical weeding) are used by 75% of organic farmers, while the remaining 25% use other strategies (multiple mechanical passages, plus hand weeding if needed). A possible increase of soybean cropping area was indicated by 42% of conventional and 25% of organic farmers. Current specialty oilseed grain prices were perceived as not fully adequate for food-grade productions.

Future prospects

In order to attract new players into the certified organic soyfood business and facilitate the evolution of this specialty oilseed production, specific targets need to be set for crop management, farm economics and marketing areas. Research and practice are particularly needed to improve non-chemical weeding tools. Genetics and breeding efforts may be useful to improve plantlets vigour and early soil covering. These strategies may be more appropriate at higher latitudes of Central Europe, where other tools (i.e. delayed planting) are troublesome. Finally, additional funding should be allocated by the public sector to sustain non-GM soybean breeding. Efforts should also be made to clarify food-grade production standards.

Status quo analysis of seed production and breeding of organic wheat in Slovenia, including implications for baking quality

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SUMMARY *A survey among organic wheat producers, processors and experts related to the organic breeding in Slovenia showed a need for an improved availability of locally adapted organic wheat varieties and seeds, also in relation to the insufficient (baking) quality of organic wheat for larger processors. Organic wheat breeding in Slovenia is at the beginning stage. In the light of the newly available financial support for organic seed production, the need for knowledge transfer and training of seed producers is very high.*

Organic wheat production in Slovenia
Organic farming in Slovenia is dominated by animal husbandry, with 87 % of the organic area under grassland. Wheat is the most important cereal grain; however the total organic wheat area in 2014 was only 329.25 ha. Along with spelt, wheat is also the most important organic bread cereal. In 2015, there were only 4 organic wheat varieties on the Slovenian market. The aim of the survey was to analyse the status quo of the organic wheat seed production and breeding, as well as the baking quality of organic wheat.

Survey of wheat producers, processors and breeding experts
The survey (2014) included organic wheat producers, processors (bakeries), commercial seed producers and experts related to organic breeding.

The survey of wheat producers aimed at identifying the status quo and the challenges of organic wheat production in relation to seed availability of appropriate varieties, testing etc. The survey included 9 farms with 160.8 ha of organic wheat production (almost 50 % of total), of which around half of the area was used for growing wheat for human consumption. Half of the surveyed producers are selling their wheat grain to the bakeries and millers.

A high share of the producers (2/3) are using only their own seeds, the rest of the producers also partly use commercial seeds. The producers rate the choice of organic wheat varieties as acceptable in terms of yields, resistance to diseases, product quality and priceon the other hand, they are not satisfied with the stability of yields. 2/3 of the producers are satisfied with the seed quality of the varieties they are currently using. Only 1/3 of the producers were acquainted with the term VCU but they didn't know the data on VCU for the varieties they use.

The survey of processors included 3 larger bakeries and 2 small (on-farm) bakeries. On-farm bakeries using their own and sometimes also bying organic wheat are, satisfied with baking quality, however, they don't perform specific testing of the baking quality. Larger bakeries perform grain and dough quality analysis; they pointed out that the producers would need to select the varieties more carefully, in order to improve the quantities and the (baking) quality of their grain. On-farm bakeries don't see the need to diversify the varieties because they process only relatively small quantities of grain.

The breeding experts confirmed that organic wheat breeding in Slovenia is in its very beginning, which is also one of the reasons for the narrow choice of organic wheat varieties and especially for the lack of locally adapted organic varieties.

Future perspectives

Out of the two seed companies in Slovenia, one is small, exclusively organic and has been focusing mostly on vegetables, while the other is a conventional company with a smaller organic programme. Both are interested in expanding their cooperation with organic seed producing farmers. Acknowledging the need for locally adapted organic varieties and for the general availability of organic seeds, the national Rural Development Programme (2014-2020) is offering support for organic seed production in the height of 800 EUR/ha per year. This measure can contribute to the availability of organic seeds, especially grains. However, the survey showed a strong need for knowledge transfer and training of (future) organic seed producers. There is also a need for developing a proper organic (cereal) breeding programme; however due to the currently small scale of organic cereal production in the country, this may be rather difficult. The necessary research could be started with the funds of the national targeted research programme, which would allow the scientists to work on the selection of organic varieties together with organic farmers.

Coordinating Organic Plant Breeding Activities for Diversity

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The COBRA project is funded via the ERA-Net CORE Organic II by national funds to each partner. CORE Organic II is a collaboration between 21 countries on initiating transnational research projects in the area of organic food and farming. CORE Organic II has initiated 14 research projetcts.
Read more at coreorganic2.org