

# Stimulating organic farmers to participate in on-farm selection by providing training courses in plant breeding

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## Abstract

Nowadays in modern agriculture very few (organic) farmers are involved in on-farm selection activities to improve varieties. They depend on commercial breeding companies for organic propagated seeds and for improved varieties. As only few breeding companies invest in organic seed production and even less in breeding programs for the organic market, the organic sector must find ways to produce improved and better adapted varieties. One of the solutions to meet the needs of the organic sector is to stimulate the commitment of farmer-breeders to enlarge the capacity to gain better adapted, open pollinating varieties. However, many interested farmers hesitate because much of the breeding process is unknown to them. For this purpose short introduction courses including theoretical and practical aspects of plant breeding were setup for organic farmers in the Netherlands from 2002-2004. In this paper the setup of these training courses is described and the effectiveness is evaluated. The conclusion is that such short introduction courses on plant breeding, including theoretical and practical sessions, is a valuable instrument to stimulate more numbers of farmer-breeders. But it also became clear that follow-up activities are needed, such as more specialized and advanced training courses, professional guidance and meetings to exchange knowledge and experiences.

**Keywords** : training courses in plant breeding, participatory plant breeding, organic plant breeding, organic seed production

## Introduction

As in many branches of industry also in agriculture specialization has occurred during the last century and enabled seed production and plant breeding to become highly specialized activities. Nowadays in modern agriculture very few farmers are involved in on-farm selection activities to improve varieties. The majority of modern farmers has lost the knowledge and skills, but also the interest to be personally involved in on-farm seed production and/or selection. Being more and more under economic pressure, modern farmers, either organic or conventional farmers, rather save time and rely on the professional breeding companies to provide them with the best varieties and the best seed quality.

In this tradition also organic farmers depend highly on commercial seed companies. As the organic sector is now putting more emphasis on closing the production chain, it has become clear that only a few commercial seed companies are prepared to produce organic seeds of a limited assortment of their existing varieties. The main reasons is that the sector is too small for organic seed production on a commercial scale next to their conventional practice.

This dependency also affects the possibility to achieve specialized varieties for organic growing conditions, because many of the conventional breeding companies are reluctant to set up special breeding programs for the organic sector as long as this market has a limited size. Another concern of some organic farmers is the increasing emphasis of plant breeders on hybridization thus neglecting the improvement of open pollinating varieties. One of the solutions to meet the needs of the organic sector is to stimulate the commitment of farmer-breeders to enlarge the capacity to gain better adapted, open pollinating varieties. Some organic farmers have indeed taken initiative to develop such activities, whereas others are considering to participate but hesitate because much of the breeding process is unknown to them. This was the reason for Stichting Zaadgoed, a foundation which aims to enhance organic plant breeding in the Netherlands, to set up training courses in plant breeding for farmers. In this paper we will describe and evaluate the setup and effectiveness of the training courses in plant breeding for organic farmers.

## Training courses

To support farmers in making a decision to start on-farm selection and/or seed production, an introduction course *Selection in farmer's own hands* for organic farmers was organized, three times during the period 2002-2004. The participants were recruited by sending all the specialized arable and vegetable growers in the Dutch organic sector (480) an announcement of the training course. The aim of the introduction course was to provide an overview of the plant breeding process and of the implications of setting up on-farm plant breeding. Therefore the course did not only present some theoretical background but also provided an opportunity to see how plant breeding works in practice through field excursions, by including some practical exercises.

In order to keep the threshold for joining such an introduction course as low as possible the course was kept short. Therefore each course consisted of 6 afternoons spread over the year, see Table 1. The costs were relatively low (250 euro per course, including some written background information) as most of the organizations and companies conducting a session did not ask a fee seeing it as part of their public relation activities.

**Table 1.** The setup of the introduction course *Selection in farmer's own hands*, Zaadgoed Foundation 2002-2004.

Session	Subject	Location	Period
1	Theoretical background of plant breeding	Louis Bolk Institute	January-March
2	Theoretical background of plant breeding	Louis Bolk Institute	January-March
3	Selection in practice for annuals crops	Plant breeding company (Vitalis Organic Seeds)	June
4	Selection in practice for biannual crops	Plant breeding company (Rijk Zwaan)	August/September
5	Genetic Resources	An example of in-situ conservation of heritage/conservation varieties (De Oersprong)	September/October
6	Rules for registration of new varieties	Seed certification body (NAKtuinbouw)	September/October

The first two sessions were planned during late winter time and focused on the basic theoretical background of plant breeding, discussing themes such as reproduction of plants (cross pollination, self pollination, etc.), genetics, heritability, variety concepts (population, open pollinating or hybrid varieties), development stages of a variety (goals, genetic resources, choice of parent lines, crossings, selection, registration) and the practical tools (design of breeding program, genotype-environment interaction, numbers).

The second set of two sessions were held during growing season and focused on making farmers familiar with practical selection activities by visiting two plant breeding companies. Both involved breeding companies showed their selection fields and discussed some of their applied methodologies. The participants could also practise with different types of selection methods, such as negative and positive mass selection. The first breeder had therefore sown two beds of radish in which the participants were allowed to select, and the individual results were discussed. To experience also the fine handwork of emasculation and hand pollination, the first breeder let the participants exercise on some cut tomato flowers.

To show the potential resources for plant breeding and the maintenance activities the fifth session was an excursion to an organization involved with *in-situ* conservation of genetic resources of old Dutch varieties. The last session of the training course was a field visit to the organization involved with the seed control, seed certification and registration of new varieties to get an overview of costs and requirements of marketing seeds of new varieties.

### Experiences

Over the three years 45 farmers and other interested professionals participated with overwhelming enthusiasm.

**Table 2.** Number of participants of the introduction course *Selection in farmer's own hands*, Zaadgoed Foundation 2002-2004.

	Farmers already involved in on-farm production	Farmers already involved in on-farm seed selection	Farmers not yet involved in production and/or selection	Breeding researchers and advisors	Policy makers	Number of participants per year/total
2002	3	4	7	5	-	19
2003	1	0	7	5	-	13
2004	3	1	3	2	4	13
<b>Total</b>	<b>7</b>	<b>5</b>	<b>17</b>	<b>12</b>	<b>4</b>	<b>45</b>

Table 2 shows five categories of participants: a) and b) farmers already involved in on-farm seed production and selection and seeking more background knowledge, c) farmers who were considering to start selection activities but needed more insight to come to a more educated decision, and others such as d) breeding researchers and advisors, and e) policy makers related to the organic sector.

The farmers of the first two groups were thankful for more insight in the background of their already existing daily work in seed production and selection. Of the third group of interested farmers had gained more knowledge on the ins and outs of the breeding process. Some came to the conclusion that this was not feasible for them; the others of this second group had become even more serious in considering to start such activities. The group of breeding researchers, advisors and policymakers saw this course as an opportunity to meet farmer-breeders and learn about their needs to be able to better support participatory plant breeding for organic agriculture in the future.

All participants emphasized that learning more about the species specific, natural reproduction and crossing systems of plants, and the process behind variety development resulted for them in more respect for nature and for the process of plant breeding as a profession. Many participants concluded that such a course should be open to every farmer involved in plant production.

All participants were very positive about the setup of the course and on the content. Often time was too short to answer all the questions of the participants as they were eager to learn as much as possible in a short time. Some of the participants would have liked to learn more about the differences between open pollinating and hybrid varieties as this is an element of a principle discussion in the organic sector. As this course aimed at providing an introduction to general basic knowledge and skills of the plant breeding process, some participants remarked at the end that they would have liked to have more insights included in the typical aspects of organic plant breeding concepts and strategies, and would have liked to discuss such in a following study group of farmers involved in on-farm selection.

### Evaluation

An inquiry among the participant farmers by telephone was made in 2006 to learn whether the course had indeed stimulated farmers to become involved in seed production or selection activities. The results are shown in Table 3. Of those farmers already involved in seed production (7) three were stimulated by the course to also include selection activities. Of those participants (17) who were at the time of the course not yet involved in seed production or on-farm selection two farmers had started seed production and six initiated selection activities. Their aim is to develop varieties not merely for their own use, but for a broader group of organic farmers. The crops involved are potatoes, cereals, vegetables (onion, squash, cabbage, leek, tomato and several others). Some are also involved in selecting flowers.

One Belgium advisor who participated in the course, was inspired to set up the same course in Belgium with 27 organic farmers in 2004 of which now 8 farmers are active in seed production and selection. Even the advisor himself has started farming and is involved in improving Chinese cabbage by selection. These involved Belgium farmers are now also actively exchanging seeds among each other.

**Table 3.** Overview of the current activities of the farmers after participating in the training courses, 2006.

Number of farmers involved in on-farm seed production				Number of farmers involved in on-farm selection, or planning in near future				Number of farmers not involved in seed production and/or selection			
During the course 2002-2004	After the course, 2006	During the course 2002-2004	After the course, 2006	During the course 2002-2004	After the course, 2006	During the course 2002-2004	After the course, 2006				
7	9	5	14	17	9						

\* including the three farmers who were already involved in seed production but also started selection

### Follow up activities

In 2005 the breeder researchers of the Louis Bolk Institute who participated in the courses, set up follow-up activities with additional funding of the Triodos Foundation to give farmer-breeders the opportunity to exchange and discuss knowledge and experiences among each other. The farmers meet each other three to four times per year on one of the farms to see and discuss examples of selection activities, such as on cabbage, onion, broad beans. The group of participants is growing and has increased to some 16 participants per meeting.

Meanwhile the Zaadgoed Foundation has also managed to raise funds to support those farmers that spend substantial time in selection and need some financial support.

A follow-up meeting was organised by the foundation in 2005 on issues, such as the requirements for registration of varieties (e.g. uniformity), and the principles of breeders rights and farmers rights. An important question that appeared was the need to commonly organise the administrative efforts and costs for registration of new varieties.

The conclusion is that such short training courses on plant breeding, including theoretical and practical sessions, can be a valuable instrument to more farmer to become involved in organic plant breeding and seed production. But it also became clear that follow-up activities are needed, such as more specialised and advanced training courses, professional guidance and meetings to exchange knowledge and experiences.