

## **Towards more sustainability in organic fruit growing: German fruitgrowers first steps to improve their production system**

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### **Abstract**

*In the frame of the project “Arbeitsnetz zur Weiterentwicklung der Anbauverfahren des Oekologischen Obstbaus” (BOEL-project Nr. 04OE178/06OE100) a group of fruitgrowers and advisers from all German regions started to discuss possibilities to enhance their production system. Several working groups have generated out of this network: The group “Intensive Extensive” which tries to test other orchard management systems. The group breeding and new cultivar and the group that is working on the enhancement of biodiversity in the orchard. Some growers test their ideas on small plots on the farms and discuss with scientists, consultants and other growers. Thus, first steps towards more resilient systems can be taken.*

**Keywords:** sustainability, variety, rootstocks, biodiversity, copper

### **Introduction**

At the beginning of 2004 in Germany the project “network for improvement of the production system in organic fruit growing” was started. 21 growers elected from the groups in the different regions of Germany discuss together with researchers and consultants approaches for solutions for management problems in organic fruit growing. In the first years, the main objectives were the solutions of different plant protection problems. In the last years, the activities focus more and more towards more sustainability in the organic production system. More sustainability, so it seems, means just to optimize the orientation towards the principles of organic farming.

In the last years, several groups started to work:

#### **1. Working group “Intensive Extensive” (coordinator R. Ortlieb)**

##### *Background*

The organic movement in Europe started from the basic, by farmers and growers, pointing out clearly what they want respectively what they didn't want any more. (p.e. Bioland, 1973)

First there was the “emotional” will, then the search for practical solutions. Along with the public and political acceptance started the growth of the market, more research and advisory and more and better plant protection caused economical success, Convention to organic became popular, especially in the last decade, and organic apple growers became much more intensive – but the mentality turned more and more into „no risk“ and „organic by law“. Visions became rare. The vision of the extensive intensive group is a combination of the „old“ ideals with „new“ solutions.

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*Aims and realization*

The main topic of the approach of this group is to build more sustainable production systems that require a lower input. Therefore it is important, to fix common goals for all members, but respecting different regional ways.

To avoid partly active plant protection and intensive treatments, we have to think about sustainability in our orchards long before the first tree will be planted. Of course, economical success is of the same importance.

Scab resistant or less susceptible varieties and stronger rootstocks are very important tools in this conception. Some growers and research stations have already some experience, all members of the group want to design a more or less small orchard on their farm to gain more experience and to learn by doing what is feasible in the context of the aim they achieve.

In 2006, they gave order to an organic nursery to propagate some interesting scab resistant and marketable apple varieties on the strong growing rootstock M 25.

In 2007, mainly “Topaz” was also propagated on rootstock Geneva 11.

Growers, nurseries and interested research workers work closely together to figure out the best varieties, tree breeding, plant distances etc.

The Geneva rootstock series seem to be very interesting for this “Intensive Extensive” system.

## **2. Working group new apple varieties and breeding (coordinator P. Haug)**

*Background*

Cultivars with multiple resistance or even more tolerance against diseases are essential to allow a more sustainable production in organic orchards.

The aim in several breeding programmes is to find high quality apples with a long lasting resistance to scab, powdery mildew and fire blight. There are other serious diseases in organic orchards for example sooty blotch and *Phytophthora cactorum* which are not in the focus of the breeding projects.

In the past new methods to allow more precise selection like marker-assisted selection (MAS) were developed. Until now there is a permanent discussion about other biotechnical methods like trans-, cisgenetic and reverse breeding techniques.

Due to the fact that single resistance genes can be broken easily, breeders started with pyramiding of resistance genes. Most of those approaches are based on monogenic resistance. Fruit quality characteristics derive from very few crossing partners (varieties like Golden Delicious a.o.).

*Aims and realization*

- In the network group we discussed the possibility of the use of new biotechnical methods in organic production. Therefore we take part in an intercultural network for organic breeding coordinated by FIBL. A statement against trans-, cisgenetic and reverse breeding techniques was released.

- A close contact to established commercial breeders and research institutes of fruit breeding to support the breeding efforts based on traditional and smart-breeding (MAS) methods. For example: At the beginning of 2010 a cooperation between 'Kompetenzzentrum Obstbau Bodensee, Bavendorf (KOB) and the 'Institut für Experimentelle Botanik', Prag (UEB) was installed and will be monetary supported by fruit growers. This cooperation arises the opportunity for an exchange between the partners about breeding aims and results in an early period of selection. An early testing and selection system was established under organic conditions on several farms.
- An other approach to save a broader genetic base in our future cultivars, is not to work only with monogen or qualitativ resistance (or their combinations) but the use of crossing partners with field tolerance (quantitative resistance) against the most important diseases. Therefore crosses and seedlings should be done and selected under organic field conditions. A working group with fruit growers and private breeders from the Netherlands, Switzerland and Germany and FIBL started to coordinate a participative approach for an organic breeding project.
- New Strategies for the market introduction of new resistant or tolerant varieties have to be developed or existent strategies have to be established. Workshops with participants of the whole supply chain are on the agenda.

### **3. Working group "Enhancement of biodiversity in the orchard" (coordinator J. Kienzle)**

#### *Background*

The "ideal" organic orchard provides not only fruit but it is also an important source of biodiversity and habitat for a lot of species. Consumers' image of organic orchards is often affected by flowering meadows and hedges. The reality in the orchards is drifting towards more or less the same system as in conventional orchards – the higher biodiversity still observed in the organic orchards in comparison to orchards under integrated production is often more due to the non-application of synthetic herbicides and insecticides than to the application of any measures to enhance biodiversity.

During the years past, many initiatives to include flowering plants in orchards were made, first by growers then by scientists. Since the enhancement of beneficials failed to improve control of key pests as the rosy apple aphid and on the other hand the flowering strips caused evidently problems with voles, these structures were not established in common practice. This working group tries to find new ways to enhance biodiversity in the orchard compatible with the needs of organic production.

#### *Aims and realization*

- Identification, test and introduction in practice of structures compatible with production that enhance biodiversity in the orchards as flowering strips that can be mulched or single bushes at the top of the rows.
- Identification of species for which organic orchards could be a potential habitat and for which almost partially good conditions are found. Targeted introduction in the orchard of factors that can complete it as habitat (for example special flowering species for *Osmia rufa* before and after apple blossom to cover the need of nectar plants during the whole period this species requires it).

The growers group is working since 2006. In this year, they started to test a mixture of flowering plants which were potentially suitable for flowering strips that can be mulched. This mixture was tested on several farms (Kienzle, 2008). Based on this experience, for interested farmers individual mixtures can be composed according to mulching regime and soil conditions.

In different workshops experts for certain species groups were invited and the potential of organic orchards as habitats for these species was discussed by the growers.

Long term aim of the group is a catalogue of measures to enhance biodiversity in organic orchards. If the first catalogue of measures is designed, more growers should participate in testing and optimizing these measures.

But not only the enhancement of biodiversity or new varieties are discussed in the network. Plant protection problems will always be a crucial point in organic fruit growing. However, from the discussions in the network it becomes very evident that even to resolve problems that at first sight seem only technical questions it is necessary to consider always the whole production system. Loosing the balance in this system at long term may mean to loose the natural stability of our production system.

Very important is this in the context of resistance management. The appearance of resistance of codling moth against the Granulovirus CpGV should be a serious warning for the organic fruit growers. The "ideal" organic system is always a well balanced combination of indirect measures of plant protection, functional biodiversity and direct plant protection measures. If growers rely too much only on direct measures and preferably on only one method, the same problems as in integrated production will arise also in organic systems. If organic fruit growers do not aim to change products each decade and to depend completely of the contemporaneous availability of several compounds that allow to alternate different active ingredients that all should be as suitable as possible for their system they have to go actively in search for other systems of resistance management. These could consist in a more balanced combination of direct and indirect measures. In codling moth control, first steps in this direction are taken: one of the standard measures to reduce the infestation pressure is just to collect injured fruits and to remove them from the orchard.

Such management conceptions should be established possibly before other resistance problems rise. A long term stability seems only achievable with balanced strategies that respect the principles of organic farming and aim always towards more resilient systems.

The resistance management should also be considered very clearly in the discussion about the reduction of the use of copper products. If this reduction is not due to a better system management but to a simple substitution of copper by other products the properties of these products must be examined carefully regarding the necessities of a future resistance management. If there are changes, the stability of the whole system is compromised. A fast and continuous change of several plant protection agents, as a modern resistance management in integrated production requires, is difficult to conform with the organic principles.

Thus, even such a technical problem as the reduction of the use of copper compounds must consider the whole production system. If it leads to more resilient systems it can be a fruitful thought-provoking impulse. If it leads to less stable systems that require always more inputs at long run there could be serious damage for the organic movement as a whole.

Thus, it is of main importance to act with care and consideration.