



Photo: Author

The potato experimental plot with many different potential breeds. While most died as a result of disease, some plants survived and produced high yields.

## Multiple strategies on an organic farm in the Netherlands

**Hans Peter Reinders**

Niek Vos' organic farm is located in the centre of the Netherlands, on land which was reclaimed from the sea nearly 60 years ago. This area is now known as the North East Polder, and as it is below sea level, the polder is surrounded by enormous dikes that protect it from flooding. The land reclamation programme of the 1940s was designed to increase food production in the Netherlands, so the area was planned for agricultural development. Sixty years later, this area has very fertile clay soils, and excellent characteristics for growing seed potatoes.

Niek Vos' farm is certified organic, and in many ways represents the market oriented organic production systems which can currently be found in the Netherlands and western Europe. Among other things, these systems are based on the use of organic manures, while at the same time avoiding the use of chemical inputs like fertilizers and pesticides. Products are sold with a special label allocated by the certifier, and generally get a better price in the markets. A large percentage of every year's production is exported to Germany, Scandinavia and the U.K., and sold in these countries' organic markets.

Niek manages his farm alone. Labour is very expensive in the Netherlands, but high-tech machinery is available. These two factors mean that everything that can be mechanised is done by machines, as this is the most economic option. Each farmer

owns some machines himself, while other very specific and expensive machines can be rented from specialised enterprises. Still, not all work can be done by machines, so during the busy months, just after planting, additional labour has to be contracted (in particular for weed control). These are often schoolboys who want to make some money after their classes. Occasionally, labour is also contracted during the harvest.

### **Many simultaneous strategies**

In Europe, as anywhere else, the climate determines the crops you can grow, but also determines what kind of pests and diseases you can expect. In the Netherlands, the wet, relatively cool and temperate conditions mean that insects are not that difficult to handle. However, this climate provides the best conditions for the development of fungi. As on many other farms, the fungus diseases which attack many of the crops grown on Niek Vos' farm are hard to control.

Niek Vos' farm has been organic since 1986. Over the last 20 years he has learned how to deal with the major pests and diseases and has found out that ecological pest management is, like weed control, an enormous challenge. The strategies he currently uses to avoid crop loss on his farm are the result of these 20 years of experience: good crop rotation, interaction with the season at the right moment; the design of the farm; cultivation measures and the use of resistant or tolerant varieties.

### Crop rotation

Good pest and disease management is based in a well-designed crop rotation system. This is why Niek Vos grows more than 8 different crops in one year, and he does not sow the same crop for at least 6 years in the same field. He grows potatoes, alfalfa, maize, beetroot, wheat, onions, carrots and oats. A lot of diseases are avoided when these crops are not grown on the same plot for a relatively long period of time. Rotating crops and adding a fallow year to the cycle (when nothing is grown), results in potato crops which are free of nematodes (*Globodera* spp.) and rhizoctonia (*Rhizoctonia solani*). Long sowing intervals also prevents carrot leaf spot (*Alternaria dauci*) and wheat head blight (*Fusarium graminearum*). Nevertheless, because many different species are grown, this crop rotation has a large impact on farm income. Not all crops are equally profitable as some have a lower price in the market. But good rotation requires diversity, so it is necessary to grow the less profitable crops as well.

### Interaction with the season

Several pests and diseases can be avoided by sowing at the right moment. Crop loss can be avoided if a crop is sown when its pest is not present. Carrot rust fly (*Psila rosae*), for example, can cause severe damage to carrot fields. As part of their reproduction cycle, the adult flies out twice a year, always in the same month, and this is when they infect the carrots. By sowing his carrots at the beginning of June, after these flights have already taken place, Niek Vos makes sure that the insects will not affect his crop. Similarly, the presence of spores of *Phytophthora infestans*, the late blight fungus, increases tremendously during the growing season. Niek and his neighbours know that it is important to plant and to harvest potatoes as early in the season as possible. A good strategy to do this is by pre-germinating the seed potatoes. The time of planting should be balanced with the risk of frost damage early in the year.

### Design of the farm

In Niek Vos' opinion, a well-designed farm is open. In an open farm, the wind is able to blow through the crops where different insects look for shelter, blowing them away before they are able to affect the crops. At the same time, the wind can contribute by "drying" the field, so the optimal conditions for the fungus diseases are reduced.

Detailed observation has also inspired many new ideas for the farmers in the North East Polder. A good way of avoiding rodent damage in beetroot, for example, is the construction of nest boxes for predatory birds like falcons. When the boxes are used for nesting, these birds catch an enormous amount of mice to feed their young birds.

### Agronomic aspects

Experience has also shown that there is a close relationship between some common agronomic practices and the presence of pests and diseases. One of them is the quantity of manure used per hectare. The availability of nitrogen, in particular, will make a plant grow fast, directly influencing the way the crop develops. Such growth stimulates productivity, but also has a negative impact, as it increases a crop's susceptibility to fungus. Good leaf development will mean that a crop will not dry easily, and the crop will be affected by fungus-borne diseases rapidly. The fields where more susceptible crops are grown should therefore receive a limited amount of manure before sowing.

Some crops suffer from bird attack. Pigeons or crows dig up the recently sown seeds and eat them. It is thus necessary to sow the seeds a little deeper than usual, making sure that they are out of reach, but that at the same time they can germinate easily.

### Resistant or tolerant varieties

Lastly, an important strategy in pest and disease management is the use of resistant or tolerant varieties. The choice of varieties depends on several factors and is always a compromise between different characteristics. A more disease-tolerant variety can be less productive or have characteristics which the consumer does not like, like taste, colour or shape. Niek Vos gives priority to varieties with high resistance to pests and diseases, even if, as a consequence, he has lower yields per hectare. In this way, he has been able to avoid leaf rust (*Puccinia* spp.) in his cereals (oats and wheat) and to reduce the damage caused by cercospora (*Cercospora beticola*) in his beets. Throughout the years, he has also seen that the attack of downy mildew (*Peronospora destructor*) on onions, and late blight in potatoes can be reduced by growing more tolerant varieties, even if it is impossible to avoid the diseases totally.

### How are new strategies developed?

Finding new strategies to control pests and diseases is an interesting process that has changed over the years. In the beginning, when he started farming organically, Niek and his neighbours didn't know how to control pests efficiently. They needed to find alternatives in a dynamic way, trying out different strategies for different crops and being open to change. Small changes in the day-to-day management of the farm resulted in new ideas emerging, many of which became effective new strategies. Exchanging information with colleagues was fundamental. A good example of this is how Niek found out how to grow carrots without relying on chemical pesticides, when none of his neighbours knew how to do it.

Several years ago, Niek rented part of his shed to a trader, an old man from another region, as he was not going to use the space for his own harvest and some additional income is always welcome. The trader used Niek's shed to store carrots. This man had worked with carrots for more than 50 years, and he had seen how people used to grow them in the past, before pesticides were introduced. The old trader recommended an even longer crop rotation than the seven year cycle which organic farmers were familiar with. So Niek decided to make an exception to his regular seven year rotation scheme, changing it to 14 years. Of course it took a very long time to see the results of the experiment and check whether the old trader was correct. Eventually, he was proved right. Having met the old trader by chance, and being open to changes, Niek could now grow carrots organically without problems. Knowing how important it is to exchange information with colleagues, Niek Vos has always been an active member of a farmer's organisation (see *LEISA Magazine* Vol. 23 no.1). The exchange of information about pests and diseases is always an important topic at the meetings: the 14 year cycle for carrots was quickly followed by other farmers.

### A personal breeding programme to avoid late blight

The incidence of late blight in potatoes in the Netherlands has grown dramatically in recent years. The economic profitability of the tuber crop was so high that conventional cultivation became very intensive. This intensive production meant that late blight increased as well. Spraying fungicides helped control this disease in conventional farms, but for organic growers, cultivating



Photo: Author

**Phytophthora is a problem in Dutch agriculture, more so in organic farms where alternatives to pesticides need to be developed.**

potatoes became nearly impossible. Varieties highly resistant to late blight were all but non-existent. It is not commercially attractive for Dutch breeding companies to develop resistant or tolerant varieties. The market for organic seed potatoes is very small, while at the same time there is a high demand for nematode resistant breeds (a characteristic which is not so relevant for organic growers as nematodes are avoided by crop rotation).

Niek Vos decided to start his own breeding programme and develop a variety which would tolerate the presence of *Phytophthora*. Thanks to a verbal agreement with a local seed company, he received 8000 clones of different potential breeds every growing season, together with the results already found by the company. Over many seasons, when the fungus started affecting the crop, he selected all the infected clones and threw them away. At the end, only a few clones remained, showing some resistance against late blight. Some years not even 10 potential breeds survived. These clones were tried again

during the following season, and those which survived again were then checked according to other characteristics (such as shape, taste, productivity, frying qualities, and resistance to other diseases). Resistant clones were found several times, but often they had other unattractive characteristics, which made it impossible to bring them out as a new commercial breed on the market. As Niek found out, it is hard to breed a variety that resists a disease, and which has all the characteristics which consumers demand as well as all the characteristics the crop needs to grow well. Tolerance or resistance to *Phytophthora* needs to be combined with more than 30 other important traits.

After more than 12 years, Niek is now happy to show some results (acknowledging that 12 years is a relatively short period for a crop breeding programme). One new clone resists the late blight without any significant yield loss, and it also has all of the other good qualities. This new clone is called "Bionica" and Niek Vos is the proud creator. Some tests have been done by the seed company recently, in order to register it as a recognised new breed, and soon it will be sold commercially. Niek's neighbouring farmers are particularly interested in it, as are other organic producers in the Netherlands. And Niek plans to continue trying new clones, recognising that the struggle against the potato diseases needs to continue. Because of large-scale cultivation of potatoes, the *Phytophthora* fungus adapts rapidly, with new types developing fast. Resistant potato varieties therefore need to continue being bred.

This experience is interesting, in particular as it shows that management practices for dealing with pests and diseases are universal. Similar techniques are applied by LEISA farmers all around the world. The example of farmer Niek Vos also shows the enormous importance of sufficient availability of genetic resources and the need to protect genetic diversity of arable crops worldwide. Genetic diversity makes it possible to develop resistant varieties, and that is often the only way to avoid pests and diseases without using agro-chemicals. ■

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## Call for articles

### Living soils June 2008, Vol. 24.2

Decreasing soil fertility is one of the world's major agricultural problems. All over the globe, farmers are complaining that their soils are "tired" or "worn out", and that their yields are falling. Reversing this trend, however, cannot be achieved by just adding fertilizers: healthy plant growth is dependent on the state of the soil that supports it (and therefore the importance of "feeding the soil, not the crops"). More than just looking at its chemical composition, this also means considering the existing soil micro-organisms and how the soil is able to sustain life. Enhancing soil fertility thus means creating favourable conditions for soil life, ensuring a good balance of components (air, water), and aiming at an optimal structure and texture.

Restoring and maintaining soil life is possible through various means. This includes different agronomic techniques, such as using diverse cropping systems and sequences, adding mulch, opting for zero tillage or recycling farm resources. All efforts made towards improving the organic matter content in the soil help in making it productive and sustainable. At the same time, we need to consider that soil is also a community resource. This issue will therefore also highlight traditional practices for restoring soil health, the social agreements towards the prevention of soil deterioration, land tenure arrangements, and the cultural practices which have enabled improving and maintaining soils as a basis of farmers' livelihoods.

**Deadline for submission of articles: 3<sup>rd</sup> March 2008.**

### Social inclusion September 2008, Vol. 24.3

**Deadline for submission of articles: 2<sup>nd</sup> June 2008.**