Challenges of Organic Arable Farming

6th module: Recovery and final synthesis





Module description and objectives

- The aim of the OK-Net Arable project is to improve the exchange of innovative and traditional knowledge among farmers, farm advisers and scientists. With specific objectives to increase productivity and quality in organic arable cropping, and to improve environmental performance of farming. Under this framework, in the last module we are going to recall some important issues for topics covered during the course.

- The objective of the module is to put an emphasis on organic arable farmer groups and their perspective about topics that were part of the course. Thus, making a synthesis of all information provided before with new inputs from farmers groups. To complement teaching material additional tools will be provided and participant are encouraged to give their final contribution in the discussion forum.

Module outline

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Introduction

Important part of the OK-Net Arable project is to respond to farmer priority challenges in terms of the tools that the project tests, linking farmer perspectives with researcher knowledge and recommendations, and developing easy-to-use methods for online farmer-to-farmer knowledge sharing. Further, to identify best practical examples, ensuring that information can be found easily and consumed quickly, identifying context specific information, and provision of reliable information from trusted sources.

The information provided in 6th module contain data collected from farmer groups involved in the project, located in 10 European countries. Common issues identified by the groups were weed management, soil fertility, and pest and disease control. Other, more specific topics are lack of knowledge and research, nitrogen management, nutrient cycling, challenges with grass and clover rotations, soil water content, cultivation issues, climatic changes, seeds and the availability of organic varieties.

1. Soil fertility

Soil is fundamental and irreplaceable; it governs plant productivity of terrestrial ecosystems and it maintains biogeochemical cycles and microorganisms in the soil will degrade ultimately all organic compounds and release them in nutrient flow (Nannipieri et al., 2003).

Soil is a natural resource that must be protected for future generations, as rates of soil formation or recovery are often too slow to cope with current rates of soil loss and degradation (Pulleman et al., 2012).

In the following link you will find the brochure "The Basics of Soil Fertility management" which delivers important information from scientific and farming perspectives. Its aims to supplement practical observations of farmers, to encourage them to reconsider their relation to their soil and to practice a truly sustainable soil culture.

1. Soil fertility

Fertilizers and soil conditioners allowed in organic farming are listed in Annex I of the Reg (EC) No 889/2008 (EC, 2008). They can, however, vary considerably in terms of the origin of their raw materials, composition, nutrient content, and rate of nutrient release. For these reasons, a systematic grouping is proposed as a useful tool to better understand how, when and at which application rate they can be used. They have been divided into three main groups as follows:

- Organic amendments (base fertilizers): animal manure, compost and digestate
- Organic fertilizers or complementary organic fertilizers
- Complementary mineral fertilizers

Here you will find practice abstract about use of commercial organic fertilizers to complement fertilization strategy for potato.

1.1 Farmers perspective – soil fertility

All farmers groups use rotations to build fertility with the inclusion to a lesser or greater extent of fertility building grass clover (or other forage legume e.g. Lucerne) leys. To complement this fertility building phase, several groups include grain legumes such as faba beans as a fertility building cash crop.

Five groups mention the use of cover cropping and the inclusion of green manures to help manage the nutrient supply, though issues around incorporation in the spring exist. One group mention the use of "cut and carry" as a method of transporting fertility around the farm.

Several groups have highlighted the importance of using catch crops to limit the amount of nitrogen leaching, with one group using intercropping of a grain legumes and cereals for a "catch and release" system where the legume provides nitrogen to the cereal crop.

1.1 Farmers perspective – soil fertility

The stockless systems often rely on off farm inputs to build fertility, while it is easier for farmers with stock to integrate grass clover leys and this can be valuable in terms of providing forage with the added benefit of providing manure and slurry for on farm use.

Farmers with stockless systems have to be more creative and innovative and two groups mentioned exchanging forage or manure with neighboring livestock farmers, while two groups mention supplying biogas plants with green waste in exchange for digestate. Issues for farmers wishing to exchange their forage are the limited numbers of organic livestock farms and organic biogas plants.

Nutrient cycling is an open system as yield is going out from farm and three groups see using sewage sludge or city compost as a way to close the cycle.

There is a trend for groups located in Denmark, Austria and Germany to discuss the use of both sewage sludge and biogas digestate for use as fertilizer.

1.1 Farmers perspective – soil fertility

There is recognition from one group that different manures may need to be applied at different points in the rotation to maximize the benefits while reducing the risk of leaching by applying liquid manure to grassland and solid manure to arable land.

Three groups mention the additional use of soil improvers/activators with sea minerals, rhizoctonia inoculation and mycorrhizae to improve fertility. Only one group was explicit about the need to increase soil organic matter with the addition of manure, compost and organic fertilizer to improve fertility and only one group expresses the need to manage nutrients other than nitrogen.

Soil fertility management is specific to the farming system and to an extent the climate which dictate management strategies. It appears that all key nutrients could be limiting factors in terms of yield. Regulations surrounding the use of off farm manure, sewage sludge and digestate make the issue of managing soil fertility difficult for stockless organic arable farmers despite the sustainability of these nutrient sources.

2. Weed management

In organic cropping systems, the effects of cultural practices on crop – weed interactions typically manifest themselves more slowly compared with conventional systems, both in the short (during a crop cycle) and in the long term (during one or more crop rotation cycles). Consequently, crop and weed management in organic agriculture should be tackled in an extended time domain and needs to be deeply integrated.

Compared with conventional systems, organic agroecosystems have some peculiar features that enforce the need to study their components (including weeds and their management) in a global framework, i.e. by taking into account any possible interactions with the other system components occurring across space and time (Bàrberi 2001).

2.1 Farmers perspective – weed management

Approaches to weed control vary between countries and farmer groups, as do the weeds. As a cornerstone of organic farming it is unsurprising that all groups mention crop rotation as a control strategy for many weeds.

More interesting are the different approaches taken, with several groups using intercropping and cover cropping to create competition and help suppress weeds. In several groups grass clover leys are mentioned as a key strategy to control annual and perennial weeds and one group uses nurse cropping to establish perennial legumes.

Control strategies vary from system to system with higher value vegetable crops tending to be mulched and manually weeded, with one group using flame weeding.

2.1 Farmers perspective – weed management

Some groups reported on including row crops into the rotation in order to allow for inter-row hoeing as a weed control strategy. There is a general trend towards mechanical weeding with several groups mentioning innovative machinery such as the kvik-killer for perennial weeds or the combcut for selective intercrop weeding. Groups that mention using mechanical weeding strategies, highlighted the cost of specialist machinery as a barrier to implement such strategies and as solution they suggest to share such equipment and cooperate with neighboring farms.

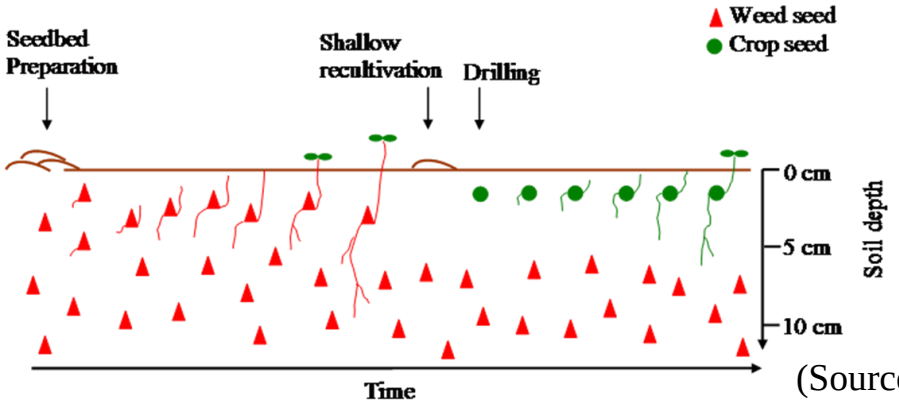
Combcut (Source: Just common sense)

Kvik-killer (Source: CMN maskintec)

2.1 Farmers perspective – weed management

Crop management as a tool for weed control is mentioned by three groups who use sowing date, sowing density and optimum crop nutrition to help the crop to compete the weeds. Although only three groups are explicit about the use of crop management, it is very likely that several, if not all, groups employ this strategy in combination with a diverse rotations.

False seed beds is technique mentioned by the farmers for reduction of annual weeds. While, researchers are concerned that in context of increased climate unpredictability this could be an increasingly risky strategy. Also, this technique can be seen as contradictory to the idea of permanent ground cover to protect soil, illustrating potential conflicting goals between reduction of weed problems and soil protection.



(Source: physicalweeding.com)

2.1 Farmers perspective – weed management

Weed control strategies are highly farm specific and depend on the weeds present, the farming system, the climate and soil moisture as these play an important role in the efficacy/feasibility of mechanical control.

However, several of the major weed species (docks, thistles, couch, fat hen, wild oats) are common in causing issues for farmers across Europe. Thus some of the control methods and control barriers (cost of machinery and lack of knowledge) are common as well.

Nature provide ecosystem service and example, in case of weed management, are ground beetles (Coleoptera: Carabidae), which are important invertebrate consumers of seeds in temperate agroecosystems. Here you will find very simple methodology to assess the level of seed predation by ground beetles in your field.

3. Pest and diseases control

Pest and pathogens control in organic cropping systems is based on continuous adaptation and adjustment of practices (equipment; natural products; varieties, crop sequence and sowing time, etc.) to prevent infestations or counteract disease development. Such strategy requires continuous evaluation of new technical options suitable for organic management.

The findings of research applied should be steadily transferred to organic producers through extension services with a correct dissemination so that farmers can independently develop innovative cropping practices according to farm size and agro-environmental constraints.

Farmers should use the advantage of integrated management approach, based on available knowledge on crop-pathogen interactions to prevent outbreaks of pest and diseases (EIP-AGRI, 2014).

3.1 Farmers perspective – pest and diseases control

The farmer groups that indicated pests and diseases as one of the top three production challenges are using rotations, drilling date, tillage and variety selection to help mitigate the risk factors and threat.

The majority use biofungicides and bioinsecticides certified for use under organic standards and these are usually copper/sulfur based, though neem oil is also used. Groups highlighted a lack of resistant crop varieties, and more certified plant protection products.

Here as well some conflicts are arising from management strategies. For example, incorporating of residues may help to limit carry-over of disease from crop residue, but this is clearly opposite to the aim to reduce the intensity of tillage. Also, one group mentions the use of certain green manures to control nematodes but this may increase the number of brassicas in rotation, thus increasing the risk of soil-borne diseases such as club root.

3.1 Farmers perspective – pest and diseases control

The farmer groups already use so called preventative measures mentioned earlier (rotation, drilling dates, variety selection, and to a lesser extent, mulching, cover cropping and intercropping), so it would seem logical that future direction will be towards novel plant protection products and decision support tools.

If extra diversification of cropping systems can help to create a more “resilient” rotation there is also a need to develop research and information dissemination in this area. Several farmer groups mentioned the need for more information on topics such as cover cropping and intercropping though not specifically in the context of pest and disease reduction.

Innovation exists in the form of smart application tools to guide management but still there is a need for more information in the form of plant protection product databases that are country specific and improved forecasting tools that help warn farmers of the spatial and temporal threat from disease and pests.

3.1 Farmers perspective – pest and diseases control

In case of curative measures much research is being done to identify novel substances, particularly to replace or reduce the use of copper. Given the time and expense that must go into the research and development of new plant protection products it makes sense to target the crops whose yield limiting factors are pests and/or diseases.

Among pest problems that were often indicated by farmer groups are wireworms (*Agriotes* spp.). Here you will find the tool that describes how to assess the number of wireworms in your field before planting potatoes and practice abstract about crop rotation planning to reduce risk of wireworm infestation.

Beside wireworms, potato beetles are well-known pest in case of potatoes and here you will find practice abstract with details on application of *Bacillus thuringuensis tenebrionis* (Bt) as direct control measure.

4. Farmers perspective – other challenges

Other highly ranked issues included: lack of knowledge and research, problems with nitrogen management, nutrient cycling, challenges with grass/clover rotations (how to get more clover in the rotation), soil water content, climate changes, availability of organic seeds. Many of these issues are interrelated and connect with the three most frequently cited challenges outlined above.

Advisers and researchers also clearly play an important role in identifying potential solutions. For example, weed suppressing rotations is a commonly cited topic where groups require more information. There are clear areas where existing research results could be applied, and supported by advisory materials or by exchanging experiences with other groups. According to the one of the farmer groups problem is that the design of suitable crop rotations is affected by strict market limitations.

4. Farmers perspective – other challenges

In addition, some specific challenges are mentioned, for example varieties of durum wheat to be cultivated under organic farming in Italy. Apparently there is low availability of varieties for cereals that are suitable for organic arable producers. Varieties have been selected for conventional agriculture and tend to be of poor quality, this issue of low quality also affects the 'processing quality' required for producing high quality pasta.

Further, there are some examples of clear demand for knowledge provision – farmers in Flanders (Belgium) rely on seasonal workers from other countries who are not able to recognize weeds and lack knowledge of appropriate weed management practices. This highlights the need to have guidelines or videos (in relevant languages) that can be provided to workers. This example also demonstrates the need to consider, and pay attention to, social elements of farming systems.

Conclusion

Three major challenges faced by organic farmers are all linked and interdependent. The interactions between management strategies and the effects, both positive and negative, on the various production challenges must be researched to guide farmers to make beneficial management decisions.

The other important point is that solutions for listed challenges cannot be regarded in isolation, as once one yield limiting factor is overcome, another one can become important.

Co-generation of knowledge between farmers, farm advisors and scientists is crucial in facing challenges of organic farming. The complex knowledge on organic cropping systems in order to stabilize and increase productivity, profitability and sustainability requires more information on economic benefits or potential risks and disadvantages. Such data that will allow farmers to assess the potential impact on their farm and to take decision easier.

References and future readings

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