Barriers for developing more robust organic arable farming systems in practice

E. Noe[1], P. Sørensen[2], B. Melander[2], J.E. Olesen[2] and Erik Fog[3]

[1]Dept. of Agroecology, Aarhus University (egon.noe@agrsci.dk), [2]Dept. of Agroecology, Aarhus University, [3] Knowledge Centre for Agriculture

Implications

There is a gap between the scientific idea of robust and economically viable organic arable farming systems with optimized crop rotations for nutrient and pest management and how these systems look like in practice. In order to explore this gap, we visited and interviewed ten organic arable farms in Denmark. Our main findings are: 1) Organic arable farming operates in a very dynamic and changing environment in terms of prizing and market opportunities, and the main focus of the farm managements was the coping strategy within this changing environment; 2) The farming systems were continuously changing and developing, buying and renting more land, changing manure agreements and other forms of cooperation and arrangements; 3) Short term profit was paid much more attention than more theoretical expectation on long term profit or opportunities in relation to optimizing the production system. This again seems logical in relation to the very dynamic world that the farmers have to operate within; 4) Most of the farmers do not see their farm as a coherent system but as a coordination of a series of separate operations, which means that most decisions are taken with specific reference to the individual field in at the present situation without considering the long-term effects. Management focus is thus much more on solving problems as they are occurring, by adjusting their practice, than it is on developing a robust system preventing problems to occur. This partial focus is also strongly supported by the way in which extension services mostly operate.

The visited farms had very different farming strategies to address this very dynamic situation, but they all had in common a strong focus on how to cope with the changing conditions of the encompassing world. From an economical and managerial point of view this makes perfect sense. In conclusion the main barriers for developing more robust organic arable farming systems are the lack of incentives for focusing on the coherence of the production system prior to the adjustment to the very dynamic economic environment. On the other hand all farmers seem challenged by the principles of robust arable farming systems presented to them and for the involvement of a more systemic and holistic discussion of how to improve their faming systems. In conclusion of our study we suggest three focal points to enhance the farmers' decision making in direction of more robust organic arable farming systems. 1) Enhance the incentive structures of arable framing in the direction a more sustainable and robust farming systems; 2) Provide the farmers with tools and extension concepts that support a more holistic and systemic approach to planning and decision making; 3) Put a stronger focus on the strategic development of the arable farming systems, in terms of cooperation with other farming systems and in relation with other market actors that through mutual benefit can establish long-term framing conditions against which more long-term and robust production systems can benefit.

Background and objectives

This study was conducted as a part of a larger multidisciplinary research project, HighCrop, which as its rationale that the projected expansion of organic farming in Denmark is conditioned on the development of more robust organic arable production systems. This would imply an increased arable crop production, which requires higher and more stable crop yields. This must be achieved while also phasing out the use of imported conventional manure and reducing environmental impacts, such as greenhouse gas (GHG) emissions. HighCrop has two main hypotheses: 1) Higher yields and reduced

environmental impact can be achieved by introduction of some basic principles of improved management of nitrogen (N) in catch crops, green manure and crop residues, and better management of weeds; and 2) Low yields in practical arable organic farming are caused by a knowledge gap that requires new strategic management tools to overcome. The main objective of this study was therefore to explore the barriers to implementing these principles in practice.

How work was carried out?

To explore the barriers for the implantation of these principles in practice ten organic arable farms were visit for an interview. Prior to the interviews the project researchers were asked to developed a list of basic principle for robust organic arable framing systems, and for each of these principle a list of potential action were formed (Table1). Picture cards to every of these actions was developed to have better interaction with the farmers.

The visit of each farm was divided into three parts. First a walk and talk around the farm to get a better visual idea of the farming systems. Second, an interview parts one, exploring the farmer's management strategy of his system. Third, an interview parts two, examining the barriers to implement the suggested actions for a more robust arable farming system. In this session the farmer was asked to consider each of the suggested action, and to which extent these were already implemented, realistic to implement or unrealistic or irrelevant to implement on the farm. Each interview was tape-recorded and pictures were taken of the placement of the action card.

Table 1: List of principles and actions for obtaining high yielding and robust arable plant production systems, suggested by the researchers involved in the project.

Principles	**Action**
Avoid nutrient losses and enhance N-fixation Distribute N where and when it is needed Long-term supply of P and K should be adequate	• Sow catch crops before August 10 or harvest main crop before August 15 when using under-sown catch crops • Minimum 20% of the crop rotation should be N fixing green manure crops (clover/alfalfa) • Catch crop species adapted to soil and climatic conditions should be used • Nitrogen fixing catch crops should be established between two non-fixing crops • Under-sown clover should be established as "intermediate crop" before sowing winter cereals • Liquid manures should always be injected, and especially surface application of cattle slurry in winter cereals should be avoided • Harvest and distribute green manures to other crops in spring, preferably after biogas digestion • Avoid autumn-sown cereal crops after grass-clover • Avoid unnecessary soil tillage
Crop rotation to break the propagation of weeds Competitive crop rotations Supplement with timely mechanical weed control	• Record weed population on the fields • Mix annual winter and spring crops and biannual crops. • Stop the growth of weeds after harvest by mowing, catch crop or trough cutting soil tillage • Use cross harrowing to make a uniform seed bed • Remove stones before weed harrowing • Keep row crops free of weeds using mechanical weed control