

Summary

The Ministries of Agriculture, Nature and Food Quality (LNV), and Spatial Planning, Housing and the Environment (VROM) are developing policy to encourage sustainable use of the soil (2003 Soil Policy Document). In addition to the general trend towards sustainable soil management, manure policy in particular plays an important role in practical soil management. Manure policy since January 2006 has hindered the use of animal manure and compost and further restricted inputs of nitrogen and phosphate. The tightening of the legislation will necessitate ever more conscious strategic decisions, and make optimum soil management increasingly important in both organic and conventional agriculture.

Organic farms have a great deal of experience in sustainable management of soil fertility. Pioneers in the organic sector can provide the seedbed for their colleagues in conventional agriculture.

To assist the transition to sustainable soil management, the Louis Bolk Institute used the *Special Fertilisation* study to answer the following questions:

- What are the effects of manure and compost on soil and crop quality, and what options are there for the use of non-animal fertilisers?
- How can the availability of nitrogen and phosphate still be guaranteed when a fertiliser treatment is aimed at phosphate balance?
- Why are certain operational strategies successful?

Ultimately a strategy which seeks to develop good soil quality as well as feeding the crop seems to be the most sustainable: the 'combi-strategies' produced the highest yields and only limited losses to the environment. Compost and goat manure seem to absorb nitrogen from the soil to break down organic matter. In the combi-strategy, nitrogen is added by way of vinasse, and that produces added value, both for the soil and for the quality of the product. In contrast to liquid fertilisers, fertilisers that are incorporated into the soil, such as goat manure and green compost, promote the penetration of roots right through the topsoil. With regard to the demand for non-animal fertilisers, lucerne shows potential, but further research is required to determine how best (in what form) to apply it. The impact of a fertilisation strategy on the quality of the end product varies according to the crop. Calculations using NDICEA showed that, in all the strategies studied, nitrogen loss below the topsoil was below the 50 mg/l nitrate standard. Variants with supplementary fertilisers such as vinasse and lucerne were most likely to lead to losses. Only strategies based on green compost or goat manure proved to increase the organic matter content of the soil (carbon fixation).

The most significant results of the research into achieving phosphate balance by improving the soil quality show that a fixed track system can have a beneficial effect on the soil structure (more useful structure elements). It lowers the resistance of the soil and results in more worm channels and a greater number of worms in the topsoil. However, for a fixed track system to have a permanent effect, harvesting also has to be carried out from the fixed tracks. The research described here makes it clear that the system has great potential, but a single harvest in poor conditions can obliterate any positive effects on the soil quality.

Working the soil using the fixed track system, in the case of crops grown in the open field (spinach and grass seed), tends to produce a higher average absolute yield per hectare. Ridge cultivation (carrots, potatoes) did not result in differences in yield. In two of the four crops the phosphate balance had a clearly detrimental effect on the crop yield: in the case of the nitrogen-hungry crops, spinach and grass seed, fertilising for phosphate balance proved insufficient for a good yield. The same trend in the yield determinations for spinach and grass seed, combined with the beneficial effects of working with the fixed track system, seems to indicate a positive correlation between soil quality and yield. The cultivation plan studied here proved too intensive for fertilisation at the level of phosphate balance. Making the plan more extensive, by including cereals and green manures in the rotation, is a precondition for sustainable production that meets the environmental and phosphate balance requirements.

The decision about whether to adopt a particular strategy and the associated measures depends on individual experience and the farmer's own vision on soil fertility and sustainability. In practice, some farmers will have been following a particular fertilisation strategy for years. When the farmers describe their vision, it is clearly linked to the way in which they interpret farm management. In this context vision is more important to them than legislation. Vision can be guided by knowledge. Proper deployment of knowledge therefore seems to be a crucial element in the transition to sustainable soil management. The mineral balances of the five farms also showed that, with sophisticated farm management and careful attention to the soil, it is often possible to reduce the input of minerals - sometime to far below the current standards. The examples described here offer prospects for both conventional and organic agriculture.

Throughout the project the researchers from the Louis Bolk Institute worked continually with the participants on the form and content of the project. Much attention was paid to communication with relevant players, both within the project and outside it.