Putting the G into green manures...

This was no ordinary setting for an organic open day. No draughty barn or village hall this. We were in the social centre of G's marketing, at their main site near Ely, a cavernous hall equipped with bar, table tennis tables and Sky Sports on the big screen. Several hours later the building would be heaving with many of the 600, mainly Eastern European, students that G's accommodate on site, watching one of the Euro 2008 matches and slaking their thirsts with lager and vodka, after a day picking and packing lettuces.

We were not here to watch the football, however, but gathered to listen to a number of presentations on improving soil nutrient management through the use of green manures. About 40 growers, researchers and advisers attended the day organised by Garden Organic (HDRA) on June 11th 2008. A packed programme of speakers, was a prelude to the main event. No, not lunch but a chance to have a glimpse at how one of the biggest players in the organic market operates, not to mention the trials of different green manure types.

In common with many other large companies G's first turned their hand to organics in 1999. Prior to conversion they perceived weeds to be the biggest challenge facing them and for this reason converted their mineral land. They found, however that fertility was more of a problem than weeds and for this reason later converted their more fertile black land. Organics now comprises about 10% of their business and they have around 400 ha (988 ac) of organic land in four areas within a 30-mile radius of the pack-house. With 230 ha of salad crops, mainly lettuce, they reckon they supply about 35% of the organic salads market. Bulb onions are also grown on 130 ha of rented organic land in Norfolk and Suffolk. The organic crops are harvested and finished in the same way as their conventional crops, which means in the field using large packing rigs. Once the harvested crop gets to the pack-house it is only handled by forklift trucks and is cooled in the 32 pallet capacity vacuum cooler to 3/5°C within 30 minutes of arrival. This facility is operated 24/7 during the season, which lasts from May to October before the harvest moves to Spain. Any waste is composted or fed to their own cattle. Aphids are their biggest problem for organic lettuce production and when we visited on the 11th June, they were about to cover with meshes.

Persian promise

Despite their recognition of the importance of soil fertility G's admitted that this year is the first time since conversion that they had grown fertility-building crops. At the trials field we walked over a newly mown stand of red clover to get to the trial plots of red clover, yellow trefoil, sweet clover, Persian clover, crimson clover and lucerne. As part of a Defra funded project (OF 0363), this is one of a number of Garden Organic (HDRA) trials across the country evaluating these species in a range of farming systems. This should provide valuable information as to what is the best type of green manure to be growing on your farm. This trial had been sown in September, over-wintered and was now due to be topped. On a peat fen soil, with an extremely high weed burden, rapid competitive growth is of utmost importance for establishing a good fertility-building ley. Of the species trialled, Persian clover was so far looking the most promising, producing large amounts of biomass that had rapidly smothered any weed growth. The red clover was perhaps the second best at this stage but had produced less biomass than the Persian clover. Other species were showing more competition from weeds, but things should hopefully improve after the topping. A test crop will be grown at the site in 2009 to assess which green manures have had the most beneficial effect on soil fertility.

Clover breeding

Earlier in the day, Heather McCalman of the Institute of Biological, Environmental and Rural Sciences (IBERS) at Aberystwyth outlined some key aspects of their (formerly IGER's) breeding programme for red and white clover. White clover has been primarily bred for persistence and winter hardiness. Unlike red clover, white clover has a stolon structure and it is the maintenance of this which is an important factor determining its persistence. Varieties have a range of leaf sizes with the smaller leaved varieties (eg AberAce and AberCrest) fairing better under a grazing regime whereas

the larger leaved varieties (eg Crusader, Chieftain) are more suitable for cutting. Some varieties (eg Aberdai) are flexible and can produce good yields under either regime. Red clover is now being bred for increased persistence, pest and disease tolerance (especially stem nematode and sclerotinia) and grazing tolerance. As it grows from a single crown, the maintenance of this crown is particularly important for persistence. Varieties such as Milvus show much improved crown persistence over older varieties. Although the emphasis of the breeding programme is towards clovers for livestock production many of these characteristics should be beneficial in a stockless situation. They are also looking at genotypic variation in nitrogen leaching and what is being increasingly recognised as being important in low input and organic situations, mycorrhizal associations.

Cut and mulch?

Stephen Briggs of Abacus Organic Associates presented some of the findings from a previous Defra funded project (OF 0316). The actual amount of nitrogen fixed depends on the legume, but as a general rule, a well established legume producing a thick canopy is likely to fix much more than a poorly established thin crop cover. Much of the nitrogen taken up by the legume is stored in the below ground fraction, but this is often neglected when measurements are taken. The cutting regime also has a significant effect on nitrogen fixation. Removing the cuttings from the field will stimulate more nitrogen fixation than if they are left to mulch, but this is not always practical - especially on farms without livestock. Once the green manure crop has been incorporated it is important to match the nitrogen released with the uptake of the subsequent crop. There is often a mismatch particularly for earlier growing crops, where the nitrogen released from incorporating the ley can be released after the main period of uptake from the crop. The release of nitrogen from the crop is dependent on many factors including the C:N ratio of the residues, soil type, weather conditions and soil organisms but there is still more work to be done before these relationships are understood fully.

Nutrient budgeting and computer modelling

Not a subject to get growers pulses (no pun intended) racing, it is true, but nutrient budgets and computer models can help growers gain a better understanding of the dynamics of their farming systems. The use of nutrient budgets as a tool for assessing rotations was discussed by Francis Rayns, head of research at Garden Organic. Nutrient budgeting considers the balance of inputs (fixation, deposition and inputs) and outputs (crop removal, leaching, gaseous losses, erosion). These balances should be considered over the whole rotation not just for one crop, although they can be expressed on an annual basis. Although nutrient budgeting can be a useful tool for making comparisons, the final numerical answers should not be interpreted too literally as there is often a good deal of uncertainty. There is also the danger that factors which have a large effect are often ignored e.g. whether the unmarketable fraction of a crop is removed from the field or incorporated.

Three recently developed models for nutrient management were considered: Clive Rahn of Warwick HRI presented the EU rotate model, which was developed as an EU partnership project and can be freely downloaded at:

http://www2.warwick.ac.uk/fac/sci/whri/research/nitrogenandenvironment/eurotaten

It is a sophisticated model that can simulate N dynamics in a wide range of climates and crops. It is very flexible but this means that it requires many parameters to be entered and as such it is not in a particularly user-friendly form at the moment. Further development is needed before it will be taken up more widely in the farming community.

Steve Cuttle introduced the FBC model, which was developed at IGER as part of an earlier Defra funded project. It is a simple model for farmers to use, as it only requires information that they are likely to have to hand. However it is less sophisticated than the EU rotate model and has not been validated yet. Initially it has been well received by farmers but it needs some further work before it can be released for general use.

The NDICEA model was developed by the Louis Bolk Institute in the Netherlands. It is in the form of a finished product and a user-friendly format has been developed. The inputs can either use standard values already in the model or you can enter your own measurements if you have them. The standard weather data used by the model is based on various regions of the Netherlands but it is possible to enter your own.

It can be freely downloaded from http://www.ndicea.nl

Garden Organic will be comparing these three models and running further validations as part of the Defra funded project (OF 0363).

Phil Sumption and Anton Rosenfeld

More information on the presentations from the day are downloadable at www.organicveg.org.uk

Harvesting and packing lettuce at G's

Photo: Phil Sumption