NSW DPI
Soil biology basics
PROFITABLE & SUSTAINABLE PRIMARY INDUSTRIES www.dpi.nsw.gov.au

How to conduct your own field trials

Many new biological products become available each year. Government agencies and research organisations only have the resources to test a few, so many products have no scientifically reliable data available. This leaflet describes how to conduct your own field trials to see whether a product makes a difference to your soil.

Promotion material for biological products may include endorsements from farmers who say 'I have seen it work', but there could be many reasons why it appeared to work. No two seasons are the same, no two paddocks are identical, and even two trees of the same variety in the same orchard can perform differently. A scientific trial is designed to account for these differences so that it is clear whether the product being trialled makes a real difference.

Design a reliable trial

There are four basic steps in designing a good field trial. Only the first two are essential, but all four will give you a really reliable trial.

Include an untreated control site

Treating an area with a product and seeing a change is no proof that the product worked. The change could be due to good rain, fewer pests or the previous crop. Comparing a treated area with a similar but untreated area will show more clearly whether the product has really made a difference. The untreated area is called the control. Both areas should be as similar as possible, with the same crop on the same soil on the same slope, with the same amount of watering and the same management.

Use accurate measurements

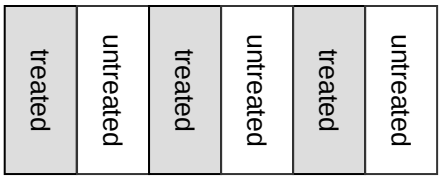
Decide what aspects you are going to measure. These can include plant height, grain size, fruit sugar, or harvest weight. If a product or technique is worth using then it is worth measuring its effects, even if that means separately harvesting small areas.

Factors such as disease incidence and yield quality can be tricky to measure, so techniques such as leaf sampling, insect traps or protein analysis may be needed. NSWDPI has experts in this area and your local DPI officer may be able to enquire on your behalf.

Some farmers like to use visual assessment but this is notoriously unreliable. Some products actually make plants greener but not necessarily healthier. Visual assessment introduces the chance of bias and can also overlook economically important differences. A difference of 10% can easily be missed visually but this can mean more than $1000/ha in some crops.

Use several trial blocks

It is easier and more convenient to have only one trial block but this can give misleading results, as there can be variation between paddocks. One area may benefit from a windbreak, a higher water table or fewer weeds. A more effective trial divides a site into several blocks or rows that suit your machinery. The first block receives the treatment and the next one doesn't, forming a trial pair. Two pairs are the minimum needed for a trial, and accuracy of results improves with every extra pair.



It is a good idea to mark the treated and untreated areas with stakes because it is easy to lose boundaries or even confuse entire plots.

You might be able to team up with other growers who want to trial the same product. If results are measured accurately, they can be pooled to give a much more confident result.

Scatter the trial blocks

Ideally the treated and control areas should be in pairs scattered randomly over the trial site. This allows for variation in soil and microclimate. Randomising is difficult to work with but the result does give a better idea how the treatment will perform on a broader scale.

Keep records

It is vital to keep detailed records during a trial to help you analyse your results. Useful records to keep include:

- paddock history, including soil type and previous crops and treatments
- locations of treated and untreated areas in the

paddock as these areas can easily become confused

- results of soil and leaf analysis
- paddock preparation including weedicides, cultivation, fertiliser etc
- timing and quantities of chemicals or additions used during the trial
- rainfall and temperature maximums and minimums
- observed differences between treated and untreated areas
- cost savings as these can be as important as yield benefits
- measured yield or quality. It is essential to measure this carefully because the treated crop or pasture may look better but give slightly poorer results.

Keep all records relating to the trial in one folder or location.

Analyse the results

If you follow these guidelines and find that the treated areas generally outperform the control areas then you can be confident that the product is working. You will also be able to work out whether it is going to be cost effective. Ideally, a field trial should be carried out over several years to take into account long term effects and the influence of different seasons. Different crops or even crop varieties may respond differently and of course what works on one soil may not work on another.

Statistical analysis

Statistical analysis of results is important because it is not enough to compare average measurements of treated areas with untreated areas. Some treated plots will have high results and some will be low. Results from the untreated plots may overlap results for treated plots, so comparing averages will not give meaningful results. Statistical analysis allows for the influence of chance even when results overlap. This type of analysis is particularly useful when trying to measure small improvements in the order of 10-20%.

Statistical analysis is difficult and requires results from several replicated plots to obtain meaningful results. If you are involved in a cooperative trial with NSW DPI, department biometricians will help with trial design and, possibly, analysis of results. Otherwise, you may have to enlist the assistance of consultant statisticians.

Work with other farmers

Organising a group of interested farmers to run field trials can be difficult initially but it has a lot of advantages. The results are more reliable and it is easier to obtain grants or financial help from industry organisations. Over time the group can test many products.

The Birchip Cropping Group started with ten farmers in 1993 and now has over 500 members. The group has performed important trials of many products and techniques and has its own website at http://www.bcg.org.au.

If you work with a group of landowners on trials, you will be able to share the workload and work over a wider range of conditions, thereby obtaining more useful results. You will learn the results of tests on a range of products and this might provide a market advantage.

Communicate your results

Results from well run field trials are important news for other farmers and advisers. By sharing this information your industry can progress. Let your industry know about your trial. If possible, write up the results for publication in a national industry journal. Journals included in international databases enable scientists to see what trials have been carried out.

More information

Soil biology basics is an information series describing basic concepts in soil biology. For more detailed information we recommend the Australian book *Soil biological fertility:A key to sustainable land use in agriculture* (2003), edited by Lyn Abbott & Daniel Murphy.

For more information on onfarm trials, consult your nearest NSW Dept of Primary Industries district agronomist or horticulturist.

The Practical Farmers of Iowa website includes trial designs, record forms and other useful advice at http://www.practicalfarmers.org.

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