



A checklist for conducting small plot trials

This checklist is produced as a summary of a series of workshops conducted by Roger Lawes from the CSIRO and Beverley Gogel and Dini Ganesalingam from the Statistical Analysis for the Grains Industry in South Australia in 2014.

The workshops aimed to address the needs of farming systems group members, field staff and farm advisers around trial design, management, analysis and evaluation.

Why conduct a trial?

So you decide you want to run a trial – why is it necessary? Is there something you do not know? Is it that you want to confirm results from trials conducted elsewhere? Is it to justify the funds you have received? Does it follow on naturally from your own previous studies?

Remember, a well-designed and conducted trial will give you very useful results that can successfully change how farmers currently farm. A poorly designed trial can give misleading results that can cost farmer's money.

Here are a series of checkpoints that can make your trial much more valuable and easier to get accurate results.

It is critical that you set out all procedures in a trial protocol that all people who are working on that trial can understand and follow.

What is the research question?

What do you currently know?

Have you looked at the results of other studies that can add useful data?

Define **precisely** what is the research question

- Focus on the issue
- Keep it simple
- What do you want to change e.g. yield, quality, weed control etc
- What environment e.g. high rainfall, frost

Avoid making the question too broad.

What treatments?

Take as much time as you need to really concentrate only on the treatments that will actually make a difference.

Avoid putting in treatments that would be nice to know.

Include a control treatment e.g. district practice, zero nitrogen etc.

Go for large treatment differences e.g. include a very high nitrogen rate in nutrition trial.

What trial design?

Keep design as simple as possible e.g. randomised complete block.

If using many treatments it may be best to split into two simple trials if possible.

Make sure you have enough replications to get a significant result

- Usually 3-4 replicates is fine
- If only a few treatments you need more replicates e.g. 3 or 4 treatments need 6 replicates (need about 15 degrees of freedom for the error term in the analysis)

Randomise every replicate differently.

If you are undertaking more than one trial with the same treatments make sure you randomise each trial differently.

If using the front replicate for field days and so restricting the randomisation into treatments in order of rate etc, add another replicate and exclude the restricted replicate from the analysis.

If using blocks e.g. time of sowing, you need to randomise these blocks to allow them to be analysed properly. This may mean that you have to put in gaps between replicates to allow seeding and spray machinery to turn.

Put buffer plots on either side of all trial blocks that are sown at the same time.

Setting out the trial in the paddock

Discuss possible sites with the landholder to use their experience about weeds, waterlogging, old fence lines etc.

Site should be as uniform as possible and represent the environment you are interested in.

Steer clear of headlands, areas inside gates, trees etc.

If on a slope, sow parallel to the slope to get a uniform site.

Avoid close proximity to likely pest refuges.

Practical checklist for sowing the trial

Try to sow the trial the day before the farmer sows the paddock – this makes the area around the site neat and tidy and also avoids the possibility of spray drift if the trial has been sown well before the farmer sows.

Check for blocked tynes and that seeding depth is correct and even across the width of the seeder.

Check fertiliser settings are correct.

Use appropriate control measures for snails, slugs and insect pests immediately after sowing the trial.

Trial management

Have one person in charge of the trial. They should keep all records, coordinate all treatments applied, be the contact for any site visitors and provide a clear trial protocol for anyone undertaking work on the trial.

Soil test the trial area to the appropriate depth to characterise the trial site for nutrient levels and/or soil water.

Keep records of times, rates etc of application of all chemicals.

Monitor for pests and control as soon as possible.

If farmer is going to spray for weeds, pests etc with his large scale machinery, make sure the site is set out so the farmer does not drive through plots when spraying. Consider dummy plots to coincide with farmer machinery to avoid wheel tracking through your plots.

If you do not have a plot harvester, get in touch with potential harvest options as early as possible, otherwise your trial will be left until last and may be badly affected by weather, pests etc.

Measurements to make sense of results

It is not good enough to show what has happened, we really need to know why it happened so it is best to measure other factors e.g. plant numbers established, tiller numbers, leaf area infected with disease, flowering date, grain size and quality etc.

Sometimes things can go wrong with a trial but by measuring and using a covariate in the analysis you may make more sense of the result.

Analysis

You can consider options such as Excel, Statistix or Genstat to analyse your trial but use a package you are confident and competent with. Alternatively try a trained biometrician but you will need to discuss the design with them prior to seeding the trial.

What it all means

One trial in one paddock in one year is just that. Multiple trials over several years give the only result you can value.

Avoid making broad generalisations based on one trial.

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