

Guide to On-Farm Field Trials

Got a hunch about what is the best way to improve one of your farming practices? It may be which fertiliser to apply or when to drench, etc. Developing an informal on-farm field trial may help you take the guessing out of your decision making. This quick guide will get you thinking about how to conduct such trials so that you get unbiased and reliable results. These types of results will give you better information about how to improve your productivity and profitability.

To achieve unbiased and reliable results from on-farm field trials you should try as much as possible to conduct a fair test. Completing a valid scientific experiment is beyond the scope of what we are discussing here. To gain a greater understanding of how a scientific experiment is conducted you should refer to 'The Scientific Method Explained'.

To get the best results from an on-farm trial you should ask yourself the following questions:

- What is the question I am trying to answer?
- How will I test this question?
- What will I manipulate, and how?
- What am I going to measure for results?
- What other factors might affect my results?
- How will I stop these other factors from interfering with a fair test?
- Finally, what did I learn?

We'll look at what is required for each of these as we examine two on-farm field trials by two different farmers.

Angus, a West Otago sheep farmer

The soils on Angus's property are cobalt deficient. Cobalt is required by animals to make vitamin B12, a vitamin necessary for high animal growth. The response to this deficiency has included adding cobalt to drenches, and vitamin B12 to injectable clostridial vaccines. However Angus has been wondering whether the timing and frequency of drench and vaccine applications is appropriate for the cobalt requirements of his lambs. He has read about long acting injectable forms of vitamin B12, and wonders if his lambs' cobalt requirements might be met more effectively by using one of these.



Figure 1: West Otago

What is Angus's question?

Angus wonders, 'Will the growth rate of my lambs be increased by injecting them with a long acting injectable vitamin B12?'

How will Angus answer his question?

He thinks the most accurate way for him to do this will be to treat every second lamb within one small flock of about 200 ewes with the injection at docking time. These lambs will be identified with a coloured tag before being returned to the flock.

What will Angus manipulate, and how?

Angus is manipulating the administering of the injection. Half of the lambs will get the 6mg microencapsulated vitamin B12 at docking time, while the other half won't.

What will Angus measure for results?

For results Angus is going to measure the live-weights of the treated lambs, together with the live-weights of the other non-treated lambs in the flock, after 100 days. He will compare the average weight of both groups. This will indicate if the B12 injected group is growing faster.

What else might affect Angus's results?

There are many other factors that might affect the growth of the lambs on Angus's farm. Feed, parasites etc. could all affect a lamb's growth. If Angus is to be certain that any difference in weight at the end of his trial is due to the B12 vaccine and nothing else, he must keep these other factors the same for his two groups.

How will Angus stop these from interfering with a fair test?

To stop these other factors spoiling the validity of his results Angus is going to run both groups of lambs together, both before and after the injection. That way all lambs will have the same starting point and will get the same feed, access to water, parasite control etc. When it comes time to weigh his lambs, he'll alternate between weighing a treated lamb and then a non-treated one. That way the lambs from each group will have had equal "emptying out" time before they are weighed. Therefore any differences in the weights of the two groups will more likely be due to the cobalt deficiency treatment.

What will Angus learn?

Either a clear and obvious large weight difference or no weight difference what-so-ever will answer Angus's question. A small difference in weight change might not. Indeed it may indicate that a scientific experiment with statistical analysis is necessary to answer the original question. As Angus is a farmer trying to improve his profitability a result that shows little change in his productivity means should prioritize other criteria such as cost.

So what happened?

Angus docked 295 lambs and gave 148 the long-acting B12 vaccination. He measured, and recorded, the live weights of the lambs without separating them when they came in for crutching. This was approximately 100 days after docking.

	Long acting B12 injection	Traditional drench and vaccine
Average live weight at 100 days after docking	42 kg	37kg

Angus was impressed: an 81g/day increase in live weight that he's pretty sure can be attributed to the B12 vaccination. He considers his question to be answered: the growth rate of his lambs was increased by injecting them with a long acting injectable vitamin B12. Furthermore the economic gains easily exceed the costs of the new treatment. Angus has improved the productivity and profitability of half his flock; there is only going to be one group next year.

Tipene, a bull beef farmer in Waikato

Let's check out what you've learnt so far by looking at what's been happening on the bull-beef farm of Tipene in North Waikato.

Tipene is aiming to meet a business goal of exceeding \$1000 EFS per hectare by increasing carcass weight per hectare. Currently Tipene is averaging 305kg per hectare. He has been researching two different perennial ryegrass cultivars that look as though they might help increase his productivity. The seed for these is sold by two different companies, with the sales reps of each one telling him that they, and they alone, have the cultivar that will allow him to meet his business goal. Tipene decides to conduct his own trial to settle the question of, 'Will the two new cultivars increase the carcass weight per hectare on my farm?'

Tipene divides a uniform paddock into two. He purchases seed of each cultivar making sure that they both have the same endophyte. Then on the same day he plants half with one cultivar and half with the other cultivar. He randomly assigns stock to each half. Throughout the growing season Tipene fertilises the two pastures identically and treats the two groups the same in regard to any husbandry. He regularly records the weights of the individual animals in both groups. He does this by weighing the individuals in both groups at the same time and after a consistent 4 hour emptying out period.



At the end of the season carcass weights per hectare were:

	Cultivar A	Cultivar B
Carcass weight per ha	420kg	410kg

Tipene thinks the results, when compared to his previous production of \$305kg/hectare, are impressive. He believes he can increase his productivity and profitability by using the new cultivars. As to which one, in terms of productivity, he does not think this really matters. Both gave a significant improvement. He will look at other factors such as price to help him pick which one of the two he will finally decide on.

To check your understanding of what we have been discussing about on-farm field trials answer the following questions about what Tipene has been doing.

1. *What was Tipene's question?*
2. *How did Tipene carry out the test?*
3. *What did Tipene manipulate, and how?*
4. *What did Tipene measure for results?*
5. *What else might have affected Tipene's results?*
6. *How did Tipene stop these from interfering with a fair test?*
7. *What did Tipene learn?*

Answers

1. Will carcass weight per hectare be increased more with the new cultivars?
2. Plant separate areas with each of the two cultivars. One stock group grazes on one cultivar while a separate group grazes on the other. Over the course of the season the cattle are weighed.
3. The two ryegrass cultivars were manipulated by planting one in a fenced off area and the other in a separate fenced off area.
4. The weights of all individuals within each group were recorded throughout the season.
5. Endophyte, planting time, soil conditions, fertiliser applications, individual stock in different condition before the trial, different weight measuring methods.
6. Purchasing seed with the same endophyte; uniform soil prior to sowing the two pastures; cultivars were planted on the same day; same fertiliser regime; random assignment of stock to the two groups; and identical weight recording times and procedure.
7. Tipene believes the difference in the weights is too small to draw any conclusions. In other words, he believes that in terms of weight gain by his stock it doesn't matter which of these two cultivars he plants. Tipene does have some reservations in that the pastures used were quite small. This last point is important as it indicates a small sample size.

Where do you go from here?

With the right steps anyone can conduct a useful on-farm field trial. On the next page is a template to help you conduct an on-farm field trial.

On-farm field trial template

1. *What is the question?*
2. *How will you test this question?*
3. *What will you manipulate, and how?*
4. *What will you measure for results?*
5. *What else might affect the results?*
6. *How will you stop these from interfering with a fair test?*
7. *What did you learn?*