Using organic amendments to replace bagged fertiliser - an update from Gippsland

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Take home messages

- There is an opportunity to use locally available amendments in place of inorganic fertiliser.
- High rates of surface-applied chicken litter tend to have a better yield response than either surface-applied compost or inorganic N fertiliser.
- Stability of these organic products may provide a less risky option for managing inputs with no need for top dressed urea in the first two years.

Introduction

This project aims to demonstrate the effectiveness of two types of surface applied organic amendments – compost and chicken manure. It is hoped the applications will increase the organic carbon content of the soil and reduce the reliance on the application of inorganic nitrogen applications, as well as increasing crop yields. Both the compost and chicken manure are readily available in Gippsland so it is an opportunity to evaluate the fertility and yield benefits of these amendments on cropping soils. However, the question is: do we see a yield increase?

What has been happening?

This project consists of two identical trials within the Gippsland branch, at Bairnsdale and Giffard. In both trials the compost and chicken manure has been surface applied at four application rates each and then compared to a normal fertiliser with no amendment and an untreated control (Table 1). The lower rates of amendment (2.5 t/ha and 5 t/ha) are applied annually, with the higher rates as a one off application. Table 1 outlines the treatment details.

Table 1. The ten treatments being compared at Bairnsdale and Giffard

1	An annual presowing surface application of chicken litter at 2.5 t/ha
2	An annual presowing surface application of chicken litter at 5 t/ha
3	A one-off presowing surface application of chicken litter at 10 t/ha
4	A one-off presowing surface application of chicken litter at 20 t/ha
5	An annual presowing surface application of compost at 2.5 t/ha
6	An annual presowing surface application of compost at 5 t/ha
7	A one-off presowing surface application of compost at 10 t/ha
8	A one-off presowing surface application of compost at 20 t/ha
9	No organic amendment applied, with inorganic nitrogen applied in crop
10	No organic amendment applied and no nitrogen applied in crop (control)

A locally available chicken litter was chosen, with a 'man-made' compost waste product being sourced from Gippsland Water to match the nutrient analysis of the chicken manure. A basic summary of a 20 t/ha chicken manure rate is given below.

Table 2. Nutrient analysis of a 20 t/ha rate of chicken litter, showing a surprisingly low nitrogen content and a high phosphorus and potassium content.

Nutrient	Amount in 20 t/ha chicken litter	
Nitrate (NO3)	14.2	kg/ha
Ammonium (NH4)	97.3	kg/ha
Phosphorus (P)	159.0	kg/ha
Sulphur (S)	85.0	kg/ha
Potassium (K)	410.1	kg/ha
Calcium (Ca)	100.1	kg/ha
Magnesium (Mg)	114.9	kg/ha

What have we seen in the first two years of the trial?

What have we seen over the first two years?

In 2012, large amounts of rain in early winter delayed any field work (not through lack of trying!) and, eventually, spring barley was sown at both sites. Due to the very late sowing at the Giffard site, yields were compromised, although surprisingly the crop did yield. Any effect the amendments had were not seen in the first year.

The Bairnsdale site had a kinder season and a good response was seen in the Westminster barley crop (see table 3). The chicken litter treatments yielded significantly higher than their corresponding compost rates. The reasons

for this are unclear, as nutrient wise they were very similar. The thinking is that perhaps the content of shavings/rice hulls in the chicken litter may have made for slower release of nutrients compared to the pure compost.

Table 3. Barley yields at Bairnsdale in 2012, the first year of treatments.

Treatment	Yield (t/ha)	
10t/ha Chicken litter	2.94	a
5t/ha Chicken litter	2.90	a
20t/ha Chicken litter	2.85	a
2.5t/ha Chicken litter	2.59	ab
2.5t/ha Compost	2.55	ab
10t/ha Compost	2.28	bc
20t/ha Compost	2.27	bc
5t/ha Compost	2.20	bc
Normal fertiliser (no amend)	2.05	c
Control (no amend or fert)	2.04	c
p-value	**<0.001**	
LSD (p=0.05)	**0.40**	

A huge 262 mm of rain fell in June in Bairnsdale, which is a whopping 200 mm above the average for June. This saw the Bairnsdale canola crop suffer from waterlogging and the impact was evident at harvest with disappointing yields across the trial area and into the farmer's paddock. Luckily, in 2013, the Giffard site delivered the goods after suffering a similar fate to Bairnsdale in 2012. Results from the canola (cv. Garnet) at Giffard are presented in Table 4. It is interesting to note that at Giffard in 2013, there was no significant yield advantage from applying 20 t/ha compared to 10 t/ha of chicken litter or even 5 t/ha. Applying 20 t/ha of chicken litter was a significantly better treatment than farmer practice fertiliser which consisted of 100 kg/ha of urea at stem elongation. Similar to 2012, the chicken litter performed better across the board than comparable rates of compost except for the 2.5 t/ha rate.

Table 4. Canola yields at Giffard in 2013, the second year of treatments

Treatment	Yield (t/ha)	
Chicken Manure 20 t/ha	3.42	a
Chicken Manure 10 t/ha	3.25	ab
Chicken Manure 5 t/ha	3.02	abc
No amen + N fert	2.92	bcd
Chicken Manure 2.5 t/ha	2.76	cde
No amend. + no N fert	2.63	c-f
Compost 20 t/ha	2.51	def
Compost 2.5 t/ha	2.51	def
Compost 10 t/ha	2.42	ef
Compost 5 t/ha	2.29	f
p-value	**<0.001**	
LSD (p=0.05)	**0.42**	

Soil fertility

The complete analysis of the soil carbon will be done at the end of the trial. There have been increases under some treatments but the reasons for these increases could be due to timing of sampling and the fact that soil organic carbon is a dynamic medium, breaking down and increasing over time. Soil carbon is expected to increase slowly under the chicken litter and compost treatments. The timing of soil sampling is being investigated at the moment by other agencies.

What does this mean for me?

Finding alternatives to bagged fertiliser using locally sourced manures and composts sounds logical, especially as input costs get higher and the growing seasons more volatile, but what if they can actually improve paddock performance? So far results are showing you can get yield increases from using an amendment like chicken litter over artificial nutrients. But the fact that two years on there are still significant results from surface applied amendments is pretty exciting. These organic amendments are proving to be pretty stable out in the paddock, applying prior to sowing with no in crop fertiliser and seeing not just similar yields but significant yield increases provides a great opportunity to manage risk- particularly in areas that experience lots of winter rainfall and make top dressing difficult.

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