

Compost - adding value for pasture production

Compost as fertiliser

Fertiliser is one of the main inputs and costs in pasture production systems. Inorganic fertilisers are becoming increasingly expensive and are often inefficient. On average only about two thirds of the nutrients in inorganic fertilisers (N, P and K) actually go to the plant¹. Significant amounts of nutrients are lost through leaching, run-off, gaseous emission and fixation in the soil. This means that you are paying full price for only about 60% of the nutrients when you apply inorganic fertilisers. When compost is used, nearly all of the nutrients are available to the plant over time, with little nutrient loss through leaching, run off or gas emissions. While the nutrient concentrations in composts are generally lower than inorganic fertiliser, the nutrient use efficiency is much higher.

In the table opposite we have shown an example of the total nutrients (minimum and maximum) in compost and their value based on current fertiliser prices.

Compost also contains a range of trace elements like boron, zinc and copper which adds further \$\$ to the fertiliser value of compost. As not all of the nutrients applied as inorganic fertilisers will make it to the plant, this is a conservative estimate of the nutrient value of compost. Using nitrogen as an example - if 50% of the nitrogen in an urea application is lost through gas emissions and leaching², then the price of N/kg rises to \$2.54. As most of the nitrogen in compost is available to the plant, this raises the value of nitrogen to \$61/t of compost. Slow and controlled release of nutrients like nitrogen in compost, increase nutrient recovery by



plants, lowers nitrogen leaching and supplies a lasting nutrient source.

Using compost to complement inorganic fertiliser application can also demonstrate good results. Australian studies³ have found that addition of compost with 5 or 10 kg/ha of inorganic fertiliser increases shoot dry matter (wheat) more than when 10 or 25 kg/ha of inorganic fertiliser is applied without compost. About 15% of the nitrogen in compost is available in the first year with the remaining nitrogen slow release. A single N fertiliser application in the first

year may be needed to account for this - check your compost analysis for levels of available nitrogen.

Soil organic matter and soil carbon - more than just buzz words

Soil organic matter is the energy source for microorganisms in the soil. These microorganisms, like bacteria and fungi, are vital for soil health as they break down organic matter in the soil, releasing nutrients for plant uptake. Compost is a great source of soil organic matter, with carbon levels around 20%, depending on the product.

\$\$ Value of Nutrients in Compost

Nutrient	min-max kg/tonne compost*	\$/kg**	min-max \$/tonne compost
Nitrogen	9-24	1.27	11.43-30.48
Phosphorus	3-11	4.40	13.20-48.40
Potassium	5-19	1.68	8.40-31.92
Calcium	10-44	0.50	5.00-22.00
Sulphur	4-6	0.70	2.80-4.20
		TOTAL	\$40.83-\$137.00

* nutrient composition of compost will vary between products - your compost supplier can provide you with an analysis. The range here includes composts made from just garden organics (min) and compost made from manures using a specialised process to concentrate nutrients (max). This range includes total nutrients, check your compost analysis for levels of available nutrients.

** based on March 2010 fertiliser prices, calculating the \$/tonne by the % nutrient/tonne.

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Adding organic matter to the soil also improves soil cation exchange capacity. This is a measure of the soil's ability to store nutrients so they are available for plant uptake.

Replenishing soils with compost not only adds valuable organic matter to your system but also adds to the stock of soil carbon. Organic matter contains carbon which plays a central and fundamental role in soil quality and fertility. The organic matter acts as the 'glue' to bind soil particles into aggregates thus improving soil structure, infiltration, air porosity, water and nutrient holding capacity.

In most pasture systems, carbon is taken off the farm through silage, cutting of hay or grazing. Soil quality and fertility reduces over time as carbon is being continually removed from the farm and not replaced. Applying compost replenishes the soil organic carbon and helps to sustain soil quality and fertility and maximise production over time.

A paired paddock study in Victoria⁴ found that paddocks with management strategies of maintaining high organic matter levels had a 15% higher average wheat yield (0.6t/ha) than low organic matter paddocks. Results were similar where canola was cropped (16% higher than average yield). The benefits of maintaining high organic matter levels

are expected to be similar in pasture systems.

Improving the soil structure and water holding capacity of soil with compost can also mean that you may not have to irrigate your pasture as much or as often. Plants are generally more able to cope during drought or times of stress when water is managed more effectively within the soil.

Liming value of compost

Composts can have a liming or neutralising effect on pH when applied to some soils. In general, compost has a neutralising value of 5% calcium carbonate equivalent in dry matter (3% in fresh compost), compared to around 50% for lime.⁵ This means that 30 tonnes of fresh compost is roughly equivalent to applying 2 tonnes of lime. The rate of soil pH change can be influenced by a range of factors including soil texture. Soils higher in sand and lower in clay are more likely to show a greater, beneficial change in pH levels. Applying 35 t/ha increased pH from 6.8 to 7.1, soil organic matter from 1.1% to 2.5% and CEC from 14.4 to 20.1 meq/100g.⁵

Improving plant health

As well as improving soil nutrition, compost can play a direct role in suppressing plant diseases. Compost introduces a range of bacteria and fungi into your soil that can help minimise the impact of disease causing organisms. Compost can also provide habitat and food for natural enemies of many insect pests.

Healthy plants have a stronger immune system and are more able to cope with insect and disease attack.

Consistency and safety

Consistency is key with compost. Your supplier will be able to give you a compost analysis which tells you exactly what you will be applying to your system. This information can then be used in your nutrient budgets. There are no stock withholding or quarantine periods necessary after compost application (AS4454 compliant composts). AS4454 compliant composts are free of pathogens and weed seeds. Weeds compete with pasture plants for water, nutrients and sunlight, reducing nutrient use efficiency and pasture yield.

Compost will have the greatest benefit for soils that:

- are deficient in a range of nutrients
- are eroding and tend to leach nutrients
- have a history of hay or silage
- are light, sandy and low in organic material
- have a low cation exchange capacity

References

- ¹ Blaesing, D. (2003) *Controlling nitrogen losses - can we learn from the European experience?* CDROM Proceedings of the 11th Australian Agronomy Conference, Geelong, Victoria. ² McNeill, A. and Unkovich, M. (2007) *The nitrogen cycle in terrestrial ecosystems in Nutrient Cycling in Terrestrial Ecosystems*. Marschner, P. and Rengel, Z. (eds) Springer-Verlag, Berlin Heidelberg. ³ Scheffe, C.R., Patti, A.F., Clune, T.S. and Jackson, W.R. (2008) *Organic amendment addition enhances phosphate fertiliser uptake and wheat growth in acid soil*. Australian Journal of Soil Research. 46, 686-693 ⁴ O'Halloran, N., Fisher, C. and Aumann, C. (2006) *Managing soil organic matter*. Victorian Government Department of Primary Industries, 63 pp. ⁵ Cooperband, L. and Roe, N. (unpublished) *On Farm Composting Handbook* ISBN: 0-935817-19-0



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For more information and a list of quality suppliers, go to

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