

Sustainable Recycled Organics Usage



ON-FARM FACTSHEET SERIES

Fact Sheet: A1.1

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LAND APPLICATION – How much should I apply?

Using manure or compost (recycled organics) as a crop fertiliser can be a sustainable management option that saves you money. However, it will take some calculations to work out the best rate to apply for good crop growth.

You need to know:

- Plant nutrient requirements
- Soil nutrient status
- Composition of the recycled organic product you are applying
- Estimated mineralisation rate of the organic product

The first step is to calculate the nutrient demand for the crop being established. Estimating the nutrient demand for a crop requires an estimate of the yield per ha and the nutrient content of the crop removed.

Table 1 provides estimated nutrient requirements and net removal of nutrients for some typical crops grown in the Condamine catchment.

Table 1. Yield and nutrient removal of some crops on the Darling Downs

	Wheat (grain) t/ha	Sorghum (grain) t/ha	Corn Silage (Irrigated) tonnes DM/ha	Cotton (dryland) Bales / ha	Cotton (Irrigated) Bales / ha
Yield	3	5	15	4	10
Protein content	12%	10%	10%		
N (kg/t)	20	16	16	12	12
Removal of N (kg/ha)	60	80	240	45	115
P (kg/t or bales/ha)	3.4	3.2	2.5	2.5	2.6
Removal of P (kg/ha)	10	15	40	10	25
K (kg/t or bales/ha)	5	5	7	4	6
Removal of K (kg/ha)	15	20	100	15	60

Once the amount of nutrients required by the crop have been estimated, it is valuable to get a soil analysis to indicate the fertility of the paddock to make a decision on fertiliser rates. By matching the fertiliser additions (inorganic fertiliser or

recycled organics) to the crop demand, you can maintain a sustainable level of production.

If the soil analysis shows that paddocks are in a run down condition, higher levels of nutrients may be applied to improve fertility.

Once the crop demands and soil condition is known, the next step is to work out the nutrients contained in the recycled organic product being used. Table 2 shows some typical nutrient values for feedlot and poultry manure (for further information see the 'Typical composition' fact sheets in this series).

Table 2. Nutrient composition of feedlot and poultry manure

	Feedlot Manure				Poultry Manure			
	fresh – 34%		stockpiled – 26%		composted – 30%		layer hen – 35%	
Moisture	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
N (kg/t)	24	16	22	16	24	16	33	21
P (kg/t)	7.5	5	9.5	7	10	7	20	13
K (kg/t)	26	17	25	18	25	17	17	11

The best way to find out the nutrient content of the product is by getting a nutrient analysis done or requesting an analysis from the supplier. This will give the nutrient content as a fraction of the total dry matter. As manure is usually applied with some moisture, the nutrient content for manure 'as spread' will be lower than the dry analysis (see Table 2).

After the nutrient analysis has been done, the next step is to work out the amount of nutrient in the material per tonne as applied (see example 1). It is also important to note that not all the nutrients will be available for plant growth in the first year.

As the amount of available nutrients in different recycled organics varies widely, this can only be estimated prior to planting. A soil analyses pre-planting will aid decision making about supplying additional fertiliser above those supplied by the recycled organic product.

The availability of nitrogen will vary with the rate of application, the weather conditions and

the type of product. Most of the nitrogen in recycled organic fertilisers is in an organic form and has to be mineralised. If the product has been composted, the product will be slower in releasing nitrogen than a non-composted product.

Example 1:
 Stockpiled feedlot manure analysis;
N = 2.2%, P = 0.8%, K = 2.3%
Dry matter = 70% (Moisture = 30%).

Calculate N content on wet basis;

N content Dry matter %

↙ ↘

= 2.2 x 0.7

= 1.5 % N as applied @ 30% moisture
 Using the same calculation gives
0.6 % P and 1.6 % K.

Calculate **kg of N, P, K applied per tonne**
N = 0.015 x 1000 = 15 kg
P = 0.006 x 1000 = 6 kg
K = 0.016 x 1000 = 16 kg

Trials conducted by Queensland DPI & F (deep litter and animal manure) indicate more nitrogenous fertiliser is required when using composted product in the short term.

A reasonable estimate for stockpiled feedlot manure is 50% of the N and 60% of the P and K available in the first season. This amount is likely to be less for a composted product.

Provided they are applied in a reasonable quantity (eg more than 3 t/ha) and are incorporated by cultivation so the nutrients do not just sit on the soil surface, almost all recycled organics derived from manure will provide enough available P and K for plant growth in the first year of crop production after application.

Recycled organics rarely have a balanced nutrient content. For this reason it is generally recommended to apply manure at a rate that will supply the P demand of the crop and supplement with an N fertiliser. This will make better use of the recycled organic resource and avoid having high amounts of nutrients that can be lost to the environment from over application.

For sorghum grown in the second year following an application of 10t/ha of manure, around 50 kg N might be expected to be available from the manure and 40 kg N/ha needed as supplementary N. The second year supply will depend upon what happened in the first crop. If there was considerable release of N in the first year then

less than 30% would be expected to be released in the second year. If it was dry with little uptake, then the second year release of N could move up towards 50%.

When selecting the application rate be mindful of ease of spreading. A minimum quantity of 3 tonnes per ha is usually needed to obtain a good distribution with a spreader. A larger application of around 6 t/ha will spread more evenly and which may avoid the need for disc ploughing to incorporate the product.

It is recommended that soil tests are used in subsequent seasons immediately prior to sowing to assist in tailoring nutrient applications. It should be remembered that significant amounts of nutrients from recycled organics may mineralise during the season.

Hint: Avoiding over application of recycled organics

10 t / ha of feedlot manure supplies about enough phosphorus for 3 consecutive sorghum crops that yield 5 t/ha.

One application of manure every 2-3 years + urea to meet nitrogen demand might be a good option!



Other fact sheets in this series:
Typical composition – Layer hen manure
Typical composition – Feedlot manure
Typical composition – Piggery spent bedding
Application – How much is manure worth?

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