The Economics of Using Feedlot Manure in Northern Region Farming Systems.

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Feedlot Manure as Fertiliser

Feedlot manures have long been identified as an alternative fertiliser option for supplying the Northern Grains Region.

"Plants do not care whether the N or P atom they just assimilated from the soil came from a decaying piece of residue, a lump of feedlot manure or a granule of fertiliser." - Mike Bell 2008

There has been an increase in the number of cattle in feedlots over the past decade in QLD and NSW, raising capacity from ~500,000 to ~600,000 head. This has led to a 20% increase in the amount of manure available to be used as fertiliser.

Image 1. Compost being spread at Billa Billa farming systems site

Source: Andrew Erbacher, DAF

In 2008, Dr Peter Wylie calculated that the nutrient value of fresh feedlot manure (Table 1) was ~$54/t, and manure aged for a year or more had a value of $61/t. However as the most recent economic analysis on the use of feedlot manure compared to granular products is over a decade old it is worth revisiting the economics of this practice.

Economic Analysis

Using the same feedlot manure nutrient compositions (Table 1) and 2018 fertiliser prices of mono ammonium phosphate (MAP) ($800/t), urea ($450/t) and potassium chloride (KCl) ($380/t), it doesn't appear that too much has changed, with nutrient content ranging in value from ~$54 - $67/t (Table 2).

Table 1. Feedlot Manure Nutrition (kg/t)

Nutrient (kg/t)	**Fresh (34% water content)**		**>1 Year old (26% water content)**	
	Dry	Wet	Dry	Wet
Nitrogen (N)	24	16	22	16
Phosphorus (P)	7.5	5	9.5	7
Potassium(K)	26	17	25	18

Source: Powell, 1994. Economic Management of Feedlot Manure, Final Report, (average of 93 samples, 17 stockpiled for more than 12 months)

On average the composition of this value is fairly evenly distributed across N ($19/t), P ($23/t), and K ($18/t).

Table 2. Value of nutrients in feedlot manure ($/t)

Nutrients	**Fresh (34% water content)**		**>1 Year old (26% water content)**	
	Dry	Wet	Dry	Wet
N	$24	$16	$22	$16
P	$24	$16	$30	$22
K	$15	$22	$15	$21
Total	**$63**	**$54**	**$67**	**$59**

With feedlot manure typically available at between $5 and $10/t, it would seem logical that getting $54 - $67 worth of nutrition for $5-$10/t, is a pretty good deal.

However, given that granular fertilisers are more concentrated in nutrients, to get the equivalent nutrition via feedlot manure requires 8 – 20 times more material to be transported and spread. These associated costs are likely to play a significant role in determining the overall economic benefit of feedlot manure.

Transport and Spreading Costs

As an example, a target rate of 20 kg/ha of phosphorus (P), would require between 2 and 4 t/ha of feedlot manure compared to less than 100kg/ha of (MAP). Assuming transport rates are similar for granular and feedlot manure, ie $20/t per 100km, the transport cost for 20 kg of P over 100km would be between $42 and $80/ha for feedlot manure, compared to just $2/ha for MAP. To account for the additional nutrition (N and K) in feedlot manure, we need to add the transport costs of Urea (60kg) for equivalent N and Potassium Chloride (90kg) for equivalent K the total transport costs for NPK in granular form would be less than $6/ha. Thus the relative distance between your granular fertiliser distributor and the source of feedlot manure will be critical in determining the economics of feedlot manure to an individual enterprise (Appendix 1, Table 4).

Image 2. Manure being spread on the Emerald farming systems site.

Source: Darren Aisthorpe, DAF

Likewise there will be a difference in spreading and incorporation costs between granular options and feedlot manure. Assuming a spreading cost of $5/t, ($35/hr at 7 t/hr) spreading 90kg KCl, 100kg MAP, and 60kg Urea (total 250kg/ha), equals a spreading cost of approximately $1.25/ha. In comparison spreading between 2 and 4 t/ha of feedlot manure will cost between $10 and $20 respectively.

Calculating the Economics of Feedlot Manure

For feedlot manure to be an attractive alternate source of crop nutrition it needs to be priced at a level which takes into account total purchase, transportation and spreading costs; compared to granular fertiliser.

Table 3 suggests that once you are beyond 30km from the source of manure it is unlikely to be economic. If you are within 5km of the feedlot, you could pay between $36 and $49/t and still come out ahead compared to using a combination of granular products.

Table 3. Economic Value of Feedlot Manure, Accounting for Transport and Spreading

Distance to Feedlot Manure	**Fresh 34% Water Content**		**>1 Year old 26% Water Content**	
(km)	Dry	Wet	Dry	Wet
5	$44	$36	$49	$41
10	$36	$28	$41	$33
15	$28	$20	$33	$25
20	$20.0	$12	$25	$17
25	$12	$4	$17	$9
30	$4	-$4	$9	$1
35	-$4	-$12	$1	-$7

Assumes transport cost of $20/t/100km, spreading $5/t, assumes same distance for granular fertiliser and feedlot manure

Additional expected benefits such as improved soil carbon under feedlot manure may encourage growers to use the practice when there is marginal difference in cost between feedlot manure and granular products. However, recent research results looking at changes in soil organic carbon levels under different management options suggest no difference between soil organic carbon of manure vs granular fertiliser products. The research was conducted by applying rates of 5 and 10 t/ha of feedlot manure, and the equivalent nutrition in granular fertiliser (CK55S), every 3 years (2013 and 2016), compared to a nil treatment. The finishing soil organic carbon levels in 2017 were compared

with a baseline level measured in 2012, it was found that under each of the high nutrition treatments soil organic carbon increased over the 5-years (2012-2017) (Gentry and Lawrence, 2018). However there were no significant differences in soil organic carbon levels between nutrition applied as manure or as granular fertiliser.

This research also found that nitrous oxide emissions were approximately four times higher with the feedlot manure treatments compared to the fertiliser equivalent treatments.

References:

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Mike Bell, 2010, Nutrient Supply by Manures in Broadacre Cropping Systems, GRDC, https://grdc.com.au/resources-and-publications/grdc-update-papers/tab-content/grdc-update-papers/2010/09/nutrient-supply-by-manures-in-broadacre-cropping-systems, Last Accessed: 23/08/18

Evan Powell 1994, Economic Management of Feedlot Manure: Final Report, Evan Powell Rural Consultants, Dalby, Qld.

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Appendix

Table 4: Economic Value of Feedlot Manure Accounting for Distance Between Nutrient Sources

	Distance to feedlot manure (km)						
Distance to Granular (km)	5	10	15	20	25	30	35
10	$44	$36	$28	$20	$12	$4	-$4
20	$46	$38	$30	$22	$14	$6	-$2
30	$48	$40	$32	$24	$16	$8	$0
40	$50	$42	$34	$26	$18	$10	$2
50	$52	$44	$36	$28	$20	$12	$4
60	$54	$46	$38	$30	$22	$14	$6
70	$56	$48	$40	$32	$24	$16	$8
80	$58	$50	$42	$34	$26	$18	$10
90	$60	$52	$44	$36	$28	$20	$12
100	$62	$54	$46	$38	$30	$22	$14

Assuming nutrient value of $60/t, spreading costs of $5/t and 8t manure required to be equivalent to 1t granular fertiliser.

Prices in table are what growers could pay $/t for feedlot manure and be no worse off than using a granular product.