Manure and Nitrogen Effect on Corn Yield

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Objective

To quantify the yield effect of nitrogen and fall applied dairy manure application on corn grain yield.

Background

Cooperator:	Bateson Farms	Soil test:	OM-4.5%, CEC-20,P-162 ppm, K-172 ppm, pH- 7.3
County:	Wood		
Nearest Town:	Rudolph	Fertilizer:	7 gal 9-18-9 preplant
Drainage:	Tile, well-drained	Planting Date:	5-2-07
Soil type:	Mermill, silty loam	Planting Rate:	30,000 seed/acre
Tillage:	disk chisel	Row Width:	30-inch
Previous Crop:	corn silage	Herbicides:	Lumax
		Harvest Date:	11-5-07

Methods

The treatments were replicated 3 times in a randomized complete block design. Plot size was 40 x 500 feet. During September, 2006, liquid dairy manure was injected at an approximate rate of 7,000 gal/ac. Estimated nutrients applied from manure based upon laboratory analysis was: total N -172 lb/ac, P2O5 – 64 lb/ac, K2O – 150 lb/ac. It is expected that 25% of the ammonium nitrogen and 33% of the organic nitrogen from manure will be available for the 2007 corn crop. Randomized strips with and without manure were applied. At corn planting, 7 gallon/acre of 9-18-9 was sprayed with herbicide. Sidedress application of liquid nitrogen (28%) was coulter injected in early June 2007 at V 6 growth stage. Two rates of sidedress nitrogen (28%) were applied: full rate of 40 gallon/acre (120 lb/ac actual nitrogen), and ½ rate of 20 gallon/acre (60 lb/ac actual nitrogen). Harvest data was collected from the entire 16 rows.

Treatment	Description
Treatment 1 (T1)	0 gal/ac UAN 28%
Treatment 2 (T2)	0 gal/ac UAN 28% + 7,000 gal/ac fall injected dairy manure
Treatment 3 (T3)	20 gal/ac UAN28%
Treatment 4 (T4)	20 gal/ac UAN 28% + 7,000 gal/ac fall injected dairy manure
Treatment 5 (T5)	40 gal/ac UAN28%
Treatment 6 (T6)	40 gal/ac UAN 28% + 7,000 gal/ac fall injected dairy manure

Results

Treatment	Manure/ Nitrogen application (sidedress)	Corn Yield Bu/ac
T 1	0 Manure + 0 Nitrogen	170.0 a
T 2	Manure + 0 Nitrogen	169.1 a
T 3	0 Manure + ½ Nitrogen	185.1 b
T 4	Manure + ½ Nitrogen	186.6 b
T 5	0 Manure + Full Nitrogen	194.2 b
T 6	Manure + Full Nitrogen	196.7 b
	LSD (0.05)	12.5

Economic Analysis

At all three levels of sidedress nitrogen applied (zero, ½ rate, full rate) the addition of manure did not have a significant increase in corn yield. One may conclude that the nitrogen from an early fall application of injected dairy manure was no longer available to growing corn the following season. An economic analysis of corn yield compared to cost of sidedress nitrogen applied is shown below. These comparisons do not include any manure application treatments.

	Nutrient applied Total sidedress nitrogen	Corn yield increase	Value of yield increase $3.50 /bu	Cost of 28% nitrogen ($0.70 /lb N)	Economic return for added N
0 nitrogen	½ rate (60 lb/ac)	15.1 bu/ac	$ 52.85	$ 39.20	+ $13.65
0 nitrogen	Full rate (120 lb/ac)	24.2 bu/ac	$ 84.70	$ 78.40	+ $ 6.30
½ rate nitrogen	Full rate (120 lb/ac)	9.1 bu/ac	$ 31.85	$ 39.20	- $ 7.45

Supplying nitrogen resulted in increased corn yield in this comparison. When compared to zero nitrogen sidedress rate, both ½ rate and full rate sidedress nitrogen had a positive economic return above the cost of nitrogen applied. When comparing ½ rate to full rate sidedress nitrogen, there was no significant yield increase and a negative economic return which did not pay for the cost of nitrogen applied.

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