Final Report

Corn Grain Response to Nitrogen in Liquid Swine Manure and Urea in Lyon County, Iowa, 2006-2007

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This study was conducted at two sites west of Larchwood, Iowa on the farm of Mr. Bruce Bonander. The previous crop each year was soybean. The soil at both sites was a Moody silty clay loam (fine-silty, mixed, mesic Udic Haplustoll). The purpose of the study was to compare corn grain yield response to the nitrogen (N) in liquid swine manure with N in the commercial fertilizer, urea (46-0-0).

The treatments were applied on April 13 in 2006 and on April 19 in 2007. Liquid swine manure was injected into the soil to supply N rates of 0, 60, 120, and 180 lb N/a using a manure spreader built specifically for small plot research. Urea was applied by hand to supply exactly the same rates of N. Each treatment was applied to a small plot that was 10 ft by 40 ft to accommodate four rows of corn spaced 30 in apart. The treatments were a factorial arrangement of N material, liquid swine manure and urea, and N rate in a randomized complete block design with four replications in 2006 and three in 2007.

Harvest occurred in mid-October both years. Twenty feet of each of the center two rows of each plot were hand harvested in 2006 while 30 feet of the center two rows were hand harvested in 2007. The corn ears were transported back to Ames. Grain was removed from the ears using a small plot stationary sheller, weighed, and sub-sampled .

Sub-samples were retained to determine the moisture content. Reported grain yields were adjusted to a standard moisture content of 15.5%.

Table 1. Chemical properties of the liquid swine manure used in the study.

	2006	2007	2006	2007
	----------%----------		------lb/1000 gallons------	
Solids	3.7	3.9		
Total N			55	52
Ammonia			47	38
Total P			7.4	13
Total K			49	30

The liquid swine manure contained about 50 lb of total N/1000 gallons (Table 1). 85% of the total N was in the ammonia form in 2006 while ammonia accounted for 73% of the total N in 2007. The analytical results for total P are low and probably not correct. It is common to measure low P concentrations if the laboratory performing the analyses isn't careful when sub-sampling the slurry and allows the solids to settle before the sample is taken. We assume that happened in this case.

The corn grain yields were low in 2006 (Table 2 and Figure 1) ranging from about 68 bu/a where no N was applied to a high of 96 bu/a where 180 lb N/a was applied as urea. This was probably due to low rainfall in the area during the growing season. Grain yields in 2007 were twice those in 2006 (Table 2 and Figure 1) ranging from about 165 bu/a to about 200 bu/a. The yield difference between years was due to more favorable rainfall amount and distribution in 2007.

There was a significant response to applied N in both years (Table 2 and Figure 1). However, there was not a difference in grain yields due to the form of N applied. Yields averaged over N rates were 83 bu/a for manure treatments and 85 bu/a for urea

treatments in 2006. In 2007 the yields of manure treatments averaged 192 bu/a and 183 bu/a in urea treatments.

Table 2. Corn grain response to N fertilizer applied as liquid swine manure and urea at four rates.

	N Materials					
	Manure			Urea		
N Rate	2006	2007	Average	2006	2007	Average
	----------bu/a----------					
lb/a	-					
0	68	163	116	69	165	117
60	87	200	144	83	185	134
120	91	199	145	90	199	145
180	88	192	140	96	181	139
Average	84	189	136	85	183	134

Statistics	2006	2007
	Prob>F	
N Rate (N)	<0.0.01	<0.01
Material (M)	N.S.*	N.S.
N*M	N.S.	N.S.

*N.S. = Differences are not statistically significant.

The observation that there was no difference in response due to N source seems logical given that 85% of the total N in the liquid swine manure was in the plant available ammonium form in 2006 and 73% in 2007.

The most surprising observation is that grain yields were maximized with the addition of about 60 lb N/a in both years. It is not known if the soil contained a significant amount of N prior to planting. It is doubtful that this will occur every year, but this should be a subject of further investigation

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These data suggest that the N in the liquid swine manure is as plant available as the N in urea.

We deeply appreciate the cooperation of Mr. Bruce Bonander in this study.

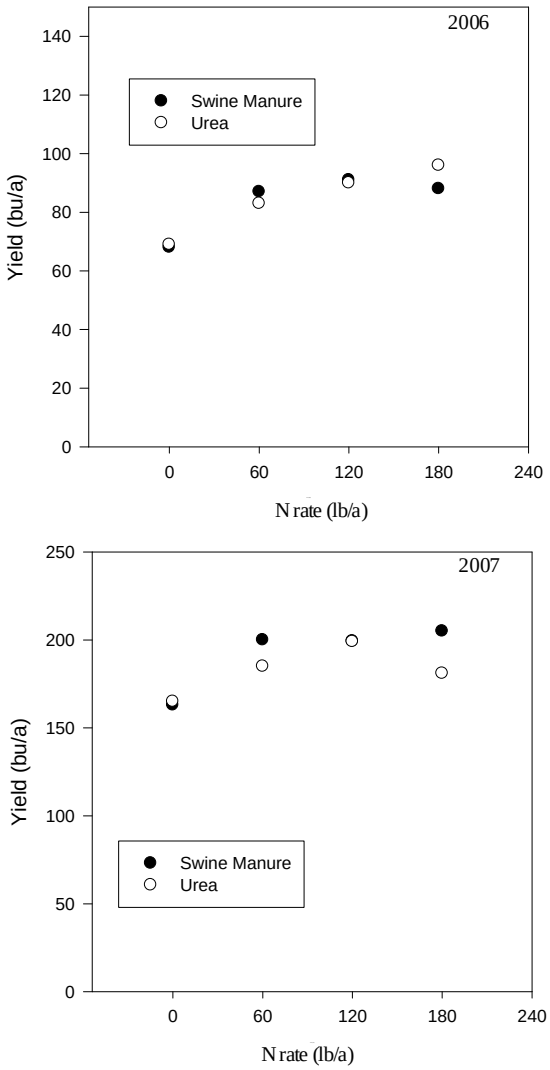

Figure 1. Effect of nitrogen in urea and liquid swine manure on corn grain yields near Larchwood, Iowa in 2006 and 2007.