2005

Swine Manure Nitrogen Availability and Carryover

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Abstract
Swine manure is readily available in Iowa and is an excellent source of fertilizer for crops. Application rates are often based on the nitrogen (N) needs of the coming year's crop. Producers often ask how much N is available the first year, and if any N carries over to subsequent years.

Disciplines
Agricultural Science | Agriculture

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Introduction

Swine manure is readily available in Iowa and is an excellent source of fertilizer for crops. Application rates are often based on the nitrogen (N) needs of the coming year's crop. Producers often ask how much N is available the first year, and if any N carries over to subsequent years.

Materials and Methods

Manure has been applied to plots in a corn-soybean rotation at the Southeast Research Farm (SERF) over the past 5 years. In 2002 and 2003 plots with a lower rate of manure and where N-Serve was used were added. On all plots (except 4000I-yearly where manure was applied every year), manure or fertilizer was only applied ahead of the corn crop. In 2004, plots were split with anhydrous ammonia nitrogen applied to half of each plot in the fall of 2003. Nitrogen was applied at 150 lb/acre. Corn was planted on all plots in 2004. Late-spring nitrate tests (LSNT) and crop yields were collected on all plots.

Results and Discussion

The manure applied in the fall of 2001 (for the 2002 growing season) was extremely uniform with an average of 40 lb of N/1,000 gal. In Table 1, the addition of N-Serve increased yields slightly at the 2,000 gal/acre rate but there was no difference in the LSNT or end of season stalk test levels. At the 4,000 gal/acre rate of manure, the addition of N-Serve showed a slight increase in the LSNT and end of season stalk test; however, there was no increase in corn yield with the addition of N-Serve.

Unfortunately, in the fall of 2002, the manure that was applied for 2003 was not as uniform as for previous years. One load of the manure had about 20 lb of N/1,000 gal while the remaining loads had nearly 60 lb of N/1,000 gal, causing a difference in manure N levels even with the same manure application rates. In Table 2, treatments with equal N levels in the manure were the 4,000 gal injected every year and the 4,000 gal injected with N-Serve. In the latter case, the addition of N-Serve did show higher LSNT and end of season stalk test levels. However, with excess levels of N available to the crop already, there was no difference in corn yield. It is worthwhile noting an over 70 bushel/acre response to the first 40 lb/acre of manure N that was applied

In 2004 with corn after soybeans where no N was applied, all LSNT results were similar but deficient (less than 20 ppm). Two treatments, 8000I and 4000I-yearly, showed increased yields over the other treatments. This is likely because of N built up in the soil where more N had been applied than removed in the previous 5 years.

For corn after corn plots where no N was applied for 2004, LSNT levels were lower (9 ppm) than for the corn after soybeans plots (11 ppm). Check treatment yields with no N applications for 5 years were also much lower in corn after corn (38 bu/A) than for the corn after soybeans (121 bu/A). While there did appear to be an increase in yields with some previous manure applications, this seemed to be more a function of total N applied in past years. When comparing treatments with no additional N applied for 2004, the yields appear to show more carryover of N where N-serve was used for 2003 (Table 3).

For both corn after soybeans and corn after corn, the previous treatments of commercial N and 4,000 gal/acre injected (both done only ahead of corn) had similar yield levels in 2004 for the same previous crop and N application.

Acknowledgments

Funding was provided by a grant from the Iowa Pork Industry Center with assistance from the Southeast Research Farm.

Table 1. 2002 manure plot results at the Southeast Research Farm.

Treatment	Manure N lb/acre	Total N lb/acre	LSNT ppm	Stalk test ppm	Corn yield bu/acre
Check	0	0	9	15	103
2000 gal injected (2002 only)	80	80	12	44	174
2000 gal injected w/ N-Serve (2002 only)	80	80	11	18	183
4000 gal injected	160	160	10	16	211
4000 gal injected w/ N-Serve (2002 only)	160	160	16	113	206
4000 gal injected every year	160	160	12	439	224
8000 gal injected	320	320	12	411	227
Commercial N	0	150	26	120	212

Table 2. 2003 manure plot results at the Southeast Research Farm.

Treatment	Manure N lb/acre	Total N lb/acre	LSNT ppm	Stalk test ppm	Corn yield bu/acre
Check	0	0	10	15	106
2000 gal injected (2003 only)	40	40	16	153	182
2000 gal injected w/ N-Serve (2003 only)	120	120	23	3072	202
4000 gal injected	75	75	25	184	192
4000 gal injected w/ N-Serve (2003 only)	245	245	59	8160	202
4000 gal injected every year	245	245	41	4390	207
8000 gal injected	150	150	36	5277	217
Commercial N	0	150	39	2063	191

Table 3. 2004 manure nitrogen carryover plots corn results at the Southeast Research Farm.

Previous Treatment	2003 N lb/acre	LSNT ppm	2004 corn bu/acre	2004 N lb/acre	LSNT ppm	2004 corn bu/acre
Corn after Soybeans		No N applied for 2004			Ammonia N applied for 2004	
Check		11	121	150	28	183
2000 gal injected		10	128	150	23	177
2000 gal injected+N-serve		12	121	150	26	181
4000 gal injected		11	143	150	25	211
4000 gal injected+N-serve		10	132	150	28	195
Commercial N		9	145	150	22	205
8000 gal injected		13	178	150	25	209
4000 gal injected yearly	245	10	201	150	24	229
Corn after Corn						
Check	0	6	38	150	22	172
2000 gal injected	40	7	66	150	25	175
4000 gal injected	75	9	74	150	22	192
2000 gal injected+N-serve	120	9	117	150	16	189
Commercial N	150	7	74	150	22	194
8000 gal injected	150	9	128	150	26	207
4000 gal injected yearly	245	9	162	150	25	218
4000 gal injected+N-serve	245	9	180	150	18	218