



Water Watch

A newsletter for Big Spring Basin, Sny Magill and Hickory Creek Watershed, and Northeast Iowa Demonstration Project areas

Project News

Soil test interpretation is a key to profitable crop production

by John Rodecap, Northeast Iowa Demonstration Project coordinator

Soil test interpretation was identified by producers in recent farming practices interviews as the key to crop nutrient management. Especially important is the upward trend in soil test levels that some producers have observed over several years.

These soil fertility records have helped producers save unnecessary fertilizer expenditures, especially where manure applications have occurred for several years.

The recent trend in fertility management has been to apply crop removal rates of phosphorus and potassium for crop production. Some producers have found this practice will quickly increase soil test levels into the high and very high range especially if manure and starter fertilizer are also applied.

A field demonstration on swine finishing manure management, known as the Burrack-Kregel study and held on a farm near Garnavillo, was initiated by the

Big Spring Water Quality Project and continued by the Northeast Iowa Demonstration Project. This study clearly indicated how quickly soil fertility can be affected by manure application. After eight years of the same replicated rates of manure application or commercial nitrogen application with maintenance rates of lime, phosphorus (P) and potassium (K), the soil and stalk nitrate test levels were dramatically different, as shown in table 1.

High application rates of manure or nitrogen had an adverse affect on soil pH which will require more

frequent application of lime and greater cost of crop production. There was no increase in corn yield when the manure application rate increased from 3,500 to 7,000 gallons per acre of manure testing 67 pounds of nitrogen in each 1,000 gallons of manure. There is sufficient phosphorus buildup in the manure soil, 70 to 216 parts per million, or ppm, to support crop production for many years without additional plow down application.

The question of phosphorus-potassium ratio was addressed in 1996 and 1998 in Clayton County

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Table 1. Liquid swine manure treatments, corn yields and eighth-year soil test results.

Treatment	Gal./acre	---- 1994 --- P	K	pH	Cornstalk NO ₃ , ppm*	1989-94 Ave. yield
Check (no manure or N)		31	143	7.1	41	100
Manure (low)	1,750	70	241	6.8	605	145
Manure (medium)	3,500	108	256	6.7	4,046	153
Manure (high)	7,000	216	342	6.3	8,606	153
Urea (spring)		26	151	6.4	—	145
Urea (fall)		31	152	6.6	1,436	148

* Optimum range for cornstalk nitrate nitrogen (NO₃) is 700 to 2,000 ppm
Note: Soil test levels above 31 ppm for P and 190 ppm for K are considered to be very high (VH).

Soil test cont.

field demonstrations on very high testing soils for phosphorus and potassium, where each application rate was replicated three times. The corn yield results with various rates of potassium are shown in table 2.

There was no difference in corn stalk quality or stalk rot among the potassium treatments and no consistent yield response to added potassium.

A field demonstration using various rates and sources of commercial fertilizer on soybeans in 1997 indicated no advantage to using additional crop nutrients on very high testing soils, as shown in table 3.

An additional long-range consideration for livestock producers is the possibility of rules restricting manure application on fields with excessive soil test levels for phosphorus. If unnecessary nutrient rates are applied and buildup of phosphorus, similar to soil test levels shown in table 1, occurs it might require producers to travel

Table 2. Corn yields on soils testing high in P and K.

1996 and 1998 potassium management demonstration				
Potassium treatment, pounds/acre	0	60	90	120
Corn yield, bu/acre				
1996, swine finishing manure (10,000 gallon, fall 1994)	172	164	182	172
1998 corn following soybeans (1997, 57 bu. soybeans/acre)	227	220	222	223

Table 3. Fertilizer treatments and soybean yields, 1997.

Fertilizer treatment, pounds/acre	Soybean yield, bushels/acre
Check (no fertilizer)	54
70 pounds N as NH ₃	44*
73 pounds actual K	55
90 pounds starter (9-23-30)	55

*White mold damage was significantly greater in the nitrogen treatment. Soil test: P 32 ppm (very high), K 212 ppm (very high) and pH 6.5.

longer distances with manure to locate fields not testing excessive for phosphorus.

The suggestion is to begin intensive soil nutrient management now to save money and avoid possible costly manure disposal problems in the future.

A soil test history should be developed to track phosphorus and

potassium levels for each field. Producers need to cut through the unnecessary numbers on their soil test report to find the phosphorus and potassium test results. A few producers have become very proficient at soil test interpretation and crop nutrient management, saving large annual investments in unnecessary fertilizer and also protecting water quality.

Question prompts another look at manure demonstrations

by Gina Hanson, manure management specialist, NEIDP

After reading demonstration results in the December issue of *Water Watch*, a dairy producer who lives near Postville called to ask if there was a difference in the results when dairy manure was compared to swine manure.

There is a difference. Our suggestion is that livestock producers get to know their manure by having a manure spreader calibration and analysis of a manure sample, especially now as the growing season approaches.

We looked at all the dairy manure

sample information, specifically the dairy gutter manure samples, and found that the average first year manure nitrogen (N) credit on the dairy gutter manure demonstrations was 70 pounds of N per acre.

Comparing the corn yield results of the plots with 70 pounds of manure N credit, we found that an additional 50 pounds of nitrogen, in the form of ammonium nitrate, resulted in significant yield increases. However, with 100 pounds of additional N, there was no significant yield response.

With that in mind, all 24 manure demonstrations, including swine,

dairy and beef feedlot, were divided into two groups, low and high. We used 120 pounds of manure N credit as the dividing point.

The next step was to average each group. The low manure N rate average was 83 pounds of N per acre; the high manure N rate average was 174 pounds of N per acre. Of interest, most of the sources in the low group were dairy gutter or cattle shed bedded pack and most of the sources in the high group were swine.

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Corn yields and end-of-season cornstalk nitrate results, 24 manure demonstrations, 1994-98.

	Manure credit*	----- Corn yield, bu/acre -----				--- Cornstalk nitrate NO ₃ , ppm ---			
		Check	Manure only	M+50	M+100	Check	Manure only	M+50	M+100
Overall average (24)	136	129	143	148	148	464	1,896	2,703	3,855
High manure (14)	174	132	157	160	158	346	2,677	3,375	4,675
Low manure(10)	83	112	124	130	133	612	1,058	2,117	3,209

*Manure credit is in pounds of N per acre. Manure sources were dairy, swine and beef.

Question cont.

When we looked at the yield results for the low group, an additional 50 pounds of N per acre produced a significant yield increase, just as it had in previous examinations of the results. The addition of 100 pounds of N per acre over the manure did not improve yield significantly.

Looking at the yield results for the high N group, we found no response to additional N (see table above). The first year manure N

contribution was enough to provide the N needs of the corn plant.

Finally, the results of the end-of-season cornstalk nitrate nitrogen test (NO₃) were evaluated. In all cases, the check plots, which received no manure and no additional nitrogen, showed that additional N would likely produce a yield increase. The addition of manure in all cases brought the plots into the “comfort range,” where there was adequate N for the corn plant.

Some producers are confident in taking a 100 percent contribution the first year after a manure application. For farmers who are not confident in the nitrogen calculations for manure applications, the addition of 50 pounds of N will meet the N needs of the crop. The additional 50 pounds of N compensates for problems such as spreading uniformity, and it is an easy first step for producers who have never credited for manure.