Five-Year Comparisons of Soil Test pH, Phosphorus, and Potassium in a Grid Soil Test System

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Objective

To measure soil-test levels over time and cropping in a field gridded in geospatially referenced 0.33-acre plots.

Background

Cooperator:	OSU Unger Farm	Variety:	Various
County:	Crawford	Fertilizer:	0-44-60 lb/A N-P_2O_5-K_2O
Nearest Town:	Bucyrus		30-0-0 lb/A starter
Soil Type:	Pewamo clay loam/		160 lb/A N as 28% UAN
	Blount silt loam	Herbicide:	Basis Gold 14 oz/A
Drainage:	Systematic		Banvel 4 oz/A, Crop Oil 1 pt/A
Previous Crop:	Corn	Planting Date:	May 5, 2001
Tillage:	Chisel plow/field cultivator	Seeding Rate:	Various
Soil Test:	pH 6.6, P 126 ppm, K 490 ppm	Row Spacing:	30 inches
		Harvest Date:	October 26, 2001\

Methods

Soil sampling is essential to maximizing economic returns and protecting the environment in grain crop production systems. To the above ends, grid soil sampling (GSS) has recently been implemented by a number of Ohio farmers with the purpose of gathering soil-test information on small areas of a field. By GSS, field points are geo-referenced, thus permitting application of varying amounts of fertilizer or lime. Further, overlaying soil test results, yield maps, soil type maps, topographic maps, etc., can develop spatially referenced information for specified small areas of a field. Thus, better associations of the factors influencing yield can be calculated. Traditional crop soil tests (most 10 acres in size or larger) and their associated results are often quite variable, which can cause a crop to be over or under fertilized.

Thus, an analysis on six 0.33-acre grids selected randomly from a total of 15 grids was conducted to examine the stability of soil test P, K, and pH over time and cropping systems. The soil tests were taken in November of each year. The soil samples were taken at the same position in the field (using GPS) over time. There were no crops grown in 1997, when initial soil samples were taken. This study attempts to eliminate spatial bias by the repeated use of very small grids to describe soil nutrient variability.

Results

Table 1. Soil pH of Six Selected Grids Over 5 Years

Year	Grid 1	Grid 2	Grid 3	Grid 4	Grid 5	Grid 6	Average
2001	6.2	6.7	6.4	6.5	7.4	7.4	6.63
2000	6.7	7	6.6	6.6	7.4	7.4	6.83
1999	6.6	7	6.5	6.4	7.3	7.3	6.7
1998	6.4	7.2	6.4	6.8	7.3	7.3	6.78
1997	7.3	7.1	7.2	6.7	6.8	6.8	6.98
						LSD (0.05)	NS
						F	<1
						CV (%)	5.2

Table 2. Soil P_2O_5 (ppm) of Six Selected Grids Over 5 Years

Year	Grid 1	Grid 2	Grid 3	Grid 4	Grid 5	Grid 6	Average
2001	34	24	21	33	34	23	28
2000	48	38	40	31	57	32	41
1999	40	36	39	37	36	44	39
1998	39	33	33	24	26	24	30
1997	10	16	26	19	15	13	17
						LSD (0.05)	7.8
						F	13.3
						CV (%)	21.2

Table 3. Soil K_2O (ppm) of Six Selected Grids Over 5 Years

Year	Grid 1	Grid 2	Grid 3	Grid 4	Grid 5	Grid 6	Average
2001	145	126	116	170	123	142	137
2000	161	126	180	143	137	130	146
1999	131	120	142	165	104	133	133
1998	180	135	172	149	88	136	143
1997	90	142	155	167	64	158	129
						LSD (0.05)	NS
						F	<1
						CV (%)	20.8

Summary and Notes

Phosphate and potassium grain removal rates for 180 bu/A corn (two crop years, 1998 and 2001), 48 bu/A soybean (1999), and 93 bu/A wheat (2000), would be 238 lbs/A P_2O_5 and 204 lbs/A K_2O respectively. The base rate(s) of fertilizer applied in the last four years were 309 lbs P_2O_5 and 422 K_2O. Thus, both P and K soil test levels would be expected to go up. P_2O_5, however, went down in five of the six grids compared to 2000. K_2O soil test levels went down in three of the six grids compared to 2000. The reduction in P, although small, is not explained by the fertilizer applied and crop removal budgets. Other factors, such as time of year of the soil testing and/or soil laboratory calibrations, may have had some impact on the final result. Soil pH was quite stable for five of the six selected grids from year to year.

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