

# Effect of Variable Rate Phosphorus and Potassium Applications on Grid Soil Test Values

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## Objective

Grid soil sampling (GSS) has recently been implemented by a number of area farmers in order to gather soil test information on small areas of their fields. The areas are geo-referenced so specific amounts of fertilizer or lime may be applied to these small areas. Geo-referenced grid information is also valuable for building geographic information systems (GIS) by overlaying yield maps, soil type maps, topography maps, etc.

GSS can also be used to examine variability of soil pH, phosphorus, and potassium. With their new experiences with GSS information, area producers have questions regarding previous soil test collection methods and the accompanying results. This study was undertaken to measure soil test level changes in pH, phosphorus, and potassium in a grid soil sampled field after a variable rate application of phosphorus and potassium and a single year of corn growth.

## Background

Cooperator:	OSU Unger Farm	Fertilizer:	Variable (36-92-120 to 90-230-300)
County:	Crawford	Previous Crop:	Fallow
Soil Type:	Pewamo	Planting Date:	May 7, 1998
Drainage:	Systematic	Planting Rate:	Variable
Tillage:	Field cultivate 1x	Harvest Date:	October 16, 1998

## Methods

An area of the Unger farm where extensive tiling was to be done was grid soil sampled both in April 1997 and November 1998. Because smaller is considered to be better in regard to grid size, 0.33 acre was chosen as the standard grid size. Six grids were randomly selected from the total of 15 for comparative analysis. Soil samples were taken in the middle of the grid (four soil probes 8" deep around an all-terrain vehicle) for each test in 1997 and 1998.

Variable rate P and K were applied 4/23/97 using 18-46-0 and 0-0-60 and a corn yield goal of 200 bu/acre. Corn was planted and harvested in 1998. What appears on the next page is an analysis of the changes in soil pH, P, and K after variable rate applications of P and K and harvest of 200-bushel corn.

## Results

Grid #	1997 pH	1998 pH	1997 P (ppm)	1998 P (ppm)	1997 K (ppm)	1998 K (ppm)
1	7.3	6.4	10	39	90	180
2	7.1	7.2	16	33	142	135
3	7.2	6.4	26	33	155	172
4	6.7	6.8	19	24	167	149
5	6.8	7.3	15	26	64	88
6	6.8	6.6	13	24	158	136
Average	7.05	6.78	16.5	29.8	129.3	143.3
	F = 2.01		F = 15.7		F = 0.41	
	NS		Significant P = 0.05		NS	
	CV = 4.7%		CV = 25.2%		CV = 27.7%	

## Summary and Notes

Phosphorus and potassium used by a 200 bu/acre corn crop would be 74 lbs/acre P<sub>2</sub>O<sub>5</sub> and 54 lbs/acre K<sub>2</sub>O respectively. The base rate (lowest rate setting for variable rate applicator) was 200 lbs/acre 18-46-0 and 0-0-60. Thus, the net P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O was at least 18 lbs/acre P<sub>2</sub>O<sub>5</sub> and 66 lbs/acre K<sub>2</sub>O. Phosphorus soil test levels went up in every sample grid. Potassium levels actually went down in three grids. Average phosphorus levels went up 13.3 ppm and average potassium levels rose 14.0 ppm. The second year soil P levels were significantly higher than the beginning P values. Variable rate application raised all sample grid P levels to critical soil test levels where little or no additional P fertilizer would be needed for a subsequent crop. Potassium soil-test levels were raised for the variable rate area; however, second-year levels were not significantly different from initial readings, and critical soil-test levels were not reached. Soil pH did not change significantly and it was not expected to do so.

In 1998 a variable rate application of P was captured by soil samples from grids while K soil samples revealed half the grids increasing in soil test value and the other half decreasing in soil test value.

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