

SOIL/WATER RESEARCH
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Fertilizer Application Influence on Nutrient Soil Tests and Spring Wheat Grain Yield and Protein at the NE Research Farm in 2008. (25508)

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Introduction

Soil testing research has shown that knowledge of soil test levels can improve the profitability of fertilizer use. Profits increase if more fertilizer is used when soil test levels are low and less or no fertilizer is used when test levels are high. It is still a common practice,

however, to apply fertilizer without a current soil test. Frequently all the major nutrients (N P K) and sometimes zinc are used. This experiment was initiated to demonstrate the effects of applying P, K and Zn regardless of soil test. The objective is to demonstrate soil testing's ability to predict crop response to fertilizer and fertilizer influence on soil tests.

Materials and Methods

Treatments listed in Table 1 are applied as below. These treatments have been applied since 1996.

Item:	Description:
Rotation	Soybean, Wheat, Corn (since 1996)
Variety	Traverse Hard Red Spring Wheat
Fertilizer* N	Rate = 150 lbs/a (urea) applied according to EC-750 and a high yield goal for wheat.
P	40 lbs P ₂ O ₅ /a/yr broadcast (Triple Super Phosphate, 0-46-0)
K	40 lbs K ₂ O/a/yr broadcast (potash, 0-0-60)
Zn	5 lbs/a/yr (zinc sulfate)
	* no fertilizer applied for 2007 soybean crop
Tillage	conventional, incorporate fertilizer treatments
Plot size	15 x 60 ft
reps	4 (randomize complete block)

Results and Discussion

Soil testing clearly shows the influence of annual fertilizer nutrient application as measured from treatment plots with and without each nutrient (Table 1). The P

check (No-P) had 5 ppm Olsen P compared to a range of 14 to 24 ppm P when fertilizer P was applied. The K check (No-K) had 131 extractable K compared to 163 to 223 ppm K when fertilizer K was applied. The Zn check

(No-Zn) had 1.0 ppm Zn compared to 6.4 to 11.4 when Zn was applied.

The no nitrogen treatment (#2) has higher P, K, and Zn soil test values when compared to the other treatments where these nutrients were added. Over the years, treatment 2 has been the lowest yielding treatment and therefore nutrient removal has probably been lower compared to the other treatments resulting in higher soil test levels. The large soil test differences between treatment 1 and the nutrient check treatments can be used to

determine if these lower tests are limiting grain yields.

During 2008, the N and P check plot limited wheat yield (Table 1). Wheat grain yield was approximately 27 and 19 bu/a less with low soil test P levels and no applied N, respectively. The wheat did not respond to higher K or Zn soil test levels. Grain protein was significantly higher from P and N check plots where the grain yield was significantly lower. However, none of the treatments had grain protein levels below 12.

Table 1. Wheat grain yield and protein response to long term N, P, K and Zn application at NE farm in 2008.

Fertilizer Nutrients Applied	April 2008 Soil Test			2008 Wheat Grain	
	P	K	Zn	Protein	Yield
	----- ppm 0-6" -----			%	bu/a
1- all - NPKZN	15	181	7.8	12.9 bc	78.3 a
2 - No N - PKZn	24	223	11.4	13.1 ab	57.0 b
3 - No P - NKZn	5	176	6.4	13.2 a	48.9 c
4 - No K - PKZn	17	131	8.9	12.7 c	74.1 a
5 - No Zn - NPK	14	163	1.0	12.9 abc	77.0 a
Pr>F				0.05	0.01
CV				1.5	4.5
LSD _(.05)				0.2	4.6

Site in corn/soybean/spring wheat rotation since 1996.

Nutrients applied = N for high yield goal = 150 lbs/a, P₂O₅ = 40 lbs/a/yr, K₂O = 50 lbs/a/yr, Zn = 5 lbs/a/yr