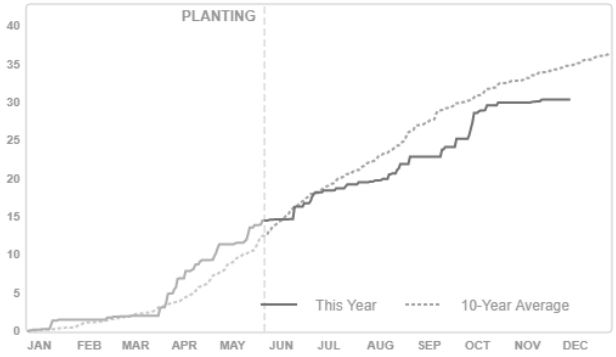
Phosphorus Application Rates on Soil with Low P Test

Study ID: 510147201701
County: Richardson
Soil Type: Marshall silty clay loam 5-9% slopes; Marshall silt loam 2-5% slopes
Planting Date: 5/29/17
Harvest Date: 11/3/17
Population: 135,000
Row Spacing (in): 15
Variety: Pioneer 35T75X
Reps: 4
Previous Crop: Corn
Tillage: Disk
Herbicides: ***Pre:*** Burndown on 12/5/16 ***Post:*** 1 qt/ac Roundup® and 2 qt/ac Warrant® on 6/20/17

Seed Treatment: Allegiance® fungicide, EverGol™ Energy fungicide, Gaucho®, PPST2030, and PPST120+ rhizobial inoculant
Foliar Insecticides/Fungicides: None
Irrigation: None
Rainfall (in):



Soil Samples: *(Lime was applied and incorporated prior to the 2017 crop.)*

2016	O.M.	C.E.C.	pH	BpH	P1	P2	K	S	Zn	Ca	Mg
	--%--				----------ppm----------						
	3.8	17.1	5.4	6.5	4	8	198	20	0.9	1856	287
	4.0	13.7	5.6	6.6	5	7	181	21	1.3	1615	236
2017	**O.M.**	**C.E.C.**	**pH**	**BpH**	**P1**	**P2**	**K**	**S**	**Zn**	**Ca**	**Mg**
	--%--				----------ppm----------						
	4.0	14.5	6.0	6.7	14	18	164	-	-	1915	271
	3.8	12.1	6.0	6.7	12	15	153	-	-	1635	204

Introduction: This is the first year the farmer rented this ground. Grid soil tests in fall of 2016 (2.5 acre grid) revealed very low P levels, ranging from 4-8 ppm (Bray 1) for the whole field. The study tested two rates of P application: 75 lb/ac actual P_2O_5 and 125 lb/ac actual P_2O_5, applied on 2/2/17. Soil samples were also taken in approximately the same locations in fall of 2017 following application of P and harvest of the soybean crop.

There are various approaches for recommending P application rates. This field is located on the Kansas/Nebraska state line; therefore, for reference, recommendation rates from both land-grant universities are presented.

- UNL Extension: With soil P levels of 5-8 ppm, the recommendation would be for 40 lb/ac P application (https://go.unl.edu/soyfertilizer).
- K-State Agronomy Department Sufficiency Approach: At soil P levels of 5-10 ppm and yield goal of 70 bu/ac, the recommendation for a sufficiency approach would be 55 lb/ac P_2O_5.
- K-State Agronomy Department Build and Maintenance Approach (four year time frame): At soil P levels of 5-10 ppm and a yield goal of 70 bu/ac, the build and maintenance approach recommendation would be 112 lb/ac P_2O_5.

Results:

	NDVI 7/3	NDVI 7/15	Moisture (%)	Yield (bu/acre)†	Marginal Net Return‡ ($/ac)
75 lb/ac P P_2O_5	0.818 A*	0.916 A	13.8 A	71 A	602.66 A
125 lb/ac P_2O_5	0.824 A	0.917 A	13.8 A	71 A	581.10 B
P-Value	0.338	0.210	0.610	0.913	0.108

*Values with the same letter are not significantly different at a 90% confidence level.
†Yield values are from cleaned yield monitor data. Bushels per acre corrected to 13% moisture.
‡Marginal net return based on $8.90/bu soybean and $425/ton of 11-52-0 (75 lb/ac P rate cost $30.75/ac and 125 lb/ac P rate cost $51.25/ac).

Drone imagery was used to calculate the normalized difference vegetative index (NDVI). This index is indicative of overall plant biomass and greenness. Imagery and NDVI from July 3 (*Figure 1*) and July 15 (*Figure 2*) are presented here.

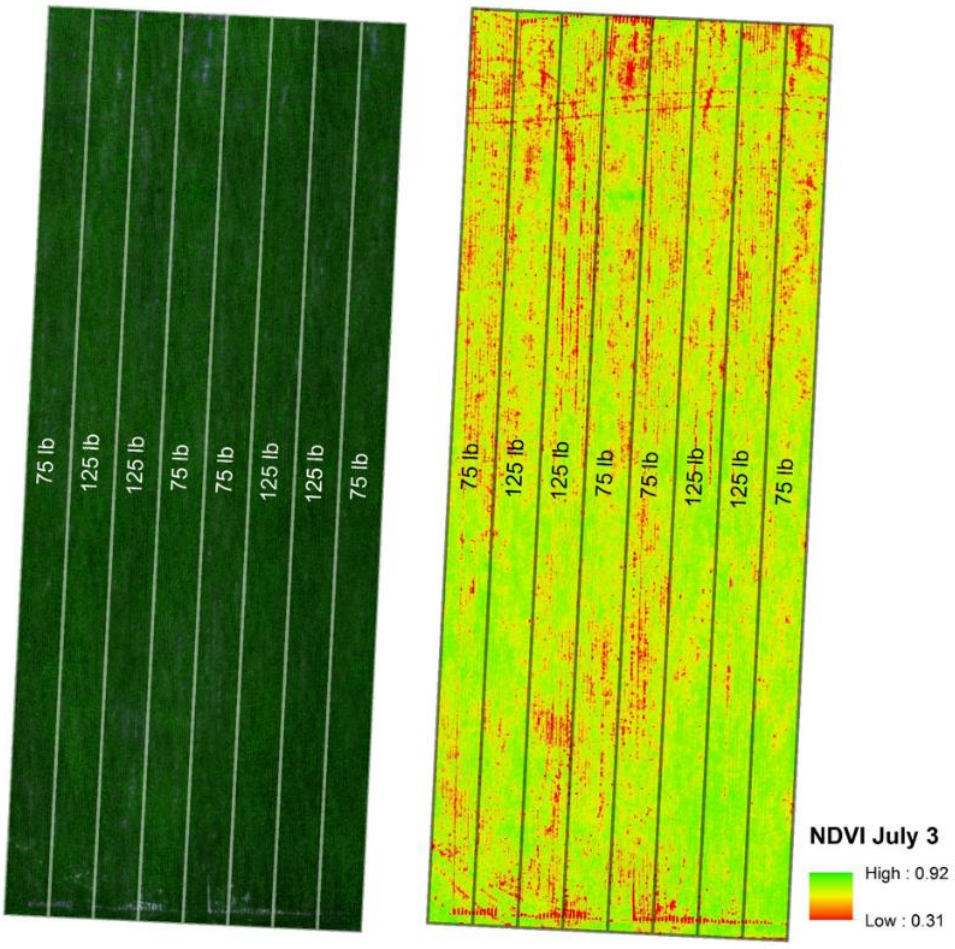


Figure 1. True color (red-green-blue) imagery (left) and NDVI (right) from July 3, 2017.

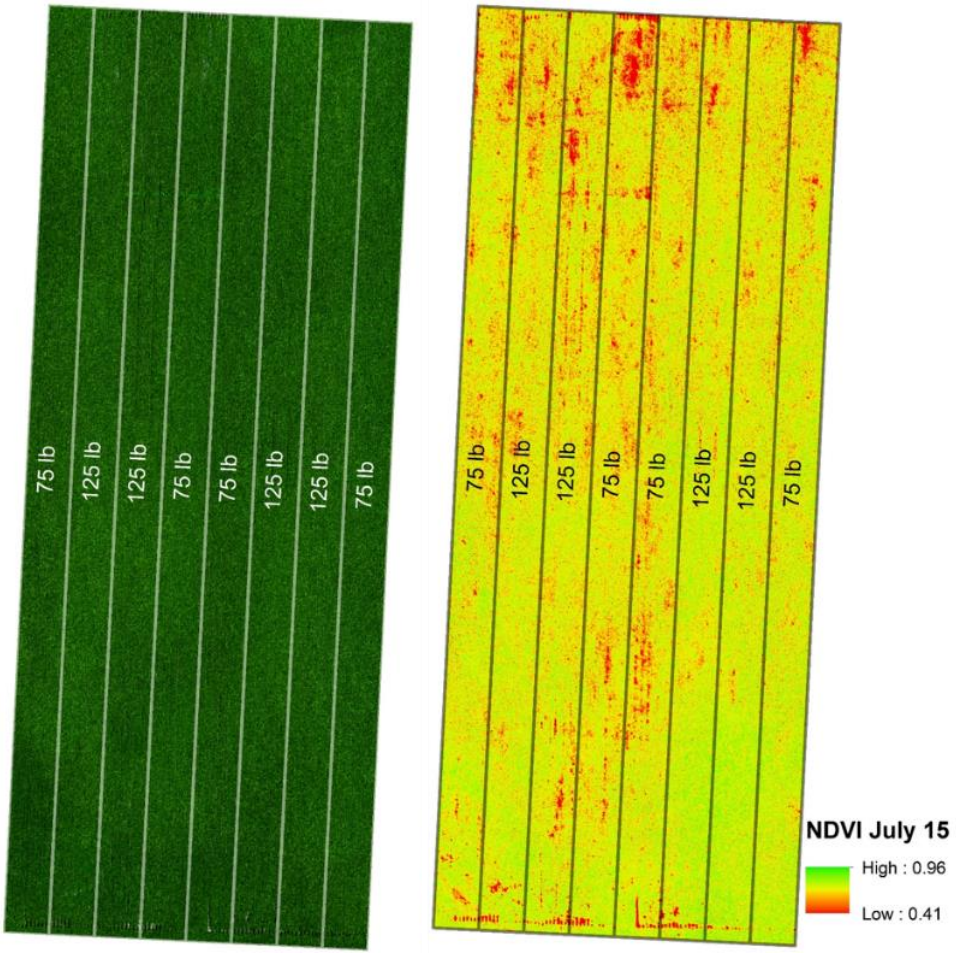


Figure 2. True color (red-green-blue) imagery (left) and NDVI (right) from July 15, 2017.

Summary: There was no difference in moisture, yield, or NDVI between the 75 lb/ac P_2O_5 rate and the 125 lb/ac P_2O_5 rate. The 75 lb/ac P_2O_5 rate had a higher net return due to reduced input costs. The locations of these strips were marked with GPS so yield can continue to be monitored in future years.

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