

## **Combining Soil fertility and Soil Health to improve Corn Potassium, Phosphorus, and Sulfur Fertilizer Recommendations**

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### **Summary**

Much of the data used to create the soil fertility recommendations for South Dakota in the South Dakota Fertilizer Recommendations Guide and Corn Best Management Practices manual is decades old. Over the past decade, more acres have been planted to corn and soybean creating a shift in crop rotations and yields have increased due to better genetics and improved agronomic practices, removing more nutrients from the soil. Further, soil health practices such as no-till, cover crops, and more diverse rotations are being promoted to improve soil structure, organic matter, nutrient cycling, and the overall health of the soils. There is also a growing interest in measuring these improvements by completing soil health tests. However, a strong connection between soil health measurements and crop yield and nutrient recommendations has not been made to aid producers in making management decisions. This project will address these issues by making the connections between traditional soil fertility tests, soil health tests, and nutrient recommendations. The information from this project will be used to help update current nutrient management recommendations based on measured soil properties and specific management practices. The annual budget of this two-year project is \$53,606 for 2020 and \$57,276 for 2021.

### **Goals and Objectives**

The goal of this project is to update P, K, and S recommendations in South Dakota under different management practices. The specific objectives of this project are 1) Determine corn yield and nutrient uptake response to added P, K, and S fertilizers under various soil fertility and soil health conditions, and 2) Identify soil health measurements that can alone or in combination with traditional soil fertility measurements be used to improve P, K, and S fertilizer recommendations.

### **Results:**

- Studies have been established at 7 field sites with 4 stamps in each field for a total of 28 stamps.
- Over 200 stamps have been established in Missouri.
- Soil characterization, soil fertility, and soil health samples have been collected at each of these field sites. Soils have been processed and sent to commercial and USDA labs for analysis.
- Graduate student has been selected and started on project.

### **Impacts:**

- Knowledge of the relationship between phosphorus, potassium, and sulfur response to soil fertility and soil health measurements will be obtained for South Dakota.
- Knowledge will be increased of the relationship between soil health measurements and agricultural management practices
- Training of a graduate and several undergraduate students in soil fertility.

**Budget:**  
**Project Budget (As of June 1, 2020):**

<b>Budget Category</b>	<b>Budget</b>	<b>Total Expenses</b>	<b>Available Balance</b>
Salaries	16,350.00	2,730.00	13,620.00
Benefits	4,256.00	19.92	4236.08
Travel	7,000.00	-	7,000.00
Contractual	20,000.00	772.91	19,227.09
Supplies	6,000.00	2903.95	3,096.05
Tuition remission		0	-
<b>Total</b>	<b>\$53,606.00</b>	<b>\$6,676.77</b>	<b>\$46,929.23</b>

**Covid-19 Impacts:**

- We had a goal of 20 research sites and around 60 stamps in South Dakota, but were only able to establish 7 research sites with a total of 28 stamps.
- Processing and analyzing of soil samples has been slowed down to minimal number of personnel collecting and processing samples.