

SULFUR Fertilizer Response Support Tool (FRST) Legacy Data Guide

We are looking for legacy data from **soil test sulfur (S) correlation/calibration, or crop response, trials** for the Fertilizer Recommendation Support Tool (FRST) database. These trials do not necessarily have to be the ones that contributed to fertilizer recommendations in your state.

Data can be provided in **any format**, including published articles, extension bulletins, fact sheets, dissertation/thesis, spreadsheets, project summaries, etc. All values must have clearly defined units associated with them. If means are given, the **standard errors** or **standard deviation** for each mean and other statistical values are desired. The data is entered into the S template that will be submitted and uploaded into the FRST database (<https://soiltestfrst.org/resources/>).

The 10 ‘**Essential Information**’ items listed below are required for data inclusion. If Essential/Required information like trial year, soil sample depth, and soil series are not available (items with an *), the trial data/metadata should be reviewed by FRST Project leadership before the data are excluded from the database. The Required information may be available from recommendations or researchers. The information listed as “**Recommended (desired)**” is not required but is important and should be recorded for inclusion in the FRST database if available. If you have legacy data to contribute, please contact one of the FRST project contacts listed on page 2.

Essential (Required) Information	
<ul style="list-style-type: none"> ○ Soil test S concentration prior to fertilization (by site year) ○ Soil test extraction and analysis methods ○ Trial location (state & county*) 	<ul style="list-style-type: none"> ○ Replication number (must be >2) ○ Yield values (for individual treatments & site years) ○ Fertilizer S treatment rates & sources (must include a no-S control)
<ul style="list-style-type: none"> ○ Soil sample depth* ○ Soil series* 	<ul style="list-style-type: none"> ○ Trial year* ○ Trial (harvest) year*
<i>* Denotes required items that may be estimated based on state recommendations, publication year, or location</i>	
Recommended (desired) Trial Information	
<ul style="list-style-type: none"> ○ Researcher information (name, contact info) ○ Publication information (if published) ○ Experiment design & structure 	<ul style="list-style-type: none"> ○ Trial location (nearest city, GPS coordinates) ○ Plot size ○ Trial duration
Recommended (desired) Soil Information	
<ul style="list-style-type: none"> ○ Sand, silt, and/or clay content ○ Other soil test values and methods for pH, CEC, SOM, P, K Ca, Mg, Na, etc. ○ Number of composite samples collected 	<ul style="list-style-type: none"> ○ Soil test S method metadata (soil mass or volume, extractant solution to soil ratio, soil moisture or drying temperature, laboratory name)
Recommended (desired) Crop Information	
<ul style="list-style-type: none"> ○ Crop & cultivar ○ Irrigation (yes/no) & method ○ In-season precipitation ○ Previous crop 	<ul style="list-style-type: none"> ○ Fertilizer applied to previous crop ○ Dates for planting, harvest, sampling, etc. ○ Row spacing ○ Plant population
Recommended (desired) Yield Information	
<ul style="list-style-type: none"> ○ Fertilizer timing (preplant, at planting, etc.) ○ Fertilizer placement (banded, broadcast, etc.) ○ Manure information (yes/no, rate, etc.) ○ Growth stage at harvest 	<ul style="list-style-type: none"> ○ Yield values and variance (standard error if means) ○ Crop harvest moisture content ○ P values (if means are given)
Recommended (desired) Plant Tissue Analysis	
<ul style="list-style-type: none"> ○ Plant part sampled ○ Growth stage at sampling 	<ul style="list-style-type: none"> ○ Sample collection date ○ Nutrient concentration (S, N, P, K, etc.)

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Project Overview

Soil testing provides the backbone for nutrient management programs in modern, intensive agricultural production systems. Guidance on fertilizer sulfur (S) addition is often based on soil test S and field metadata, but few studies have correlated and calibrated crop yield to soil test S. Regardless of the nutrient, soil testing has the common goal of determining where fertilizer is needed and how much to apply. However, soil testing laboratories may use different soil analytical methods, interpretative terminology, and philosophical approaches to develop fertilizer recommendations. These differences often result in dissimilar fertilizer recommendations, leading to end user confusion and reduced confidence in soil-test based nutrient management, that ultimately proves detrimental to research and educational efforts that encourage 4R Nutrient Stewardship. 4R Nutrient Stewardship provides a framework supporting the Right fertilizer source, applied at the Right time, in the Right place, and at the Right rate in a well-managed cropping system to meet specific performance objectives.

The Fertilizer Recommendation Support Tool (FRST) decision aid was released in April 2024 and communicates with a relational database containing data and metadata from approximately 2700 phosphorus (P) and potassium (K) fertilization trials to provide novel insight into crop fertilizer response and soil testing. Due to the uncertainty of soil-test S based recommendations and reports of increasing frequency of crop responses to S fertilization, we targeted S as the third nutrient for FRST and in October 2024 began adding soil test S data to the relational database. The long-term goal of FRST is to develop more consistent, transparent, and science-based nutrient management recommendations across the USA. The FRST project supports innovative soil fertility research to advance site-specific, precision nutrient management to augment existing fertilizer P, K, and S recommendations.

For general information about FRST, to contribute data, or ask other questions:

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Acknowledgments

Funding sources for this project include USDA-ARS National Programs for Natural Resources and Sustainable Agricultural Systems (Grant 58-8070-8-016), the USDA-NRCS (NR203A7500010C00C & NR233A750011G016), Hatch Funds provided by the National Institute of Food and Agriculture, US Department of Agriculture, and Hatch and Smith-Lever funds that support collaborator research and extension projects.

This project is possible due to the participation of 100+ team members and collaborators from more than 40 state, federal, and private (industry) institutions. We thank all who have contributed to making FRST a success.