

The FRST Soil Test Database

Soil testing and fertilizer management are at the core of modern agriculture. The majority of soil test correlation and calibration trials and corresponding development of fertilizer recommendations occurred from the 1950s to 1970s. Despite many changes and advancements in agronomy and increases in crop yields, research on key soil fertility topics has not been conducted in many states. Today, the imperative of upgrading fertilizer and soil amendment recommendations is highlighted by variable on-farm economic conditions and concerns over the fate of fertilizer nutrients in the environment.

The Fertilizer Recommendation Support Tool project, or “FRST”, is a national initiative to modernize fertilizer recommendations by pooling expertise and soil test correlation and calibration data from across the country into an accessible decision support tool. Researchers working as a national team rather than within individual states and institutions will reduce ambiguity while optimizing soil amendment and nutrient use across state lines. FRST activities also include the improvement of soil pH management and liming recommendations. The FRST tool and data generated by FRST activities are expected to augment existing recommendations with the potential to enhance soil and natural resource management, increase return on soil amendment investment by growers, and reduce excess nutrient losses to the environment.

A key objective of the FRST Project is to preserve soil test correlation and calibration data in a relational database. The FRST database is the foundation of the FRST decision aid (<https://frst.scinet.usda.gov/Tool>),

an interactive tool to facilitate soil test correlation.

Data collection started in 2019 with soil test correlation data and metadata from legacy sources including journal articles, land grant institution publications, theses, and dissertations. By June 2021, the database contained 1,295 trials. When v1.0 of the decision aid was launched in April 2024, the database contained 2,457 P and K field trial observations representing 21 crops, 40 states, and 251 counties and, by the end of 2024, had expanded to 2,711 trials. It is important to note that the scope of the database is greater than the number of field trials as a single trial may have soil test data from multiple soil sample depths or soil test methods.

Archiving past and present soil-test P and K correlation trial data generated interest in adding data for other nutrients. Sulfur (S) was added to the database in October 2024. Efforts to populate the S database are underway, utilizing the same resources for populating the database with P and K data. By the end of 2024, the FRST database contained data and metadata from 2,828 trials including 1,404 P, 1,307 K, and 117 S trials from 44 states and Puerto Rico (Figure 1).

Having a large volume of soil test correlation data in a single database expands the soil test correlation beyond state-based boundaries allowing correlation to be performed on larger more robust datasets. Large datasets may help answer questions like “is the critical soil test value and the probability of response to fertilization similar between regions with different climatic conditions and soils?” or “does the critical soil test value and the

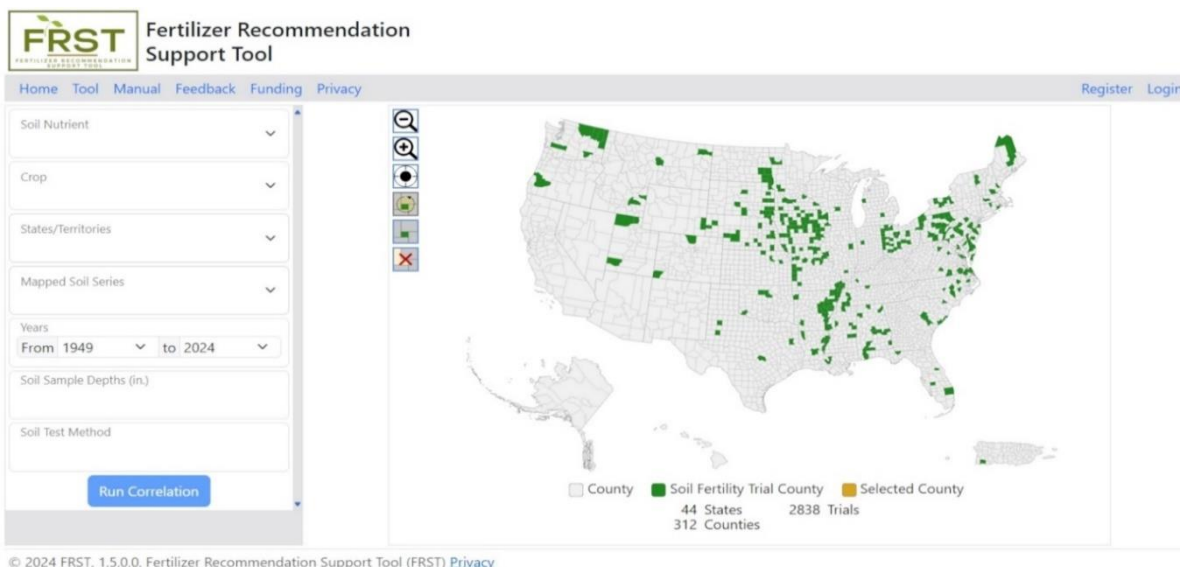


Figure 1. The Fertilizer Recommendation Support Tool Project Decision Aid (version 1.5) map populated with trials from the complete database. Dropdown menus on the left are used to filter the database, allowing users to focus in on nutrients, crops, regions, soils, or soil test methods of interest.

probability of response to fertilization change as crop yield potential increases?”.

Highlights of the FRST relational database, as of 1 January 2025, include:

- 39 states and 21 crops are represented in the P database
- 30 states and 13 crops are represented in the K database
- Corn data accounts for 50% of the P data and 47% of the K data
- Soybean data accounts for 33% of the P data and 29% of the K data
- 43% of the P trials and 61% of the K trials were established since 2000
- Bray-1 and Mehlich-3 (ICP) extractable P comprise 71 & 80% of the corn and soybean data, respectively
- Ammonium acetate and Mehlich-3 extractants for K comprise 87 and 76% of the corn and soybean data, respectively

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For more information visit soiltestfrst.org.

For more detailed information on the FRST Decision Aid, please see:

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