Legacy Database Development

Soil testing and fertilizer nutrient management are at the core of modern agriculture. The majority of soil test correlation and calibration trials and development of fertilizer recommendations occurred from the 1950's to 1970's. Despite many changes and advancements in agronomy and increases in crop yield, little soil fertility research has been conducted in the last several decades. Today, the imperative of upgrading soil test fertilizer recommendations is highlighted by global supply chain disruptions and concerns over the fate of fertilizer nutrients in the environment.

The Fertilizer Recommendation Support Tool, 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 nutrient use across state lines through the development of the FRST. Users will select specific conditions, such as soil, crop, geographic region, and soil test extractant, to provide tailored soil test recommendations that are expected to save farmers millions of dollars annually while reducing excess nutrient losses to the environment.

The legacy database is a critical component of the FRST decision tool. Historical phosphorus and potassium soil test trial data was initially collected as the legacy database was being developed; initially the process was highly iterative between collecting the data and developing the database. These legacy data were collected from many different sources, including journal articles, extension and research bulletins, conference proceedings, dissertations and theses, spreadsheets, word-processing documents, etc.

A FRST Legacy Collection Guide (soiltestfrst.org/resources) helps researchers determine whether their historical data can be used and should be shared with the FRST team. Both raw and summarized data in either electronic or hard-copy formats have been and are accepted. Some of the data were provided by FRST collaborators while other data were obtained via online searches. The minimum requirements for the legacy database are different from the minimum dataset (URL for FRST Fact Sheet on Minimum Dataset) as it allows some trials with very little metadata to be included in the database.

The data were entered into a Microsoft Excel multi-tab spreadsheet that has been migrated to a relational database format housed within the USDA-ARS Agricultural Collaborative Research Outcomes System (AgCROS). Legacy data, as well as current data, in the relational database, will be accessed via the online FRST decision support tool.

The FRST legacy database initially included over 1,200 trials from a range of years, cropping systems, geographic regions, and management practices. There are almost 20

crops from 35 states contained in this database. Regardless of when a study was published, certain pieces of information were more common than others. For example, 93.5% of trials reported soil pH, 51.3% reported county information, 28.3% reported crop planting date, and only 9.7% reported a measure of variability for yield. We continue to collect legacy data and will do so throughout the life of this project.

For more detailed information on the development of the legacy database please see: Lyons, S.E., D.K. Arthur, N.A. Slaton, A.W. Pearce, J.T. Spargo, D.L. Osmond, and P.J.A. Kleinman. 2021. **Development of a Soil Test Correlation and Calibration Database for the USA**. Agriculture and Environmental Letters. DOI: 10.1002/ael2.20058

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For more information, visit soiltestfrst.org.

Authors: S. Lyons (NC State University), Nathan Slaton (University of Arkansas), Dan Arthur (USGS), John Spargo (Penn State), and Deanna Osmond (NC State University)

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