Science Societies

Soil Spectroscopy for Routine Lab Analysis

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The soil archive at the National Soil Survey Center. More than 80,000 of these samples have be

The soil archive at the National Soil Survey Center. More than 80,000 of these samples have been scanned by mid-infrared spectroscopy. Photo by Jonathan Sanderman.

Timely data on soil properties are critical for decision making in agricultural management, environmental assessment, and ecological modeling. In many nations, laboratory capacity to analyze soils is limited. Where capacity is good, cost is often a barrier to routine analyses. Diffuse reflectance mid-infrared (MIR) spectroscopy is rapidly emerging as a quick, low-cost, and environmentally friendly complement to traditional soil testing.

A major barrier to routine use of soil spectroscopy is developing methods to take advantage of existing large spectral libraries, such as the USDA NRCS National Soil Survey Center – Kellogg Soil Survey Laboratory (NSSC-KSSL) MIR library. In particular, there is a lot of uncertainty in how to apply models developed from a national library

to spectra acquired in different laboratories. Researchers recently tested different statistical approaches to harmonizing spectra among spectrometers so that models built from the national MIR spectral library could produce robust predictions regardless of what spectrometer was used. In general, good estimates of soil properties could be produced with simple mathematical transformations, but more sophisticated calibration transfer algorithms helped eliminate bias in estimates.

These findings provide an encouraging blueprint for laboratories looking to develop in-house soil spectroscopy capacity utilizing the NSSC-KSSL MIR library.

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