Standardized Soil Sampling Protocols and Their Use on Two Indiana CSCAP Research Sites

Jason Cavadini[1], Kaylissa Horton[1], and Eileen Kladivko[2]
[1]Graduate Research Assistants and [2]Professor, Dept. of Agronomy, Purdue University, West Lafayette, IN

RATIONALE & OBJECTIVES

Purdue University, located in one of the nation's top corn producing states, is part of a new regional Cropping Systems Coordinated Agricultural Project (CSCAP), with the overall goal of improving the resilience of corn-based cropping systems to climate change and reducing carbon, nitrogen, and water footprints. There are two field locations in Indiana:

- A new cover crop study was initiated at the Southeastern Purdue Agricultural Center (SEPAC).
- *Rationale*– cover crops improve soil quality, reduce nitrate losses, and conserve water

- An ongoing drainage water management (DWM) study is being expanded at the Davis-Purdue Agricultural Center (DPAC) in east-central Indiana.
- *Rationale*– drainage water management reduces nitrate losses and improves water conservation

Samples were collected to obtain baseline data (objective 1) and conditions continue to be monitored (objective 2) according to standardized protocols established by the regional team, in order to observe effects of the cropping systems. This poster describes and illustrates the standardized sampling protocols used at the sites and discusses field plot design of the Indiana sites.

LOCATIONS

SEPAC, Butlerville, IN
- Cover Crop Project
  - Corn-soybean, with and without rye cover crop
  - Soybean-corn, with and without rye cover crop
  - 4 treatments x 4 replicates = 16 plots

DPAC, Farmland, IN
- DWM Project *
  - 4 subplots (quadrants), ~10 A (4 ha) each
  - 2 quadrants DWM, 2 quadrants conventional drainage
  - 3 sampling location per quadrant = 12 plots

Figure 1. Sampling sites.

* See poster by Kyle Brooks (Purdue) for more detail

METHODS

Standard Soil Measurements (0-10, 10-20, 20-40, 40-60 cm depths):
- Bulk Density (ρ_b)
  - Core Method (hand samples, hydraulic probe)
- Water Retention Curves
- Chemical Analysis (organic carbon, total nitrogen, pH, cation exchange capacity, phosphorus, potassium)
- Texture

Optional Soil Measurements:
- Aggregate Stability
  - Wet Sieving Method (MWD, WSA)
- Penetration Resistance
  - Cone Penetrometer

Crop and Insect Measurements:
- Soil Samples for Insect Analysis (0-20 cm)
- Cash Crop Observations (population counts, general observations, crop yield)
- Plant Samples
  - Cash Crop- grain, stover
  - Cover Crop- shoot biomass

Soil Temperature and Moisture Measurements:
- Decagon 5-TM sensors (dielectric permittivity) and data loggers (10, 20, 40, 60, 100 cm depths)

Soil Nitrate-N Measurements:
- After fall harvest and before spring planting for cover crop and drainage studies

Weather Data

DESIGN

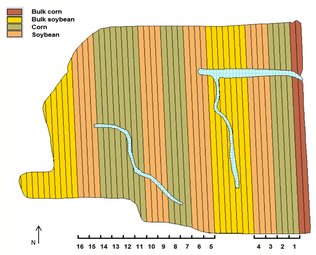


Figure 2. SEPAC plot map.

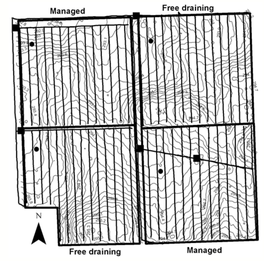


Figure 3. DPAC plot map.

SAMPLING PROCEDURES


Hydraulic probe for bulk density cores.


Slicing cores into depth increments.


Soil samples on sand table for water retention curve measurements.


Cone penetrometer for penetration resistance readings.


Soil temperature and moisture sensors at respective depths.

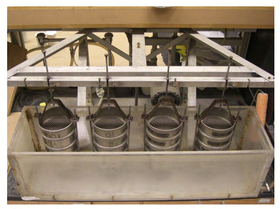

Installed soil temperature and moisture sensors equipped with data logger.


View of SEPAC field and alternating corn and soybean treatments.


Chopping corn stover samples for analysis.


Cereal rye cover crop planted after harvest at SEPAC.


Nest of sieves for aggregate stability analysis.


Nest of sieves in wet sieving tank.


Biomass sampling of cover crop.

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USDA United States Department of Agriculture National Institute of Food and Agriculture