

Northeast SARE 2006 Annual Report

Project Number: LNE06-235 (USDA 2006-38640-16700)

Project Title: SOIL HEALTH ASSESSMENT FOR SUSTAINABLE LAND USE AND PROFITABLE CROP PRODUCTION IN THE NORTHEASTERN USA

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Summary

Intensive crop production in the Northeast region has often resulted in soil degradation, contributing to reduced crop yield, increased production inputs and lower farm profitability, thus there is increased interest in soil health. Our Cornell Soil Health Team has made significant progress in increasing soil health literacy, developing a cost-effective protocol for soil health assessment, facilitating soil health demonstrations by growers, and promoting multi-disciplinary research and outreach. To build on this progress and momentum, our team of growers, extension educators and academic staff in New York, Maryland, and Vermont aim to continue to network as a team to provide soil health programs and research collaborations in the NE region.

We plan to reach 1500+ producers via surveys, participatory trainings, field days, annual meetings and web-based and written materials. The soil health status of 50+ fields in MD, VT, and NY will be assessed annually using the developed assessment protocol. The team will also investigate the mechanisms contributing to improved soil health status by implementing recommended management practices (rotation, cover crops, tillage systems, etc.) and evaluating visible-near infrared sensing as a potential rapid assessment tool of soil health. Another major objective is to develop a web-based, accessible database for NE soils and decision making software to assist in selecting what to test and interpreting the results.

Our final targets will be that 200+ growers will have assessed the soil health status of their fields and 100+ will have implemented a long-term soil health management program. Targets will be documented by mailed surveys, personal interviews and on-farm visits. The direct beneficiaries are vegetable, cash grain, and dairy producers, whereas indirect beneficiaries are rural communities and consumers.

Performance Targets

- Of the 1500 growers that will be reached in New York, Vermont and Maryland; 200 will have their soils assessed using the developed soil health protocol in New York and Maryland, and 100 growers will implement a long-term improved and sustainable soil management program (including reduced tillage system(s), improved crop rotation(s), new cover crops and/or compost and green manure applications).
- A web-accessible database of regional soil health data will be made available for researchers and extension educators to conduct query-based research and data analysis.
- Decision support software will be developed to aid in: (i) determining an optimal site-specific set of soil physical, chemical and biological parameters to test, (ii) interpreting the results obtained and, (iii) providing guidelines on needed interventions.

Milestones

- In spring 2006, a survey was mailed to over 1000 growers in New York State to: (1) assess current grower practices relevant to soil quality; (2) identify grower perceptions of soil factors most limiting profitability on their farms; (3) identify types

of information and assistance that would be most helpful to growers interested in improving the health and productivity of their soils; and (4) serve as a benchmark for the evaluation of effectiveness of the Soil Health Program Work Team educational efforts. This survey will be considered the baseline for this project and these results will be compared to the one which will be distributed at the conclusion of this project.

- In early spring (pre-till/pre-plant) 54 soil samples were collected from the fields of 33 interested growers in New York in cooperation with Cornell Cooperative Extension and in Vermont 20 fields of 10 growers were sampled. Soil samples were also collected from grower demonstration sites in Maryland (also Pennsylvania) and are described later). Of the 10 Vermont farms involved in the sampling, 80% of the farms felt that they could shift management to improve soil quality. Each field was sampled using a station approach to soil sampling. At each of four locations in the field, one soil core (3-in dia. and 3-in high) is collected and pushed into a small bag, 3 bulk soil samples are taken and placed in a larger bag, and penetrometer resistance measurements are taken at the 0-6, 6-12, and 12-18 inch depths in three locations and recorded on the sample data form. Once sampling is completed, the smaller bag (containing a total of four disturbed cores) is placed in the larger bag (containing a total of 12 bulk soil samples) to make the one complete soil health sample per field.
- Replicated research trials and grower demonstration sites were also sampled in 2006. In Maryland, 12 cover crop/ tillage research plots plus 20 plots in two commercial vegetable farms, one organic and one employing ecologically based soil management strategies were sampled. The 16 no-till cover crop plots at the later grower site were also sampled again in August and November. A new research experiment was established in August with a factorial arrangement of trafficking compaction treatments (three levels of compaction) and four cover crops. In Vermont 20 research plots were sampled and assessment for soil health using the developed protocol. In New York, six replicated research trials were sampled where management practices such as cover crops, reduced tillage systems, cover crops and organic amendments are being evaluated. The results from these replicated trials will contribute to our understanding of the mechanisms by which various practices impact soil health quality.
- All the soil samples were analyzed using the developed Cornell Tier I soil health assessment protocol in one centralized lab at Cornell University in Ithaca, NY. Each grower received an auto-generated grower friendly soil health assessment report of their sampled field(s). The report provides a value and rating for each soil health indicator measured. When an individual indicator scores below the acceptable range, the report highlights the constraints that may be limiting field productivity and sustainability. Suggested soil management options for addressing specific soil health constraints are also provided.
- Several field days were held in New York (6), Vermont (2) and in Pennsylvania/ Maryland (1) during 2006. The two field days in VT were held in Alburg and Highgate in July and September, respectively. The topics at the day long soils and

crops field days included soil quality analysis, soil health assessment protocols and impacts of cover crops and cropping systems on soil quality. Of the 71 and 68 farmers that attended in Alburg and Highgate, VT respectively, 98% and 100% learned how crop management can improve soil quality, 75% and 86% intended to make a change on their farm that would improve soil quality and 50% and 75% were interested in having soil quality monitored on their farm. Six field days were held across New York State at various replicated research and grower demonstration sites (Geneva, LeRoy, Aurora, Shortsville, Willboro, and Candor) and attended by a total of 175 interested growers, county extension educators and other interested agriculture service personnel. The topics ranged from general soil health constraints, assessment protocols, reduced tillage of small seeded crops, and available and sustainable soil management practices.

- Three soil workshops were held in Southern Vermont (Clarendon, Woodstock, and Bennington) in November. These were on-farm “kitchen table” events with 10 to 15 farmers attending at each location (total 42 people). Basic information was covered including organic matter management, soil testing, soil quality testing, and soil test interpretation. Of the 42 people at the meetings, 100% had increased knowledge on how organic matter management influences soil quality, and how to improve organic matter content in soils. A soil health training workshop was also held in Ithaca, NY on 4 Dec and attended by 30 individuals.
- Work has begun to evaluate and relate the use of visible near-infrared reflectance spectroscopy (VNIR) to the indicators measured as part of the Tier I soil health assessment protocol.

Outcomes

Over 370 soil samples from New York, Vermont and Maryland were analyzed from commercial grower fields and research trials using the developed Tier I soil health assessment protocol during 2006. The new soil health assessment data have already been added to the accumulated dataset and are used in the auto-generated grower soil health reports.