

Technical Soil Services and Conservation Planning Integrated Approaches, Tools and Resources for Sustainable Farming

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One of the Natural Resources Conservation Service Soil Science Division major priorities is to sharpen the focus of technical soil services to enhance and support conservation planning. The poster will highlight the importance of integrated approaches, tools and resources in achieving sustainable farming systems of soil, water, air, plant, animal and human resources. Case studies, field trials, demonstrations are all important approaches for technology exchange. Interdisciplinary teams including producers and partners are essential in developing integrated sustainable farming systems. NRCS provides resource inventory, technical assistance and training for planners, partners and producers on "how-to" evaluate and understand site-specific field conditions, including chemical, biological and physical. This enables us to evaluate and implement best management practices/approaches for cropland management within an integrated whole farming system. The Revised Universal Soil Loss Equation version 2 (RUSLE2) is a process-based model that predicts long-term average annual soil loss for a given set of climatic conditions, on a defined land slope, and under a specified cropping and tillage management system. RUSLE2 can be used to predict the erosion and soil quality benefits of conservation practices. Also, as part of the Soil Science Division ongoing support, a tool to assist planners, soil scientists and land managers in assessing soil health, Soil Health – Rapid Assessment Tool, is being developed. One of the goals is to bridge the gap and utilize the same resources, including management information, for soil survey and conservation planning tools, creating integrated tools. Integrated approaches, tools and resources in developing long-term sustainable conservation plans for our nation's farms and ranches will be provided.

Sustainable Farming Systems must integrate:

- Soil Quality
- Water Quality
- Nutrient and Salinity Management
- Cropping Systems, incl. Cover Crops
- Irrigation Water Management and Systems
- Integrated Pest Management
- Livestock and Wildlife
- Energy and Air Quality
- Economics
- Whole Farm Planning
- Watershed, Marketing Opportunities

Potential Benefits of Sustainable Systems: Soil Resource

- Improved soil quality (greater yields, more crop biomass/residues, improved soil structure, organic matter)
- Reduced wind and water erosion
- Proper salinity and nutrient management (reduced use of soil amendments, reduced runoff and leaching)

Potential Benefits of Sustainable Systems: Water Resource

- Conserved surface and ground water quantity and quality
- Increased efficiency, higher yields
- Reduced pumping costs
- Water losses minimized (evaporation, runoff and deep percolation)

Potential Benefit: Plant Resource

- Crop production costs reduced
- Increased crop yield and quality
- Reduced pest incidences (e.g. weeds, insects, diseases)
- Available water quantity and quality meet specific requirements of crop (consumptive use, leaching)

Other Potential Benefits

- Reduced overall on-farm energy use
- Increased beneficial use of fertilizer and soil amendment inputs
- Protection of resources by planned judicious use of water and all inputs
- Record keeping is used as a tool in decision-making and management of current and future water resources

CONSERVATION Showcase

Role of Soil Health Promoted

Continued success of agricultural systems in our world is dependent upon the ability to conserve soil health and manage these resources through conservation planning, according to New Mexico NRCS agricultural planner Kenneth F. Scheffe. "Soil health is the foundation for increased understanding of the soil conservation planning plan in the maintenance and improvement of soil health."

"Conservation planning seeks to reduce soil health and productivity from the erosion level and manage it to achieve the best possible," said Kenneth F. Scheffe. "One of the most powerful tools to achieve this information is through conservation planning, and the maintenance and improvement of soil health."

The Web Soil Survey provides local soil maps, descriptions, data, and available maps for the land of New Mexico.

Another source of information NRCS New Mexico is making available to land and water users. In the effort to continually provide more and better information, in the Integrated Farm Management Handbook. "The handbook incorporates materials that explain the effects of tillage, irrigation, and nutrient and pest management upon long term soil productivity. This information was used to help farmers and ranchers make better conservation decisions and NRCS partners."

In addition, NRCS New Mexico has updated soil quality fact sheets on local field and energy effects on erosion and conditions for farmers and ranchers, and offer online and on-site information for improving soil health. Resource management and health indicators to improve NRCS New Mexico is also scheduling workshops for farmers and NRCS partners.

"Global reduction in agricultural productivity due to soil erosion and degradation, depletion of irrigation water supplies, and competing land uses is putting a squeeze on capacity to sustain growing world-wide demand for food and fiber," said Scheffe. "From when looking at the local picture, we consistently receive or produce more materials soil health and manage water resources through conservation planning."

Integration of local conservation practice and management across water quality, soil quality, and erosion assessment health is maintained.

For more information about the Web Soil Survey and Integrated Farm Management Handbook go to: www.nrcs.usda.gov

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Conservation Planning and Tech Soil Services for Sustainable Farming Systems

Conservation planners and soil scientists work with producers to inventory soil, water, air, plant, and animal resources on the land and develop conservation plans and resource management systems

Objectives include:

- Reduce overall on-farm energy use, inputs, production costs, pest incidences, water loss, soil loss; improve production, air, water, and soil quality
- More economical, sustainable farming enterprise
- Healthier watershed and community

Conservation Planning and Technical Soil Services – Integrated Approaches

- Soil survey information is key to inventory of natural resources, site selection and design of conservation practices, establishment/installation/construction and operation/maintenance phase of conservation practices and resource management systems
- Evaluate site-specific conditions, including chemical, biological and physical
- Build soil quality and improve integrated farming system

Soil Quality Test Kit (for Field Assessments)

Tests/Measurements:

- Soil Respiration
- Earthworm
- Bulk Density
- Electrical Conductivity
- pH
- Soil Nitrate Test
- Aggregate Stability
- Slack Test
- Other (Soil Temp., Earthworms, etc.)

Integrated Tools and Resources

- Planners and soil scientists have integrated tools and resources to assist in developing conservation plans
- Brings in soil survey information and other inventory data for field, farm, watershed, or other planning area
- Facilitates resource assessment, development of conservation plan and recordkeeping
- Simple tools, including RUSLE2, Integrated Erosion Tool and Soil Health Rapid Assessment Tool

Conservation Planning and Technical Soil Services – Integrated Approaches

- Conservation planning considers resource opportunities on farm and also resources available in community or watershed which could be utilized; use problem-posing/solving approach
- Goal is to reduce use of external inputs if these are available internally
- Philosophy is to provide technology exchange with a producer, not technology transfer and develop an economically feasible and environmentally responsible conservation management system

NRCS Conservation Planning and Tech Soil Services Integrated Approaches

- NRCS has offices in each county and provides technical and financial assistance to landowners with planning, design, and installation of conservation practices which improve natural resources
- Interdisciplinary teams planning on whole farm, watershed basis
- NRCS provides advisory assistance to other countries in setting up a conservation planning and soil survey infrastructure

Integrated Erosion Tool

- Each agronomic, including water and wind erosion, model currently contains its own databases
- Most utilize similar data
 - Soil map unit and component data
 - Climate location data on temperature, precipitation and wind energy
 - Crop and plant data, Crop Management Scenarios
 - Tillage, pesticide, nutrient and manure application, planting and harvest operations
- NRCS has been developing, trying to maintain and serve up separate databases for each model; now transitioning to one database (Land Management Operations Database) and developing an integrated erosion tool

Guidelines for Soil Quality Assessment in Conservation Planning

Soil Quality Test Kit Guide

NRCS Conservation Planning and Tech Soil Services

- Conservation Planning considers on site and off site effects of each conservation practice installed; considers impacts to watershed and downstream landowners; considers run-on to fields/farm from hydrologically upstream
- System must contribute to improvement of all resources and not negatively impact any one resource (e.g. can't improve water quality while depleting water quantity)
- Since dynamic system, need to plan creatively and flexibly as conditions change
- Soil scientists provide onsite technical investigations and services for specific land uses

Develop Conservation Plan

- Use integrated approach to inventory resources and develop conservation plan for whole farm
- Choose and apply conservation practices, technologies, approaches to address identified resource concerns and take advantage of opportunities
- Not only think outside the box, but step outside the box

Achieving Sustainable Farming: Perspective and Attitude is Everything

- Interconnected system comprised of soil, water, air, plant, animal, and human components/ resources, constantly changing, interacting, through which energy is flowing
- Team members must come to the table/field in active listening/learning mode and with open mind, keen observational skills, and be ready to adapt to change
- Proactively become involved in every step; only hands-on experience changes paradigms

Integrated Technology Exchange and Outreach Approaches

- Field trials and on-farm research/demonstrations serve to ground-truth on-station research and provide an effective method for planners, soil scientists, consultants, universities to exchange/test technology with producers.
- Workshops, field days, farmer-to-farmer networks, tours, international exchanges are also very effective outreach methods.
- Case studies, including comparing a benchmark condition to a planned condition and showcasing integrated approaches/practices/systems/technologies.

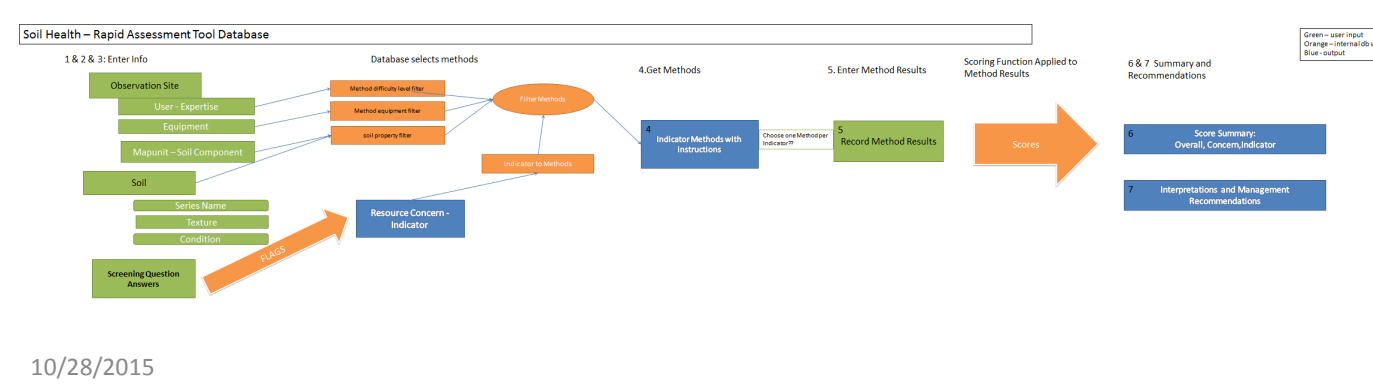
Develop a Case Study/Conservation Plan

Producers Sustainable Workshops Resource Inventory Includes:

- Irrigation Water Samples
- Soil Samples
- Plant Tissue Samples
- Irrigation System evaluation
- Soil Texture, Structure and, most importantly, Aggregate Stability
- Tillage Operations
- Fertility Inputs
- IPM
- Cover Crops
- Crop Rotations

Soil Health-Rapid Assessment Tool Overview

- User Enters Site, Soil, and User Information
- User Records Resource Concerns
- Tool Assists User to Select Appropriate SH indicators and methods
- User Enters Results from SH indicator methods
- Tool Scores Results and Provides Metrics of SH
- Tool Assists User in Providing Recommendations for Improving SH



Keys to Achieving Sustainable Farming with Conservation Planning and Tech Soil Services

- use integrated systems approach (ecosystem, whole farm, watershed)
- problem-posing, problem-solving approach
- actively seek resource, watershed, marketing opportunities
- resource efficient and resource conserving
- technology "exchange" vs. "transfer"
- develop whole farm conservation plan; plan creatively and flexibly
- consider on-site and off-site effects
- focus on keeping energy flow through the integrated system
- reemphasize biological factors, improve biodiversity
- improving soil quality is key to improving soil, water, air, plant, animal resources
- case studies, field trials, on-farm research/demonstrations, farmer-to-farmer networks
- interdisciplinary teams including producers and partners
- recordkeeping is tool in decision-making and management of current and future resources
- need user friendly fact sheets, brochures on integrated systems, integrated tools
- NRCS can advise on developing soil survey and planning infrastructure



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