

Report as of FY2009 for 2008SD136B: "Determining Soil Moisture and Temperature Condition Effects on Potential Run-Off for Cold Season Manure Application"

Publications

Project 2008SD136B has resulted in no reported publications as of FY2009.

Report Follows

State Water Resources Institute Program (SWRIP)
March 2009 to February 2010

Project Title: Determining soil moisture and temperature condition effects on potential run-off for cold season manure application.

Investigators: Primary PI: Dr. Dennis Todey
Other PIs: Mr. David German

Project narrative containing:

1. Statement of Problem
- 2.

Currently NRCS guidelines for application of manure on frozen soils are being reviewed in South Dakota. Balancing the risk of application between producer needs and protection of water quality has been a major part of the discussion. Both producers and regulators have sought scientific data to support their cause. But lacking in the discussion has been specific data related to South Dakota based on South Dakota soils and climatic conditions. This project will continue the process of evaluating those conditions and help deliver some assessment of risk of application based on soil temperature and soil moisture conditions as well as the risk of water quality impairment by run-off from frozen soils.

In addition, little work has focused on analyzing weather data to determine the risk of occurrence of conditions that are perceived as potentially detrimental to water quality from manure application on frozen ground. All economic development, whether agricultural, municipal or industrial, is carried out with the understanding of risks and implementation of policies and rules to minimize risks, especially with regard to human health and safety. There are three winter conditions that are expected to yield runoff:

1. Frozen soil and snowmelt that can not enter the soil;
 2. Snowfall that insulates the soil from freezing but that is in excess to soil storage;
and
 3. Rainfall on snowpack or frozen soil.
3. Research Objectives
The objective of this project is to 1. Complete an assessment of the risk of spreading manure on frozen soils, compare winter manure spreading practices in relation to location, timing and placement to determine which minimize impacts to water quality to develop BMPs, and develop climatic risk factors using frequency of soil frost and rainfall events on the risk of manure application to assist livestock producers in timing manure applications during least risky time periods.
 4. Methodology
The plot studies completed in 2009 evaluated several treatments of winter manure applications on 16 plots each split into two parts with the same treatment. Soil sensors were installed in each plot at the 6 inch and 20 inch depth intervals to establish temperature and soil moisture profiles before and during snowmelt runoff. Three treatments plus a control with four repetitions on tilled and untilled soybean stubble resulted in runoff from 32 plots.

Treatments included:

1. manure applied on frozen soil in November, followed by snow,
2. manure on snow covered in January followed by more snow,
3. manure applied to snow-covered soil in March before snowmelt, and
4. the control (no manure).

Principal Findings and Significance

Natural snowmelt occurred in March 2010. Runoff was received from all 32 plots for 1 to 3 days. One Plot was compromised due to overflow of melt water from outside the plot due to an ice dam. Runoff was not collected from this plot. The graduate student is currently compiling and analyzing the data to calculate loadings of nutrients, sediment and bacteria to determine differences between treatments.