Developing BMP’s to Minimize the Water Quality Impacts of Winter Manure Spreading

Nathan Brandenburg¹, Jeppe Kjaersgaard², Ron Gelderman³, Dennis Tody⁴, Todd Trooien⁵

South Dakota State University
¹Agricultural and Biosystems Engineering, Masters Student
²Water Resources Institute, Assistant Professor
³Plant Science, Professor
⁴Agricultural and Biosystems Engineering, Associate Professor
⁵Agricultural and Biosystems Engineering, Professor

Background
Livestock production is one of South Dakota’s largest businesses. Along with this business comes manure management throughout the entire year. There are very limited options for managing the manure during the winter months. Currently the SD DENR discourages any manure spreading on frozen soils, and the NRCS disapproves of winter spreading. So the only option for manure management during the winter is to store it until the spring and summer. Allowing some manure spreading during the winter on crop ground would decrease the amount of storage space needed, and it would also provide more time for application on cropland while reducing the amount of soil compaction. A major concern with manure application on frozen ground would decrease the amount of storage space needed, and it would also provide more time for application on cropland while reducing the amount of soil compaction. A major concern with manure application on frozen ground is the potential degradation of the water quality of water leaving the field through surface drainage.

Objectives
Minimize the water quality impacts of winter manure spreading:
• Assess the water quality impacts when spreading manure on frozen ground
• Compare the water quality impact due to timing and location of manure application on the field
• Develop a climate risk factor (snow cover, rainfall, frost) for spreading manure during the winter
• Provide education on winter manure spreading BMPs to producers, extension educators, resource managers, etc.

Methods
➢ Location - 3 Watersheds: 3 Treatments
  • South WS - 10.2 acres
  • North WS - 6.7 acres
  • East WS - 6.8 acres
➢ Manure Application
  • March 4-5, 2011
  • 18 ton/acre
    • South WS: manure application on highest 50%
    • North WS: manure application on lowest 50%
    • East WS: no manure application
➢ Water Control
  • 1.5' H-Flume
  • Stevens Type F Stage Recorder
  • ISCO Automatic Water Samplers
➢ Water Quality
  • Samples collected for N, P, and K
  • Climatic Factors
    • Manual and Tipping Bucket Rain Gages
    • Soil Moisture and Temperature Sensors @ 6 in, 20 in, and 40 in

First Year Discoveries
➢ Changes/Additions
  • Improved sampling during the spring runoff events
  • Better fall winterization of flumes and stilling wells
  • Heating elements and anti-freezing agent for freezing conditions
  • Better spring monitoring to prevent ice buildup in flumes
  • Live video streaming from the watersheds to campus
  • Sampling of water for bacteriological (E. Coli) analysis

References

Acknowledgements
➢ Mike Schmidt - Land Owner
➢ South Dakota State University
➢ Funding Sources
  • EPF 319 Grant
  • East Dakota Water Development District
  • South Dakota Farm Bureau
  • South Dakota Agriculture Experimental Station
  • South Dakota Water Resources Institute