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Canada

High Tech Tools to Assist in Land Use Planning for Livestock Production

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INTRODUCTION

In a joint study funded under the Hog Environmental Management Strategy, Research Branch and PFRA have developed a decision support methodology for assessing the suitability of soils and landscapes for the application of hog manure. Test areas were selected in collaboration with each of the Prairie Provinces to represent typical agricultural landscapes where hog industry development is expected to take place (Fig 1). Nitrogen management was the primary consideration in the development process.

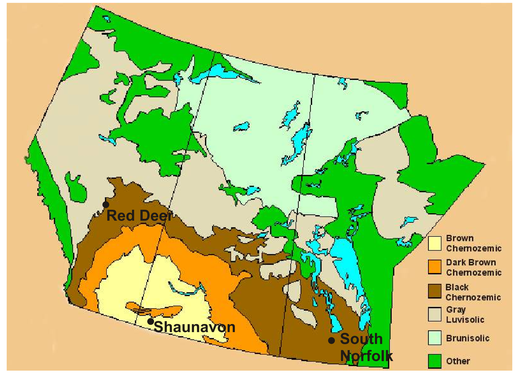
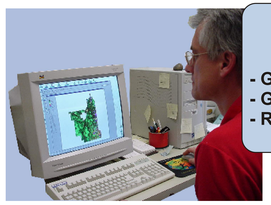


Figure 1. Selected test areas in Alberta, Saskatchewan and Manitoba

METHODOLOGY

Technical data in the soils and geology databases was used to calculate indices for soil productivity (Nutrient factor), soil landscape (Surface water factor), root-zone leaching potential and geological materials (Groundwater factor). These factors were combined to form 9 Soil Management Groups (SMGs). The SMGs typically encompass the significant environmental conditions that determine manure management plans for application. At the field level however, a relatively large range of local variations maybe included in the SMG description, therefore more specific field inspections or knowledge should be incorporated into the planning process. GIS provides the capability to display this information visually for decision-making (Fig. 2).



High Tech Tools

- Geographic Information Systems
- Global Positioning Systems
- Resource Expertise

Soil Management Groups (SMG)

SMG "A"
Highly productive soil landscapes with few environmental limitations for manure application.

SMG "B"
Highly productive soil landscapes with moderate runoff risk and/or a moderate groundwater risk.

SMG "C"
Marginally productive soil landscapes with significant crop growth limitations and low to moderate risk to surface water and groundwater.

SMG "D"
Highly productive soil landscapes where the predominant concern from manure application is a high risk of surface water runoff.

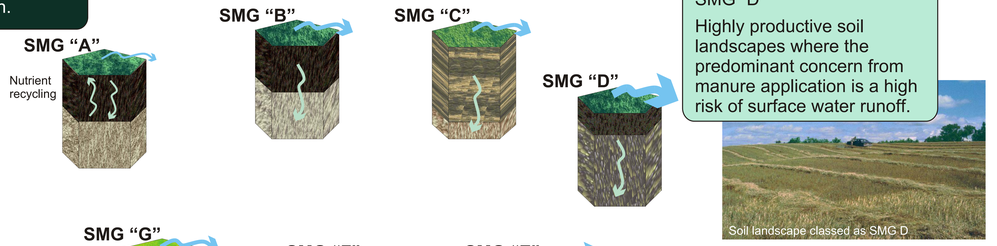
SMG "E"
Marginally productive soil landscapes where the predominant concern from manure application is a high risk of surface water runoff.

SMG "F"
Highly productive soil landscapes where the predominant concern for manure application is a high risk to groundwater.

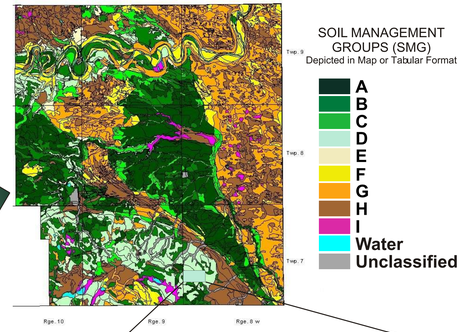
SMG "G"
Marginally productive soil landscapes where the predominant concern for manure application is a high risk to groundwater.

SMG "H"
Soil landscapes generally unsuitable for agriculture with very severe limitations for crop production. Application of manure is not recommended.

SMG "I"
Organic (peaty) soil landscapes. Application of manure may have severe environmental implications.



Soil Management Group Map



Example

SMG D
Significant considerations for surface water protection require the use of management strategies that alter the potential for nutrient runoff such as injection or incorporation of manure, composting manure, management of grazing intensity, use of cover crops, preservation of residue cover and use of filter strips next to surface water.

Figure 2. GIS assists in the organization and integration of information to define soil management groups according to their environmental susceptibility. This information can be displayed in the form of maps to assist planners in decision-making.

SUMMARY

- This new technology utilizes existing resource information such as soils, geology, hydrology, climate and land use to qualitatively define unique soil management groups.
- Each of these groups has important manure application considerations to enhance soil productivity and at the same time protect valuable surface and groundwater resources.
- Other research on current manure management practices as well as provincial manure management guidelines will be readily applicable to these soil management groups.
- This technology is based on generic resource parameters and therefore has good potential for extension to other regions of Canada.
- The primary outcome of this project is a new standardized methodology which can be used by planners to identify soil and landscape conditions favorable for livestock development.

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