



Nutrient Management: A Decade Journey of Science to Policy

The Road Paved with Good Intentions

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Nutrient Management Act 2002

- “to provide for the management of materials containing nutrient in ways that will enhance the protection of the natural environment and provide a sustainable future for agriculture”
- Fertilizers excluded except when used with ASM or NASM
- Attempted to incorporate the research and better management practices of the time into regulations

- “A policy is a temporary creed liable to be changed, but while it holds good it has got to be pursued with apostolic zeal.”

Mahatma Gandhi

NM Act has Undergone Several Revisions

- Questions regarding scientific basis and/or effectiveness of several land application standards

Extended separation distances
(slope, soil type, runoff potential)

P index

Maximum liquid loading rates

N index

Application on saturated soils,
shallow soils, tile drained lands

- Revision on NASMs

Nutrient Management Joint Research Program

- To identify the scientific basis for land application standards
- Address some of the identified scientific knowledge gaps with respect to questioned standards through a 2-3 year research program
- Research community involvement

Challenges of Science to Support Some Policies

- Questions around the intent/purpose of a particular land application standard
 - Maximum liquid loading rates, runoff potential and extended separation distances...
- Nutrient (and pathogen) management in an agro-ecosystem is a complex system difficult to parse into a series of (currently somewhat unrelated) standards

- Several meetings of researchers to discuss research and general 'comfort' level with specific statements/directions concerning land application options
 - 'clickers' to gauge level of agreement in audience

The dilemma

- Most researchers are cognizant of the limitations of their work due to study design/purpose, biophysical conditions etc.
 - Recommendation vs. regulation

“The whole problem with the world is that fools and fanatics are always so certain of themselves, but wiser people so full of doubts.”

Bertrand Russell

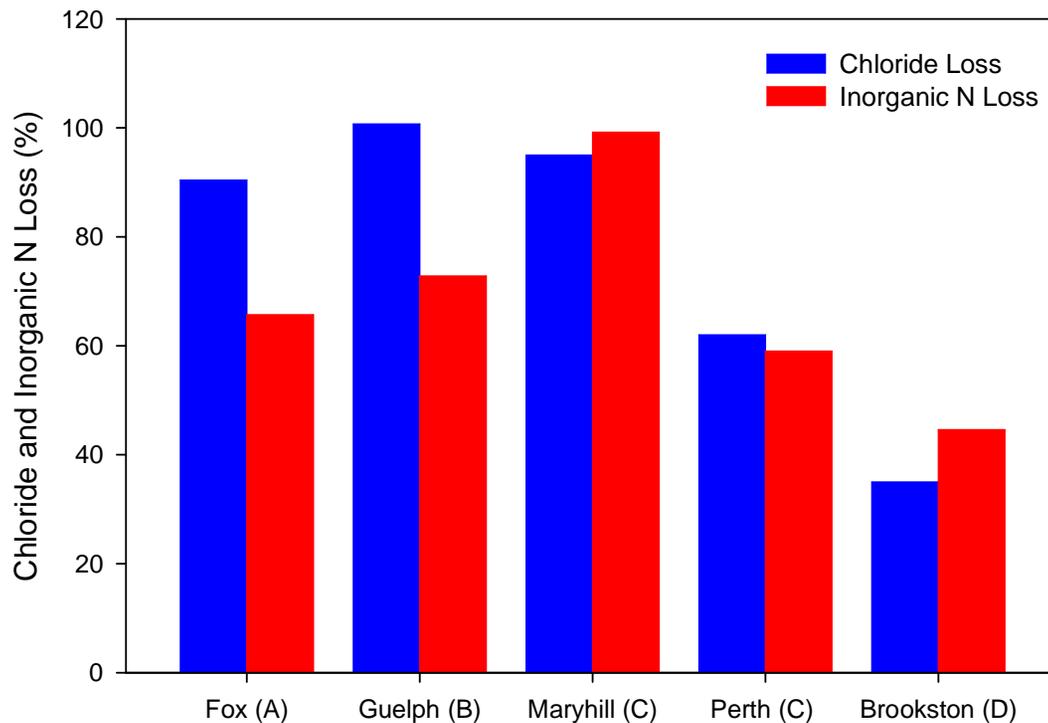
NMJRP - Report

- Submitted/presented to OMAFRA-MOE in January 2010
- Attempted to illustrate the scientific rationale for specific practices although much more difficult (impossible?) to truly give an indication of effectiveness and efficacy of practices due to complexity of the biophysical system
- Lack of 'studies' for certain issues e.g. shallow soils

The N Index

- Targeted nitrate leaching
- Agronomics → primarily from research based in Ontario and relevant jurisdictions
- Environmental → some Ontario research and inferences from agronomic studies
- Major questions with respect to:
 - fate of excess N in different soils (HSG)
 - allowable “excesses” based on soil type

NMJRP Research – Dr. C. Drury



- Leaching tended to vary with soil HSG but...

Variability in observed K_{sat} for a given soil type

Leaching increased by tile drainage

Additional mineral N "losses" above leaching

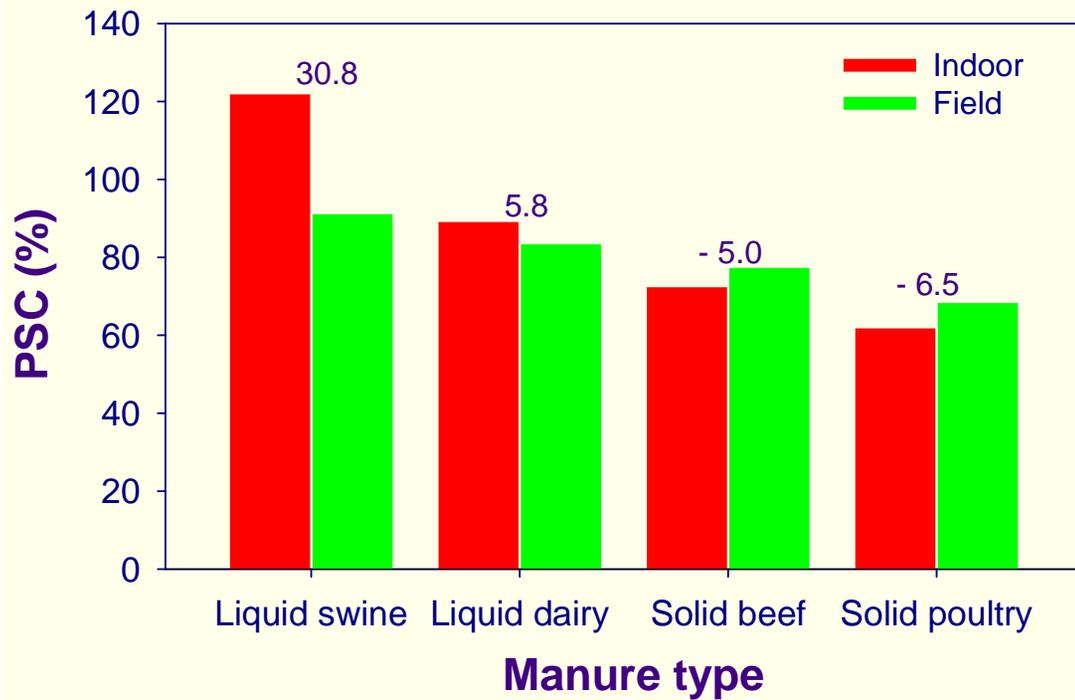
The N Index

- Remains as a management tool in NMAN programs
- On-going research to ascertain fate of applied N from various materials as related to source and management

P index

- Relate source, management and site factors to risk of P movement – different models used in different areas
- Although widely used throughout many agricultural regions in the world – limited research to actually substantiate the benefit of its use
- No peer reviewed article pertaining evaluations of the Ontario P index

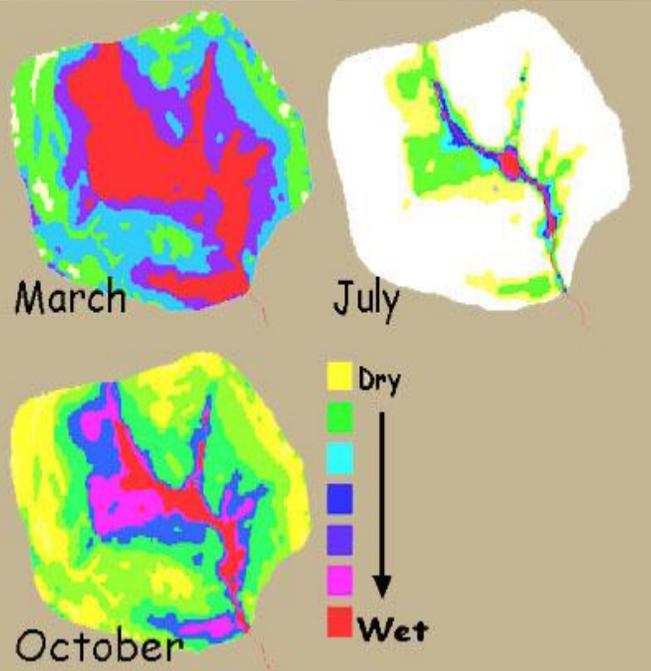
NMJRP Research – Dr. T.Q. Zhang



- Differences in P source coefficients between manures of similar and different types and considerably lower PSC for biosolid
- Estimation of predictors of P loss from soils

NMJRP – Research Dr. R. Rudra

- Characterization of surface/subsurface flow in watershed/sub-watershed areas based on HSG, tile drainage and other site characteristics
 - Identified need for further research



Variable source areas → quite dynamic

P Index

- Currently a team is 'revising' the Ontario P index, considering
 - Form and mechanism of P loss in runoff/tile flow
 - PSC for various materials
 - Inherent P loss and P application losses
 - Contributing areas / delivery ratio
- Once in place → question of testing/validation

NMJRP Research – Fleming and Wall

- Maximum liquid loading rates and slope classes → impact on overland flow → runoff varied based on manure type/DM content (LHM > water > LDM)
- Importance of management factors (e.g. tillage, headlands etc.) on runoff potential
- HSG – doesn't appear to be very important

The journey continues

- Still have 'information gaps'
- Recognition of importance for system approaches for research (and policy?) and longer -term studies for some of the questions
- Perhaps a different approach is required for nutrient management regulation

One final quote

“All exact science is dominated by the idea of approximation.”

Bertrand Russell