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Nutrient Stewardship in North America *Voluntary Initiatives for a Sustainable Industry*

Presented by: Roger Larson, President, CFI
IFA Workshop on Fertilizer Best Management Practices (BMPs)
Brussels, Belgium ~ March 8, 2007

Agenda

- North American BMP Framework
- United States Situation
- Canadian Situation
- Case study: Lake Winnipeg
- Economic Models
- Future Directions



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Becoming a Sustainable Industry

SUSTAINABILITY GOALS

Environmental

- Sustain or improve soil quality
- Maintain nutrient levels within natural ecosystems
- Preserve wildlife habitat



Social

- Produce nutritious, abundant and affordable food
- Support programs for strong and caring communities
- Help meet global food needs
- Provide ongoing employment opportunities in agriculture and related industries

Economic

- Produce revenue to sustain farm operations
- Preserve quality of life
- Make the most of dollars spent on fertilizer



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Fertilizer's Image - 1900



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L. L. CROCKER'S
BUFFALO HONEST FERTILIZERS,
Ammoniated Bone Super-Phosphates,
AND
PURE GROUND BONES.

These goods have been long tried by over eleven years, and the best results. Fertilizers in the market, and are thoroughly reliable. Send for Circular to nearest Agent, or to
L. L. Crocker's Buffalo Fertilizer and Chemical Works, Buffalo, N. Y.



COMPLIMENTS OF
W. A. PERUMBER,
DEALER IN
AGRICULTURAL IMPLEMENTS
FERTILIZERS, &c.
OFFICE ON RAIL ROAD STREET,
HANOVER, PENNA.

Call special attention to HERRING'S Fertilizer, the most complete
Fertilizer of the kind in the market.



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Fertilizer's Image - 2006

WANTED AT LARGE
POLLUTANT: Phosphorus
Alias: Punky P
Description: Phosphorus is a chemical in fertilizer & household products.
Effects: Excess in lakes creates the scum of the highest in Earth causing algae blooms, low oxygen levels, fish kills & costly water.
Causes: Many cars have been retro-phosphated in their gas tanks. It can also get to lakes from your driveway. Livestock manure contains phosphorus.
Abates: Washed fuel can have too much phosphorus. Reduce levels at that time to reduce levels in manure. Plant grass and trees along waterways. Use less manure and fertilizer. Restore wetlands. Keep livestock from manure to help eat up manure.
www.iowadnr.com

WANTED AT LARGE
POLLUTANT: Nitrogen
Alias: Slick Nick Nitrogen
Description: Nitrogen is in fertilizers and household manure. Excess causes blue to 10 ft in the lake, up to 2 ft.
Effects: Excess causes algae growth that takes oxygen from water & kills plants.
Causes: Fertilizers and manure added to water can cause most of toxic nitrogen.
Abates: Stop rain from carrying nitrogen into water by planting grass and trees along waterways. Reduce levels at that time. Restore wetlands to filter nitrogen. Run livestock out of manure. Treat farm waste with septic systems. Use nitrogen to store livestock manure.
www.iowadnr.com

WANTED AT LARGE
POLLUTANT: Sediment
Alias: Sediment Sally
Description: Sediment is soil carried off land by water and left as a mass layer on the bottom of waterways.
Effects: Sediment can smother bacteria, plants and decapods in water and cause algae problems. Sediment fills in areas to reduce depth. Sediment clogs water, making it look murky, and smother on fish, plants and animals. The results.
Causes: Rain washes or erodes soil from fields and roads into waterways.
Abates: Plant grasses & trees on waterways. Leave dirt water on roads after harvest to help soil. Buffer eroding fields with water and fertilizer. Use till forces at construction sites.
www.iowadnr.com

WANTED AT LARGE
POLLUTANT: Microbes, Bacteria
Alias: Sicko
Description: High bacterial levels in water can cause fish and plants to die and pollute the lake. They come from human, livestock, pet, and wild manure.
Effects: Fish and animals that swim in or drink water will experience some sickness.
Causes: Excess waterways from filling septic systems & wastewater treatment plants, manure from livestock, pet, manure from birds, and wildlife waste.
Abates: Don't flush toilet water. Volunteer to monitor water quality. Keep septic tanks properly serviced. Keep livestock manure away from waterways. Proper manure storage at farms, feed lot and stalls.
www.iowadnr.com

What is "Best" for nutrient management?

- A flexible, site-specific approach
- Based on science and industry expertise
- Voluntary initiatives accommodate both these objectives



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Voluntary BMP Framework

The Right Products at the...

BEST MANAGEMENT PRACTICES (BMPs)	
BMP Category	BMP Examples
 <p>Right Rate Match amount of fertilizer to crop needs</p>	<ul style="list-style-type: none"> • Soil Testing • Yield Goal Analysis • Crop Removal Balance • Nutrient Management Planning • Plant Tissue Analysis • Applicator Calibration • Crop Scouting • Record Keeping • Variable Rate Technology
 <p>Right Time Make nutrients available when crops need them</p>	<ul style="list-style-type: none"> • Application Timing • Controlled Release Technologies • Inhibitors • Fertilizer Product Choice
 <p>Right Place Keep nutrients where crops can use them</p>	<ul style="list-style-type: none"> • Application Method • Incorporation of Fertilizer • Buffer Strips • Conservation Tillage • Cover Cropping • On Farm Fertilizer Storage



United States Situation



Nutrient Use Task Force

- Collaborative effort
 - ▶ The Fertilizer Institute (TFI)
 - ▶ International Plant Nutrition Institute (IPNI)
 - ▶ Foundation for Agronomic Research (FAR)

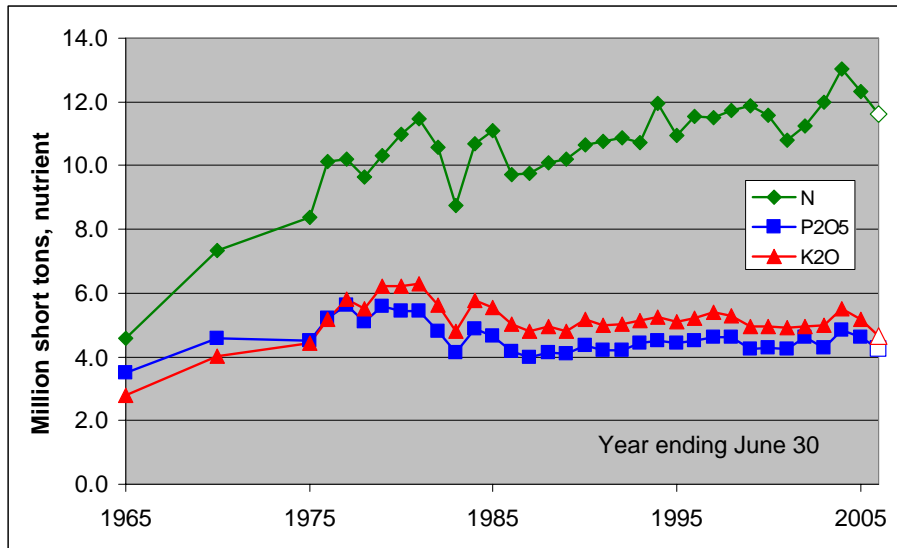


Mission Statement

- To assist in developing and implementing strategy... to promote the appropriate and efficient use of fertilizer
 - ▶ Fertilizer industry seeks optimum plant nutrition for an abundant, economical, safe, nutritious food and fibre supply
 - ▶ At the same time, we seek to encourage farmers and their advisers to responsibly protect and improve air and water quality

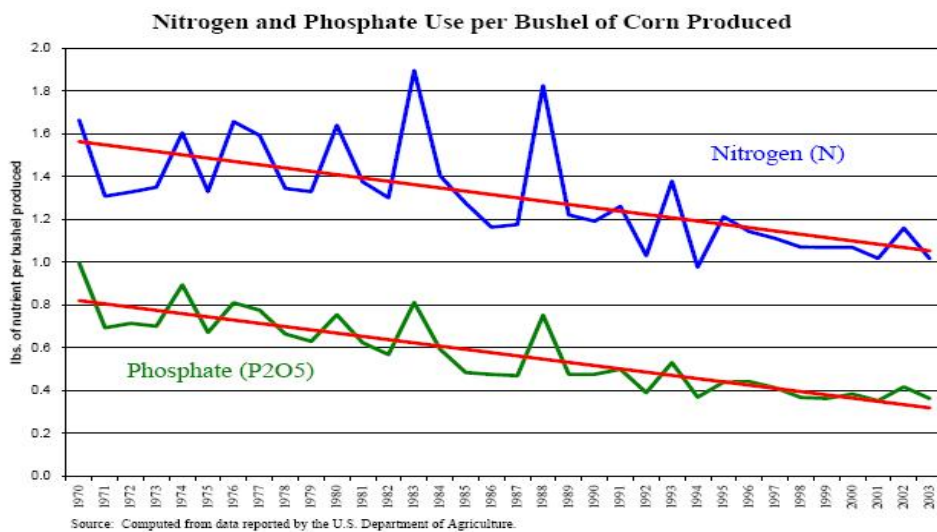


U.S. Fertilizer Consumption

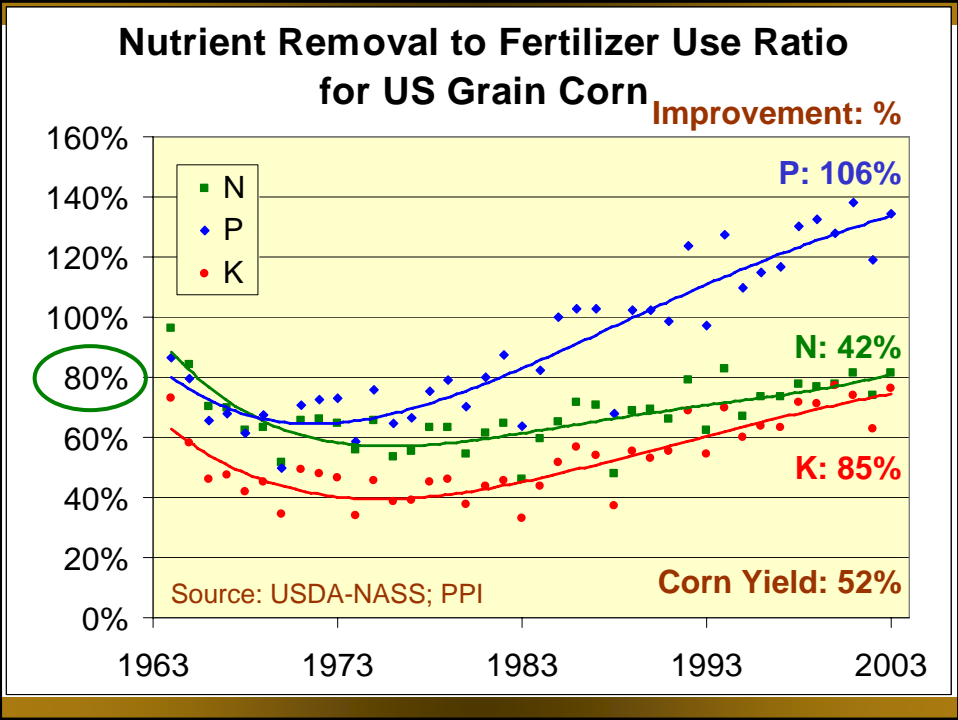


*Preliminary estimates from Vroomen (10/20/06). TFI

Nutrient Use Efficiency Improving



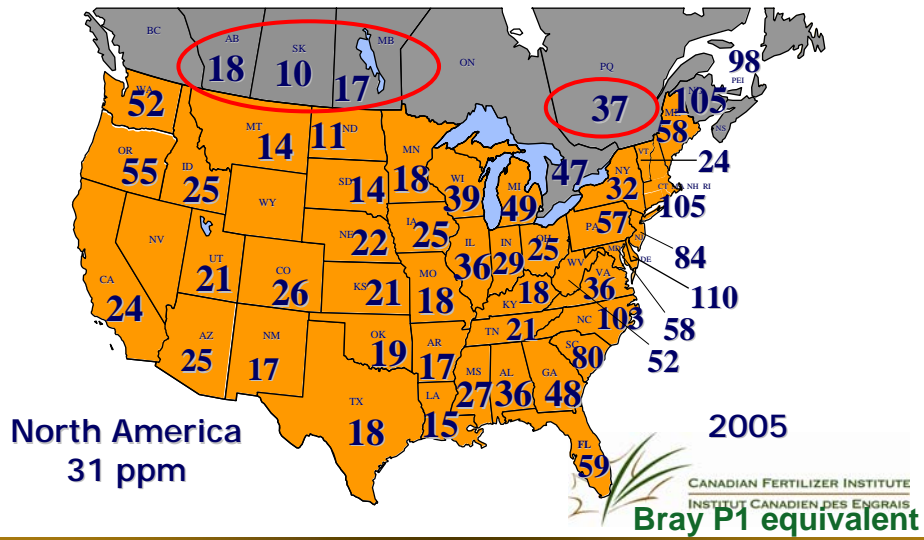
Source: Computed from data reported by the U.S. Department of Agriculture.



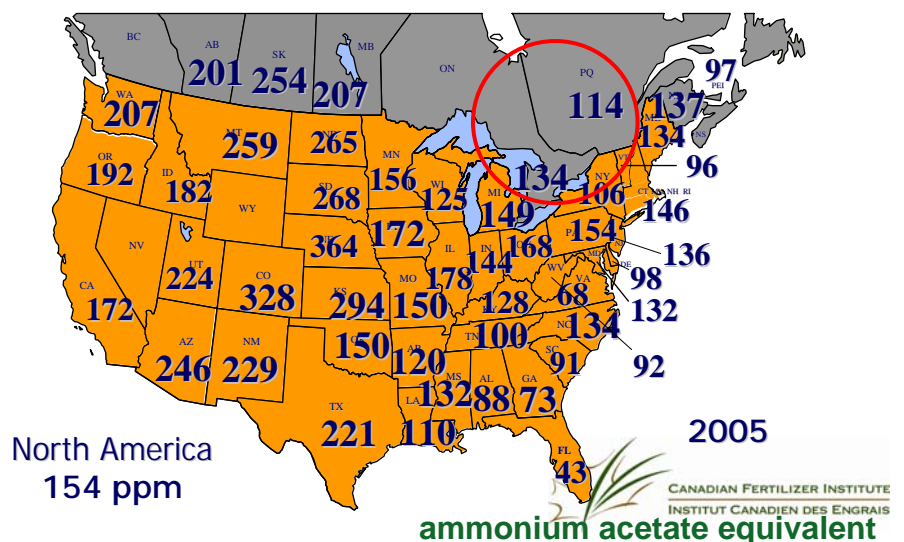
Canadian Situation



Median soil test P levels



Median soil test K levels



Ratio of crop removal to nutrients applied

	Removal to use ratio (%) ¹		% land in P deficit
	N	P	
Prairies	101	107	79
Eastern Prov.	80	69	32
U.S.A.	75	95	71

1/ Removal to use ratio = $\frac{\text{crop removal}}{(\text{fertilizer} + \text{recoverable manure} + \text{legume fixation})}$

Data sources: PFI, 2002; for crop years 1998-2000
CFI, 2004; for crop years 1991-2001



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The Manitoba Challenge: Lake Winnipeg



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The Manitoba Challenge: Lake Winnipeg



- 10th largest freshwater lake on Earth
- 2nd largest watershed in Canada
- 1M km², 5M people



The Manitoba Challenge: Lake Winnipeg



Manitoba Nutrient Regulations

- The provincial government originally proposed hard caps on Nitrogen and Phosphorus application rates, but backed down in the face of opposition from farmers and the fertilizer industry
- Instead, softer limits on residual soil N and P were established
- Farmers can escape the regulations if they submit nutrient management plans
- Now agriculture has to deliver results



Manitoba MOU

- CFI is proposing Memorandum of Understanding with the Manitoba government
 - ▶ Founded on Right Rate, Right Time, Right Place™ principles
 - ▶ CFI will provide training for farmers through Certified Crop Advisers and science from IPNI
 - ▶ Manitoba will share the cost





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An Economic Evaluation of BMPs for Crop Nutrients in Canadian Agriculture

Purpose

- To estimate farm profitability before and after participation in crop nutrient BMPs.
 - ▶ With and without financial assistance
- BMPs evaluated:
 - ▶ Soil testing
 - ▶ Variable rate fertilization
 - ▶ Minimum tillage
 - ▶ No-tillage
 - ▶ Nutrient management planning
 - ▶ Buffer strips



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Survey of Canadian Producers

- 1,000 producers surveyed across Canada
- Producers are familiar with BMPs:
 - ▶ 97% of producers use at least one BMP
 - ▶ 50% of producers use multiple BMPs
- High level of importance on managing their farm to protect the environment.
 - ▶ 98% of survey respondents
- Low uptake of financial assistance programs
 - ▶ Only 1-7% of producers using financial assistance



Survey of Canadian Producers

- Key reasons to adopt BMPs:
 - ▶ Increased yields
 - ▶ More efficient use of fertilizer and manure
 - ▶ Concern about soil quality/erosion
 - ▶ Fuel, labour and monetary savings
- Barriers to adoption:
 - ▶ Cost
 - ▶ Lack of equipment
 - ▶ Believing that BMPs are unnecessary



Farm Profitability Models

- Developed representative farm models for western, central and eastern Canadian farms.
 - ▶ Based on 2006 provincial cost of production budgets
- Survey results used to determine impact of BMP on yields and operating costs
 - ▶ Determined % change in net income due to the adoption of the BMP based on producer perceptions
- Estimated results with and without financial assistance



Farm Profitability Models - Results (% change in net income due to BMP)

	Soil Testing	VRF	Min-Till	No-Till	NMP	Buffers
Alberta - Black Soils		53			78	-10
Alberta - Brown Soils	19		34		33	
Sask - Black Soils	24	25			38	
Sask - Brown Soils	15		17		30	
Manitoba	12	-7	12	12	20	-1
Ontario	59	-9	23	23	42	-3
Quebec	1	-6	12	8	13	-2
Prince Edward Island						-1

VRF – Variable Rate Fertilization
 NMP – Nutrient Management Planning
 Note: Table shows models without financial assistance



Key Results

- Profitable BMPs included:

- ▶ Soil testing
- ▶ Nutrient management planning
- ▶ Minimum tillage
- ▶ No-tillage



- These BMPs increased yields which offset any increase in operating costs, enhancing farm profitability.



Key Results

- Unprofitable BMPs included:

- ▶ Variable Rate Fertilization
 - Equipment costs outweighed benefits of the BMPs.
 - Exception: Alberta and Saskatchewan
- ▶ Buffer strips
 - High costs of establishment and lost crop production.



Summary and Conclusions

- Research provides farmers with knowledge of how adopting BMPs affects their financial bottom line.
- Research demonstrates that some BMPs can improve farm profitability.



Summary and Conclusions

- To manage environmental risk using BMPs, barriers to adoption need to be addressed.
- How?
 - ▶ Written material on adopting BMPs
 - ▶ More accurate information on economic and environmental impacts of BMPs on the farm
 - ▶ Workshops/seminars
 - ▶ Agricultural extension assistance
 - ▶ More financial assistance





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Future Directions

Future Directions

- Major Opportunity
 - ▶ U.S. Farm Bill is being drafted
 - ▶ Canada is developing its new five-year, federal provincial plan: Agricultural Policy Framework II



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3Rs/4Rs

- TFI and CFI are working to get government recognition for nutrient BMPs system – the Right Product at the Right Rate, Right Time, Right Place™
- Next Step: International recognition



Critical Elements

- Science-based
- Extension is needed
- Partnerships with farmers is essential
- Voluntary is key



Science-based



- Better Crops, Better Environment...through Science
- BMP definition, improvement and impact measurement



Extension: Certified Crop Advisers

- ▶ American Society of Agronomy's Certified Crop Adviser Program (CCA)
- ▶ The largest certification program in agriculture
- ▶ Over 14,000 certified throughout the USA and Canada



Partnerships with farmers



CNC Mission

- “To promote science-based Beneficial Management Practices for crop nutrients that enhance both the **economic** and **environmental** sustainability of agriculture”
- It’s all about balance



Voluntary Nutrient Management Plans

- Focus has been on manure management
- Fertilizer is next
- Avoid regulation that imposes quantitative limits instead of supporting nutrient balance
- Protect fertilizer's reputation
- **RIGHT PRODUCT/S @ Right Rate, Right Time, Right Place™**
 - ▶ This is the foundation



Communication of BMPs

- **Right Rate, Right Time, Right Place™**
- **Right Products, Right Rate, Right Time, Right Place™**
- **RIGHT PRODUCT @ Right Rate, Right Time, Right Place™**

