“NERP” — Protocol ‘Plus’

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GHG Mitigation and Food Security

Sustainable Intensification

OBJECTIVE

The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system, to enable economic development to proceed in a sustainable manner and to ensure that food production is not threatened.

http://unfccc.int/essential_background/convention/background/items/1353.php


Climate-smart agriculture sustainably increases productivity, resilience (adaptation), reduces/removes greenhouse gases (mitigation), and enhances achievement of national food security and development goals.

4R Nutrient Stewardship

<table>
<thead>
<tr>
<th>Development Approach</th>
<th>Consensus of consulted experts in Canada &amp; US</th>
<th>Standards-setting process, integrating iterative learnings in Alberta Offset System</th>
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</thead>
<tbody>
<tr>
<td>Scope</td>
<td>4R N management for cultivated crops in and Canada.</td>
<td>4R framework is universal, but quantification and BMPs tuned to regional crops and conditions.</td>
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<tr>
<td>Quantification method</td>
<td>Canada’s National Inventory Method and Reduction Modifiers for direct and indirect N$_2$O.</td>
<td>Factors based on extensive research results. Method addresses variation of soil, topography and climate in Canada. But, uses scale which allows verifiability.</td>
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<tr>
<td>Baseline</td>
<td>3-year historical average for each crop type per unit crop produced.</td>
<td>Output-based intensity approach facilitates comparison of baseline and project, and aligns with knowledge-based agriculture.</td>
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<tr>
<td>Project</td>
<td>Implement 4R N management with Accredited Professional Advisor.</td>
<td>Implement at selected performance level, increasing in degree of landscape-directed management</td>
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<tr>
<td>Guidance for N management</td>
<td>Prescriptive requirements for practices and documentation, which support environmental co-benefits.</td>
<td>4R-based training program for professional advisors to streamline project implementation and verification.</td>
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Protocol Characteristics — Industry ‘Must haves’

- Must provide framework for practice change.
  - Innovative nutrient management involves:
    - 4R-based practices to increase yields and enhance nutrient efficiency;
  - Supporting infrastructure must provide training to farmers and advisors.

- Must provide framework for decision-making.
  - Farmers will only implement practices which make economic sense;
  - Required monitoring and record-keeping must be sufficiently comprehensive to allow cost-benefit analysis.

- Must provide framework for environmental assurance.
  - Quantification method and prescribed practices based on consensus of science (meta-analysis vetted by broad consultation with experts).
  - Required monitoring and record-keeping must be sufficiently comprehensive to support audit for environmental integrity.
Connecting NERP to Agriculture

• Capital investment — $ millions per farm.
• Operating costs — up to $1000’s per acre per year.
• Nutrient advisor costs — up to $20 per acre per year.
• Offset revenues — up to $5 per acre per year.
• Efficacy to frame infrastructure for practice change and to document environmental attributes of change — PRICELESS???

Offset protocol assures environmental integrity of economic innovation!

Infrastructure to implement offset protocol addresses barriers to economic innovation!
## Value of Beneficial N Management

<table>
<thead>
<tr>
<th></th>
<th>CURRENT</th>
<th>OPTIMUM</th>
<th>DIFF</th>
<th>FUTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>N applied (kg/ha)</td>
<td>146</td>
<td>100</td>
<td>144</td>
<td></td>
</tr>
<tr>
<td>Yield (kg/ha)</td>
<td>8440</td>
<td>8390</td>
<td>10980</td>
<td></td>
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<tr>
<td>Partial N Balance (PNB)</td>
<td>72%</td>
<td>105%</td>
<td>95%</td>
<td></td>
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<tr>
<td>Recovery Efficiency (RE)</td>
<td>30%</td>
<td>43%</td>
<td>55%</td>
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### Annual Benefits to Ontario:

<table>
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</thead>
<tbody>
<tr>
<td>Yield benefit from N use ($M)</td>
<td>389</td>
<td>382</td>
<td>809</td>
<td></td>
</tr>
<tr>
<td>Cost of N fertilizer ($M)</td>
<td>168</td>
<td>115</td>
<td>166</td>
<td></td>
</tr>
<tr>
<td>Net Return To Grower ($M)</td>
<td>221</td>
<td>267</td>
<td>46</td>
<td>644</td>
</tr>
</tbody>
</table>

Assumption: 1 M ha, $165 /t corn, $1.15 /kg N

*From: Tom Bruulsema, International Plant Nutrition Institute*
Guidance — Implementation & Documentation

• Prescribe suite of practices for each performance level, with increasing degree of landscape-directed management.
  • Implementation of protocol in harmony with emerging innovations in agronomic practice;
  • Protocol supports infrastructure to overcome barriers to practice change.

• An Accredited Professional Advisor (APA) must sign-off.
  • To become APA, professional must be qualified to sign-off on regulatory documents in agronomic practice
  • To become APA, professional must pass 20+ hour on-line course.

• The prescribed data and documentation are aligned to:
  • Support comprehensive management of N;
  • Assess economic benefits of practices; and
  • Provide assurance of sustainability (‘eco-label’, water quality, etc.).
Accredited Professional Advisor (APA)

• APA will sign-off on the Baseline calculation.
  • Review of the documentation for Baseline practices,
  • Evaluate conclusions supported by the documentation, and
  • Attest to the accuracy of calculations.

• APA will design and sign-off on 4R plan for participating farm.
  • 4R plan will address all fields and all crops at the performance level
    selected by the grower.

• APA will provide written attestation that the 4R nitrogen plan
  was implemented as designed.
  • Involves post-harvest assessment of activities (including responses to
    weather-related disruptions), of yield data and of N use efficiency.
  • Assessment will form the basis for the next year’s 4R nitrogen plan.
Next Steps for NERP

• NERP used to drive change in knowledge-based agriculture.
  • Adapting NERP — Saskatchewan, Ontario (Australia, China, Europe?).
  • Farmer extension — Global Research Alliance Funding?
  • Provides basis for other nutrient initiatives in North America.
  • NERP as an element in sustainable brands, eco-labeling in North America.

• Canadian Fertilizer Institute supports implementation of the Alberta NERP (planning for roll-out in Spring 2011).
  • Train and certify Accredited Professional Advisors;
  • Fund research to refine GHG mitigation coefficients.

• The Fertilizer Institute has budget to adapt NERP to USA.
  • Select appropriate 4R practices for climate / cropping regions;
  • Adapt quantification method aligned with USDA methods / tools;
  • Implement as part of 4R program — enhance nutrient efficiency to increase yield, to decrease GHGs, and to protect water.