



IPNI PROGRAM REVIEW

Nitrogen

Key Issues & Needs

- **Reducing inappropriate emphasis** by the regional-to-global food supply chain on lowering fertilizer nitrogen (N) use as the chief and only means to curtail nitrous oxide emissions from agriculture.
- **Improving fertilizer N efficiency** as a central component of 4R Nutrient Stewardship implementation.
- **Identifying and emphasizing key technologies and tools** that improve crop yields while also reducing risks of environmental N loss.
- **Providing scientific leadership** on N stewardship to global, national, state, and provincial fertilizer industry trade associations.
- **Providing guidance on university and government research** initiatives to evaluate improved agronomic and horticultural N performance.
- **Advancing education and outreach** on suites of 4R N management techniques that achieve positive production and environmental outcomes.

TACTICAL PLAN highlights & priorities



4R Stewardship

Increase adoption of 4R stewardship for N management and encourage nutrient documentation and tracking on local, national, and regional scales.

Nutrient Education

Emphasize the need for site-specific N management in different cropping systems to reduce environmental N losses.

Support regional IPNI training resources for agronomic practitioners.

Improved Fertilizer Recommendations

Influence and guide N management research on enhanced fertilizer effectiveness for crop nutrition, and facilitate implementation of improved recommendations into decision support systems.

Closing Yield Gaps

Assist IPNI directors and other leading scientists in identifying and addressing N-related plant nutrition factors that limit yields.

Enhancing Sustainability

Lead development and implementation of N management science that addresses both farmer and food supply chain sustainability goals and metrics of cropping system performance.



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examples of IMPLEMENTING THE TACTICAL GOALS

Significant Partnerships:

- To encourage acceptance of 4R Nutrient Stewardship, the Nitrogen Program Director partners with leaders on many levels (e.g., federal, state, and provincial regulatory agencies, environmental NGOs, state industry associations, university research and extension, global agricultural industries, sustainability alliances, soil health partnerships, and professional agronomic, soil science, conservation, geophysical, and ecological societies).

Educational Activities:

- Summarized science (presented through many diverse outlets) on global 4R N technologies and tools that increase crop yields and reduce N loss.
- Highlight significant scientific developments on the IPNI N Program website that illustrate the positive effects of increased crop yields (and N removal) on improved N balance in cropland soils, and reduced loss of N.
- Regular publication of articles in popular press showing how optimized fertilizer and manure management, with proper conservation practices, can reduce nutrient loss.

Engagement in Industry:

- Serving on North American 4R Fund Technical Advisory Group to prioritize research needs and facilitate implementation.
- Contributing scientific expertise on N management to fertilizer industry groups (e.g., IFA, TFI, Fertilizer Canada, Fertilizers Europe). Provide them with technical oversight to correct inaccuracies on N behavior issued in reports by influential groups (e.g., OECD, U.N. FAO, UNEP, USGS, US EPA).

Leadership in Plant Nutrition Issues:

- Serving as an elected member of the continuing national Science Advisory Council of the U.S. *Field to Market Alliance for Sustainable Agriculture*. Provided expertise on nutrient management as it relates to greenhouse gas emission, water quality, soil carbon, soil health, and other sustainability issues.
- Communicating the importance of IPNI educational tools, such as the *North American Soil Test Summary* and *NuGIS* software. Facilitate their use in soil health assessments by numerous private and civic organizations.
- Delivering technical presentations and 4R N science outreach on current technologies and tools; ensuring inclusion of sound science in policy and communication actions to multiple groups and stakeholders.
- Collaborating with scientists to expand consideration of 4R N management science in soil carbon sequestration and greenhouse gas emission modeling efforts.

Research Leading to Impact:

- High-priority research with key scientists is currently assessing (1) how implementation of 4R N-management principles can reduce subsurface drainage system N losses contributing to impaired water quality, and (2) how 4R N management leads to reduced nitrous oxide emissions.
- On-going research demonstrates how balanced fertilization and ecological intensification can improve crop yields, nutrient efficiency, soil health, and environmental footprint.

EXAMPLES OF IPNI IMPACT

Many leaders of the global food supply chain are members of the *Field to Market Alliance for Sustainable Agriculture* (>100 industry and affiliated members). Several large global companies have publicized their commitments to sizably reduce their emissions of greenhouse gases (GHGs) within the next 5 to 10 years. Most *Field to Market* member companies recognize that within crop production, N fertilizer accounts for the largest portion of the crop and soil system emissions of GHGs. Some environmental NGOs had persuaded those companies to incorrectly believe that U.S. farmers were universally using 20 to 30% too much fertilizer N.

The *Field to Market Fieldprint Calculator* uses a constant factor (based on N rate) to estimate nitrous oxide emissions.

As a consequence, the focus of many *Field to Market* members was to get all farmers

to reduce fertilizer application rates to minimize nitrous oxide emissions.

The IPNI N Program Director assembled relevant 4R N management science, showing that all components of 4R N management are important and that nitrous oxide emissions are influenced by local conditions. This IPNI-led contribution has led to adoption of an improved method of estimating nitrous oxide emissions. The new method now accounts for local conditions, is flexible for actual N fertilization practices, and credits the use of advanced N management.

This example of science-based leadership by IPNI demonstrates the opportunity for influence with *Field to Market*, and with other sustainability groups and agencies. There is an appreciation for the ability of IPNI to provide the scientific rationale for 4R management in addressing soil carbon, soil health, and water quality goals.



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The Alliance for Sustainable Agriculture



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