IPNI PROGRAM REVIEW

Phosphorus



- **Providing** leadership in addressing water quality impacts of phosphorus (P) management: eutrophication, harmful algal blooms, and hypoxia.
- **Identifying** where agricultural soils have too little or too much P for sustainable crop production.
- **Communicating** the value of adopting 4R P Nutrient Stewardship practices for improving both crop yields and water quality.
- Promoting sustainable P management to reduce waste and increase efficiency.



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Develop and maintain effective working relationships with leading P scientists to facilitate adoption of 4R principles of nutrient management.

Nutrient Education

Develop case studies to inform a wider range of stakeholders on how P fertilizer stewardship can favorably impact crop yields, soil health, and water quality.

Improved Fertilizer Recommendations

Review the science on the influence of cover crops and conservation tillage on soil P in terms of risks to both crop productivity and water quality, to be used as a reference for key IPNI partners.

Closing Yield Gaps

Document current and potential contributions of P fertilization to crop yields. Identify opportunities to overcome potential P limitations for crops grown in regions of deficiency.

Enhancing Sustainability

Assist in the revision of IPNI's Nutrient Use GIS (NuGIS) to achieve improved clarity and accuracy of data available for interactive download.





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examples of IMPLEMENTING THE TACTICAL GOALS

Significant Partnerships:

- Contribution of data from *NuGIS* and support for its interpretation led to IPNI co-authorship of two high-impact scientific publications. This involvement with internationally leading scientists raises awareness of the social and economic benefits of phosphate fertilizer and the fertilizer industry.
- IPNI, in collaboration with The Fertilizer Institute and the Field to Market Alliance for Sustainable Agriculture coordinated a scientific workshop to define 4R P practices for major commodity crops of North America. An issue review paper describing the practices and linking them to metrics for sustainability initiatives was developed and a peer-reviewed paper is in preparation.

Educational Activities:

• IPNI was an active partner in the coalition of agricultural and conservation organizations that launched the Iowa 4R Plus program in 2018 to support farmers' efforts to implement precise nutrient management and conservation practices.

Engagement in Industry:

• The 4R Certification program in the Western Lake Erie Watershed, and throughout the state of Ohio, in which IPNI continues to play an advisory role, currently has certified 45 agri-retail locations. The growth of this program extends 4R nutrient management education to 5,900 growers managing nearly 3 million acres of highly productive cropland.

Research Leading to Impact:

 An IPNI managed 4R Research Fund project resulted in a peer-reviewed journal article published within a special

EXAMPLES OF IPNI

In the 8 million acres of cropland surrounding Lake Erie, IPNI's information has had a profound impact. While some voices have called for reductions in P fertilizer use or for a tax on fertilizer sales, most of the leading scientists and government and environmental agencies have been convinced to support a 4R approach instead. The IPNI information that has influenced their thinking is shown in the two figures to the right. Trends in the nutrient balance and soil P concentrations show that excessive rates of P application are <u>not</u> the cause of the increase in tributary loads of dissolved P and algal blooms over the past 15 years. Thus attention has been focused on other potential causes, including surface placement of fertilizer P. IPNI's message is '**Put phosphorus in the right place**.'



The Lake Erie watershed includes substantial cropland in Ohio, Indiana, Michigan, and Ontario. [from epa.gov] issue. It addressed P loss in artificially drained landscapes and results emphasized the role 4R P management practices have in reducing P loss.

• A recent Better Crops article discussed principles for optimizing the placement of P in soils of the tropics, with a focus on better agronomic, economic, environmental, and social outcomes.

Changes in Nutrient Practices:

• A survey of farmers in the Lake Erie watershed found that the practice of subsurface placement of P fertilizer has increased during the past three years, with more farmers planning to adopt this practice in the near future. These changes in fertilizer placement are driven by the industry's efforts in 4R education and certification, supported by IPNI.

Leadership in Plant Nutrition Issues:

- Dr. Peterson was elected to serve as the 2018 Vice-Leader (Leader in 2019) for the American Society of Agronomy's Nutrients and Environmental Quality Community.
- Dr. Peterson was invited to chair a Council for Agricultural Science & Technology (CAST) issue paper on reducing the impacts of agricultural nutrients on surface water quality in a changing climate.



The distribution of soil samples from the Lake Erie region with P concentrations in four categories between 2001 and 2015.



The partial P balance for the Western Lake Erie region. The amount of P from animal manure and fertilizer inputs are compared with the amount of P removed from fields in harvested crops.

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