



Agronomy Meeting 2020

Lamplighter Inn - London - January 21st, 2020

4R Plant Nutrition & Sustainability

Tom Bruulsema, Chief Scientist

IPNI Canada

Guelph, Ontario, Canada



4R Plant Nutrition & Sustainability

1. What happened to IPNI?
2. Scientific Panel on Responsible Plant Nutrition
3. 4R Solutions for Africa
4. Efficacy of 4R for Lake Erie Phosphorus goals
5. Expectations for accountability



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Better Crops
with plant food

A PUBLICATION OF THE INTERNATIONAL PLANT NUTRITION INSTITUTE (IPNI) 2019 NUMBER 1

Behold... Phosphorus!

01 Apr 2019

Final Issue of Better Crops with Plant Food

As 2019 marks the 350th anniversary of Hennig Brandt's discovery of phosphorus (P), it is a time to reflect back on the number of significant scientific advancements that have followed.

[Read More](#)

Publications

- ▶ Better Crops
- ▶ Plant Nutrition Today
- ▶ Issue Review Series
- ▶ Fact Sheets

Research

- ▶ Image Database
- ▶ Research with Impact Series
- ▶ Nutrient Uptake & Removal
- ▶ Toolbox & Software

News & Information

- ▶ About IPNI
- ▶ Photo Contest
- ▶ Scholar Award
- ▶ More ...

Note

The agronomic programs of IPNI ceased operations on April 1, 2019. This website will remain online until the end of



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4R and Plant Nutrient Educational Resources

The Fertilizer Institute is now your source
for select educational resources previously published
by the International Plant Nutrition Institute



Preparing for the 2019
**International
Certified
Crop
Adviser
Exam**



**Soil
Fertility
Manual**



Preparing for the
**4R
Nutrient Management
Specialist Exam**
**Certified
Crop
Adviser**



**4R
PLANT
NUTRITION**



**Soil Management Practices
for Nutrient and Low Fertilization**



Digital Download - Crop
Nutrient Deficiency Image

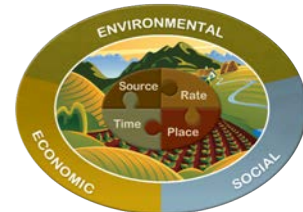


SCIENTIFIC PANEL
ON RESPONSIBLE PLANT NUTRITION

Vision: Responsible plant nutrition nourishes plants in a sustainable manner that enhances earth's capacity to support healthy life.

Mission: Provide a sound scientific basis for principles and practices of responsible plant nutrition in farming systems.

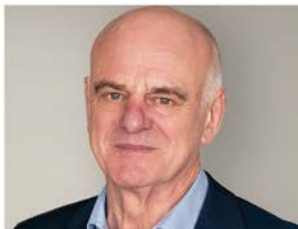
4R & more.



18-19 NOVEMBER 2019



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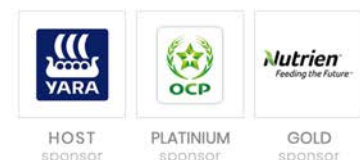
D. NABARRO

MONDAY, 18 NOVEMBER

David Nabarro is the Co-Director of the Imperial College Institute of Global Health Innovation at the Imperial College London and supports systems leadership for sustainable development through his Switzerland based social enterprise 4SD. Furthermore, he is Advisor at the Global Commission on Adaptation in Rotterdam. He secured his medical qualification in 1974 and has worked in over 50 countries – in communities and hospitals, governments, civil society, universities, and in United Nations (UN) programs.

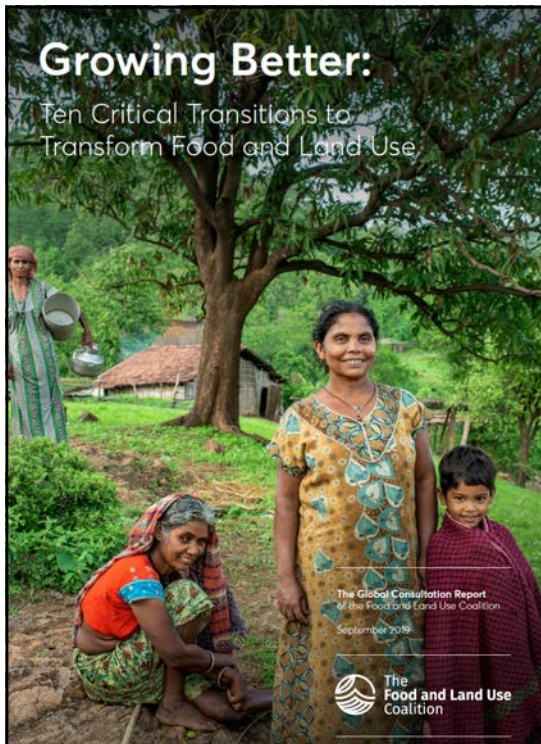
David worked for the British government in the 1990s as head of Health and Population and director for Human Development in the UK Department for International Development. From 1999 to 2017 he held leadership roles in the UN system on disease outbreaks and health issues, food insecurity and nutrition, climate change and sustainable development. In October 2018, David received the World Food Prize together with Lawrence Haddad for their leadership in raising the profile and building coalitions for action for better nutrition across the Sustainable Development Goals.

SPONSORING COMPANIES



PARTICIPATING ORGANIZATIONS

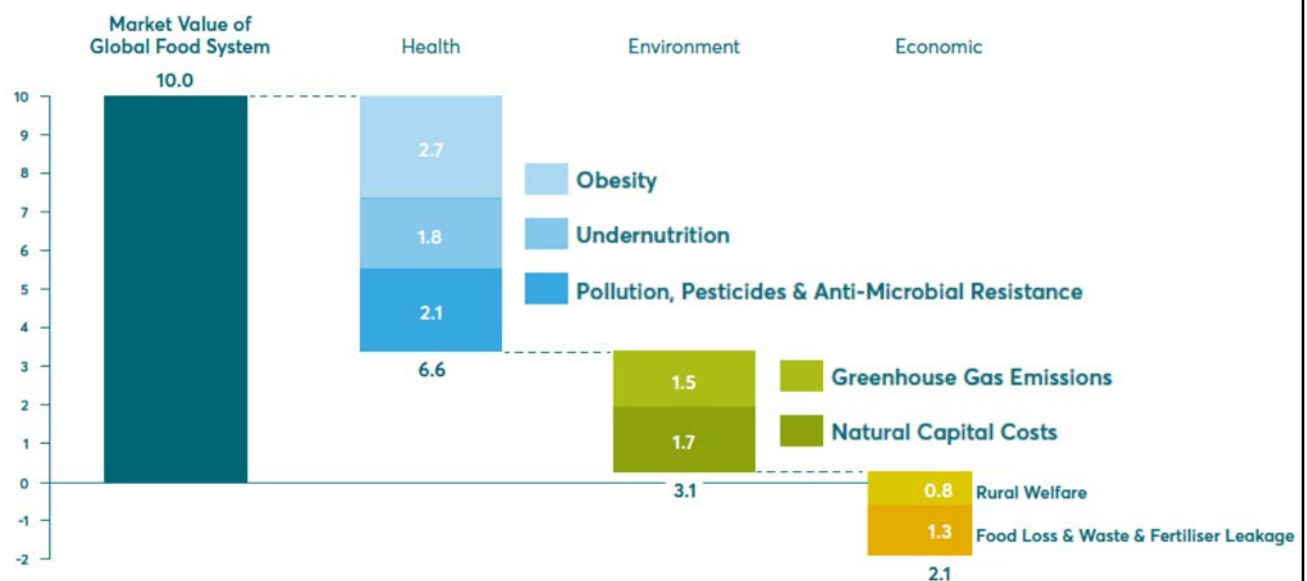




JANEZ POTOČNIK, Co-chair

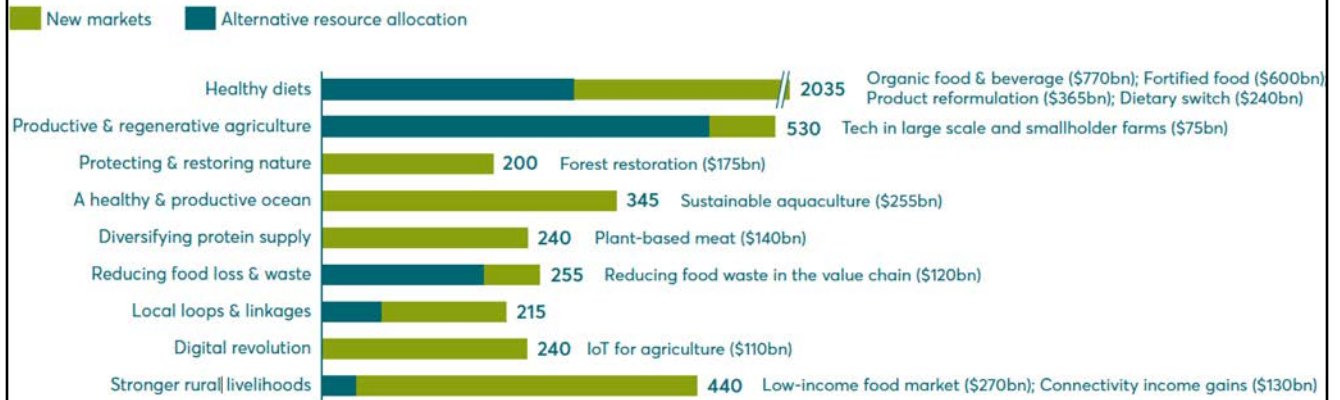


The hidden costs of global food and land use systems sum to \$12T, compared to a market value of the global food system of \$10T



There is an annual business opportunity of \$4.5 trillion associated with the ten critical transitions in 2030


USD billions (2018 prices), 2030 estimates, examples of opportunities >\$100bn



Source: SYSTEMIQ, Blended Finance Taskforce, 2019 (see online technical annex for methodology)







AFRICAN
PLANT NUTRITION
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The idea to create a new independent plant nutrition organization, with a sole focus on African needs, emerged from a vision to form a science-based institute to address soil fertility issues ranging across scales.

Our Mission...

Innovate plant nutrition through evidence-based practices for a resilient and food-secure Africa.

Dr. Kaushik Majumdar serves as the founding Director General of APNI. Majumdar previously served as vice president of the International Plant Nutrition Institute (IPNI), with responsibilities for programs in Africa and Asia.

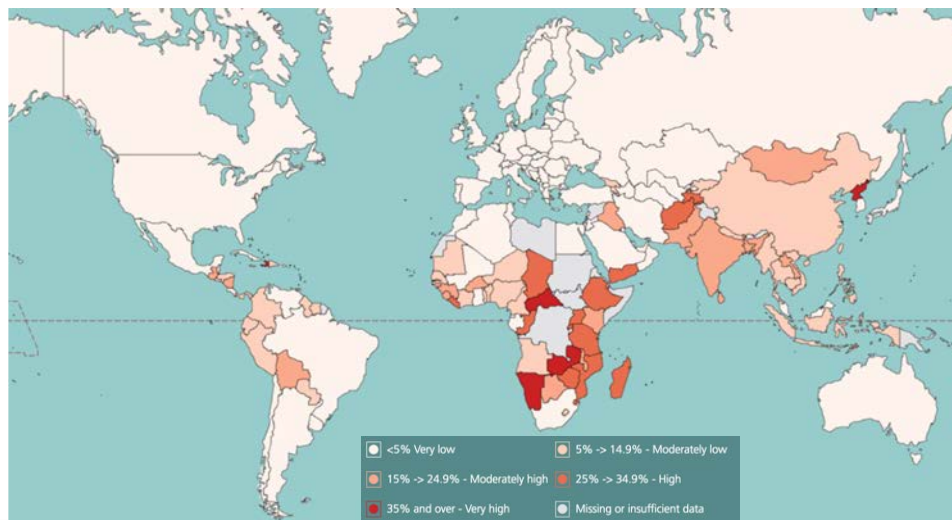


Dr. Kaushik Majumdar is Director General of APNI

<http://www.apni.net>



Global status of food security



% of the population affected by chronic hunger and malnutrition

Dr. Shamie Zingore | Director for Research
Dr. Samuel Njoroge | 4R Solution Project Scientist
AFRICAN PLANT NUTRITION INSTITUTE

Dr. Samuel Njoroge | 4R Solution Project Scientist

AFRICAN PLANT NUTRITION INSTITUTE

Increasing productivity and agronomic efficiency

Responsive soil

Non-Responsive soil

Increasing Knowledge

Current practice Fertilizer + Improved seed

Fertilizer Improved seed
Org. resource
Local adaptation

Fertilizer + Improved seed + Org. resource

The diagram is a circular graphic with a thick border divided into three colored segments: green at the top labeled 'ENVIRONMENTAL', yellow at the bottom left labeled 'ECONOMIC', and blue at the bottom right labeled 'SOCIAL'. In the center of the circle is a landscape illustration featuring rolling hills, a winding river, and a small farm with a red barn. Overlaid on this landscape is a dark brown circle containing four interlocking puzzle pieces. The pieces are labeled: 'Source' (top-left), 'Rate' (top-right), 'Time' (bottom-left), and 'Place' (bottom-right).

4R development process in sub-Saharan Africa



4RSolution.org

[@4RSolution](https://twitter.com/4RSolution)

[linkedin.com/company/4R-Solution/](https://www.linkedin.com/company/4R-Solution/)

Partners & Funders

PARTNERS



FUNDERS



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Western Lake Erie Watershed

Cropland PUE almost doubled.
Loss of dissolved P to the lake also doubled.

Year	P outputs, kt crop removal	P inputs, kt fertilizer	P inputs, kt manure	PUE
1987	30	37	5	72%
2014	49	31	5	135%

Partly, unintended consequence of conservation tillage with broadcast application of P fertilizer.

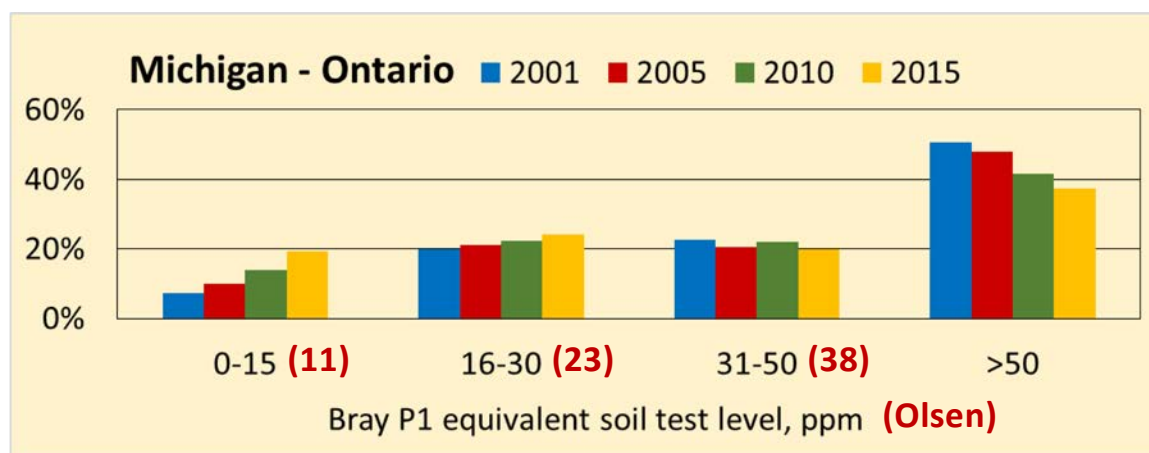


NuGIS

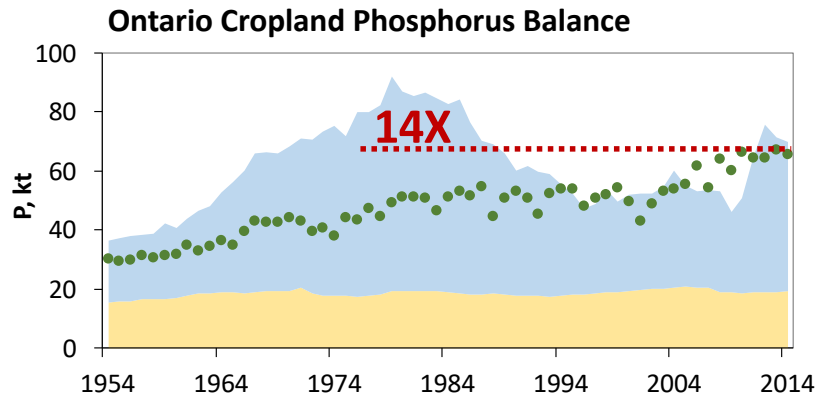
Nutrient Use Geographic Information System

Jarvie et al., 2017, *J Environ. Qual.* 46(1):123-132

Phosphorus legacy – progress?



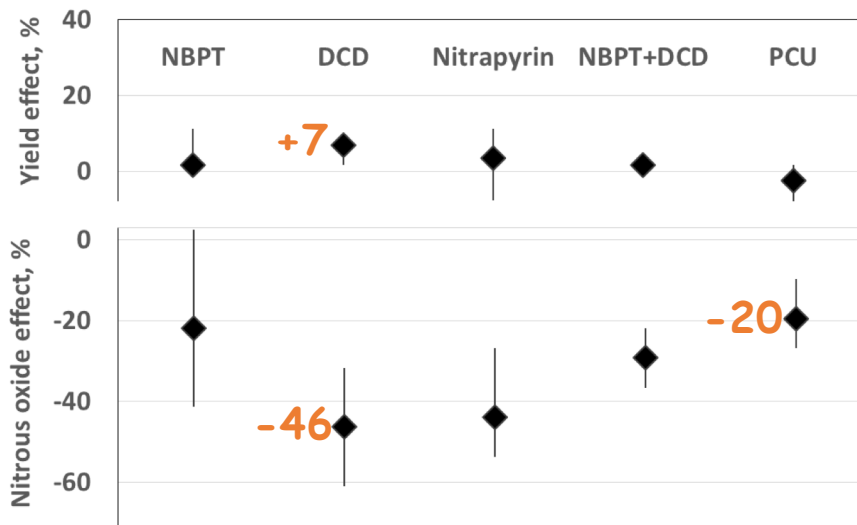
As a multiple of crop removal, Ontario's **cumulative P surplus** is similar to that of the USA.



= > 500 lb P_2O_5 per cropland acre

See Bruulsema et al. (2019) J Environ Qual (for USA, Europe, and Brazil)

Inhibitors impact nitrogen loss more than yield



Thapa et al. (2016)
Effect of enhanced efficiency fertilizers on nitrous oxide emissions and crop yields: a meta-analysis. Soil Science Society of America Journal 80:1121–1134

Mean effect size (%) and 95% confidence interval for technologies applied to urea

Nutrient use efficiency & nutrient losses

- Improving NUE can reduce nutrient losses
- Optimizing economic returns may not be enough to achieve goals for nutrient loss reduction
- Need to consider other ways to recognize & reward

Made possible through funding by:



The 4R Certification standards were created by the 4R Ontario Steering Committee in close collaboration with the Nutrient Stewardship Council, the Ohio Agri-Business Association and The Fertilizer Institute in the U.S. to ensure alignment between cross-border efforts to implement 4R Nutrient Stewardship and minimize nutrient losses under the 4R Certification Program. The standards are reflective of the best available science, technology and regulatory requirements for Ontario conditions.

Members of the 4R Ontario Steering Committee represent a diversity of stakeholders including Fertilizer Canada; the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA); the Ontario Agri-Business Association (OABA); the Grain Farmers of Ontario; the Ontario Federation of Agriculture; the Christian Farmers Federation of Ontario; Conservation Ontario; The Nature Conservancy – Ohio; the Ministry of the Environment and Climate Change; the International Plant Nutrition Institute; the Ontario Certified Crop Advisor Board; and Ontario agri-retailers.





Right Source @ Right Rate, Right Time, Right Place®

 4rcertified.ca
 4rcertification@fertilizercanada.ca
 (613) 230-2800



Program administered by Fertilizer Canada on behalf of the 4R Ontario Steering Committee



4R Nutrient Stewardship Certification Program in Ontario

Voluntary program for Ontario agri-retailers and nutrient service providers implementing 4R Nutrient Stewardship

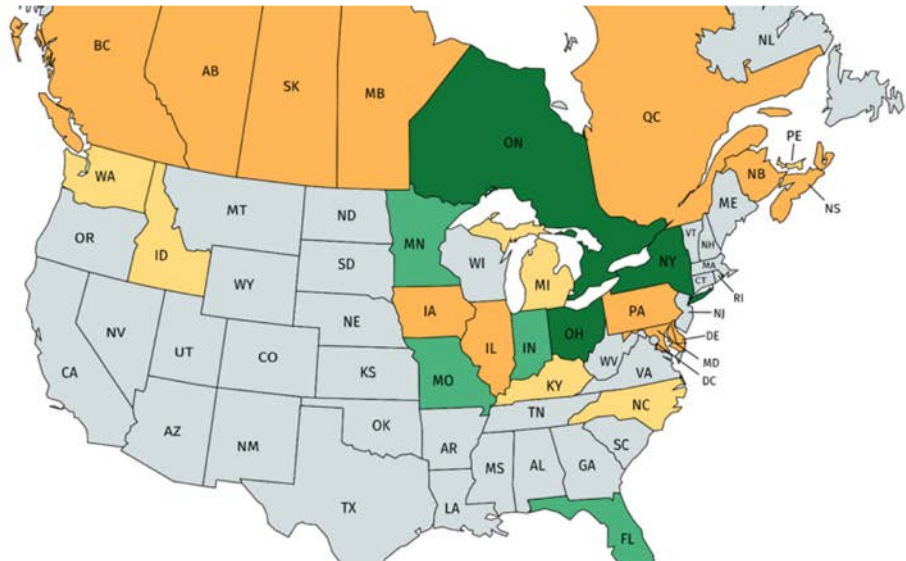
Collaboration – “We All Play a Role”



Growing interest in 4R Certification

Interest in 4R Programs

- Current 4R Certification Programs
- Developing 4R Certification Programs
- Inquired About 4R Certification
- Active (broadly adopted) 4R Outreach Programs



Carrie Vollmer-Sanders, The Nature Conservancy

Support for research underscores industry commitment to linking 4R practice to outcomes



Initiated 2013.

Delivering ~\$1M per year.

2019: \$2.7M for new projects in AZ, AR, CA, UT, VA.

2020: new projects for Canada



Contents lists available at ScienceDirect

Journal of Great Lakes Research

journal homepage: www.elsevier.com/locate/jglr



Building partnerships to scale up conservation: 4R Nutrient Stewardship Certification Program in the Lake Erie watershed

Carrie Vollmer-Sanders^{a,*}, Andrew Allman^b, Doug Busdeker^c, Lara Beal Moody^d, William G. Stanley^e

“...implementing the 4Rs has been identified as a key step to improving water quality.

The rigor, structure, governance, and credibility of the 4R Certification Program make it a top candidate to act in other regions with **wicked problems related to nutrient management.**”

How to meet society's expectations for responsible plant nutrition?

Document.
Collaborate.
Participate.

