



USDA Partnership Management Team
Nitrogen Management Technology Symposium
Washington, DC
25 September 2012

Technologies and Approaches for Managing Crop Nitrogen – The Industry Perspective

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Agrium Inc.



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Belarusian Potash Company



CF Industries Holdings, Inc.



Compass Minerals Specialty Fertilizers



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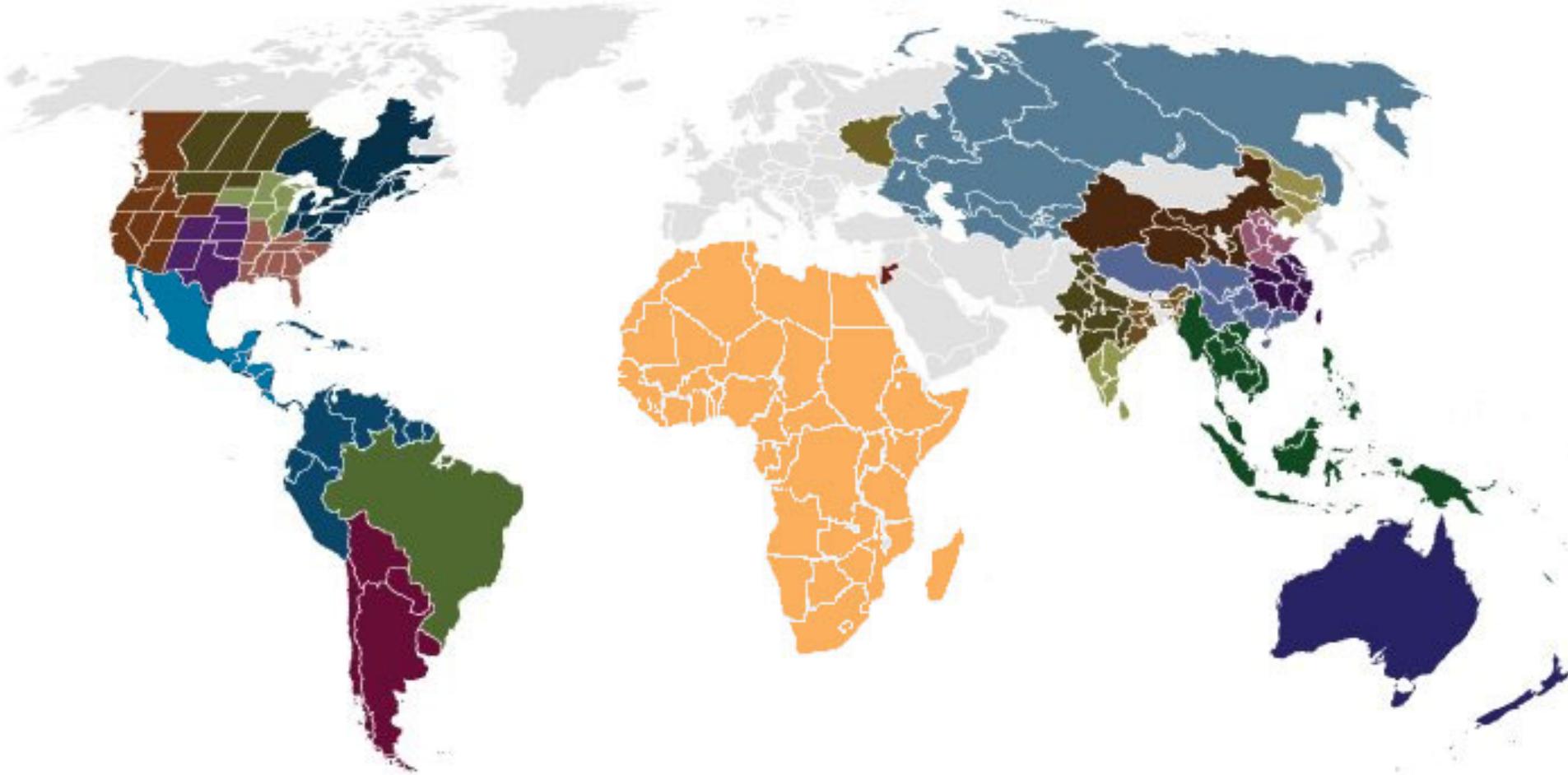


Uralkali

Formed in 2007 from the Potash & Phosphate Institute, the **International Plant Nutrition Institute** is supported by leading fertilizer manufacturers.

IPNI Mission

“to develop and promote scientific information about the responsible management of plant nutrition for the benefit of the human family.”



Outline – Technologies and Approaches for Managing Crop Nitrogen

1. What is 4R?
2. 4R technologies and practices
3. 4R adoption by agri-service providers
4. Reporting 4R performance
5. 4R research

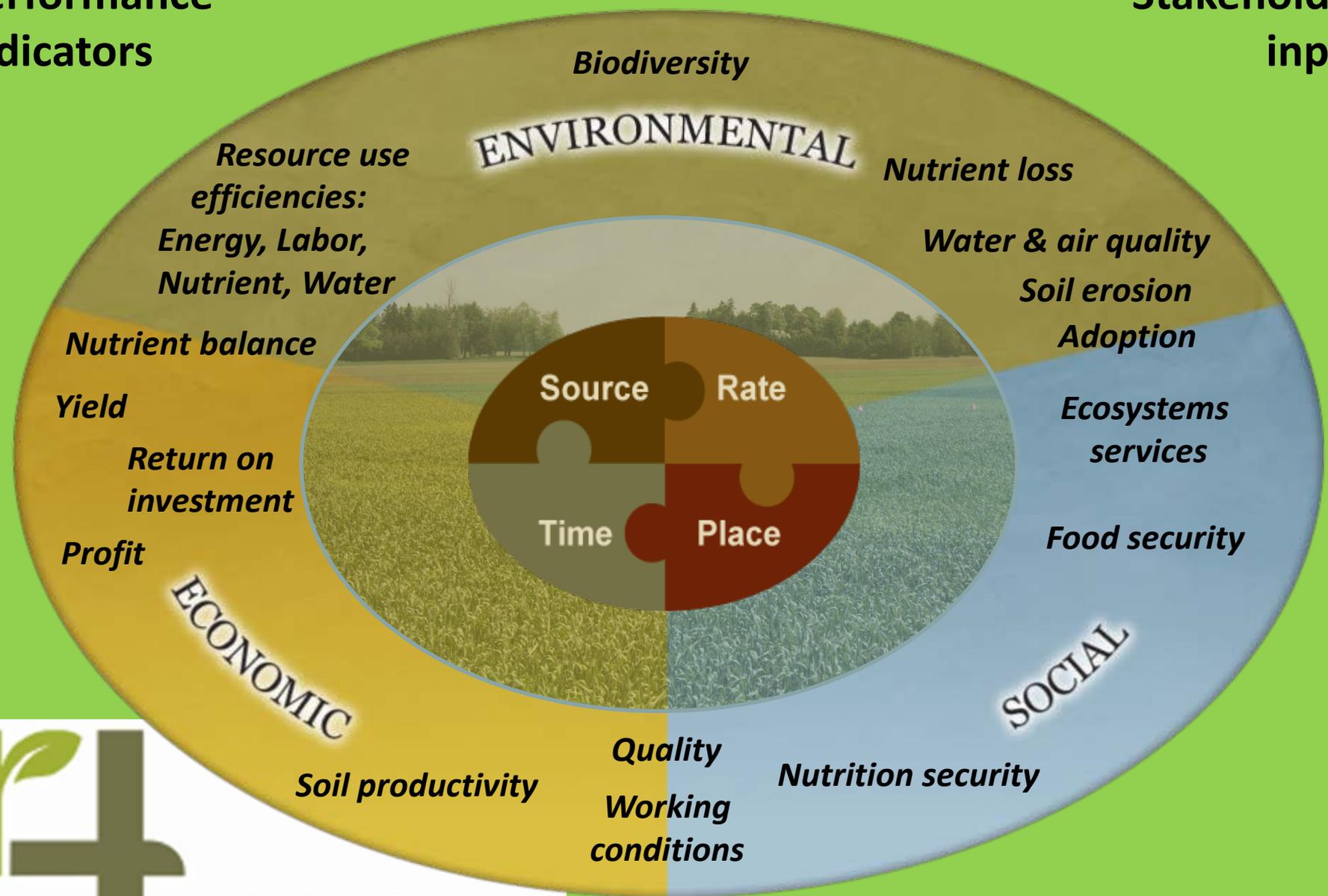


1. What is 4R?



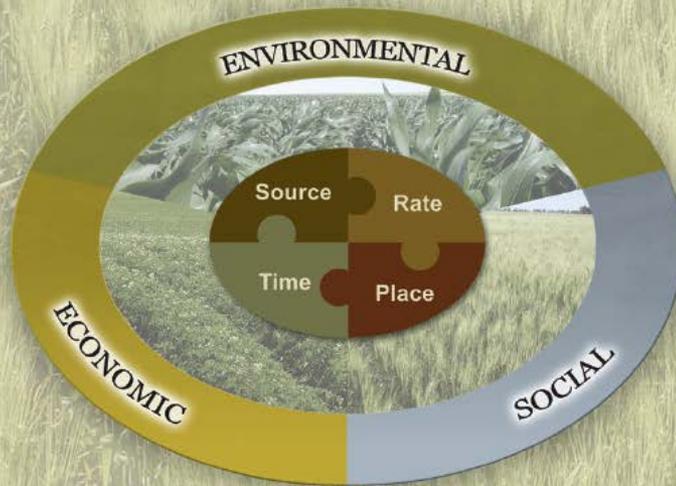
Performance indicators

Stakeholder input



4R PLANT NUTRITION

A Manual for Improving the Management of Plant Nutrition
NORTH AMERICAN VERSION



Chapter 1 Goals of Sustainable Agriculture

Chapter 2 The 4R Nutrient Stewardship Concept

Chapter 3 Scientific Principles Supporting — Right Source

Chapter 4 Scientific Principles Supporting — Right Rate

Chapter 5 Scientific Principles Supporting — Right Time

Chapter 6 Scientific Principles Supporting — Right Place

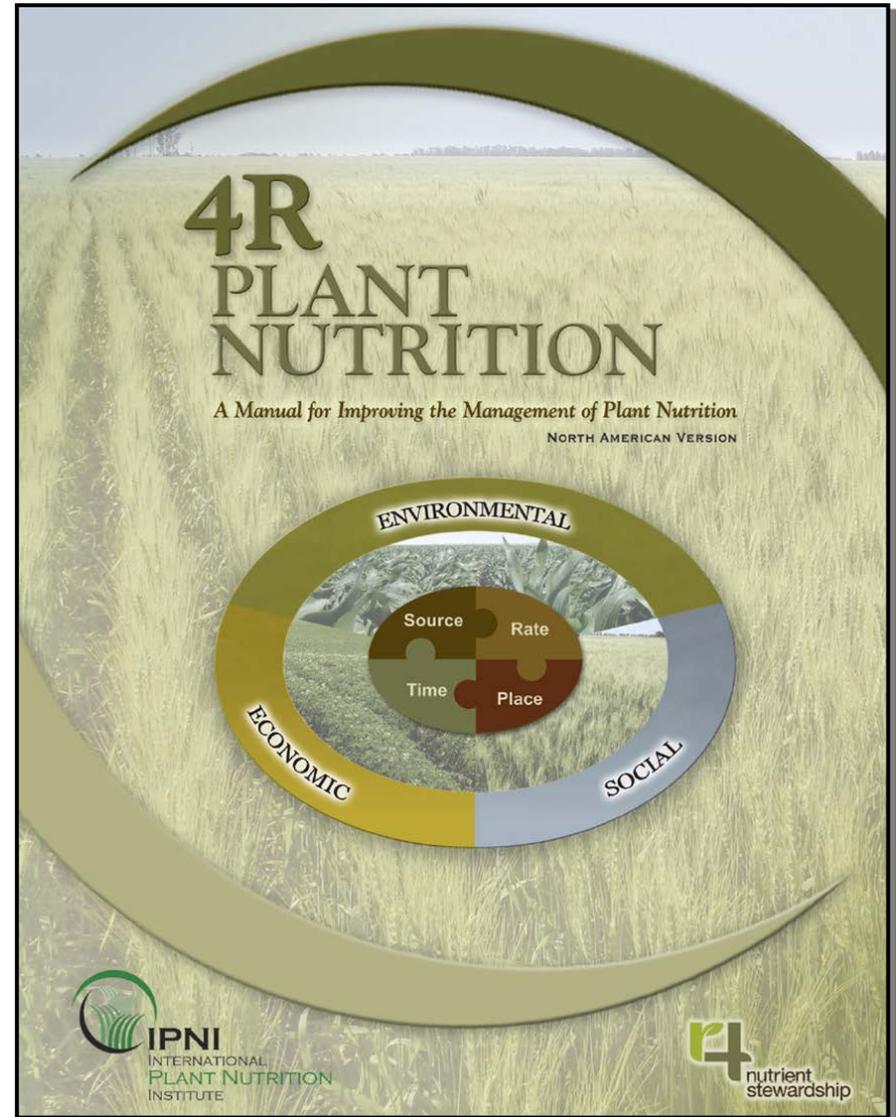
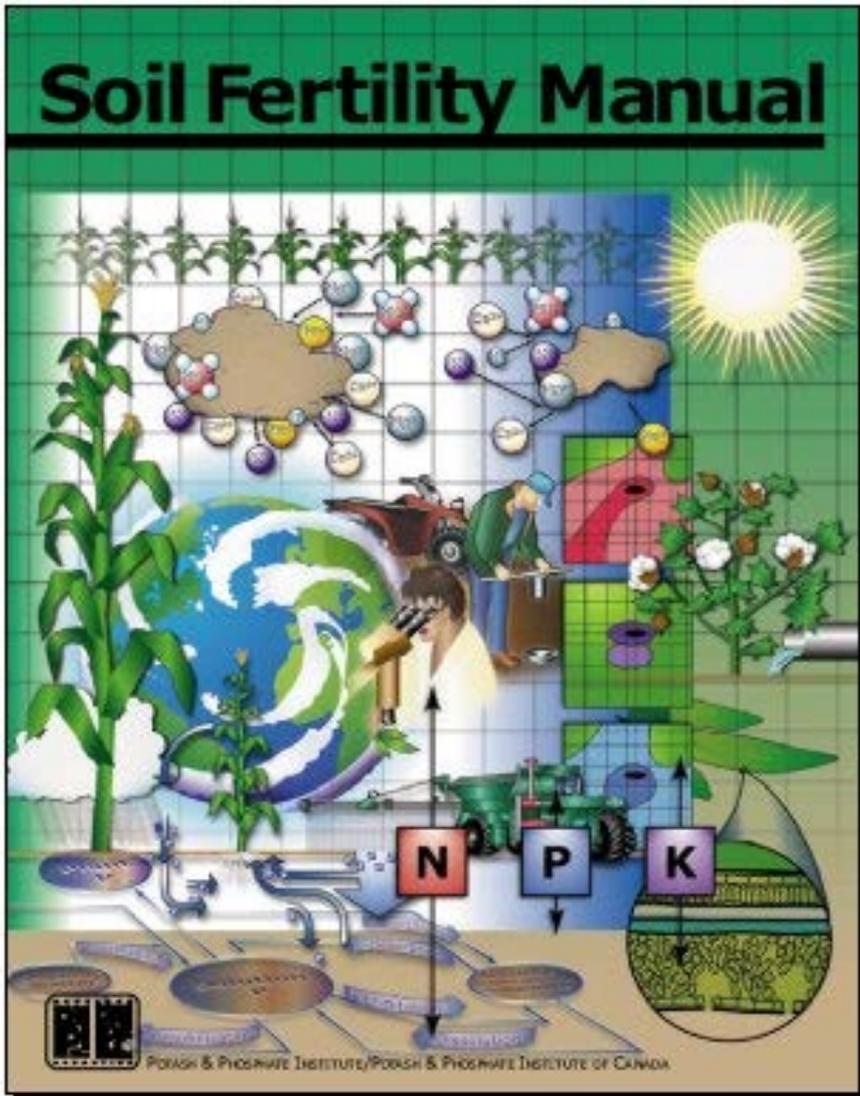
Chapter 7 Adapting Practices to the Whole Farm

Chapter 8 Supporting Practices

Chapter 9 Nutrient Management Planning and Accountability

<http://nane.ipni.net>

What's different?





2. 4R technologies and practices





Right Source

Scientific Principle:

- Ensure a balanced supply of plant-available forms of N, utilizing all available sources.

Practices:

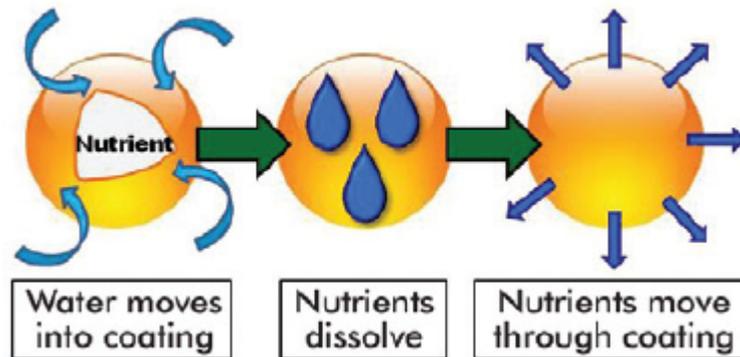
- Credit N from manures and composts
- Credit N from previous crops
- Assess use of enhanced-efficiency sources
 - Granular versus fluid
 - Inhibitors of urease and nitrification
 - Coated fertilizers



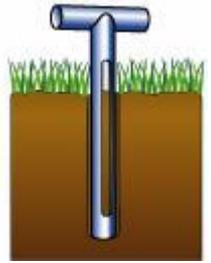


Enhanced-Efficiency Nitrogen Sources

1. Synthetic organic compounds containing N
 - urea-formaldehydes, IBDU, triazones, etc.
2. Physical coating or barrier around soluble N fertilizer
 - Sulfur-coated or polymer-coated urea.
3. Stabilized materials
 - urease and nitrification inhibitors



Right Rate



Scientific Principle:

- Assess soil nutrient supply and plant demand for N.

Practices:

- Soil test
- Balance crop removal
- Determine crop yield potential
- Assess price ratios



BETTER CROPS
WITH PLANT FOOD

A Publication of the International Plant Nutrition Institute (IPNI)

2010 Number 3

In This Issue...

- Precision Agriculture: Does It Make Sense?
- Temporal Variability of Crop Response to Fertilizer
- GIS-Based Soil Fertility Mapping Use in India

Also:

- Precision Topics from Argentina, Australia, Brazil, China, India, Russia, USA...
- ...and much more

Focus Issue:
Spatial Variability



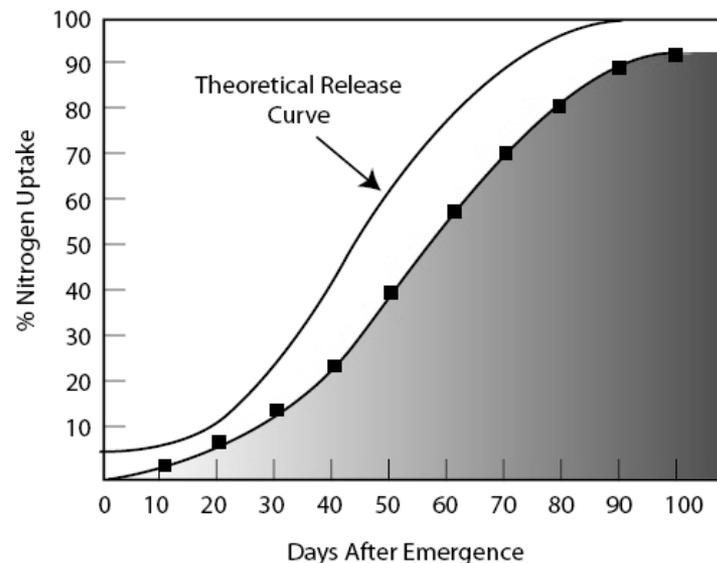
Right Time

Scientific Principle:

- Assess timing of crop uptake, soil nutrient supply, weather, loss risks and field operation logistics.

Practices:

- Split-application for sandy soils
- Cover crops to capture nutrients
- Suit tillage and planting operations





Right Place

Scientific Principle:

- Place nutrients where they are accessible to the crop.

Practices:

- Site-specific sensing technologies
- Starter placement near seedlings



In This Issue...

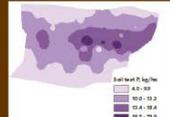
Precision Agriculture: Does It Make Sense?



Temporal Variability of Crop Response to Fertilizer



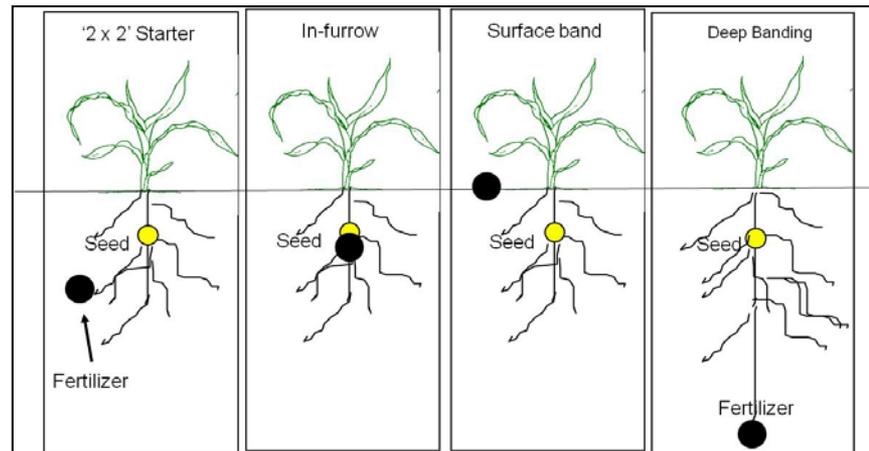
GIS-Based Soil Fertility Mapping Use in India



Also:

Precision Topics from Argentina, Australia, Brazil, China, India, Russia, USA...

...and much more





3. 4R adoption by agri-service providers





4R CONSISTENT SYSTEMS

These systems are consistent with the 4Rs and can help you create a comprehensive 4R nutrient stewardship plan. [Learn more](#) about what it means for a nutrient management system to be 4R-Consistent.

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IMPLEMENT THE 4RS

4R Nutrient Stewardship represents an innovative approach to fertilizer best management practices (BMPs). The 4Rs imply there are four aspects to every fertilizer application and it provides a framework to assess whether a given crop has access to the necessary nutrients. Asking "Was the crop given the right source at the right rate, at the right time, and in the right place?" helps identify opportunities to improve fertilizer efficiency and prevent nutrient movement from each field.

To learn more, please download our brochure:  [Implementing 4R Nutrient Stewardship on the Farm Right Now](#)

This is an example of an unpublished revision.



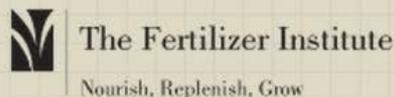
RIGHT SOURCE

RIGHT RATE

RIGHT TIME

RIGHT PLACE

PARTNERS WITH THE PRODUCTS AND SERVICES YOU NEED TO FOLLOW THIS PART OF YOUR 4R PLAN





“4R Inside” Checklist

1. **Balance economic, social, environmental areas.**
2. **Include BMPs addressing SRTP.**
3. **Provide site-specific recommendations.**
4. **Balance essential elements.**
5. **Assess nutrient requirements.**
6. **Consider all sources.**
7. **Comply with regulations.**
8. **Measure effectiveness of BMPs.**
9. **Use terminology consistent with 4R standards.**
10. **Document plans and implementation.**

4R Advocate Winners 2012

FertilizerInstitute

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1 video ▾

2012 4R Advocate Winners



Crop Production

Understanding **NERP** and what it can mean to you

Nitrous oxide Emission Reduction Protocol



CANADIAN FERTILIZER INSTITUTE
INSTITUT CANADIEN DES ENGRAIS

Benefits

Farmers

- Offset credit for reduced GHGs

Industry

- Source of credits

Government

- Tool to meet emission reduction targets
- ISO 14064-2 criteria for “real, measurable, additional, verifiable”
- Approved October 2010 by Alberta Environment

Researchers

- Advance science relating farm practices to N₂O emissions



4. Reporting 4R Performance





A Nutrient Use Geographic Information System (NuGIS)

for the U.S.

A PUBLICATION OF THE



IPNI

INTERNATIONAL
PLANT NUTRITION
INSTITUTE



Cropland Nitrogen Balance, USA

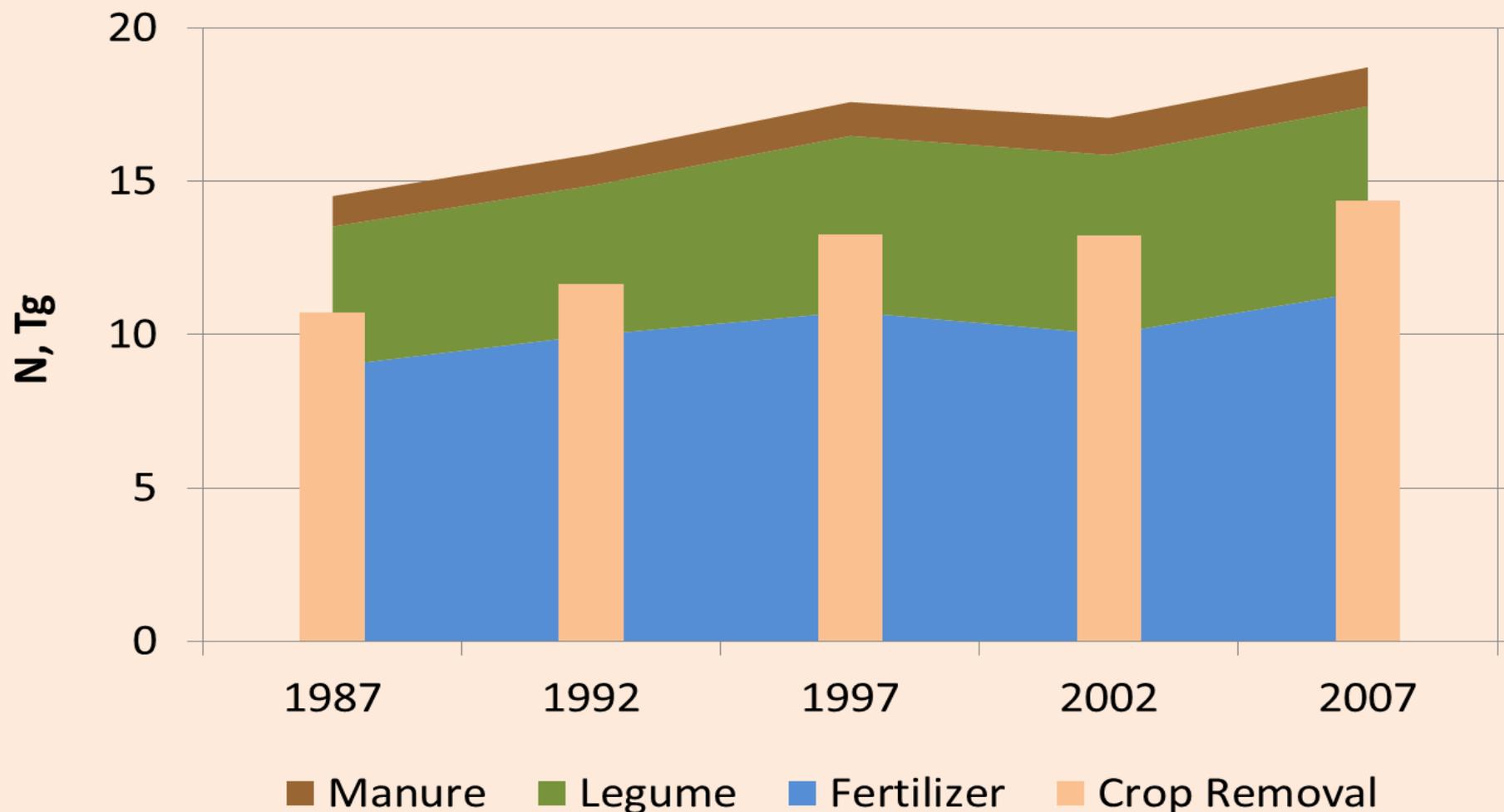
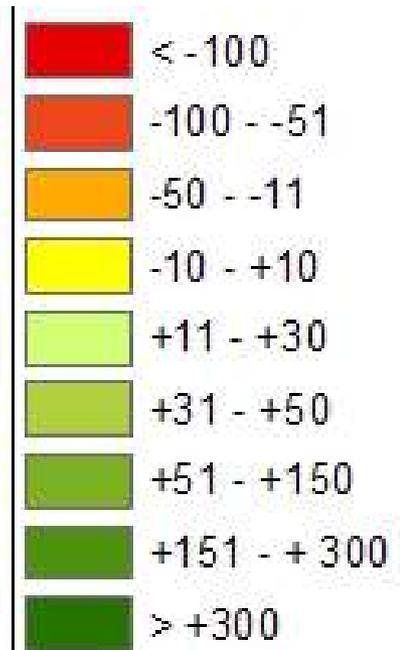
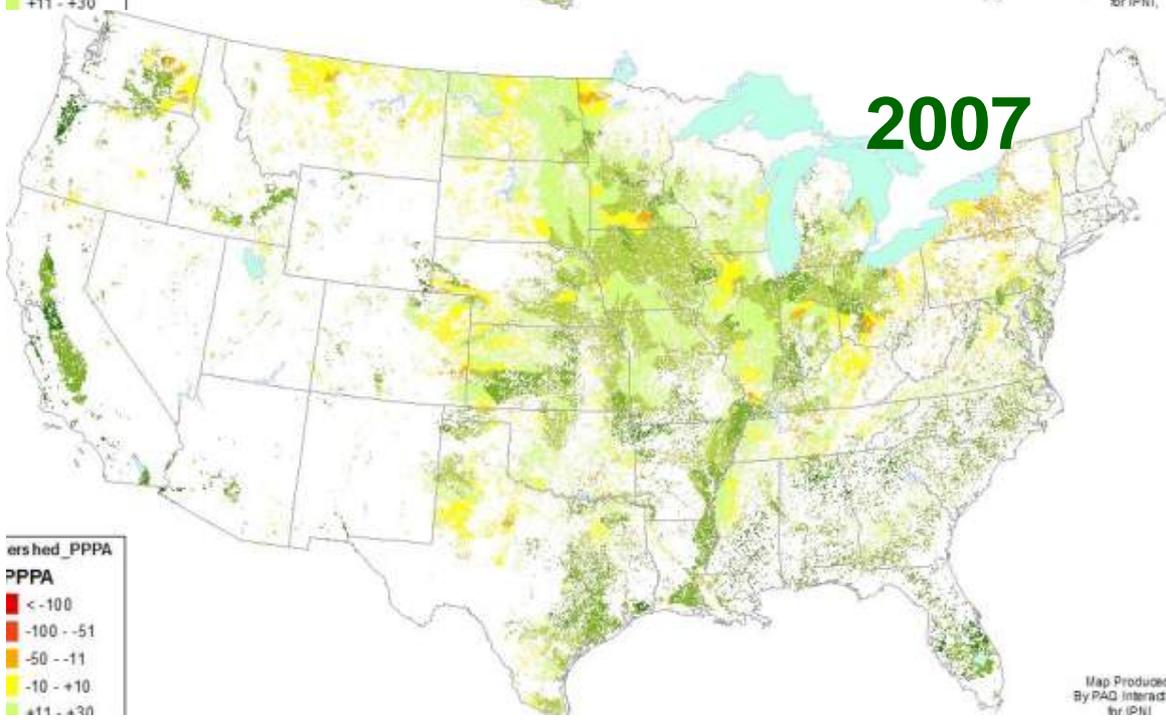
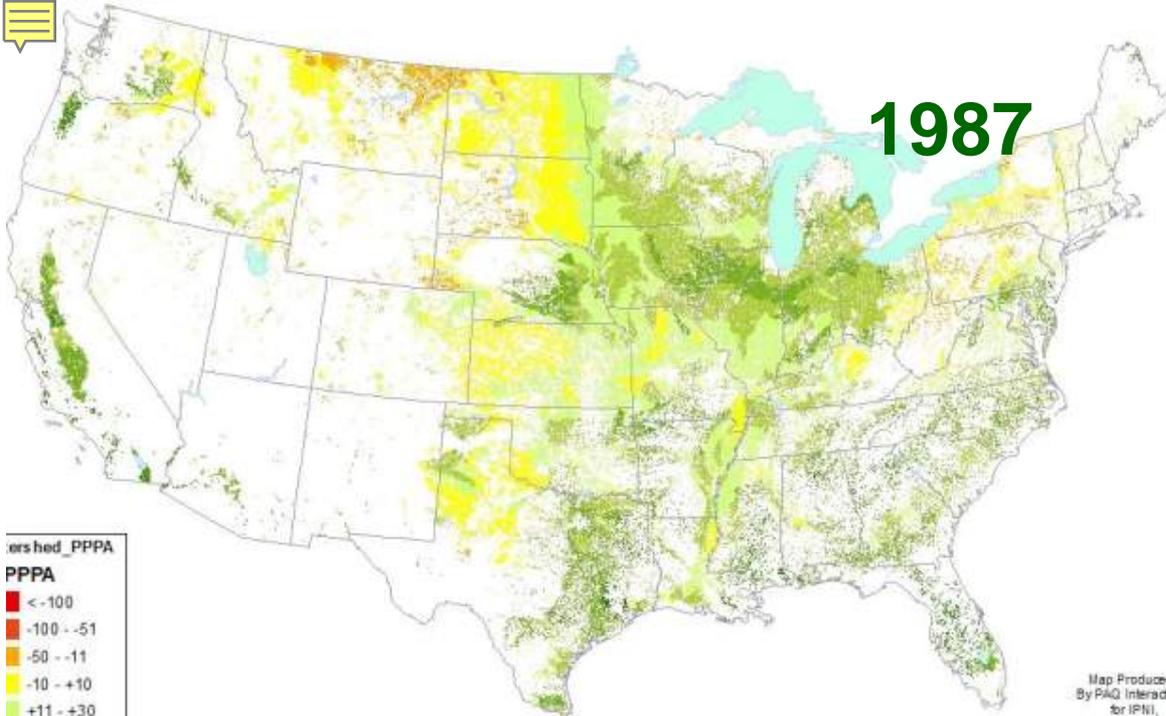


Figure 4.1: Inputs of N to US agricultural land, including recoverable manure, legume fixation, and commercial fertilizers, as compared to removal by crops (adapted from IPNI NuGIS, 2011). [In Robertson et al., 2012, Biogeochemistry, in press]

Partial N balance by 8-digit hydrologic unit

Ib N/planted acre

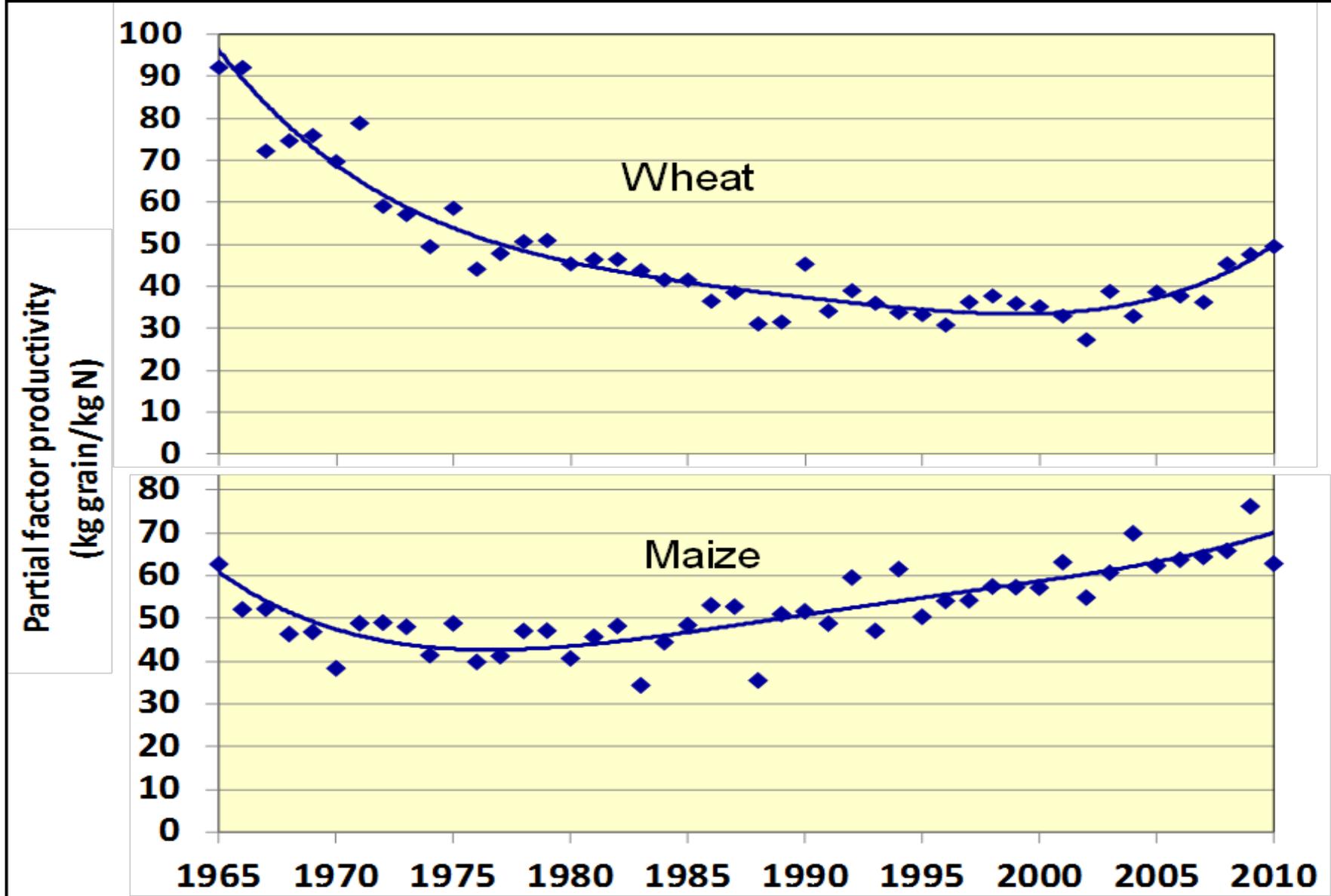




U.S. Partial N Balances (NuGIS 2011)

	1987	1992	1997	2002	2007
	kg N ha ⁻¹				
Per harvested cropland	36	38	37	33	36

- U.S. N balances are considerably lower than those similarly estimated for 2002-2004 in:
- **Netherlands 229**, **Germany 113**, **EU-15 83**, **OECD 74**, **France 54**, and the **United Kingdom 43**, and similar to the N balance for **Canada 35** kg N ha⁻¹ (OECD 2008)



Partial factor productivity in the U.S. for fertilizer N used on maize and wheat from 1965 to 2010 (Adapted from USDA-ERS and USDA-NASS, 2011).

[From Fixen et al., 2012, article in preparation]



5. 4R research

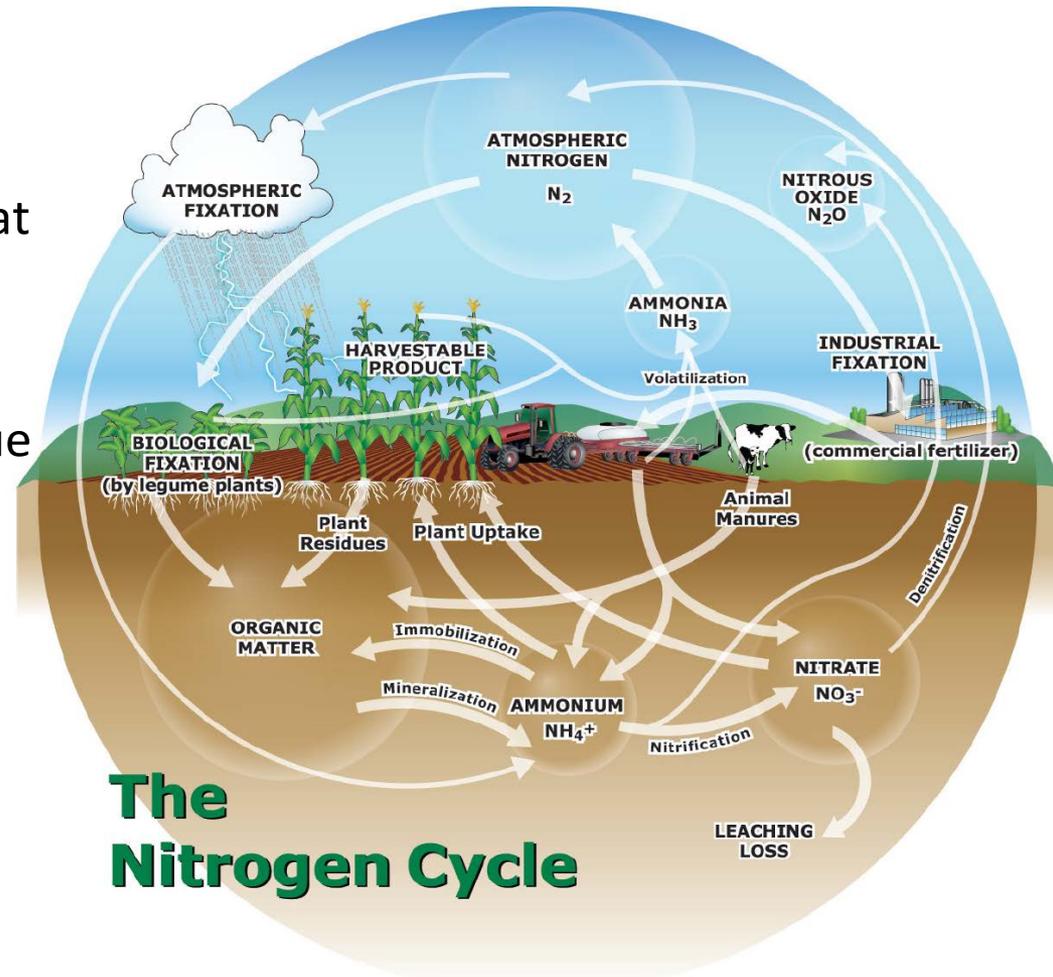


4R Applied Research Needs for N – North America

...validation of efficacy of specific application practices (SRTP)

...environmental impact per unit of economic and social value

1. Adapting N management to weather
2. Ammonia emissions from wheat
3. Integrated management for ecological intensification
4. Nitrate leaching from high-value fruit, vegetable and tree crops
5. Nitrate leaching from wheat
6. Nitrate leaching index
7. Nitrous oxide emissions
8. Practice indicators
9. Research infrastructure
10. Sensor-based variable-rate N



Summary – Nitrogen Technologies

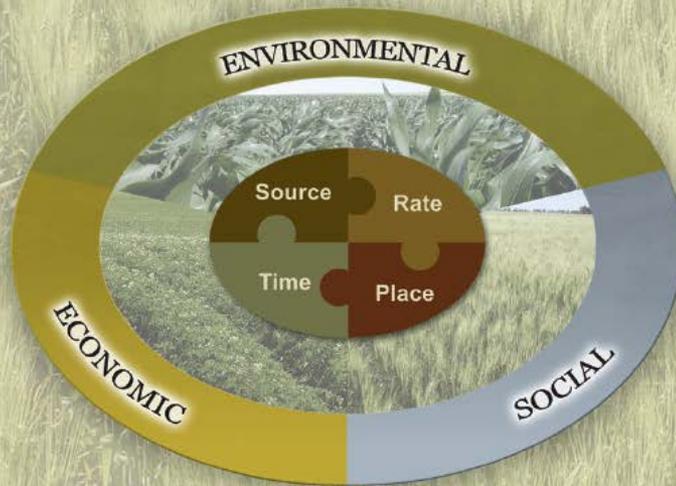
1. 4R connects science to sustainable management of plant nutrition.
2. 4R technologies and practices are available.
3. Agri-service providers are making improvements through voluntary measures by adopting 4R.
4. Reporting 4R performance requires collaboration among producers, agri-service providers, and government.
5. 4R research needs to focus on validating sustainability performance of specific 4R practices



4R PLANT NUTRITION

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ipni.net/4R