



Livestock and Poultry Environmental Learning Center
Educational Webcast Series
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The 4Rs of Nutrient Stewardship

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



Outline

1. Sustainability
2. The 4R Nutrient Stewardship concept
3. Using the 4Rs to reduce runoff losses of dissolved P in Ohio



Brundtland's report

- *Our Common Future* (1987) addressed concerns "about the accelerating deterioration of the **human environment and natural resources** and the consequences of that deterioration for **economic and social development.**"
- This report provided the basis for sustainable agriculture.

Source: Advisory Panel on Food Security, Agriculture, Forestry, and Environment World Commission on Environment and Development. 1987.

4R PLANT NUTRITION

4R nutrient stewardship

Sustainability Initiatives Abound in 2012

PEPSICO

Field To Market: The Keystone Alliance for Sustainable Agriculture

Fieldprint Calculator

THE SUSTAINABILITY CONSORTIUM

Walmart and The Sustainability Consortium Announce Global Sourcing Goals in Beijing

4R PLANT NUTRITION

4R PLANT NUTRITION

A Manual for Improving the Management of Plant Nutrition

ENVIRONMENTAL

ECONOMIC

SOCIAL

IPNI

4R nutrient stewardship

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

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Sustainable Agriculture

Definition: Accommodating the growing demand for production without compromising the natural **resources** upon which agriculture depends.

The concept of sustainability is multi-dimensional. It applies to


- **Social**
- **Economic**
- **Environmental**

dimensions simultaneously.





The 4R Nutrient Stewardship Concept

4R Plant Nutrition Manual
Chapter 2



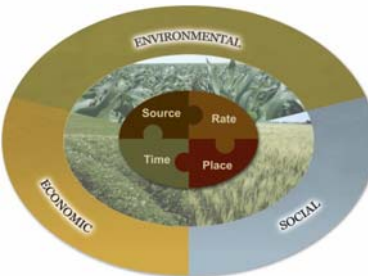
Source, rate, time, and place describe any nutrient application



Right means Sustainable

- Right source, rate, time, and place
- Outcomes valued by stakeholders



Stakeholders have a say on performance indicators



- Stakeholders define goals
- Indicators relate to goals
- Producers choose practices


 



Producers choose practices


- Practices selected to suit local site-specific soil, weather, and crop conditions
- Conditions may change even on the day of application
- Local decisions preferred





Equal attention to all 4Rs

- Balance attention to all 4Rs
- Rate: easily overemphasized
- Source, time, place: often require major changes and investments





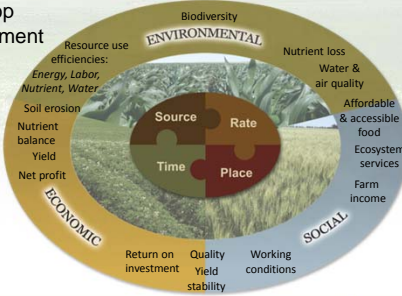
The 4Rs Interconnect

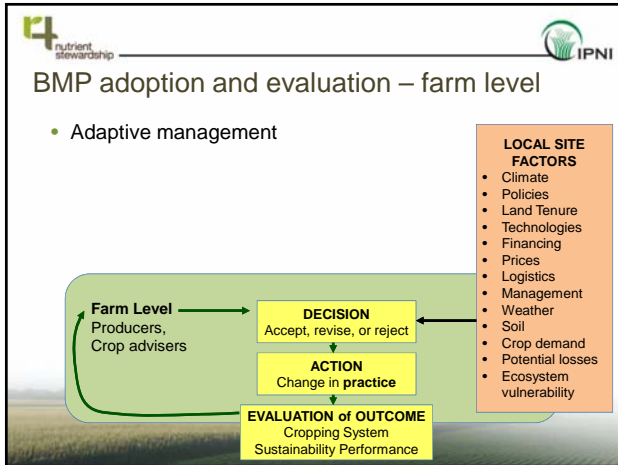
- with each other
- with local soil and climate factors
- with management of soils and crops
- other factors can limit productivity even when levels of plant nutrients are adequate

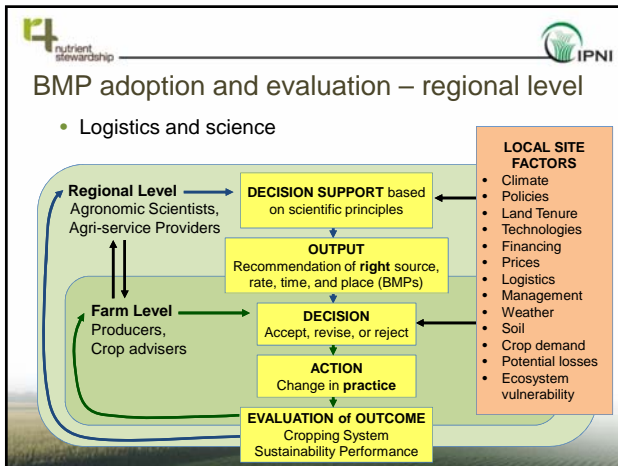


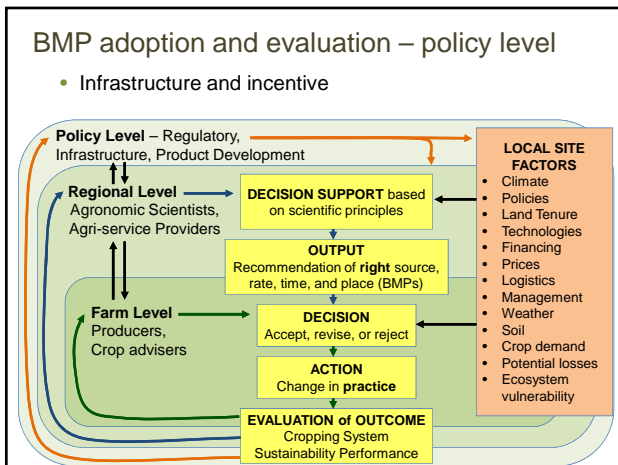
The 4Rs influence many performance indicators

- social, economic and environmental performance
- influenced by crop and soil management as well
- whole system outcomes

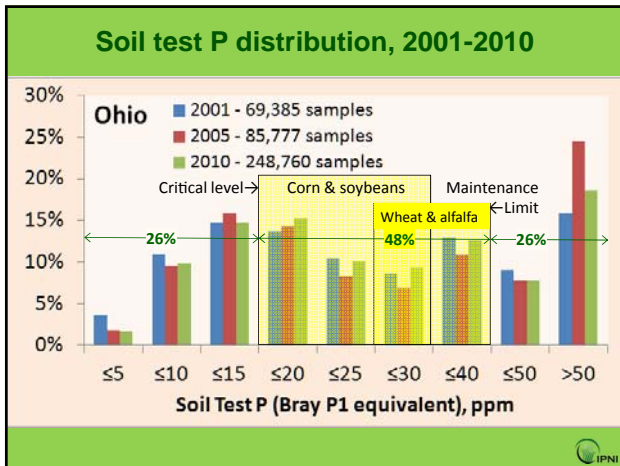


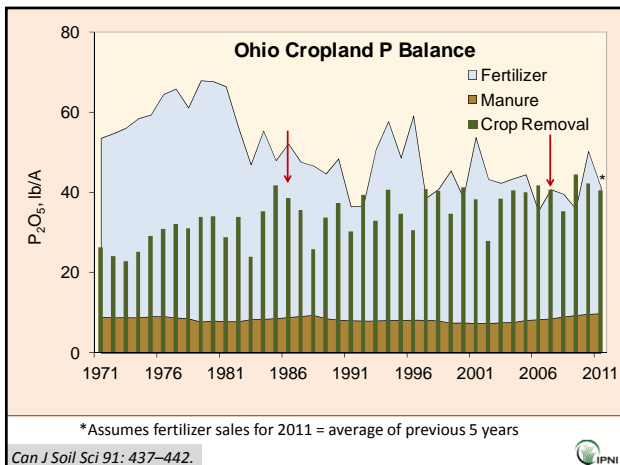


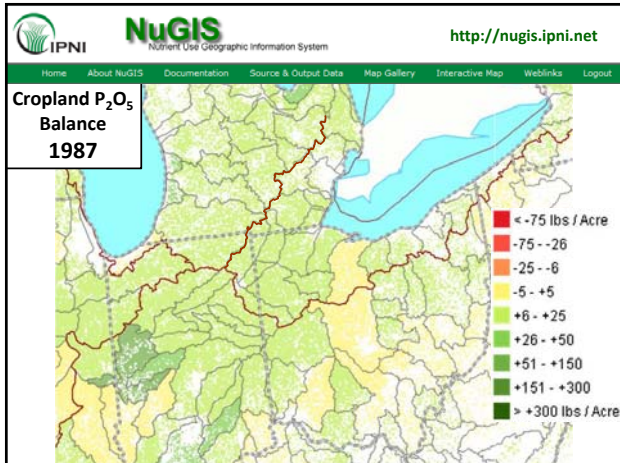


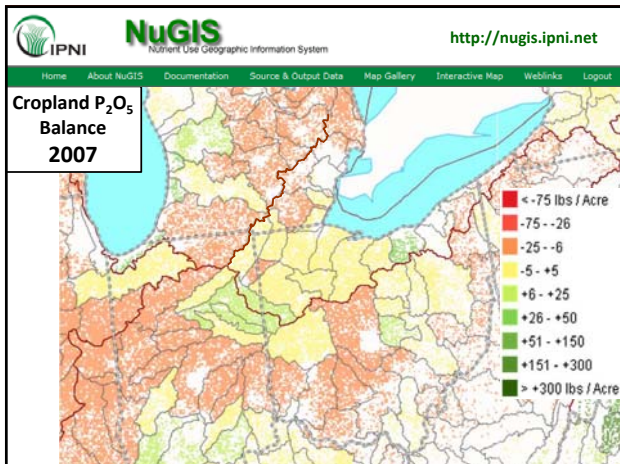












Applying 4R principles to P loss...




- The greatest volume of runoff (from surface or tile) likely comes from the flat, heavy clay soils of NW Ohio.
- These are the soils with the fewest workable days, and thus where timeliness of planting is the most challenging.
- They are also the soils most likely to receive fall broadcast P. Weather may prevent incorporation until spring.
- We need to think about viable **source-rate-time-place alternatives** for this situation, in combination with **conservation tillage** systems and **soil stewardship** that increases water infiltration, soil water holding capacity, thereby minimizing runoff.




Practice	Advantages	Limitations
S – MAP or DAP R – rotation removal T – fall P – broadcast	<ul style="list-style-type: none"> Minimal soil compaction Allows timely planting in spring Lowest-cost fertilizer form Low cost of application 	<ul style="list-style-type: none"> Risk of elevated P in runoff in late fall and winter Long time to react with soil: may reduce availability to crop Low N use efficiency
S – MAP or DAP R – rotation removal T – spring P – broadcast	<ul style="list-style-type: none"> Minimal soil compaction Better N use efficiency Lowest-cost fertilizer form Low cost of application 	<ul style="list-style-type: none"> Risk of elevated P in spring runoff before incorporation Potential to delay planting Retailer spring delivery capacity
S – MAP or 10-34-0 R – crop removal T – in planter P – 2" x 2" band	<ul style="list-style-type: none"> Best N use efficiency Low risk of elevated P in runoff Less soil P stratification 	<ul style="list-style-type: none"> Cost and practicality of planting equipment with fertilizer Potential to delay planting Retailer delivery capacity Cost of fluid versus granular P
S – MAP or DAP R – rotation removal T – fall P – banded strip-till	<ul style="list-style-type: none"> Low risk of elevated P in runoff Better N use efficiency Maintain good residue cover Allows timely planting in spring Less soil P stratification 	<ul style="list-style-type: none"> Cost of RTK GPS guidance Cost of new equipment Requires more time than broadcast

Summary

- IPNI's 4R Plant Nutrition Manual describes and provides examples of sustainable nutrient stewardship
- 4R Nutrient Stewardship engages stakeholders to shape sustainability goals, allowing producers to choose practices.
- To reduce losses of dissolved P from cropping systems, the key focus needs to be on "right place" for fields with greatest propensity to generate surface runoff.

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