Global Applications of 4R Nutrient Stewardship

Saskatchewan Soils and Crops Workshop

July 14, 2018

4R Nutrient Stewardship

nutrient stewardship

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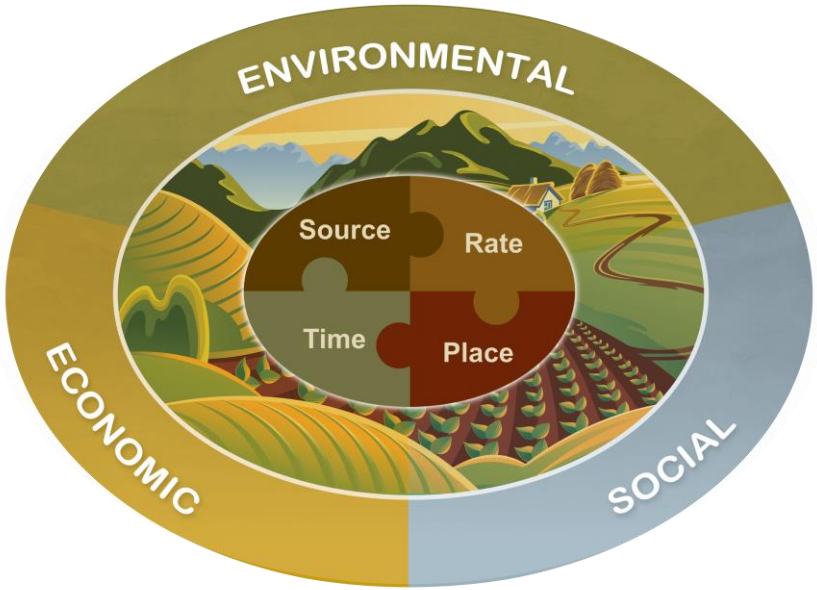

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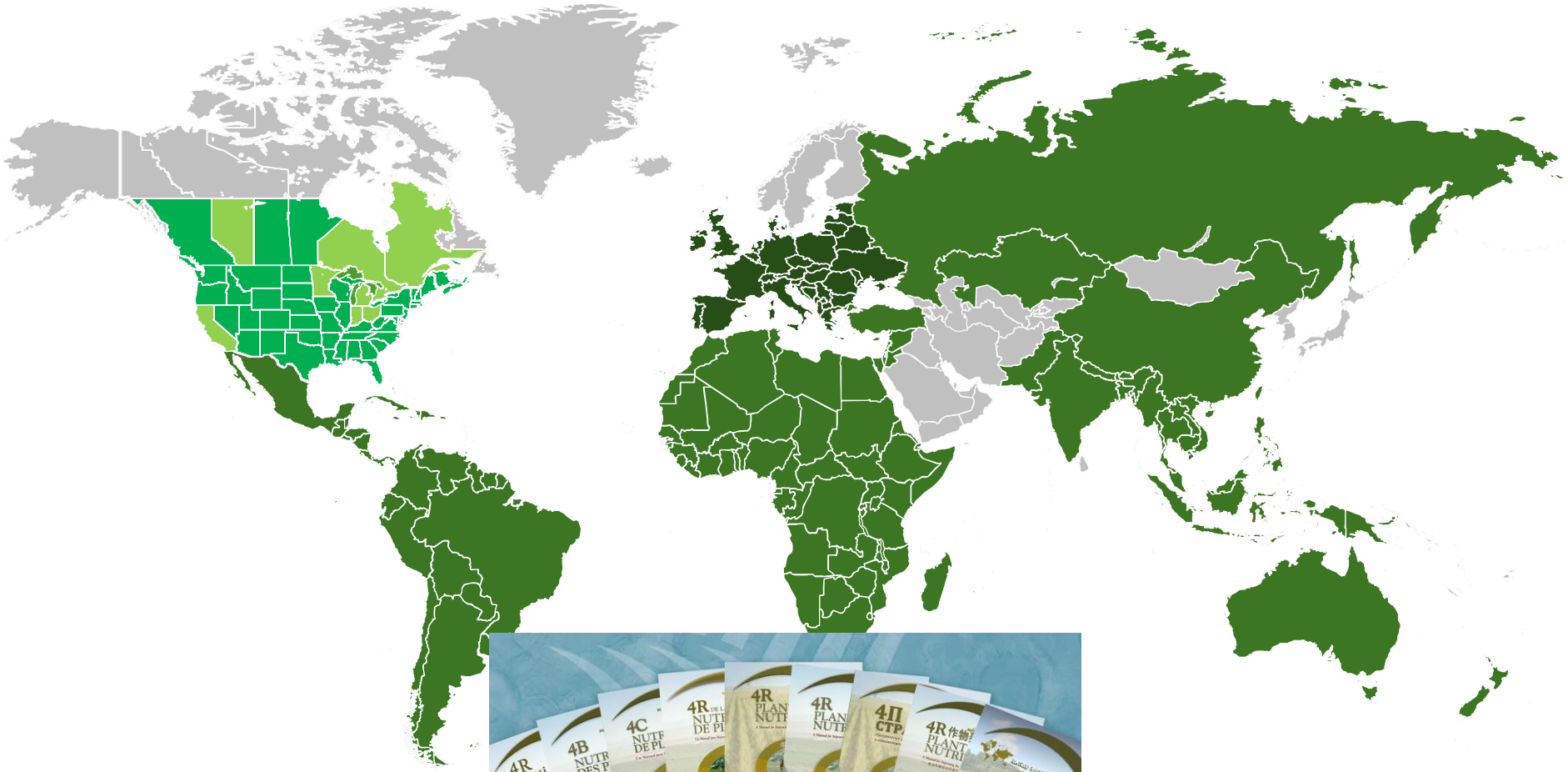
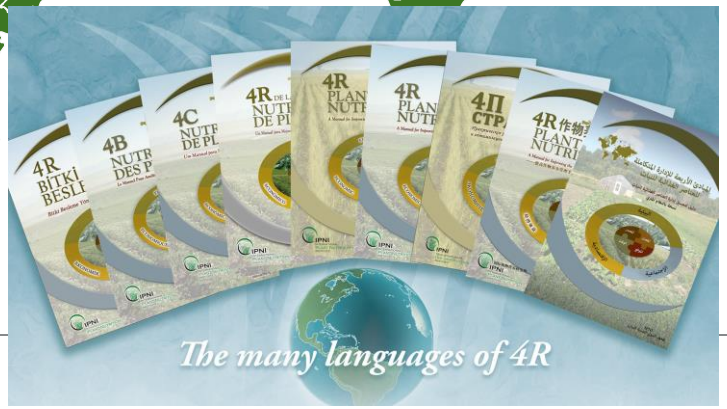
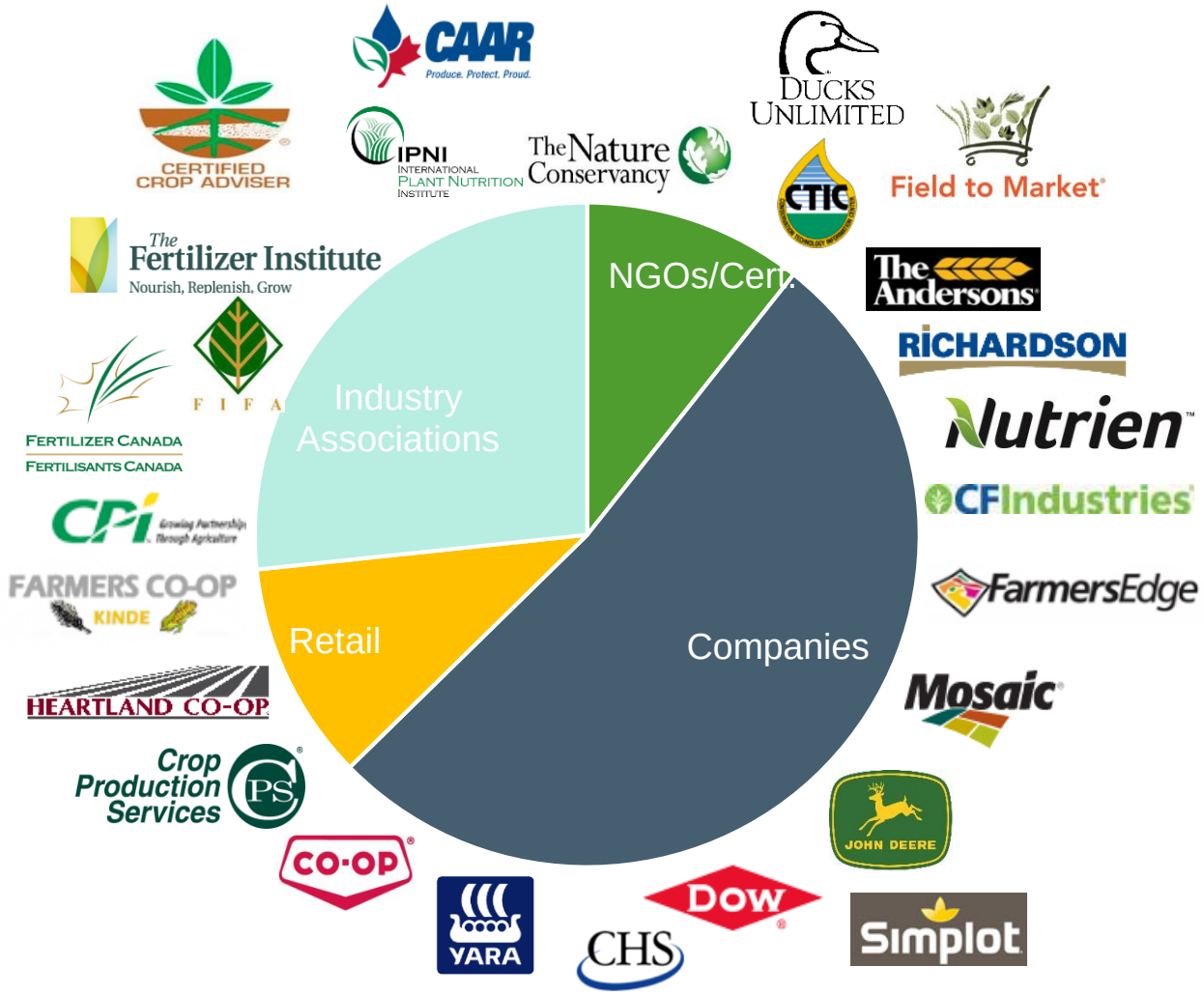
Global 4R Programs





4R is a Shared Value Partnership Model

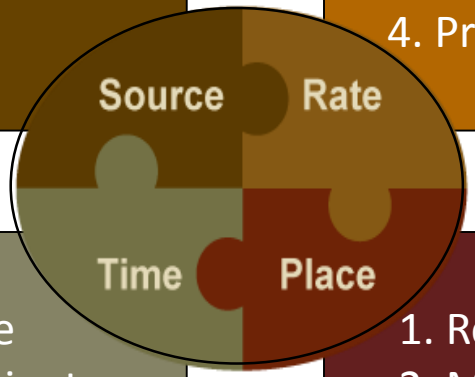
- ☑ **Increases Credibility**
- ☑ **Builds Consensus**
- ☑ **Increases Reach**
- ☑ **More Saleable to Policy Makers**
- ☑ **Lowers Cost**



4R Principles Are Universal

1. Supply in plant available forms
2. Suit soil properties
3. Recognize synergisms among elements
4. Blend compatibility

1. Appropriately assess soil nutrient supply
2. Assess all available indigenous nutrient sources
3. Assess plant demand
4. Predict fertilizer use efficiency



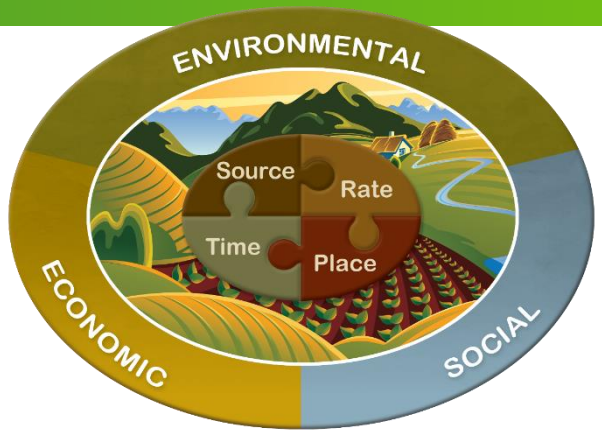
1. Assess timing of crop uptake
2. Assess dynamics of soil nutrient supply
3. Recognize timing of weather factors
4. Evaluate logistics of operations

1. Recognize root-soil dynamics
2. Manage spatial variability
3. Fit needs of tillage system
4. Limit potential off-field transport

Indicators of Sustainable Crop Nutrition

Enablers (process)

- Extension & professionals
- Infrastructure
- Research & innovation
- Stakeholder engagement



Actions (adoption)

- **Cropland area under 4R [Requires regional definition of 4R]**

Outcomes (impact on ecological services)

1. **Farmland productivity**
2. **Soil health**
3. **Nutrient use efficiency**
4. **Water quality**
5. **Air quality**
6. **Greenhouse gases**
7. **Food & nutrition security**
8. **Biodiversity**
9. **Macroeconomic value**

Evidence that farmers are making sound crop management decisions.

Key Farm Outcomes

Productivity, Soil Health, Nutrient Use Efficiency and Effectiveness

4R Advocates

Becks Lead Citrus Industry and Communities

Growers: Glenn and Mark Beck, Beck Brothers Citrus, Inc. Windermere, FL Crop Advisor: Rob Watson, Griffin Fertilizer Company, Frostproof, FL

READ THEIR STORY

Sixth Generation Builds on Family Success

Grower: Maria Cox, Cox Land and Cattle, Inc., White Hall, IL Crop Advisor: Kyle Lake, CHS Carrollton, Carrollton, IL

READ THEIR STORY

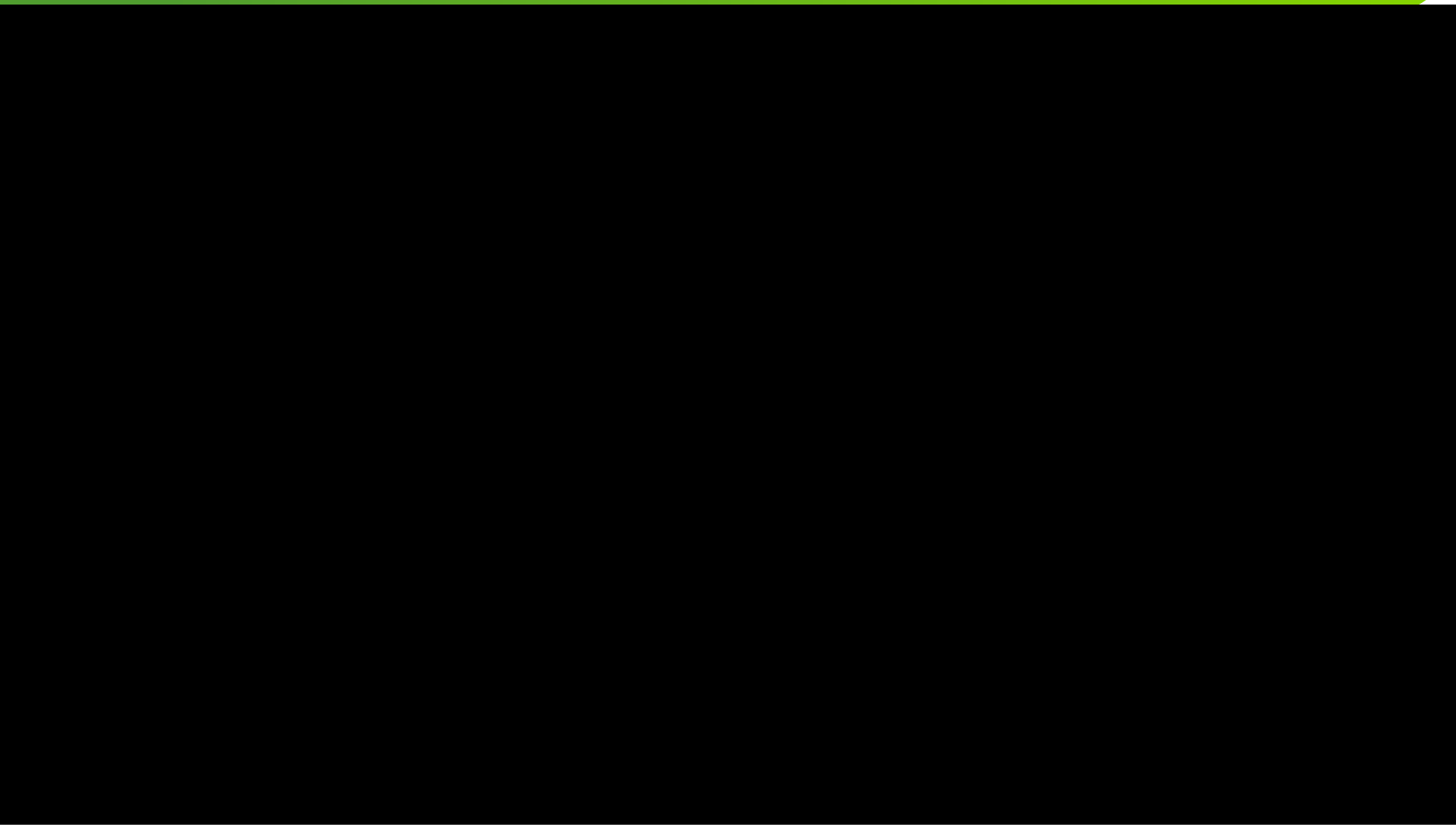
Sustainability, Longevity Drive Decisions at Dunlop Farms

Growers: Chuck and Darin Dunlop, Dunlop Farms, Inc., Parker, KS Crop Advisor: Jason Sutterby, Ag Choice/MFA Inc., Moran, KS

Rice and Crawfish Production Match Perfectly with 4Rs

Growers: Jeff, C.J. and Greg, Durand, St. Martin, LA Crop Advisor: Earl Garber Sanders, Pinnacle Agriculture, St. Martin, LA

4R Advocate



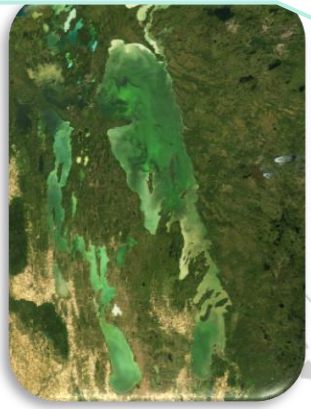
4R for Improved Water Quality

GLOBAL APPLICATIONS OF 4R NUTRIENT STEWARDSHIP

July 14, 2018

Water Quality Challenges

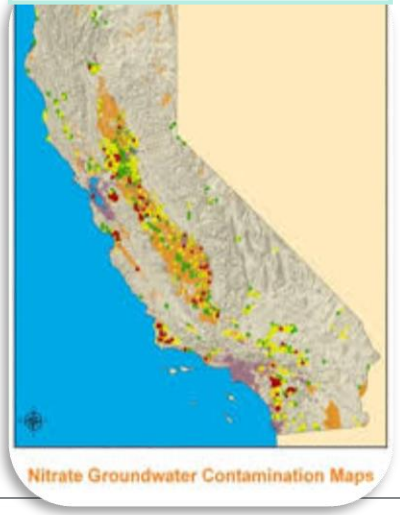
Lake Winnipeg (P, N)



PEI (N)

Lake Erie (P, N)

Ground Water (N)



Hypoxia in the Gulf (N, P)

Chesapeake Bay (P, N)

Western Lake Erie Basin (WLEB)

Characterized by shallow water

Nutrients from sediments, agriculture, manure, wastewater plants, storm water, open dumping, septic systmess and lawn fertilizer

Toledo water crisis
August, 2014

4R Certification Program – IN, MI, OH

Voluntary 4R Certification, 2012
Multi-stakeholder input

Goals:
Maximize crop nutrient uptake and minimize crop loss.
Positively impact local water bodies.

Requirements:
Training and on-going education.
Monitor 4R implementation, recommendations and application

3rd Party Verification every year

38% of WLEB farmland in May 2017

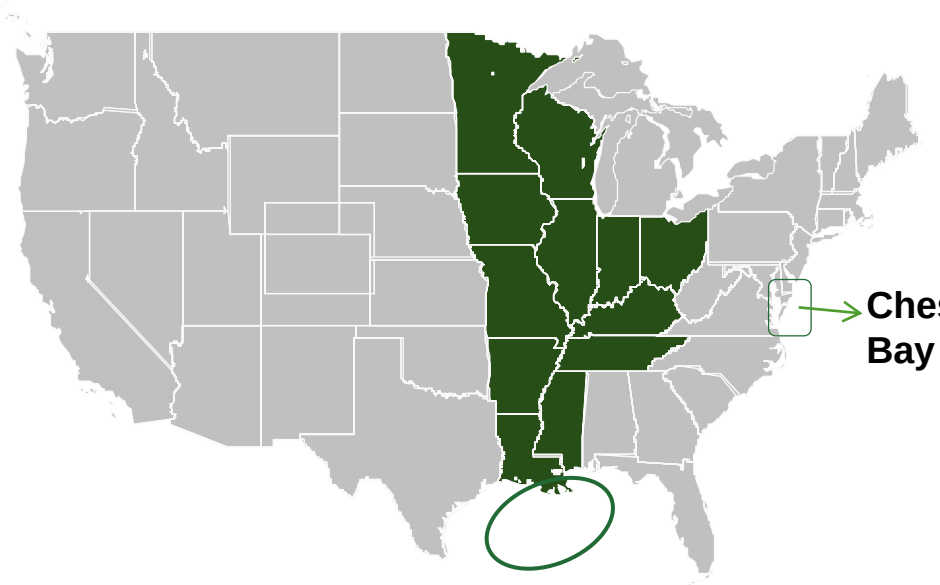
Ontario 4R

4R to Reduce Nutrients in Water

Gulf Hypoxia

12 Mississippi River Basin States

- Nutrient Loss Reduction Strategies
- 45% N & P Reduction Target
- Voluntary Implementation of BMP's



Gulf Hypoxia

States with EPA Mandated Nutrient Reduction Strategies:

Minnesota	Wisconsin
Iowa	Illinois
Indiana	Ohio
Missouri	Kentucky
Tennesee	Arkansas
Louisiana	

4R Alliance Programs

- Chesapeake Bay
- Delmarva - Delaware, Maryland, Virginia
- Pennsylvania

Iowa and Illinois Nutrient Loss Reduction Strategies

Illinois Nutrient Research and Education Council
Fertilizer levy to fund 4R research
$9.8 Million invested since 2012
Multi stakeholder council

Illinois Fertilizer and Chemical Association
4R Code of Practice

Iowa 4R Plus
Partnership with The Nature Conservancy
CF and ag industry support

Key Influencers with Global Reach

4R Based Carbon Programs

- Alberta NERP
- Ontario, Quebec, California
- Intergovernmental Panel on Climate Change IPCC
  - Tier II methods
- WBCSD Climate Smart Ag

Moving toward a convergence:

- Regulatory
- Voluntary markets
- Supply chain initiatives and
- GHG inventory accounting

Supply Chain Sustainability and 4R

Field to Market

Canadian Field Print Initiative

World Business Council for Sustainable Development

UN Fertilizer Management Code of Conduct

UN Sustainable Development Goals

Key Influencers- Defining, Measuring and Advancing Sustainable Agriculture

Invited Scientists Participated in IPNI-TFI-CFI Nitrogen (N) Management Workshop

N Agronomists

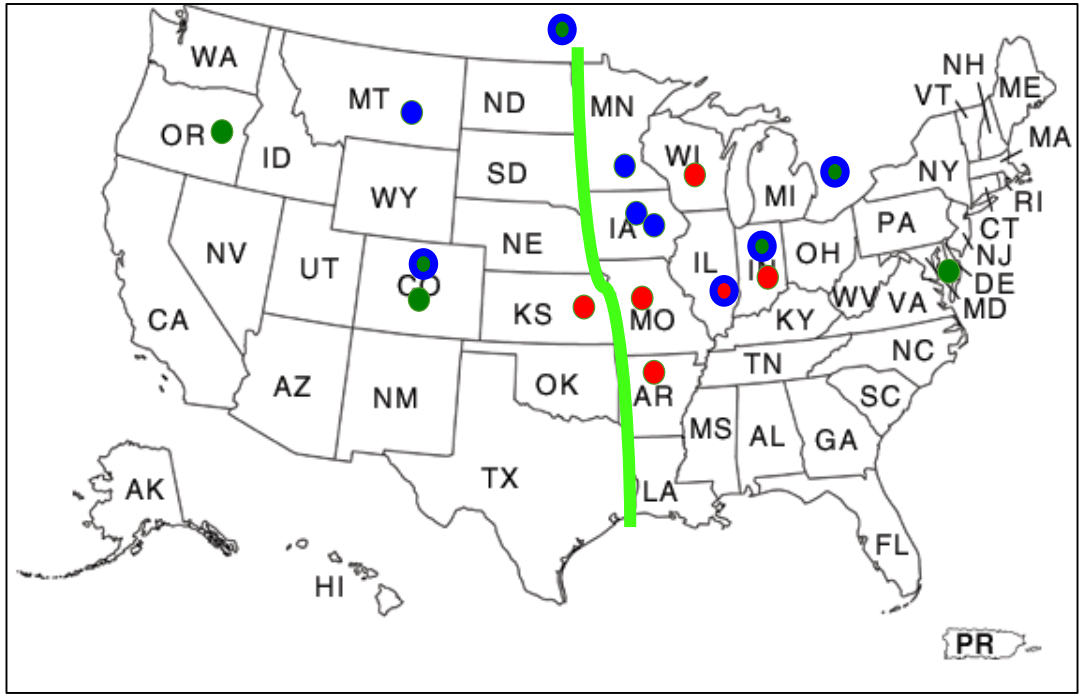
- Peter Scharf – U of MO
- Dave Franzen – ND State U
- Jim Camberato – Purdue U
- Dave Mengel – KS State U
- Carrie Laboski– U of WI
- Cameron Pittelkow – U of IL
- Trent Roberts – U of AR

N_2O Scientists

- Rick Engel – Montana State U.
- Rod Venterea – MN, USDA-ARS
- Tony Vyn- Purdue U
- Jerry Hatfield – IA, USDA-ARS
- Tim Parkin – IA, USDA ARS
- Keith Paustian/ Steve Ogle – CO State U.
- Steve Del Grosso – CO, USDA ARS
- Adam Chambers – OR, USDA NRCS
- Marlen Eve – DC, USDA Ofc. Chief Econ.

Canadian Scientists

- Claudia Wagner-Riddle - U of Guelph
- Mario Tenuta, U of MB
- David Burton, Dalhousie U (formerly Nova Scotia Ag. College



Scientific Advisory Group member

INTERNATIONAL PLANT NUTRITION INSTITUTE

ISSUE REVIEW Ref #17023

4R Phosphorus Management Practices for Major Commodity Crops of North America

INTERNATIONAL PLANT NUTRITION INSTITUTE

ISSUE REVIEW SEPTEMBER 2016 No.1

Suites of 4R Nitrogen Management Practices for Sustainable Crop Production and Environmental Protection

By C.S. Snyder, International Plant Nutrition Institute

Impacts of crop production nitrogen (N) inputs and losses to the environment *are a growing public concern. A U.S. national N management and nitrous oxide emission science workshop, aided by science input from Canada scientists, resulted in seven crop- and region-sensitive N management frameworks. Each framework has three tiers or suites of 4R N management practices to improve economic, social, and environmental outcomes. Intelligent implementation of improved 4R suites of N management practices can result in greater crop recovery of applied N, sustained and improved soil fertility and health, and cleaner water and air; while reducing emissions of nitrous oxide.*

Field to Market®

The Alliance for Sustainable Agriculture

4R practice tables – combinations of source, rate, time & place.

Step 1 – N_2O emissions
Step 2 – water quality

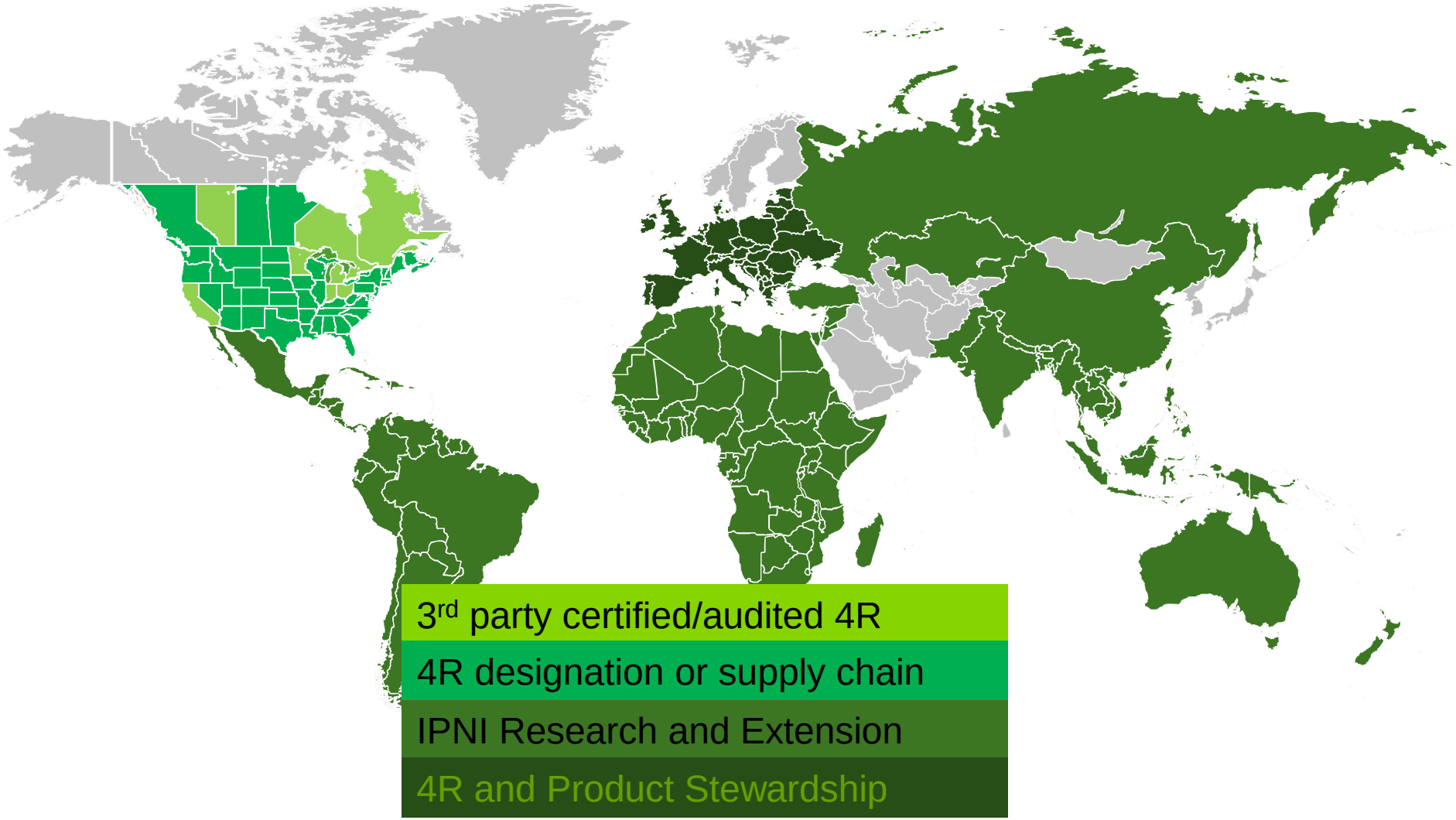
description not prescription

decision trees

Canada – protocols

verification

Global 4R Programs



Agriculture and the Sustainable Development Goals

4R Designation Canada

CCA 4R Specialty

4R Designation

Education:

- Verify competencies of 4R Agronomists
- P.Ag, (provincial qualifications as required) and CCA
- 5.5 CEU 4R Training Course
- Agronomist attestation confirming credentials

Planning:

- Grower and agri-retailer develop a 4R plan
- Consistent with the 4R Checklist or planning guide
- Sign off by accredited professional

Reporting

- Acres, Crop and Eco-district data filed confidentially to registry

Implementation, follow-up and review

- Adaptive management process