

DRAFT 4R Adaptive Nutrient Management

November-December-January, 2012

Sponsored by the Environmental Defense Fund and offered by the American Society of Agronomy

Class Schedule/Time

Orientation Thursday November 1, then Tuesday mornings as shown on the syllabus. 11:00 a.m. to 1:00 p.m. Eastern, 10:00 a.m. to 12:00 Noon Central, 9:00 to 11:00 a.m. Mountain, 8:00 to 10:00 a.m. Pacific.

Most class periods will last about two hours, with a ten-minute break halfway through. To maximize their learning, students will be expected to spend time reading and studying outside of class in addition to the scheduled class periods. The instructor may be contacted at any time via telephone or email with questions or comments.

Assessment A ten question quiz will be offered after each lesson, available for students to take on-line during their own time. Quizzes must be completed by Midnight Central Time on the last day specified for each quiz (see Syllabus/Schedule). Individual performance on weekly quizzes will be provided confidentially to students via email to give an indication of mastery of various topics. **No make-up quizzes will be offered.** There will not be a final exam for this course, and grades will not be assigned. Students who accumulate at least 52 of the 80 quiz points (65%) can request a certificate of completion for the course. Missed quizzes will count as zero.

Certified individuals seeking Continuing Education Units (CEUs) must get a passing score (at least 7 of 10) on a quiz to get credit for that particular session. The system allows you to take quizzes multiple times, but only your first score is counted. Total CEUs include eight in Nutrient Management and four each in Soil & Water Management and Crop Management.

Class Web Site Students registered for the class will have access to the class web site where the following will be posted:

- Lecture video recordings (audio with PowerPoint slides)
- PowerPoint slides in PDF format.
- Link to quizzes
- Answer keys to quizzes

Access to the class web site will begin by November 1 and end one month following the last class period, ending February 15, 2013.

Required Textbook

4R Plant Nutrition: A Manual for Improving the Management of Plant Nutrition (International Plant Nutrition Institute) (770) 447-0335

<http://www.ipni.net/ipniweb/portal.nsf/0/231EA9CAE05F5D24852579B200725EA2>

Optional Reference Materials

Nitrogen in Agricultural Systems, by J.S. Schepers and W.R. Raun, editors

Phosphorus: Agriculture and the Environment by J.T. Sims, A.N. Sharpley, G.M. Pierzynski, D.T. Westermann, M.L. Cabrera, J.M. Powell, T.C. Daniel, and P.J.A. Withers, ed. 2005.
(American Society of Agronomy)

Schedule/Syllabus (subject to change)

Dates	Topics (CEU'S)	Reading Assignments Prior to Class	Quiz
Thursday Nov 1	Orientation Using the Online Classroom, Introductions, Learning Objectives		
Tuesday Nov 6	Lesson 1. Basics of Plant Nutrition, Soil Chemistry, and Water Quality (1 SW, 1NM) Essential Plant Nutrients, Functions in Plant, Deficiency Symptoms, Cation Exchange, Soil pH, Soil Organic Matter, Root Anatomy, N Fixation, Water Movement and the Hydrologic Cycle, Measures of Soil Quality		TBD
Tuesday Nov 13	Lesson 2. The Nitrogen Cycle, Nitrogen Reactions in the Soil (1 SW, 1NM) The Processes of Mineralization, Nitrification, Immobilization, Volatilization, Denitrification, Leaching: When They Occur, What Influences, How to Manage	4R Manual Chapters 1 and 2 The Nitrogen and Phosphorus Cycle in Soils (AR): http://www.uaex.edu/Other_Areas/publications/PDF/FSA-2148.pdf Nitrogen Basics—The Nitrogen Cycle (Cornell): http://nmsp.cals.cornell.edu/publications/factsheets/factsheet2.pdf	
Tuesday Nov 20	Lesson 3. The Phosphorus Cycle, Phosphorus Reactions in the Soil, Other Nutrient Cycles and Reactions (1 SW, 1 NM) Forms of Phosphorus and their Interactions in the Soil, How Phosphorus Reacts in Different Soil Environments—Soil Texture, pH, Moisture Content, How Phosphorus and Other Nutrients Travel Off Site, Phosphorus' Role in Water Quality	Understanding Soil Tests for <i>Plant-Available</i> Phosphorus (Ohio State) http://ohioline.osu.edu/agf-fact/pdf/Soil_Tests.pdf	
Tuesday Dec 4	Lesson 4. Assessing Nutrients in the Soil and Plant (1 NM, 1 CM) Soil Sampling, Plant Tissue Analysis, Chlorophyll and Greenness Sensors, Remote Sensing, Managing Field Variability, Zones vs. Grids, Proximal Sensing	Using Crop Sensors to Improve Corn Nitrogen Management (Pioneer): http://www.pioneer.com/home/site/us/agronomy/library/template.CONTENT/guid.8AA5E524-D466-6643-809B-DA3586758BEA Methods of Phosphorus Analysis (USDA/SERA 17) http://www.sera17.ext.vt.edu/Documents/P_Methods2ndEdition2009.pdf	

Dates	Topics (CEU'S)	Reading Assignments Prior to Class	Quiz
Tuesday Dec 11	Lesson 5. Selecting the Right Source: Nutrient Sources and Fertilizers, Fertilizer Application (1 NM, 1 CM) Fertilizer Production, Analyses, Fertilizer Additives, Manure, Biosolids: When to Use and How to Manage Various Sources to Maximize Crop Productivity and Protect Water Quality	4R Manual Chapter 3 Fertilizer Use and Price (USDA) http://www.ers.usda.gov/Data/FertilizerUse/ Nitrogen Transformation Inhibitors and Controlled Release Urea (KY) http://www.ca.uky.edu/agc/pubs/agr/agr185/agr185.pdf Nitrogen Extenders and Additives for Field Crops (ND) http://www.ag.ndsu.edu/pubs/plantsci/soilfert/sf1581.pdf	
Tuesday Dec 18	Lesson 6. Selecting the Right Rate: Fertilizer Recommendations and Economics (1 NM, 1 CM) Fertilizer Calculations, Management Philosophies in Various Regions/Crops, Selecting a Rate that Balances Crop Needs with Environmental Concerns, Nutrient Management Planning	4R Manual Chapter 4 Corn Nitrogen Rate Calculator http://extension.agron.iastate.edu/soilfertility/nrate.aspx	
Tuesday Jan 8	Lesson 7. Selecting the Right Time and Place (1 NM, 1 SW): Variable Rate Technology, Application Methods: Foliar, Banding, Broadcast, Surface, Sidedress, Row. Case Study Examples Exemplifying Approaches that Support Crop Productivity and Water Quality	4R Manual Chapters 5 and 6 Using Crop Sensors to Improve Corn Nitrogen Management (Pioneer): http://www.pioneer.com/home/site/us/agronomy/library/template.CONTENT/guid.8AA5E524-D466-6643-809B-DA3586758BEA	
Tuesday Jan 15	Lesson 8. An Adaptive Management Approach to Crop Production (1 NM, 1 CM) Designing Field Trials, Working with Growers, Results Analysis and Statistics, Water Quality/Greenhouse Gas Emissions, Cover Crops	4R Manual Chapters 7, 8, and 9 Comprehensive Nutrient Management Planning: http://www.extension.org/pages/8959/comprehensive-nutrient-management-planning-cnmp Reactive Nitrogen in the United States: http://yosemite.epa.gov/sab%5Csabproduct.nsf/67057225CC780623852578F10059533D/\$File/EP-A-SAB-11-013-unsigned.pdf	

The PowerPoint presentations, class recordings, quizzes, worksheets, and other materials developed specifically for this class are for the educational purposes and use of students registered for this class. They are not to be copied, forwarded or shared in any way with anyone for any other use without the permission of the American Society of Agronomy.

Communication Requirements The course is delivered live via the Web using GoToMeeting software. An email address and high-speed internet access are required.

For PC-based Organizers and Attendees:

Windows® 7, Vista, XP or 2003 Server (Linux is not supported)

Internet Explorer® 7.0 or newer, or Mozilla® Firefox® 3.0 or newer (JavaScript™ and Java™ enabled) or Google Chrome™

Minimum of Pentium® class 1GHz CPU with 512 MB of RAM (2 GB of RAM for Windows Vista)

For Mac-based Organizers and Attendees:

Mac OS® X 10.4 (Tiger®), OS X 10.5 (Leopard®), OS X 10.6 (Snow Leopard®)

Safari™ 3.0 or newer, Firefox 2.0 or newer; (JavaScript and Java enabled)

PowerPC G4/G5 or Intel processor, 512 MB of RAM or better recommended

Course Description

The 4R Approach to Soil and Water Management combines the science of plant nutrition and soil fertility with a practical knowledge and application to successfully manage crop nutrients. Upon completion, the learner should have a solid grasp of the roles of macronutrients in crop production; how soils supply nitrogen, phosphorus, and other nutrients; nutrient transformations and movement in the soil and water; quantifying nutrient needs and availability; modifying crop nutrient amounts through the use of fertilizers and manures, supplying crop nutrients from the correct source, at the right rate, at the right time, and in the right place, and all of the differences that occur amongst soil situations, weather, and cropping systems. The goal of the course is to provide the base knowledge needed to increase crop production while reducing the environmental impact of crop production systems.

The course is taught using distance education technology, but a variety of practical examples and case situations will be woven into content delivery to maximize understanding and its application in the field.

Whether you are personally involved in production agriculture, advising farmers as an agricultural retailer or consultant, a representative for an agricultural business or government agency, or just looking to build your expertise, this course will cover topics that should be of direct interest to you.

Course Facilitator

Bruce Erickson is a Certified Professional Agronomist employed by the American Society of Agronomy as their Agronomic Education Manager, and is also Adjunct Assistant Professor of Agronomy at Purdue University. Erickson's areas of expertise include corn and soybean production, remote sensing and its application in precision agricultural practices, instructional design, and competency-based education and assessment. Erickson grew up on an Iowa farm, completed his undergraduate work at Iowa State University in Agronomy, then began his professional career as an agronomist with Pioneer Hi-Bred. After completing his Master's at Iowa State in Crop Production and Physiology and his PhD in Agronomy at Purdue, Erickson was on the staff of the Purdue Department of Agronomy where he taught the introductory agronomy course and played a leading role in developing and maintaining the performance objective documents and the minimum proficiency exams for the International Certified Crop Adviser Program (CCA). For three years Erickson served as Senior Technical Designer at Agri Business Group in Indianapolis (now Adayana), an agricultural consulting company. Most recently Erickson was Director of Cropping Systems Management and Associate Director of the Center for Commercial Agriculture, where he coordinated the Top Farmer Crop Workshop, and worked extensively with precision farming and crop production economics research and Extension.