

Curriculum Development and Training in Nitrogen Management

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Purpose of the Program

- Enhance economic and environmental benefits through improved management of agricultural use of nitrogen and irrigation water.



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Background

- CDFA Nitrogen Tracking and Reporting System Task Force
- Regional Water Quality Control Boards
 - Central Valley
 - Irrigated Lands Regulatory Program
 - East San Joaquin Water Quality Coalition
 - Central Coast
 - Others



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Certification

- CCAs completing the course will gain a certificate of completion from CDFA/FREP
 - Allows them to sign-off on nitrogen reporting requirements



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Partnerships

- UC Agriculture and Natural Resources
 - California Institute for Water Resources (Organizational Lead)
 - Water Quality, Quantity and Security Strategic Initiative (Programmatic Content)
 - Cooperative Extension Specialists and Advisors
 - Campus Faculty
- California Department of Food and Agriculture
 - Fertilizer Research and Education Program
- California Certified Crop Advisors
- California Association of Pest Control Advisors (as the CCA Training Coordinator)



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Progress

- Initial discussions between UC and CDFA began in October 2012
- Formed Steering Committee in November 2012
- Steering Committee has met 6 times
 - Outline Process, Curriculum and Curriculum Development Teams
 - Plan Workshops



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Steering Committee

UC ANR

Doug Parker

Patrick Brown

Allan Fulton

Tim Hartz

Dan Munk

Stuart Pettygrove

Larry Schwankl

CDFA

Asif Maan

Amrith Gunasekara

Doug West

Erika Lewis

CCA

Jerome Pier



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Initial Target Audience

- California Certified Crop Advisors (CCAs)
- Regional Trainings
 - 4 in Central Valley
 - 1 in Salinas Valley



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Program

- 1.5 -Day Program
 - Day 1: General Session
 - Day 2: Choose Session (some overlap)
 - Annual Crops
 - Permanent Crops
- Can get other crop either on-line or at alternative training session



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Curriculum Outline: Day 1: General Session

1) Objectives of the course:

- Economic and environmental benefits through improved management of agricultural use of nitrogen and irrigation water. Overview of what we know about nitrate impairment of surface water (coast only) and groundwater (all regions), and the relative contribution of ag to those impairments.
 - Lead/Liaison Jerome Pier (Crop Production Services)
- Region-specific discussion of local soil and hydrologic conditions as they relate to groundwater vulnerability and nitrate contamination. ILRP action to reduce nitrate loading to groundwater; the proposed / enacted requirements for nitrogen (N) management plans, and Certified Crop Advisor (CCA) signoff requirements.
 - Refer to Coalition for recommendation (region-specific discussion)



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Curriculum Outline: Day 1: General Session

2) Nitrogen Cycle in Crop Production Systems

- Quantify the relative scale of N loss through denitrification / volatilization / leaching, and the factors that contribute to N losses from soils. Discuss the dynamics of soil N mineralization, and how it should factor into N management. Representative permanent crop and annual crop systems will be contrasted to point out how patterns of crop N uptake, fertilizer application, and water flux (irrigation and rain) govern potential N loss to the environment. In-depth discussion of nitrogen cycles in crop production systems.

- Lead/Liaison Patrick Brown (UCD)



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Curriculum Outline: Day 1: General Session

3) Nitrogen Sources

- Mineral fertilizer N forms (including slow release fertilizers), soil reactions, mobility; environmental (temperature/moisture) effects on those transformations. Contribution of irrigation source nitrogen. Characteristics of manures, composts, cover crops and other plant residues, and their N mineralization potential.
 - Lead/Liaison Tim Hartz (UCCE/UCD)



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Curriculum Outline: Day 1: General Session

4) Irrigation and Nitrogen Management

- Connection of irrigation to N management. Discuss irrigation scheduling and irrigation system design and operation, identifying the practical limit of irrigation efficiency, common errors that result in lower uniformity or efficiency than should be possible. Give examples of the magnitude of possible $\text{NO}_3\text{-N}$ leaching losses. Discuss how soil characteristics contribute to managing leaching requirements, and how 'strategic' leaching might be done to minimize $\text{NO}_3\text{-N}$ loss.

- Lead/Liaison Larry Schwankl (UCCE/KAC)



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Curriculum Outline: Day 1: General Session

5) Nitrogen Budgeting

- Nitrogen budgeting – matching supply with demand. Introduction to the idea of developing an N budget template and what field-specific factors, for annual and permanent crops, should be considered. (Note: greater detail on this topic in the concurrent sessions.)
 - Lead/Liaison Stu Pettygrove (UCCE/UCD)



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Curriculum Outline: Day 1: General Session

6) Future Resources

- Provide an overview of available tools and resources e.g., CropManage, FREP database, yield monitoring, variable rate application, soil mapping, and aerial imaging.
 - Lead/Liaison Asif Maan (CDFA)



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Curriculum Outline: Day 2: Annual and Permanent Crops Sessions

A) Current Practices

- For each crop type (i.e. leafy vegetables vs. berries or citrus trees vs. grapes) critically examine current practices to highlight what practices lead to high N loss potential, and when (seasonally) those losses occur.



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Curriculum Outline: Day 2: Annual and Permanent Crops Sessions

B) The Use of BMPs

- Discussion of BMPs to address these weaknesses in the current system. This discussion would be crop specific; depending on the cropping system the emphasis could be on soil testing, tissue analysis, irrigation upgrades, fertilizer timing, etc. Tools for N budgeting. Discussion of the methods available and constraints of plant, soil and irrigation water monitoring: Sampling protocols, sampling designs, tools, installations and interpretation. Discussion of temporal and spatial field variability and approaches required to optimize monitoring and management responses.



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Curriculum Outline: Day 2: Annual and Permanent Crops Sessions

C) Nitrogen Management Planning Exercise

- Cropping scenarios that highlight differences in crop rotation (where appropriate), yield goals, soils, crops and irrigation methods will be provided. Participants will break into groups and be tasked with developing an N management template for two contrasting scenarios: Feedback and discussion.



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Curriculum Outline: Day 2: Annual and Permanent Crops Sessions

D) Local and Statewide Considerations

- An opportunity for the Regional Board or ILRP to present additional local and state level considerations and reporting requirements.



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Curriculum Outline: Day 2: Annual and Permanent Crops Sessions

Annual Crops Team:

- Lead/Liaison
 - Tim Hartz (UCCE/UCD) – Coastal liaison
 - Dan Munk (UCCE/Fresno) – Modesto, Fresno and Tulare liaison
 - Allan Fulton (UCCE/Tehama/Glenn/Colusa/Shasta) – Northern liaison

Permanent Crops Team:

- Lead/Liaison
 - Patrick Brown (UCD) – San Joaquin liaison
 - Allan Fulton (UCCE/Tehama/Glenn/Colusa/Shasta) – Northern liaison



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Timeline

- October 2012
 - Initial discussion UC and CDFA
- November 2012 – March 2013
 - Set program goals
 - Draft curriculum outline
 - Draft list of potential team members
- April – May 2013
 - Form Curriculum Development Teams
 - 50+ Potential Individuals Identified
 - UC, CSU, USDA, Private Sector, Coalition Groups



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Timeline

- May – October 2013
 - Create Draft Curriculum
 - PowerPoints with Notes
 - Reference materials
- November – December 2013
 - Edit and Finalize Curriculum
 - Create Trainings Website and other Materials



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Timeline

- January – March 2014
 - Provide Initial Trainings
- Beyond March 2014
 - Video of Trainings
 - Publications
 - Trainings for 2015
 - Assess Additional Needs



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Initial Trainings

- Modesto - Stanislaus Ag Center, January 14-15
- Woodland - Heidrick Ag Center, February 18-19
- Fresno - Ramada University Hotel, February 25-26
- Salinas - Salinas Elks Lodge, March 5-6
- Tulare - Tulare Ag Center, March 11-12



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Discussion



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