NC-1195 Annual Meeting
March 12-13, 2014

Enhancing nitrogen utilization in corn based cropping systems to increase yield, improve profitability and minimize environmental impacts

Attendance

Name	Institution	Email	Phone
IN ATTENDANCE			
Fabian Fernandez	Univ. of Minnesota	fabiangf@umn.edu	612-625-7460
Carrie Laboski	Univ. of Wisconsin	Laboski@wisc.edu	608-263-2795
John Grove	Univ. of Kentucky	jgrove@uky.edu	859-333-8262
Warren Dick	Ohio St. Univ.	dick.5@osu.edu	330-263-3877
Beatrix Haggard	Louisiana State Univ.	BHaggard@agcenter.lsu.edu	318-498-2967
Mike Castellano	Iowa State Univ.	castelmj@iastate.edu	515-294-3963
Will Horwath	Univ. of California Davis	wrhorwath@ucdavic.edu	530-754-6029
Rhae Drijber	Univ. of Nebraska	rdrijber1@unl.edu	402-472-1770
Dave Mengel	Kansas State	dmengel@ksu.edu	
DID NOT ATTEND			
John Sawyer	Iowa State Univ.	jsawyer@mail.iastate.edu	515-294-7078
Peter Scharf	Univ. of Missouri	ScharfP@missouri.edu	573-882-0777
Jac Varco	Mississippi State Univ.	jvarco@pss.msstate.edu	662-325-2311
Kurt Steinke	Michigan State Uni.	ksteinke@msu.edu	517-355-0271
Robert Kratochvil	Univ. of Maryland	rkratoch@umd.edu	
Sue Blodgett, Admin Advisor	Iowa State Univ.	sblodg@iastate.edu	515-294-1739

Introductions

Approval of agenda
The meeting agenda was approved.

Approve minutes of last meeting
The minutes of the March 2013 meeting were approved.

Election of member-at-large
Beatrix Haggard was elected member-at-large.

Clarify leadership
In 2014 : Chair – Rhae, Secretary – Carrie (send minutes for posting, includes state reports), Member at large – Peter
In 2015: Chair – Carrie, Secretary – Peter, Member at large – Beatrix (make meeting arrangements for 2015 meeting)

2015 meeting date
Doodle poll for first couple weeks on March. (Beatrix)

Communications
Need to make up a current email/group list. This will be added to minutes as part of the attendance list.

Committee member reports – Please send Carrie Laboski your report and send relevant publications as well.

California – Horwarth
Developing NM guidelines for major crops. Website. Show deficiency symptoms, recommended nutrient rates. Creating a repository of guidelines based on miscellaneous data, reports, etc. apps.cdfa.ca.gov/frep/docs/Guidelines.html
Also created a website that is a searchable version of FREP reports.
Evaluating performance of Solvita for prediction of net N mineralization

Iowa – Castellanos
Enhanced environmental benefits of cover crops prior to soybean and effect on N2O emissions also related to previous corn year's N rate.

Kansas – Mengel
N recommendation equation for corn will be updated.

Kentucky – Grove
Southern regional water resources committee was just formed (SERA-43). Salt water intrusion, water quantity issues, karst, different water rights laws (or not) in various states. Information exchange. SERA6 is going to evaluate the Haney test compared to university soil test procedures. Josh McGrath will join faculty on July 1. Kentucky is getting into industrial hemp for fiber and oil, but need funding for basic agronomy work. Kentucky targeted as major contributor of N & P to the Mississippi River Basin, but many people don't want to accept agriculture's responsibility. University will have greater participation in state TMDLs. New major in modern agriculture production has started.

Louisiana – Haggard
Dealing with salt dome issues. Working with N stabilizers. Also some focus on runoff. Doing some cover crop research. N release from vetch and radish were similar. Trying to get cover crops to fit in with corn system. State doesn't have NM guidelines/regulations. State does say that there needs to be nutrient limitations because of a lawsuit. Want a 50% reduction.

Minnesota – Fernandez
Part of a group that is trying to develop a regional group on hypoxia. Nutrient reduction strategy was completed over winter. Minnesota is working on updating N recommendations for corn on irrigated sandy soils. Will begin a large ag drainage project and N loss. Evaluating N mineralization potential of 26 Minnesota soils. Field studies to evaluate time of N application on the priming of soil N mineralization.

Mississippi – Varco
Report at end of minutes.

Nebraska – Drijber
Evaluating ammonia oxidizing bacteria.

Ohio – Dick
Hired Steve Coleman for soil fertility position. His specialty is organic matter. Ohio State is part of the ISU Corn Cap project. Evaluating N sensors. Measuring methane at sites where there is a toposequence of no-till and also includes a forested site. Found that the greater the duration of no-till, the greater methane oxidation.

Wisconsin – Laboski
Have been evaluating the nitrification inhibitor instinct with manure and fertilizer N. Found a significant reduction in the amount of nitrate in water collected from suction cup lysimeters placed 5 feet below the soil surface where Instinct was applied with liquid dairy manure at one location. There was no difference in nitrate concentrations at the other location. Efficacy of Instinct appeared to last trough mid- to late-July. Evaluating N sensors as part of several studies for corn, and also wheat.

<u>Discussion of products</u>
Write a review paper of definitions of NUE showing regional differences using data from members. The goal is educate what these definitions mean, variability across regions, and how results might mean something different based on NUE definition. Perhaps also add in post harvest residual soil nitrate. Dave Mengel is willing to take the lead.
Measurements needed:

1. N response study with N response curve
2. grain yield
3. ideally N uptake in grain at each N rate, if possible
4. ideally N uptake in biomass (R6) at each N rate, if possibe
5. post harvest soil profile nitrate (2'), if possible
6. preplant soil profile nitrate (2') if possible
7. 2000 to present data
8. Maize only
9. Need mean data, but not rep; maybe better if each PI
10. Everyone tries to get 10 to 15
11. NE, MN, WI, IA, KS, IN, IL, LA, OH, MO, CA, KY
12. soil series name and texture

13. soil OM
14. pH
15. drainage class
16. tiled ?
17. Irrigated?
18. county and state
19. manure history in last 5 years (Y or N)
20. No manure in the last 2 to 3 years
21. previous crop must be corn or soybean
22. crop history for previous 3 years
23. tillage
24. hybrid (optional)
25. relative maturity (optional)
26. year
27. available water capacity from soil survey
28. site productivity (low, medium, high) (eg sandy no irrigation is low productivity)
29. site productivity for the growing season
30. goal is to find sites that represent typical conditions for soil and weather (not extreme drought years or extreme wet years)

Compile NUE equations and create template for how to calculate – Laboski

Develop data reporting spreadsheet – Sawyer

Data reported by December 15, 2014 to Dave Mengel

Data compiled by February 1, 2015 by Dave Mengel

First discussion on data at next meeting in early March.

Enhancing Nitrogen Utilization in Corn Based Cropping Systems to Increase Yield, Improve Profitability and Minimize Environmental Impacts, NC 1195 Report for the 2013 Crop Year, Mississippi State, MS

Jac J. Varco
Plant and Soil Sciences Dept.
Mississippi State University

Nitrogen (N), in various forms is essential to agriculture production systems. Nitrogen is required in the greatest quantity of all fertilizer elements excluding legumes and it constitutes one of the largest production input expenses. Inadequate N is a limiting factor in crop production and its deficiency, coupled with numerous other environmental and biophysical variables, reduces yields. Due to the transient nature of available soil N and its high mobility and potential for gaseous loss, managing it to optimize crop growth, while minimizing excessive costs and environmental losses is challenging. It is imperative to develop techniques which can easily help growers assessing in-season crop N status be developed and tested. Corn leaf N monitoring and variable rate applications have been successfully demonstrated using in-season remote sensing technologies, but these tools are often cost prohibitive for smaller producers. Objectives 1.) Reassess current N rate and management practice recommendations; and 2.) Develop user-friendly N management decision-making tools for use by growers. A study was conducted at the W. B. Andrews Agricultural Systems Farm, Mississippi State, MS, to measure reflectance of leaves with a Spectral Evolution PSP 1100 and canopy with a YARA N Sensor in an effort to predict corn leaf and whole plant N status at V4 to V8, or prior to side dress fertilization. A urea-ammonium nitrate solution (32% N) was applied at 0, 80, 160, and 240 lb N ac^{-1}, with 50% of the total rate applied at emergence and the remainder at V4. The most recently matured, fully collared leaves were sampled for spectral reflectance and leaf total N % at V4, V8, and VT growth stages. At the same time, the YARA N Sensor mounted on a tractor acquired canopy reflectance.

Leaf N response to applied rates is shown in Fig. 1. A good relationship was obtained suggesting leaf N values should be 3.4% or greater at V4. To produce near maximum agronomic corn grain yield (Fig. 1). Fertilizer N rates were limited in this study due to large plot size necessary for canopy sensing; thus making it difficult to determine a highly accurate optimum N rate on this non-irrigated site. Leaf reflectance with the PSP-1100 spectro-radiometer provided a good prediction of leaf N status in early corn at V4 and at V8 as well using the Green Normalized Difference Vegetation Index and the Canopy Content Chlorophyll Index (CCCI) (Fig. 2). Results for the YARA canopy sensor are not shown, but CCCI relationships to leaf N and whole plant N at V4 were good. Furtherer evaluation of the data and inclusion of multiple years will be necessary to build a model with greater confidence.

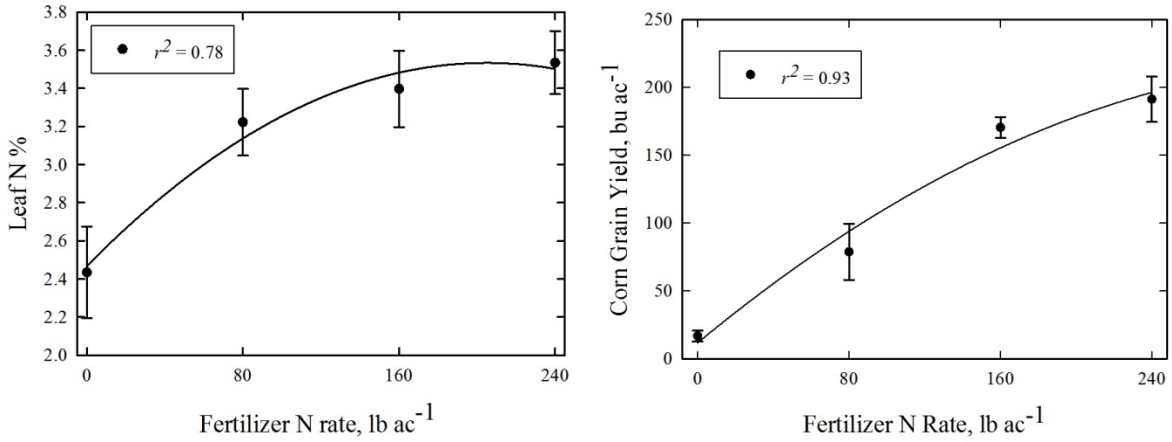

Fig. 1. Relationships between fertilizer N rate and leaf N% and grain yield.

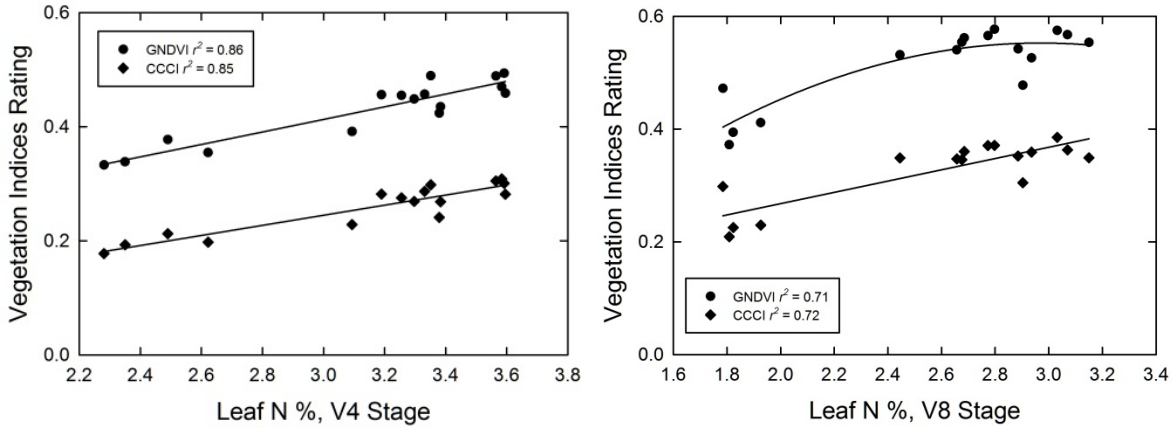

Fig. 2. Relationships between corn leaf N % at V4 and V8 to CCCI and GNDVI using the PSP-1100.