

NC205/NCCC46 Joint Interim Meeting Minutes

Research and Extension Coordination to Sustain the Use of Bt Corn in the USA

June 18-19, 2012, Ames, IA
Iowa State University
Brenton Center, Curtiss Hall

Attendees: **Craig Abel** (USDA-ARS and ISU), **David Andow** (University of Minnesota), **Sue Blodgett** (ISU Entomology Dept. Chair), **Brad Coates** (USDA-ARS and ISU), **Eileen Cullen** (University of Wisconsin), **Wade French** (USDA-ARS, Brookings, SD), **Billy Fuller** (South Dakota State University), **Aaron Gassmann** (Iowa State University), **Mike Gray** (University of Illinois), **Rick Hellmich** (USDA-ARS and ISU), **Bruce Hibbard** (USDA-ARS, University of Missouri), **Tom Hunt** (University of Nebraska), **Christian Krupke** (online, Purdue University), **Chuck Mason** (University of Delaware), **Lance Meinke** (University of Nebraska), **Andy Michel** (Ohio State University), **Ebony Murrell** (postdoc, University of Wisconsin), **Ken Ostlie** (University of Minnesota), **Pat Porter** (Texas A&M University), **Steve Pueppke** (NC205/NCCC46 Administrative Advisor, Michigan State University), **Tom Sappington** (USDA-ARS, Ames, IA), **Art Schaafsma** (University of Guelph), **Elson Shields** (online, Cornell University), **Blair Siegfried** (University of Nebraska), **Joe Spencer** (Illinois Natural History Survey), **Jing Sun** (graduate student, USDA-ARS, Ames, IA), **Wendy Wintersteen** (ISU CALS Dean).

ACTION ITEMS

1. Research proposal to implement a standardized resistance bioassay protocol for western corn rootworm beetles collected throughout the North Central region from Bt corn fields with unexpected root damage during the 2012 growing season.
 - Eileen Cullen will send first draft to David Andow for editing by July 1st, then to Aaron Gassmann and bioassay participants.
 - Final proposal to Steve Pueppke by July 7th. Steve will present the research proposal and budget at the AES directors meeting July 9th.
 2. Handout summarizing the peer-reviewed literature on western corn rootworm resistance to Bt rootworm protected corn. The document is intended to give AES directors and farmers a common understanding of the status of corn rootworm resistance research and extension recommendations to manage insect resistance and preserve the use of Bt corn.
 - Bruce Hibbard, Aaron Gassmann and Mike Gray will forward research and review publications to Eileen Cullen to summarize into one document.
 3. Lance Meinke and Mike Gray will provide surveys they have conducted about Bt corn IRM with farmers and agriculture professional audiences via TurningPoint “clicker” technology or written survey questionnaires. These can be used as templates for focus groups.
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Monday, June 18, 2012

1:00pm

Meeting co-chairs Tom Hunt and Eileen Cullen welcomed attendees and reviewed meeting goals and agenda.

Goals:

1. Identify data gaps regarding field-evolved corn rootworm resistance to Bt corn and insect resistance management. Prioritize and implement field and laboratory research projects using a coordinated regional approach. Research project(s) should generate near term outcomes, one year 2012 and part of 2013.
2. Plan three joint meetings among NC-205/NCCC-46 public-sector scientists to, *a*) clarify scientific and regulatory definitions of unexpected damage, suspected resistance, and confirmed resistance; and *b*) improve communication about resistance from farmers to public-sector scientists. Set meeting dates, locations, broad agenda goals, and stakeholder involvement from outside NC205/NCCC46 committee membership.

Dean Wendy Wintersteen, Iowa State University (ISU) College of Agriculture and Life Sciences welcomed NC-205/NCCC-46 to ISU and recognized the importance and urgency of this committee work to help corn producers effectively manage corn rootworm resistance and maintain profitability.

Update on Related Committees Addressing Insect Resistance Management (Tom Hunt):

- **Agricultural Biotechnology Stewardship Technical Committee (ABSTC).** ABSTC has convened a committee on CRW resistance research and communication. Several NC-205 and NCCC-46 members are on the ABSTC committee. EPA is not currently part of the ABSTC committee although it was suggested and they seemed open to it.
- ABSTC proposed a voluntary process for communicating information on corn rootworm abundance, damage to rootworm-protected Bt corn products, and resistance status of rootworm populations between seed company industry members and key public sector stakeholders. Tom Hunt and Eileen Cullen circulated an ABSTC document titled ‘ABSTC/Academic Communication Guidelines’ to NC-205/NCCC-46 for comment.
- **EPA Resistance Detection Workgroup.** NC205 and NCCC46 membership are represented on this EPA committee. Industry is not currently involved in this EPA committee.

Possible Logistics of Agricultural Experiment Station (AES) Funding (Steve Pueppke):

Research Projects

- AES directors/deans need project proposal and funding request specifics.
- AES directors would like to see National Corn Growers Association (NCGA) contribute.

- Industry approached Steve Pueppke about funding NC-205/NCCC-46 research. Steve discussed the importance of transparency and avoiding conflicts of interest regarding how industry funded research would be viewed.
- Possible to set up a steering committee including non-industry members who are involved in making the funding decision. (Rick Hellmich mentioned this approach was used in the past for Monarch and Bt research projects by public-sector scientists).
- Funding for NC-205 and NCCC-46 members to attend series of meetings (Ames planning meeting, June 18-19, plus three additional joint meetings) will be paid for by respective state colleges of agriculture. Steve Pueppke noted the AES directors are aware of this from their April 2012 meeting in Indianapolis and should pay travel expenses for 1-2 people per state.

Focus Groups

AES directors in MN, IA and NE agreed to fund focus groups in their states. IL and IN are potential participating states, but AES funding is not confirmed. IL may not require extra funding. Deans/directors funding focus groups expect this activity to generate state level outcomes for reporting and evaluation purposes.

Entomological Society of America (ESA) Symposium 2012 (Art Schaafsma):

- Art gave an overview of the symposium 'Remember IPM? Risks and Benefits of Global Expansion of Transgenes and Insecticide Seed Treatments in Field Crops' scheduled for the ESA annual meeting, November 2012, Knoxville, TN.
- Art Schaafsma expects the symposium to generate a peer reviewed journal publication. Topics include IPM overview (Mike Gray), Bt and neonicotinoid seed treatments in the Canadian corn belt (Art Schaafsma), unintended effects of neonicotinoid seed treatments on pollinators (Christian Krupke), risks and benefits of seed treatments in US corn belt (John Tooker), Bt crops in IPM (Bill Hutchison), insect resistance management for seed treatments (Blair Siegfried), IRM/IPM and commerce in the corn belt (Clint Pilcher, Pioneer), IRM science, regulators and end users (Martinez, EPA).

2:00 – 4:00pm

Research Project Discussion

- Projects should be short term, 12 months. AES directors expect outcomes.
- Discussion focused on how to monitor for field-evolved corn rootworm resistance and assay beetles from fields with higher than expected damage to Bt CRW corn during the 2012 growing season.
- Three of the four general assay methods are plant-based (Aaron Gassmann):
 1. Artificial diet-based assay with purified Bt Cry protein(s). There are several variants of this approach.
 2. Plant-based assay; seedling mat in growth chamber.
 3. Plant-based assay; single plant in growth chamber (Gassmann et al. 2009 PLoS ONE)
 4. Plant-based assay: survival to adulthood on potted plants in greenhouse. (Bruce Hibbard has run several experiments like this).

- **Discussion identified the following research data gap:** Currently, there is no NC-205/NCCC-46 common regional protocol for field sampling and CRW beetle resistance assays from corn fields with unexpected damage to Bt CRW corn hybrids.
- Several Land-Grant University and USDA-ARS scientists have expertise and/or current projects on CRW resistance screening, but effort is not centralized or standardized. No specified lab assay location(s) to receive CRW from multi-state field monitoring efforts in corn fields with unexpected damage. (Art Schaffsma, others).
- Assay method should correlate with what is going on in the field. Some assays may be part of regulatory trigger for resistance definition but do not correlate in a timely manner with resistance development and unexpected damage in the field. (Lance Meinke).
- Limitations with diet based assays (e.g. Bt Cry proteins are proprietary, difficult for public-sector scientists to obtain proteins).
- Pat Porter suggested sentinel field approach (continuous Bt CRW corn plots) throughout region to generate CRW beetle samples for a common screening protocol. This method could become more valuable over consecutive years. Logistical issues were discussed (payments to farmers, farmers may change practices from year to year at sentinel sites, resistance may not develop at sentinel sites).
- Need to be careful with monitoring over a vast geographical area. CRW have relatively low dispersal rates. It can take a while before assay methods pick up on field-evolved resistance because it will likely be heterogeneous spatially. Diet-based assays have shortcomings. Plant-based assays are likely to be more reliable (Aaron Gassmann).
- Issues with diet-based assays include diet availability, egg viability, hatch, larval age, change in Bt Cry proteins, Cry protein availability. (Ken Ostlie).
- Bt Cry protein is an issue for diet-based assays because the protein is proprietary, and assay protocols may be proprietary as well. NC-205/NCCC-46 would need to develop a publicly available diet-based assay. This would take longer than 12 months, and we do not have the Bt Cry protein(s). (Blair Siegfried).

4:00 – 5:00pm

Fall 2012 will be the next joint committee meeting. Potential agenda topic is addressing CRW field monitoring and standard assay method for coordinated regional use by public-sector scientists. Can we make some decisions about field monitoring and assay research methods before the fall meeting (see below)? (David Andow). The agenda topic was broadened to consider the decision problem more broadly, first identifying all possible sources of information that could be used to inform resistance management (whether they are publicly available or not), then considering how and when this information is collected, the kinds of IRM decisions that the information could affect, and ultimately leading to how those decisions could affect resistance evolution and delay resistance failures. This will be considered within and outside of the constraints of current EPA registrations for CRW Bt corn.

CRW Resistance Assay Discussion Continued

- We can either look at one population using several assay methods, or several populations using one assay. (Aaron Gassmann).

- Diet assay would need to be publicly available that any of us could run in our labs. This still does not address Bt Cry protein proprietary access associated with diet-based assay method (Aaron Gassmann).
- Discussion and comparison of reliability and repeatability of assay method. Diet assays may be more repeatable compared with plant based assays (seasonal differences under greenhouse conditions depending on when assays are conducted).
- Diet assays are subject to microbial, fungal, bacterial contamination. (Blair Siegfried)
- Assay must be reliable, repeatable and relatively quick.
- Pat Porter talked with Trece, Inc., Adair, OK. Trece may be willing to develop CRW cucurbitacin bait without insecticide to aid in adult beetle collection (Pat Porter).
- Given shift in CRW emergence patterns on Bt CRW corn vs. non-Bt corn, what part of the adult population do we want to sample? Be aware of these emergence shifts when developing field monitoring protocol. (Ken Ostlie).
- IPM and IRM Extension message is consistent, but not being adopted by growers. Insurance approach using Bt CRW corn plus soil insecticide is easy for growers to manage risk of potential damage to Bt CRW hybrids. This insurance approach is attractive to farmers when corn prices are high.
- Lack of knowledge among growers and public-sector scientists about CRW resistance or unexpected damage fields regionally underscores the need for a uniform field monitoring and CRW resistance assay method to fill this research data gap.

Definitions of unexpected damage, suspected resistance, confirmed resistance.

- What is the EPA definition of resistance, and trigger for reporting by registrants from fields with unexpected damage? Varies by registrant, event, product registration and re-registration documents. Usually involves two phases, report of unexpected damage (based on node-injury rating), and repeated damage for more than one year.
- Discussed need for clarity about EPA definitions of resistance and trigger for unexpected damage reports from registrants to EPA.
- EPA definition seems to link resistance to product (Bt event) failure. There is a time lag between unexpected damage reports from the field from registrants and steps to meet EPA criteria for resistance. What are the consequences when/if an event is deemed to have CRW resistance by EPA definition?
- Could IPM practices be part of Bt trait registration? (Aaron Gassmann).
- Tabashnik and Gould called for IPM practices to be connected with Bt corn registration and addressed the lack of non-Bt seed (*J. Econ. Entomol.* 105:767-776).
- EPA oversight and enforcement capacity is quite limited. IPM compliance would be equally challenging.
- Can incentive(s) for IPM compliance be built in to IRM compliance? Could seed companies promote IPM as a way to retain and service customers if it sustains their product traits over the long term? (David Andow).

- Pest susceptibility to Bt traits is a public good. Who are the stewards of this resource? While seed companies have ownership/domain of trait technology, insect susceptibility is a public good and should be managed for the public good, not just industry market share. Public sector scientists, farmers and EPA have roles to play. (Joe Spencer, Mike Gray, others).
- Mike Gray suggested a 2-3 page document on what is known (published in peer reviewed literature) about CRW resistance to Bt corn and current Extension IPM recommendations for growers to address the issue this growing season. The objective of this document is to bring various groups (AES directors/deans, growers, consultants) to a common understanding of the issues and management recommendations.
- This would be helpful to growers and public-sector scientists in states not yet affected by the problem to plan for field calls of unexpected damage and participate in regional research.
- A 2-3 page update could also be parlayed into an ESA Journal of Integrated Pest Management issues article geared to consultants and growers (Andy Michel).

5:00pm - Day 1 Adjourned.

(5:00-6:00pm): A subcommittee met to outline subsequent joint meeting dates, locations and topic areas. [Tom Hunt, Eileen Cullen, Pat Porter, Tom Sappington, Aaron Gassmann, David Andow, Blair Siegfried, Lance Meinke, Ken Ostlie, Art Schaafsma and Rick Hellmich].

Tuesday, June 19

8:00am – 9:00am

NC205/NCCC46 Interim Joint Meeting Schedule.

Need for research and coordination to sustain the use of Bt corn in the USA

I. Broadening the use of information in IRM in relation to definitions of unexpected damage, suspected resistance, and confirmed resistance.

Fall 2012 Meeting

Dates: **October 23rd – October 24th, 2012**

Duration: 1.5 days.

Time: 1:00pm to 5:00pm, Tuesday, October 23rd
8:00am to 5:00pm, Wednesday, October 24th

Location: **Minneapolis, MN (Local Arrangements: David Andow).**

Purpose: Consider the decision problem underlying IRM more broadly: identifying all possible sources of information that could be used to inform resistance management (whether they are publicly available or not), consider how and when this information is collected, identify the kinds of IRM decisions that the information could affect, and ultimately determine how those decisions could affect resistance evolution and delay resistance failures. This will be considered within and outside of the constraints of current definitions of unexpected damage, suspected resistance and confirmed resistance in EPA registrations for CRW Bt corn. This includes sharing of initial findings from summer 2012.

Invitees:

- Jeanette Martinez (EPA)
- National Corn Growers Association (NCGA) grower representative(s) – *Blair Siegfried and Ken Ostlie will invite NCGA grower contacts with background of Bt and IRM stewardship issues.*
- Crop Consultant(s): *-Ken Ostlie will invite*
- Mike Caprio (Mississippi State University, Population Genetics and IRM)
- Bruce Tabashnik (University of Arizona, Resistance Evolution and IRM, Bt Corn)
- Fred Gould (North Carolina State University, Insect Ecology and Evolution)
- Brigitte Tenhumberg (University of Nebraska, Modeling Expertise, Plant-Insect Systems)
- Others?

**Ask Steve Pueppke if AES directors at Mississippi, Arizona, North Carolina and Nebraska can cover travel for Caprio, Tabashnik, Gould, Tenhumberg. NCGA and crop consultant stakeholder travel will also need to be covered.*

Agenda Topics:

- Jeanette Martinez: Overview of EPA resistance definition and regulatory response to unexpected damage and resistance, as per Bt corn product registration documents.
- Stakeholder perspective: NCGA grower(s), crop consultant(s).
- What sources of information are generated from unexpected damage reports and how can this information be used to guide the IRM process?
- What sorts of information are generated by growers, consultants, and seed companies routinely?
- Improved understanding of definitions of unexpected damage, suspected resistance, and confirmed resistance.
- Working definition of confirmed resistance used by EPA, industry, and public sector scientists. (goal to work towards).
- Research needs
- Initial phases of resistance detection

II. NCCC-46/NC-205 Joint Session during annual January 2013 meeting

Dates: **January 21st – January 24th, 2013**
 Duration: NCCC46 (1 day); Joint Meeting (1.5 days); NC205 (1.5 days)
 Location: **New Orleans, LA (Local Arrangements: Fangneng Huang)**

NCCC-46 Meeting: Monday, January 21st, 8:00am – 5:00pm

NCCC-46/NC-205 Joint Meeting on CRW Resistance Research and Communication

Tuesday, January 22nd, 8:00am – 5:00pm

Wednesday, January 23rd 8:00am – 12:00pm

Purpose: Inform stakeholders of the results of the October meeting and the plan for the future; discuss sampling and assay methods with registrants, present results of cooperative NCCC46 sampling and assay effort, and develop conclusions related to developing a common standard for sampling and assays.

Joint Session Breakdown

Invitees:

- Jeanette Martinez (EPA)
- ABSTC
- Individual Registrants (Monsanto, Pioneer, Dow, Syngenta)
- Bruce Lang? (Custom Bio Products, Maxwell, IA) (diet assays for registrants)
- NCGA grower(s)
- National Alliance of Independent Crop Consultants (NAICC) and Certified Crop Advisor (CCA) representative(s)?
- Other stakeholders?
- Participants from October 23-24 meeting in Mpls., MN (see page 7).

Date	Time	Open/ Closed	Topics <i>(Rough draft, joint session to be developed by Resistance Operations Committee and NC205/NCCC46 membership).</i>
Tues. Jan. 22 nd	8:00am - 12:00pm	OPEN	-Outcomes from October 23-24 meeting (Mpls.) (regulatory & scientific definitions of resistance, grower and consultant communication with public sector). -ABSTC/Academic communication guidelines -Individual registrant presentations on assay methods (invited, to the degree they can share).
Tues. Jan. 22 nd	1:30pm – 5:00pm	CLOSED	-NCCC-46 and NC-205 membership - EPA? (Jeanette Martinez) -Propose resistance definitions, link IRM response/mitigation measures to definitions.
Wed. Jan. 23 rd .	8:00am – 12:00pm	OPEN	-Stakeholder presentations, questions, feedback (growers, consultants) -Research needs related to field monitoring, resistance assays, update on modeling projects initiated at October meeting.

NC205 Meeting: Wednesday, January 23rd, 1:00pm – 5:00pm
Thursday, January 24th, 8:00am – 3:00pm

III. Spring 2013 Meeting

Dates: **March 12 – 13, 2013**

Location: **Minneapolis, MN (David Andow, local arrangements)**

Invitees: Same as January meeting

Purpose: Synthesize information obtained to develop rigorous and operational definitions for the “stages” of resistance that are embedded in a decision process. Specifically the information should be linked to particular sources and methods, inform a well-defined decision (with alternative responses and valuation methods for the alternatives), and projected consequences for reducing the rate of resistance evolution and the time to resistance failures.

AGENDA – details to be worked out. Will involve both open and closed sessions.

9:00am – 11:00am

2012 Research Project Proposal

- Mike Gray proposed 2012 growing season regional research project to conduct field sampling and CRW resistance assays. This would be a multistate effort across Bt CRW events.
- Collect CRW beetles from continuous corn fields planted to Bt CRW corn that have unexpected root damage (defined below). Fields can be research sites of NC205/NCCC46 members or grower and consultant calls to Extension reporting unexpected root damage by CRW to Bt CRW corn.
- Send beetles to public-sector scientist labs within NC-205 and NCCC-46 for resistance assay. Suggestion to use Aaron Gassmann’s plant based assay method; single plant in growth chamber (Gassmann et al. 2009 PLoS ONE).
- Aaron Gassmann agreed to share plant-based assay method with cooperating NC205/NCCC46 labs. If possible, video-tape the instructions from Aaron.
- Standardize Bt CRW corn hybrids and near isolines for susceptible comparison used in the plant-based assay across labs. (Aaron Gassmann).
- Cost estimate for setting up Gassmann’s plant-based assay in other labs. Labor is the biggest expense (e.g., graduate student and undergraduate assistant). Need a dedicated person or two assigned to the assay work. Plants are grown in the greenhouse, but plant assays need to be done in a growth chamber. If screening multiple populations this can take 6 or more months.
- Budget per cooperating lab (student labor, Berlese funnels, etc.). Aaron Gassman, Iowa, and cooperating labs (Lance Meinke, Nebraska; Joe Spencer, Illinois, Wade French, USDA-ARS, South Dakota; Bruce Hibbard, USDA-ARS, Missouri) will need to determine a budget for this effort. Actual needs are probably closer to \$40k/lab = \$200k.
- North Central IPM Center Mini-Grants Program RFA is accepting proposals through September 30, 2012 as long as funds are available. Individuals may request up to \$10,000. (NCIPM will invest approx. \$30,000 in to the grants program). Consider mini-grants program (\$5-6K supplement for each lab running the assay). This could be leveraged with a request to AES directors and NCGA or corn promotion boards.

- If sufficient beetles are available, Blair Siegfried will use them for some insecticide resistance assays
- NC-205/NCCC-46 members willing to run the assay in their labs and receive beetles from states that do not have CRW resistance assay capabilities include:

Aaron Gassmann - Lead (Iowa State University)

Lance Meinke and Blair Siegfried (University of Nebraska)

Joe Spencer (Illinois Natural History Survey)

Wade French (USDA-ARS, Brookings, SD)

Bruce Hibbard (USDA-ARS, University of Missouri)

-Partially standardized field sampling and bioassay methodology across states to pool data and map unexpected damage.

Field history (crop rotation), continuous corn.

Trait use history in suspect field

Node-injury rating (ISU scale)

Trigger for unexpected damage (1.0 node minimum proposed).

Collect CRW beetles early to mid-emergence curve. Need females that are becoming gravid but have not laid all their eggs yet.

Decide what level of root injury to use to include fields in the survey and assay.

1.0 node-injury rating (ISU scale) proposed.

Check USDA APHIS PPQ permit requirements associated with intra-state beetle shipments.

Assay labs (IA, NE, IL SD and MO) need to decide how many populations they can screen.

Participating states need to coordinate with assay lab group which lab they will send beetles to.

If any states have sentinel plots, beetles could be assayed from sentinel plots.

Send adult CRW beetles to assay labs (females and males, females predominantly)

Determine sex ratio to send to assay labs as per protocol that assay labs are using

Determine how many beetles assay labs need to screen a population from a problem field.

Sampling- Several approaches were suggested, and it was agreed not to standardize these yet so that the group can consider the pros and cons of the different methods

- Sentinel trap crop
- Emergence cages
- Field collections

- Wade French can maintain colonies of highly resistant populations, put them on an annual rearing colony cycle.

Discussion of which states assay labs could accept beetles from:

IL beetles to: Illinois Natural History Survey (Spencer)

NE beetles to UNE (Meinke)

SD, WI and OH beetles to: USDA-ARS, Brookings, DS (French)

IA beetles to: ISU (Gassmann)

TX and other states either to USDA-ARS (French or Hibbard)
Other participating states for field collections: (MN?, MI?, IN?, PA?, others?)

Other Research Needs:

(Ken Ostlie): New CRW thresholds that take CRW resistance into account. Thresholds for Bt CRW corn in areas with resistant populations. (Interested Individuals: needs more discussion, not a short-term project for current 2012-13 focus).

(Hellmich): Can farmer volunteers be mobilized to provide information related to resistance evolution? (Interested: Mike Gray, Dave Andow)

(Andow): If resistance is found in a field, how does this affect nearby fields? What are the spatial and landscape level implications for grower recommendations? This relates to the county-wide basis for mitigation. Andow will develop ideas during July. (Interested: Dave Andow, Aaron Gassmann, Lance Meinke, Tom Sappington, Wade French, and Joe Spencer).

(Mike Gray): How does increasing use of insecticides on Bt CRW corn (pyrethroids, organophosphates) affect beetle survivorship and resistance evolution? (Mike Caprio, Mississippi State University, has done some modeling on organophosphate resistance).

(Blair Siegfried): Brigitte Tenhumberg (University of Nebraska, Modeling Expertise, Plant-Insect Systems) may be interested in IRM modeling. Eileen Cullen and Tom Hunt will add Brigitte to NCCC46 and NC205 mailing lists and invite her to future meetings.

(Aaron Gassmann): Allele frequency and fitness costs. Project ongoing in this area, Gassmann JEE paper. (Interested: Aaron Gassmann, Brad Coates, Blair Siegfried, others).

(Mike Gray): Neonicotinoid seed treatment on Bt corn hybrids and selection pressure for neonicotinoid resistance. Blair Siegfried collected baseline data on this 8-9 years ago. Focus is on Bt trait resistance. Another future issue may be resistance to soil applied insecticides (pyrethroids) and/or neonicotinoid resistance. (Interested: Billy Fuller, Mike Gray, Blair Siegfried, others).

11:00am - 12:00pm

II. Communication about resistance from farmers to public-sector scientists.

Focus Groups

- Involve farmers who have experienced unexpected damage from CRW on Bt corn. Determine **(a)** which institutions they trust to give information about potential resistance on their farms, **(b)** what reassurances they would need (confidentiality, anonymity, etc.) before they share such information, and **(c)** how they would be willing to share information (field visits, telephone, email, etc.).
- Crop consultants who have experienced the problem on farms with farmer clients may also be good to include in focus groups (organizers in participating states can determine farmer and consultant involvement and interaction).

- Focus groups are not intended to document the scope of the problem, rather to develop stronger farmer to public-sector scientist communication networks to inform our research and resistance definition project work and develop best management practices for farmers.
- Previous surveys (written or TurningPoint technology “clicker” format) done by Lance Meinke and Mike Gray.
- Develop focus group “script” that can be used by public-sector scientist hosts (Extension faculty likely to lead) at focus group meeting locations.
- David Andow has drafted an introductory script.
- The following states have been proposed and/or identified by AES directors to hold focus groups: IA, MN, NE, IL and IN. AES directors in IA, MN and NE have agreed to fund this activity.
- Budget (estimate): Minnesota (\$15K, Andow), Iowa (Who will lead focus group? \$?), Nebraska (\$?, Wright and Hunt), Illinois (\$0?, Gray), Indiana (will the IN AES add funds?, Krupke).
- MN \$15K: David Andow expects to have someone code the tapes and conduct qualitative analysis. The person could probably code tapes from all locations, although this should be open for discussion once the participation details are worked out.
- Mike Gray indicated that he would conduct the IL focus group as part of a regularly scheduled extension meeting in the state and would probably not need funds. (Note: *Some funds for logistics of the meeting may still be needed for IL*).
- Planning for the focus groups (IA, MN, IL, NE, IN) will take place during summer and early fall 2012.
- Conduct focus groups late fall or early winter 2012.
- Analysis and reports to be completed spring 2013.
- Discussed a larger audience state or regional meeting of farmers who have experienced the problem vs. smaller group of farmers using traditional focus group methodology. Larger audience format would be good for multiple choice clicker surveys and assessing extent of problem. Focus groups will pose open-ended questions with smaller group of farmers in a setting designed to elicit greater depth of information and discussion.

Potential topics to cover with farmers in focus groups (and extension meetings conducted by Extension entomologists, North Central Field Crop Entomologist Working Group, etc.):

Farmer Group: Cropping history; trait use; soil insecticide + Bt hybrid use; impediments to switching or rotating traits; access to non-Bt elite corn hybrids; Is unexpected damage from CRW on Bt corn a problem for you?; If yes, how severe is the problem?; what action steps have you taken or plan to take to manage this risk?; Questions about yield losses; Questions about how and to whom farmers are comfortable reporting unexpected damage.

12:00pm – Meeting Adjourned.