Midwest Cover Crops Council
Indiana Report for February 23-24, 2016 Meeting in Madison, WI

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Highlight—Four new Extension publications, two of which are "consensus" documents of broad spectrum of Purdue faculty

Cover crops for modern cropping systems. Aug. 2015. Purdue Exten. Publ. AY-352-W.
- https://www.edustore.purdue.edu/item.asp?Item_Number=AY-352-W

An introduction to integrating cover crops into a corn-soybean rotation. Aug. 2015. Purdue Exten. Publ. AY-353-W.
- https://www.edustore.purdue.edu/item.asp?Item_Number=AY-353-W

Checklist for integrating cover crops into your cropping system. Aug. 2015. Purdue Exten. Publ. AY-354-W.
- https://www.edustore.purdue.edu/item.asp?Item_Number=AY-354-W

Cover crops for prevented planting acres. Aug. 2015. Purdue Exten. Publ. AY-355-W.
- https://www.edustore.purdue.edu/item.asp?Item_Number=AY-355-W

Research
Ongoing studies by Dr. Eileen Kladivko and graduate students include:
- Effects of cover crops on soil health. This project began in fall 2012 as part of a Conservation Innovation Grant (CIG) project (see Extension listings). Research plots at three Purdue Agricultural Centers were started with oats/radish, cereal rye, and oats/radish/crimson clover/cereal rye mixes in replicated plots under both corn and soybeans. Measurements include a variety of soil health parameters including aggregation, penetration resistance, soil nitrate at time of biomass termination, biological soil health indicators, and soil moisture during the growing season. Selected measurements are also being made on 12 farmer cooperator sites. Sara Alford, Holly Hauenstein, now Jennifer Woodyard
- Corn Systems Coordinate Agricultural Project (CSCAP)—We are part of a large regional project on corn systems and climate, led by Dr. Lois Wright Morton at Iowa State. The project includes 10 states and over 40 principal investigators. Cover crops are one of the practices being studied by about six of those states. The objectives are to determine the effect of cereal rye cover vs. no cover, in both corn and soybeans, on the resilience of the system to climate stresses. This includes measurements of soil moisture content, soil quality measures, soil nitrate in fall and spring, and crop growth and yield. Cereal rye was chosen as the cover crop because it was the most widely adaptable across the whole

region in the project. Some states (like us) are also doing smaller studies with other cover crops, such as radishes (see below). Trevor Frank, now Joe Rorick.

- Oilseed radish bicultures and their effects on nitrogen cycling. Objectives were to evaluate effect of oilseed radish alone vs. oilseed radish mixed with oats or cereal rye, on N uptake in fall and subsequent release the following spring/summer. This was a one-year, one-site repetition of MS work of Kaylissa Horton. Trevor Frank

Studies led by new faculty member Dr. Shalamar Armstrong (sarmstro@purdue.edu)

- The overarching goal of Armstrong's current research program in Indiana is to develop a comprehensive understanding of how cover crop species and the soil microbial community influence the availability of soil inorganic nitrogen (N) to the subsequent cash crops following cover crop termination. Thus, the following specific research objectives must be achieved: (i) evaluation of cover crop residue release of N as it relates to the seasonal demands of cash crops; (ii) determination of the impact of cover crop species and mixtures on soil microbial diversity (e.g., identification of microbes involved in different aspects of N cycling), function, and activity as it relates to N mineralization; and (iii) Assess the influence of cover crop species and cropping system on the soil microbial community and N release from cover crop residue. These objectives would allow his research group to evaluate the effect of planting different cover crops species (grass or legume) following corn (grass) on the release of N from cover crop residues after spring termination. Furthermore, results from this study will allow for the correlation of cover crop N release with the N demands of the cash crops across critical developmental stages. The objectives are being achieved at 3 Purdue Agriculture Centers in the state and thus far involves collaborations with Dr. Cindy Nakatsu, Purdue Agronomy soil microbial ecologist and Dr. Shaun Casteel, Purdue Agronomy extension soybean agronomist.

Work led by Dr. Shaun Casteel, Dept. of Agronomy (scasteel@purdue.edu)

- We applied swine manure following wheat and evaluated 12 cover crop systems to manage the nitrogen for subsequent corn crop. Five pre-plant N rates were crossed with the 12 cover crop systems. We finished the second cycle of this project with corn harvest in 2015, and sample analysis and data interpretation is ongoing.
- Shalamar and I will be establishing a long-term cropping systems evaluation in these two fields at NEPAC and DPAC in 2016. The system will include 6 cover crop systems and manure application following wheat in a soybean-wheat-corn rotation. We have also pooled resources to purchase a high clearance sprayer to be modified to interseed cover crops in standing corn and soybeans at a medium plot scale (15 or 30-ft wide plots that are ~300-ft long).

Continuing work by Dr. Keith Johnson, Dept. of Agronomy (johnsonk@purdue.edu)

- Utilizing cover crops and summer annuals as double cropped forages following wheat . The objective is to determine the suitability and forage quality of ten crop species at varying nitrogen application rates. The crops that are being investigated are; grain amaranth, BMR sorghum sudangrass, pearl millet, teff, foxtail millet, oat, chickling vetch, forage turnip, and oilseed radish.

Ongoing work by Dr. Lori Hoagland, Dept. of Horticulture (lhoaglan@purdue.edu)

We are trying to determine how changes in microbial community structure induced by cover crops are related to pathogen suppression, and improved vegetable crop growth. We are working with soil collected from completed field and greenhouse trials. Unfortunately we don't have any on-going field trials at the moment.

Work by Dr. Bryan Young, and Dr. Bill Johnson, Dept. of Botany and Plant Pathology (BryanYoung@purdue.edu; WGJ@purdue.edu)
Young--We have two projects with the United Soybean Board that are being conducted collaboratively with the Univ. of WI, Univ. of MO, Univ. of TN, and Univ. of AR.

1) Evaluation of herbicides for spring termination of cover crops.
2) Evaluation of potential herbicide carryover to fall-seeded cover crops.

Johnson--conducts applied research on weed control provided by cover crops, spring termination of cover crops with herbicides, and the effect of herbicide residues on cover crop establishment.

Christian Krupke, Dept. of Entomology (ckrupke@purdue.edu) —Extension work speaking with producers and consultants about the insect pest management challenges associated with cover crops, and how to scout for and manage them.

Some long-term or always ongoing work continues:

- Winter wheat or other cover crops used in tile drainage research project, where nitrate is measured in tile drainflow. This year drilled a 3-way mix after corn harvest. Long-term (25+yrs) but no simultaneous comparison without cover crop. Could make more measurements related to N cycling, if regional collaboration.
- Biomass crops, new and old work (Miscanthus, switchgrass)
- Ongoing work on pest suppression (disease, nematode, weeds) and in vegetable production (Dept. of Botany and Plant Pathology; Dept. of Horticulture)
- Always ongoing work on forages for hay or grazing (Dr. Keith Johnson, Dept. of Agronomy, johnsonk@purdue.edu)

Extension/Education/Outreach/On-farm trials
Tremendous growth in interest in cover crops in Indiana has continued. All of the partners in the Indiana Conservation Partnership have seen the need for increased training and services related to cover crops. The Indiana Conservation Partnership includes NRCS, Soil and Water Conservation Districts (SWCD), Conservation Cropping Systems Initiative (CCSI), Indiana State Department of Agriculture (ISDA), State Soil Board, and Purdue Extension. Highlights of major activities are given here:

1. Conservation Cropping Systems for Soil Health and Productivity--A Conservation Innovation Grant (CIG) was awarded to the Indiana Association of Soil and Water Conservation Districts (IASWCD) and partners of Purdue Extension, ISDA, NRCS, and others, starting in fall 2012. The project established four regional hubs around the state, for trainings and workshops on soil health. The major practices being discussed are cover crops and conservation cropping systems, especially no-till. Twelve farmer cooperators are involved in helping train-the-trainers and mentoring other farmers who want to transition to conservation cropping systems. Activities include strip trials of their current system vs. a new practice on their farms, workshops and field days on their farms, and field trials and trainings at regional university research farms. Train-

the-trainer workshops have included Advanced Cover Crops and Advanced Conservation Cropping Systems, one of which was offered in each regional hub each year. At least three farmer workshops per regional hub are offered each year and include a variety of topics. Soil health sampling is accomplished by regional teams pulled from across the Partnership, strengthening ties among the participating agencies. Lisa Holscher is project coordinator (lisa.holscher@in.nacdnet.net). We are currently seeking other funds to continue this project.

2. Introduction to Soil Health workshops, as train-the-trainer opportunities. These are aimed at providing an introduction to soils and soil health, cover crops, and no-till, to new employees and to those wanting a refresher on some of the concepts being brought to farmers at soil health field days and workshops. The costs are covered by SARE funds allocated to the state through our SARE representative Roy Ballard
3. Soil Health, in-depth 3-day training. This training is led by Barry Fisher, IN- NRCS, with assistance from Kladivko, and others. The main audience is NRCS but other participants include county Extension, SWCD, and ISDA field staff.
4. Indiana Conservation Cropping Systems Initiative (CCSI)—Was awarded the No-Till Innovator Award (in the Organization category) at the National No-Till Conference in January 2016 in Indianapolis. This six year old initiative of the Indiana Conservation Partnership put two experienced people on the ground, for working with farmers interested in no-till, cover crops, and other conservation practices. (Hans Kok and Dan Towery). They worked with SWCDs, NRCS, and Extension to promote and educate. Last spring this program transitioned to an Extension professional at Purdue to fill that role, and Ashley Hammac began in March.
5. The second edition of the Cover Crop Pocket Guide continues to be a hot seller! Its Sept 2014 printing run of 20,000 copies sold out in less than a year, and another 10,000 were printed. The publication won an Extension materials award in November 2015 from the American Society of Agronomy at their annual meeting. A new iphone and android app have been temporarily put on hold until the system has been worked out with the Corn and Soybean guide at Purdue and the hiring of MCCC program mgr.
6. We are making progress on broadening the base of faculty and Extension specialists involved with cover crop Extension publications and education. Currently we have two new publications that were completed this year by the larger group.
7. Soil Health Partnership (SHP)—This new initiative by National Corn Growers, Monsanto, The Nature Conservancy, and Environmental Defense Fund, has many of the same objectives as the Indiana CCSI, but it has expanded the area to all three "I" states (Iowa, Illinois, Indiana). There are ongoing discussions to try to coordinate and collaborate between these two programs.
8. Jasper County SWCD Cover Crop Demonstration Program continued in 2015. This continues to be an excellent example of on-farm cover crop demonstrations, with many different farmers participating. Led by Dan Perkins, Watershed and Conservation Program Specialist (www.jaspercountyswcd.org). Other demonstration plots or on-farm trials occurred at various locations around the state, usually initiated by farmer interest but often facilitated by NRCS, SWCD, Extension, or consultants.
9. Cover crops are now part of the "tillage transect" done in Indiana in the spring after planting. In addition, at least some counties did a fall transect, to document cover crop fields in November.