

NCCC211 2015-2016

Meeting date: 23 February 2016, Madison, Wisconsin

Reporting dates: March 2015 to March 2016

Participants: Marisol Berti (North Dakota State Univ., Past Chair), Matt Ruark (Univ. of Wisconsin-Madison), Eileen Kladvko (Purdue Univ.) Andy Lenssen (Iowa State Univ., Chair), Erin Haramoto (Univ. of Kentucky), Tom Kaspar (USDA-ARS), Dean Baas (Michigan State Univ.), Scott Wells (Univ. of Minnesota), DeAnn Presley (Kansas State Univ., not a member), Rich Hoormann (Univ. of Missouri, not a member), Gary Lesoing (Univ. of Nebraska, not a member), Kendall Lamkey (Committee Coordinator)

The NCCC 211 meeting was held in conjunction with the Annual Midwest Cover Crop Council Conference and The Science of Cover Crops meeting (sponsored by the College of Agriculture & Life Sciences, Univ. of Wisconsin-Madison, Midwest Cover Crops Council, Univ. of Wisconsin Extension, Michael Fields Agricultural Institute, Sustainable Dairy, and North Central Region Sustainable Research & Education Program) in Madison, Wisconsin (total attendance: 120). The following is the agenda of the MCCC meeting, which included a business meeting for the NCCC 211. State reports were presented during the conference and will be available on the MCCC website.

Agenda

Tuesday 23 February 2016

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| 7:15 am-8:15am | NCCC-211 Project Meeting – NCCC-211 representatives only, Meeting Chair, Marisol Berti, North Dakota State University |
| 8:30am - 10:15am | MCCC Business Meeting – Main Conference Room (MCCC executive committee, state & province representatives, and NCCC 211 collaborators) <ul style="list-style-type: none">• MCCC update• Oral state reports (Ohio, South Dakota, Wisconsin, Iowa, Nebraska, Illinois) |
| 10:30am-12:15pm | <ul style="list-style-type: none">• Oral state reports (Michigan, North Dakota, Minnesota, Kansas, Ontario, Indiana, Missouri) |
| 1:30pm-3:00pm | Working sessions <ul style="list-style-type: none">• MCCC website updates• Decision tool• Field guide and other publications• Granting collaboration |
| 3:15pm-4:15pm | MCCC Partner reports <ul style="list-style-type: none">• Sustainable Agriculture Research & Education• National Wildlife Federation• Practical Farmers of Iowa• North East Cover Crops Council |
| 4:15pm | Business meeting adjourns |
| 4:30pm-5:30pm | Board of Directors Meeting (Board members only) |
| 5:30pm-6:30pm | Dinner on your own or you are encouraged to dine with other MCCC and NCCC211 members and continue discussion |

Wednesday 24 February 2016

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|----------------|--|
| 8:00am-9:00am | Joint MCCC/Univ. of Wisc.-Extension Conference registration & informal poster presentations |
| 9:00am-12:30pm | Joint MCCC/Univ. of Wisconsin-Extension general conference (open to the public; see conference agenda for details) |

1:30pm-4:30pm

Joint MCCC/Univ. of Wisconsin-Extension general conference (open to the public; see conference agenda for details)

Accomplishments

Midwest Cover Crop Council Website

- In 2015, the MCCC website received over 26,000 visits from 19,000 unique visitors. These visitors viewed approximately 80,000 pages of cover crop information from the website.
- The MCCC listserv increased to 531 subscribers this past year and has 891 likes on Facebook. These subscribers regularly receive information, request advice and discuss current issues through the listserv.
- In 2015, the web-based MCCC Cover Crop Decision Tool was accessed 885 times by 771 users to assist them in making decisions about the implementation and selection of cover crops.
- Member states updated state information on the website.
- Selector tool was updated.

Midwest Cover Crop Field Guide 2nd Edition

- The Midwest Cover Crop Field Guide 2nd Edition of 20,000 printed copies were all distributed. Another printing of 10,000 copies for done.
- Planning continued for an “app” version of the guide for electronic devices (iPhone and Android).

NCCC-211 Committee member’s accomplishments

In 2015, members and graduate students of this committee published 26 peer-reviewed publications, 1 proceeding, 26 conference or abstracts presentations, 11 extension publications and numerous extension bulletins, blogs, factsheets, and websites. Also members of this group received funding for 35 research grants and advised 29 MS students, 9 PhD students, and 2 post-doctoral researchers.

Accomplishments by state

Kansas

According to the 2012 Census of Agriculture data collected for Kansas, no-till is used on 10.4 out of the 21 million acres of cropland. For cover crops, the 2012 Census values were 322,454 acres on 2,498 farms. In percentages, that would represent 1.5% of the cropland acres, and 5.6% of the farms. Since 2012, the adoption rate of cover crops visually appears to be increasing, but no estimates of the increases in acreage are readily available, particularly if the land was not enrolled in a conservation program such as the USDA-NRCS. Future efforts will be made to quantify cover crop adoption rates in Kansas. Fourteen extension meetings, workshops, and field days on cover crops and soil health presented to 500 attendees since the February 2015 NCCC211 meeting

Indiana

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. Cover crops are now part of the “tillage transect” done

in Indiana in the spring after planting. 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.

Iowa

The total acreage of annual cropland acres seeded to cover crops in Iowa during the 2015 cropping season is unavailable. Annual crop land acres planted to when this report was completed. However, unofficial estimates are that about 500,000 acres were planted to cover crops in 2015, approximately 1.92% of the annual cropland acres in the state. In 2015, there were 50 cover research projects and demonstrations in Iowa. In Iowa for 2015, cover crop activities and outputs included over 200 in-state field days, Extension meetings, and other programs attended by over 7000 individuals. Ten graduate students, two postdoctoral research associates, and one research associate are conducting research on cover crops at Iowa State University.

Michigan

Michigan State University (MSU) has increased University-supported funding for cover crop outreach and research in 2015 by moving Dean Baas to an Extension Educator position and by hiring Erin Hill as an Academic Specialist (20% research and 30% outreach appointment dedicated to cover crops). This has increased the capacity to understand the breadth of research occurring at the University and will translate into increased information available for outreach programming in the future. In 2015 there were 15 extension articles published on the MSU Extension News page, which has approximately 400,000 visitors per month. Extension educators held 40+ field days and workshops across the state, reaching several specific commodities and audiences (growers, conservation districts, NRCS, drain commissions, agribusiness, etc.). MSU also educated hundreds of undergraduate and graduate students through 13 different courses in the Departments of Plant, Soil, and Microbial Science, Entomology, and Horticulture that include cover crops in their curriculum. Beyond the classroom, there were five M.S. and three Ph.D. students with cover crop related research projects.

Minnesota

NRCS Promoted the Cover Crop Soil Health Initiative (multiple species cover crops, same acres, for 5 years) through news articles, fact sheets, and trainings. They had 54 producers sign up in 2013 with 2539.9 acres, 25 producers in 2014 with 1126.3 acres and in 2015 was the last year for the Initiative and we had 26 producers sign up with 1492.1 acres. Working with Field Offices, soil scientists, and ARCs once they have producers signed up for the initiative. In addition, 22 producers are interested in working with the University of Minnesota on getting usable data from the Initiative after the 5 years. State Agronomist works with RMA (Risk Management Agency) to understand the Cover Crop Insurance policies so that can be relayed back to the ARCs and field offices. RMA, University of Minnesota Extension, SWCD, National Wildlife Federation, and NRCS met on September 3, 2015 to discuss changes to insurance policies to consider cover crops under good farming practices and not separately.

North Dakota

Cover crops awareness and adoption is rapidly increasing in North Dakota. This has been reflected in the increasing number of field days and workshops in cover crops in the state. We had 210 total farmers and consultants attend the café talks in four counties (only 63 farmers in 2014). We had eight field days, and two train-the Trainer Workshops in cover crops with 45 attendees. Through these workshops we

reached 20 NDSU extension county agents, five NRCS-USDA, one NDSC educator, five ARS-USDA staff and 10 NDSU researchers. NDSU College students have participated of two field days and one workshop (40 students). Also, Dr. Berti was awarded a multi-institutional (NDSU, ISU, ARS_USDA, Morris, and UMN), multi-state (ND, IA, MN) CAP-NIFA grant for \$3,739,199 to work on cover crops related research and a Professional Development Program –SARE to train extension agents and educators about cover crops. Cover crops researchers and extension staff published two peer-reviewed publications, six abstracts and presentations at conference meetings, and one extension publication in 2015.

Wisconsin

Ten meetings were held on cover crops in Wisconsin in 2015. Meetings were sponsored by industry, university, and/or federal and state agencies and had 1283 attendees. Extension University of Wisconsin-Madison research personnel have extensive efforts with cover crops including determining N credits from legume species, assessment of grass cover crop impacts on dairy production systems, spring-seeded cover crop influences on in-season N supply or control on sandy soils, herbicide-cover crop interactions in corn, soybean, and wheat cropping systems, and potential for suppression of pigweeds (*Amaranthus* spp.) by cover crops.

Impacts:

1. In 2015 cover crop research, demonstrations, and publications by Iowa Cover Crops Working Group, an affiliate of NCCC211 and MCCC, has led to cover crop presentations at over 200 meetings, conferences, workshops, and field days in Iowa with more than 7000 attendees.
2. 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.
3. 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.
4. Increased numbers of enrolled and/or graduated students from graduate programs focusing on cover crop research and management.
5. Cover crops have been included as a nutrient loss reduction practice for both N and P in the Nutrient Reduction Strategies for Iowa, Minnesota, Ohio, and Illinois which should result in improved water quality.
6. Cover crops will impact Midwest’s economy by improving soil health, nutrient cycling, productivity of grain and energy crops, reducing expensive nitrogen inputs, and increasing supply of supplemental summer and fall forage.
7. Adoption of cover crops in the Upper Mississippi Basin and Great Lakes Region continues to increase through 2015.

Publications

Peer-reviewed

- 1 Basche, A.D., Archontoulis, S., Kaspar, T.C., Jaynes, D.B., Parkin, T.B., Miguez, F. 2015. Simulating long-term impacts of cover crops and climate change on crop production and environmental outcomes in the Midwestern United States. *Agriculture, Ecosystems and Environment*. 218:95-106.
- 2 Berti, M.T., R.W., Gesch, B.L. Johnson, Y. Ji, W. Seames, and A. Aponte. 2015. Double- and relay-cropping of energy crops in the Northern Great Plains. *Industrial Crops and Products*. 75B:26-34.

- 3 Bjorkman, R., C. Lowry, W. Shail, Jr., D.C. Brainard, D.S. Anderson, J.B. Masiunas. 2015. Mustard cover crops for biomass production and weed suppression in the Great Lakes Region. *Agronomy Journal* 107:1235-1249.
- 4 Daigh, A.L.M., X Zhou, M.J. Helmers, C.H. Pederson, R. Horton, M. Jarchow, M. Liebman. 2015. Subsurface drainage nitrate and total reactive phosphorus losses in bioenergy-based prairies and corn systems. *Journal of Environmental Quality* 44:1638-1646.
- 5 Gamble, J.D., J.M. Jungers, D.L. Wyse, G.A. Johnson, J.A. Lamb, and C.C. Sheaffer. 2014. Harvest Date Effects on Biomass Yield, Moisture Content, Mineral Concentration, and Mineral Export in Switchgrass and Native Polycultures Managed for Bioenergy. *Bioenergy Res.* 8: 740–749.
- 6 Gieske, M.F., V.J. Ackroyd, D.G. Baas, D.R. Mutch, D.L. Wyse, and B.R. Durgan. 2016. Brassica cover crop effects on nitrogen availability and oat and corn yield. *Agron. J.* 108: 151–161.
- 7 Gieske, M.F., D.L. Wyse, and B.R. Durgan. 2015. Spring and Fall-Seeded Radish Cover Crop Effects on Weed Management in Corn. *Weed Technol.* (February): WT–D–15–00023.1 Available at <http://www.wssajournals.org/doi/10.1614/WT-D-15-00023.1>.
- 8 Hayden, Z.D., M. Ngouajio, D.C. Brainard. 2015. Planting date and staggered seeding of rye-vetch mixtures: Biomass, nitrogen, and legume winter survival. *Crop Ecology and Physiology* 107:1-8.
- 9 Iqbal, J., D.C. Mitchell, D.W. Barker, F. Miguez, J.E. Sawyer, J. Pantoja, and M.J. Castellano. 2015. Does nitrogen fertilizer application rate to corn affect nitrous oxide emissions from the rotated soybean crop? *Journal of Environmental Quality* 44:711-719.
- 10 Johnson, G.A., M.B. Kantar, K.J. Betts, and D.L. Wyse. 2015. Field pennycress production and weed control in a double crop system with soybean in Minnesota. *Agron. J.* 107: 532–540.
- 11 Jordan, N.R., K. Dorn, B. Runck, P. Ewing, A. Williams, K.A. Anderson, L. Felice, K. Haralson, J. Goplen, K. Altendorf, A. Fernandez, W. Phippen, J. Sedbrook, M. Marks, K. Wolf, D. Wyse, and G. Johnson. 2016. Sustainable commercialization of new crops for the agricultural bioeconomy. *Elem. Sci. Anthr.* 4(1): 000081 Available at <http://www.elementscience.org/articles/81>
- 12 Jungers, J.M., T.W. Arnold, and C. Lehman. 2015a. Effects of Grassland Biomass Harvest on Nesting Pheasants and Ducks Effects of Grassland Biomass Harvest on Nesting Pheasants. *Am. Midl. Nat.* 173: 122–132.
- 13 Jungers, J.M., A.T. Clark, K. Betts, M.E. Mangan, C.C. Sheaffer, and D.L. Wyse. 2015b. Long-Term Biomass Yield and Species Composition in Native Perennial Bioenergy Cropping Systems. *Agron. J.* 107:1627
- 14 Jungers, J.M., J.O. Eckberg, K. Betts, M.E. Mangan, D.L. Wyse, and C.C. Sheaffer. 2015c. Plant roots and GHG mitigation in native perennial bioenergy cropping systems. *GCB Bioenergy*: n/a–n/a Available at <http://doi.wiley.com/10.1111/gcbb.12321>
- 15 Jungers, J.M., J.E. Fargione, C.C. Sheaffer, D.L. Wyse, and C. Lehman. 2013. Energy Potential of Biomass from Conservation Grasslands in Minnesota, USA. *PLoS One* 8(4).
- 16 Jungers, J.M., C.C. Sheaffer, J. Fargione, and C. Lehman. 2014. Short-term harvesting of biomass from conservation grasslands maintains plant diversity. *GCB Bioenergy*: 1050–1061.
- 17 Jungers, J.M., C.C. Sheaffer, and J.A. Lamb. 2015d. The Effect of Nitrogen, Phosphorus, and Potassium Fertilizers on Prairie Biomass Yield, Ethanol Yield, and Nutrient Harvest. *Bioenergy Res.* 8(1): 279–291.
- 18 Jungers, J.M., D.L. Wyse, and C.C. Sheaffer. 2015e. Establishing Native Perennial Bioenergy Crops with Cereal Grain Companion Crops. *Bioenergy Res.* 8(1): 109–118.
- 19 Kaspar, T.C., Bakker, M.G. 2015. Biomass production of 12 winter cereal cover crop cultivars and their effect on subsequent corn yield. *Journal of Soil and Water Conservation.* 70:353-364.
- 20 Liebig, M.A., J.R. Hendrickson, D.W. Archer, M.A. Schmer, K.A. Nichols, and D.L. Tanaka. 2015. Short-Term Soil Responses to Late-Seeded Cover Crops in a Semi-Arid Environment *Agron. J.* 107(6):2011-2019.

- 21 Marti, A., J.E. Bock, M.A. Pagani, B. Ismail, and K. Seetharaman. 2016. Structural characterization of proteins in wheat flour doughs enriched with intermediate wheatgrass (*Thinopyrum intermedium*) flour. *Food Chem.* 194: 994–1002
- 22 Marti, A., X. Qiu, T.C. Schoenfuss, and K. Seetharaman. 2015. Characteristics of perennial wheatgrass (*Thinopyrum intermedium*) and refined wheat flour blends: Impact on rheological properties. *Cereal Chem.* 92(5): 434–440.
- 23 Pantoja, J.L., K.P. Woli, J.E. Sawyer, D.W. Barker. 2015. Corn nitrogen fertilization requirement and corn-soybean productivity with a rye cover crop. *Soil Science Society of America Journal* 79:1482-1495.
- 24 Sheaffer, C.C., K.M. Martinson, D.L. Wyse, and K.M. Moncada. 2014. Companion Crops for Organic Alfalfa Establishment. *Agron. J.* 106(1): 309
- 25 Williams, A., D.A. Kane, P.M. Ewing, L.W. Atwood, A. Jilling, M. Li, Y. Lou, A.S. Davis, A.S. Grandy, S.C. Huerd, M.C. Hunter, R.T. Koide, D.A. Mortensen, R.G. Smith, S.S. Snapp, K.A. Spokas, A.C. Yannarell, and N.R. Jordan. 2016. Soil Functional Zone Management: A Vehicle for Enhancing Production and Soil Ecosystem Services in Row-Crop Agroecosystems. *Front. Plant Sci.* 7

Proceedings

- 1 Patel, S., J.E. Sawyer, J.P. Lundvall, and J. Hall. 2015. Root and shoot biomass and nutrient composition in a winter rye cover crop. p. 113-118. In *Proc. Forty-Fifth North Central Extension-Industry Soil Fertility Conf.*, Des Moines, IA. 4-5 Nov. 2015. Vol. 31. International Plant Nutrition Inst., Brookings, SD.

Conferences and abstracts

- 1 Acharya, J. 2015. Effect of cereal rye cover crop on corn seedling diseases and yield. Departmental seminar, Plant Pathology and Microbiology, Iowa State University, 27 October 2015. 40 attendees.
- 2 Appelgate, S., T.C. Kaspar, M.H. Wiedenhoef, A.W. Lenssen. 2015. Cover crop options and mixes for the upper Midwest. 15-18 Nov. ASA-CSSA-SSSA International meetings. St. Paul, MN.
- 3 Bakker, M., T. Moorman, T. Kaspar, D. Manter. 2015. Cropping systems for enhanced sustainability and environmental quality in the Upper Midwest. *Am. Phytopath. Soc. Annual meetings.*
- 4 Banik, C., D.A. Laird, K.J. Moore, and A.W. Lenssen. 2015. Soil C and N dynamics for a corn-perennial cover crop cropping system. 15-18 Nov. ASA-CSSA-SSSA International meetings. St. Paul, MN. <https://scisoc.confex.com/scisoc/2015am/webprogram/Paper93241.html>
- 5 Bartel, C.A., K.J. Moore, A.W. Lenssen. 2015. Establishment of perennial cover crops with corn and soybean. 15-18 Nov. ASA-CSSA-SSSA International meetings. St. Paul, MN. <https://scisoc.confex.com/scisoc/2015am/webprogram/Paper94490.html>
- 6 Berti, M.T., 2015. How to select a cover crop to maximize the benefits of having a cover crop. 11th Conservation Tillage Conference. Wilmar, MN. 15-16 December, 2015.
- 7 Berti, M.T., O. Teuber, D. Samarappuli, A. Aponte, J. Lukaschewsky, G. Gramig, D. Ripplinger, A. Wick, C. Heglund, E.M. Gaugler, K.K. Sedivec, D.L. Whitted, B.W. Neville, S. Zwinger, S. Schaubert, and P. Carr. 2015. North Dakota report 2014. Annual Midwest Cover Crops Council conference. Ames, IA., 16-19 February, 2015.
- 8 Davis, C., D.R. Presley, J. Farney, G.F. Sassenrath. 2015. Evaluating multi-species cover crops for forage production. *In Annual meetings abstracts, ASA, CSSA, and SSSA, Madison, WI.* Poster.
- 9 Gerdes, S., K. Cassida, S. Snapp, V. Morrone, and K. Renner. 2015. Using cover crops in wheat-corn rotations to provide forage while improving soil health. ASA-CSSA-SSSA annual meeting.

- Minneapolis, MN.
- 10 Johnson, B.L., M.T. Berti, S. Dash, P.K. Gilbertson, K. Sahu, and P.J. Petersen. 2015. Screening new crops for adaptation promotes agricultural sustainability. In Proc. 2nd International Conference on Sustainable Agriculture and Environment. Selcuk University, Konya, Turkey, Sept. 30 - Oct. 3, 2015.
 - 11 Kandel, H. 2015. Cowpea trial evaluation. Northern Plains Ag Association Breeding Club Members. Prosper ND, September 9, 2015.
 - 12 Kaspar, T.C., J. Acharya, A. Robertson, M. Bakker, A. Lenssen, and T. Moorman. 2015. Effect of length of interval between cereal rye cover crop termination and corn planting on seedling root disease and corn growth. 15-18 Nov. ASA-CSSA-SSSA International meetings. St. Paul, MN.
 - 13 Kladviko, E.J. 2015. Managing cover crops for improved soil health and water quality. 15-18 Nov. ASA-CSSA-SSSA International meetings. St. Paul, MN. (invited talk)
 - 14 Lukaschewsky, J., A. Aponte, M.T. Berti, D. Samarappuli, O. Teuber, D. Undersander. 2015. Intercropping Silage Corn and Alfalfa in Eastern North Dakota, USA. ASA-CSSA-SSSA International Annual Meetings. Minneapolis, MN. 15-18 November 2015.
 - 15 Marcillo, G. and F. Miguez. 2015. Corn Yield Response under Winter Cover Crops: An updated Meta-analysis. ASA-CSSA-SSSA annual meetings, 15-18 November 2015, Minneapolis, MN.
 - 16 Millar N, DG Baas and GP Robertson. Nitrous oxide emissions from Midwest row-crops: Comparing presence and absence of winter cover crops. GLBRC Sustainability Retreat 2015. Kellogg Biological Station, February 9-11, 2015 (Poster)
 - 17 Millar N, DG Baas and GP Robertson. The influence of potential biofuel cover crops on nitrous oxide (N₂O) emissions from Midwest row-crops. USDA-DOE Plant Feedstock Genomics for Bioenergy Meeting, Washington DC, February 22-25, 2015 (Poster)
 - 18 Millar N, DG Baas and GP Robertson. The influence of potential biofuel cover crops on nitrous oxide (N₂O) emissions from Midwest row-crops. GLBRC 2015 Annual Meeting, South Bend, IN, May 19-21. (Oral)
 - 19 Millar N, DG Baas and GP Robertson. The influence of potential biofuel cover crops on nitrous oxide (N₂O) emissions from Midwest row-crops. ASA, CSA, SSSA 2015 Annual International Conference, Minneapolis, MN, Nov 15-18, 2015. (Oral)
 - 20 Ostlie, M. 2015. Utilizing winter rye for weed suppression in soybeans. Western Society of Weed Science annual meeting. Portland, OR, March 2015.
 - 21 Patel, S., J.E. Sawyer, and J.P. Lundvall. 2015. Enhancing corn yield in a winter cover crop system. In Annual Meetings Abstract (on-line), ASA, Madison, WI.
 - 22 Presley, D.R., P.J. Tomlinson, C. Rivard, K. Oxley, J. Griffin. 2015. Soil health evaluation in no-till, cover crop, pumpkin production systems in the Great Plains. In Annual meetings abstracts, ASA, CSSA, and SSSA, Madison, WI. Oral.
 - 23 Rogers, K. M. and C. L. Sprague. 2015. Preharvest herbicide application effects on winter wheat harvestability. North Central Weed Science Society. Indianapolis, IN. (98)
 - 24 Rorick, J.D., T.J. Frank, and E.J. Kladviko. 2015. Soil physical properties as affected by a cereal rye (*Secale cereale* L.) cover crop in a corn-soybean rotation in Indiana. 15-18 Nov. ASA-CSSA-SSSA International meetings. St. Paul, MN.
 - 25 Sklenar, T., A.W. Lenssen, M.H. Wiedenhoef, T.C. Kaspar. 2015. Cover crops in soybean systems: Brassicas, rye, biomass use and termination timing. Iowa Soil & Water Conservation Society and Midwest Cover Crop Council annual meetings, 17-18 February 2015, Des Moines, IA.
 - 26 Thelen, M. 2015. Rainfall simulator use for extension programming. National Association of County Agricultural Agents. Sioux Falls, SD.

Extension

- 1 Baas, D., E. Kladvik, S. Casteel, T. Kaspar, D. Wyse, J. Hoormann, R. Hoormann, M. Ruark, D. Clay, S. Clay, P. Gross, N. Millar, H. Murray, and S. Noggle. 2015. Integrating cover crops in soybean rotations. Midwest Cover Crops Council. Available online at: http://mccc.msu.edu/documents/2015Integrating_CoverCrops_Soybeans.pdf
- 2 Berti, M.T., and A. Wick. 2015. How to select a cover crop or cover crop mix? NDSU Forages webpage. Available at: <http://www.ag.ndsu.nodak.edu/research/plantsciences/forages>
- 3 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
- 4 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
- 5 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
- 6 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
- 7 Hartzler, B, M. Anderson, and R. Vittetoe. 2015. Herbicide use may restrict grazing options for cover crops. Iowa State Univ. Ext. Outreach. Crop 3082. <https://store.extension.iastate.edu/Product/Herbicide-use-may-restrict-grazing-options-for-cover-crops>
- 8 Hill, E. K. Renner, and C. Sprague. 2015. Quantifying the impacts of cover crops on organic dry beans. Organic Agriculture Research Symposium, La Crosse, WI and live broadcast on eXtension-eOrganic
- 9 Sackett, J. & Wells, M.S. (reviewed by: Sebastian, R.- USDA RMA & Spencer, C. – USDA NRCS) USDA Cover Crop Guidelines Updated. February 16, 2015. Minnesota Crop News (blog). <http://blog-crop-news.extension.umn.edu/2015/02/usda-cover-crop-guidelines-updated.html>
- 10 Werling, B., J. Bakker, C. Noyes, and D. Baas. 2015. Mustard cover crop: How to help your biofumigation potential. MSUExtension YouTube page, available at: <https://www.youtube.com/watch?v=jePUyzjXlmw&feature=youtu.be>
- 11 Midwest Cover Crop Field Guide. 2nd edition. 2014. Midwest Cover Crop Council and Purdue Crop Diagnostic Training and Research Center. 10,000 additional copies printed in 2015.

Research grants

- 1 Anderson, J. Intermediate Wheatgrass Breeding Support using Phenotypic and Genotypic-based Selection Methods. 2016. Forever Green Initiative Clean Water Land & Legacy Amendment. \$51,615
- 2 Anderson, J. Field Pennycress Breeding Project Support. 2016. Forever Green Initiative Clean Water Land & Legacy Amendment. \$90,132
- 3 Berti, M., B. Johnson, D. Ripplinger, H. Kandel, A. Wick, A. Akyuz, J. Ransom, D. Franzen, R. Gesch, F. Forcella, A. Lenssen, S. Wells. 2015-2019, USDA AFRI Food Security CAP, Agricultural Production Systems – Cropping Systems. A5160. A novel management approach to increase productivity, resilience, and long-term sustainability in cropping systems in the northern Great Plains. \$3,739,199.
- 4 Berti, M. and A. Wick. 2015-2016. Enhancing soil health with cover crops in North Dakota: Training program. NC-SARE Professional Development Grant. \$71,012.
- 5 Brandvain, Y. Developing Genomic Resources for Helianthus divaracatus to facilitate the development of perennial sunflower for food production and wildlife services. 2016. Forever Green Initiative Clean Water Land & Legacy Amendment. \$80,652

- 6 Braun, L. Sustaining Hazelnut Breeding and Agronomic Research at the University of Minnesota. 2016. Forever Green Initiative Clean Water Land & Legacy Amendment. \$80,000.
- 7 Building market foundations for sustainable vegetable production and processing.” USDA-SCRI, 2012-2016. (\$2,523,336)
- 8 Chen, S. Population Dynamics of Soybean Cyst Nematode in Winter Annual Oilseeds. 2016. Forever Green Initiative Clean Water Land & Legacy Amendment. \$94,424.
- 9 Garcia y Garcia, A. Effect of Cover Crops on Water Use and Nitrogen Leaching in Corn and Soybean Cropping Systems. 2016. Forever Green Initiative Clean Water Land & Legacy Amendment. \$50,000.
- 10 Grewal, P. and K.R. Islam. 2011-2015. Maximizing ecosystem services in the soil food web in organic farming systems. \$178,929, The CERES Trust.
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Graduate students in cover crops research

MS students: 8 in Iowa, 1 in Kansas, 5 in Michigan, 7 in Indiana, 6 in Wisconsin, 2 in North Dakota

PhD students: 2 in Iowa, 3 in Michigan, 2 in North Dakota, 2 in Wisconsin

Postdoctoral researchers: 2 in Iowa