Midwest Cover Crops Council

Indiana: Report for February 23-25, 2021 Meeting host University of Guelph

Contact Information

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Abstract

Cover crop interest and adoption continues to grow in Indiana (~ 950,000 adopted acres). Therefore, the demand for training and services related to cover crops by the Conservation Partnership continues to increase. 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. Collectively in 2020, the conservation partnership provided technical training, logistical and promotional support for 38 events, reaching nearly 4650 Individuals. To further strengthen cover crop training and services to farmer and trainers, Purdue research scientist conducted approximately 13 distinct research projects related to cover crop adoption, soil health, cropping systems climate resilience, syncrony of N and P release from cover crop residue, water quality, forage quality, weed supression, and cover crop economics. Additionally, seven cover crop related papers were accepted or published in scientific journals, eight extension and outreach publications, and 35 extension or outreach presentations that reached approximately 2,000 individuals. Ongoing research in cover crops facilitated the graduate education of 11 graduate students (5 Ph.D., 6 M.S.).

Highlights

Extension and Farmer Outreach publications

- Kladivko, E. 2020. Drainage for the long haul: Key takeaways from the SEPAC study. AY-396-W. Purdue University Extension. https://ag.purdue.edu/agry/drainage/Pages/New-Summaries.aspx (plus video post at same site).

- Kladivko, E. 2020. Soil drainage impacts on cover crop growth and soil improvement: Insights from long-term SEPAC study. AY-398-W. Purdue University Extension. https://ag.purdue.edu/agry/drainage/Pages/New-Summaries.aspx (plus video post at same site).

- Kladivko, E. 2020. Soil drainage and nitrate losses to surface waters: Insights from long-term SEPAC study. AY-399-W. Purdue University Extension. https://ag.purdue.edu/agry/drainage/Pages/New-Summaries.aspx (plus video post at same site).

- Coppess, J., C. Navarro, S. P. Satheesan, V. V. G. Naraharisetty, R. Bhattarai, S. Armstrong, and R. Gupta. "Introducing the Cover Crop Decision Support Tool." farmdoc daily (10): 176, Department of Agricultural and Consumer Economics, University of Illinois at Urbana Champaign, October 1, 2020. https://farmdocdaily.illinois.edu/2020/10/introducing-the-cover-crop-decision-support-tool.html

- Coppess, J., C. Navarro, S. Satheesan, V. Gowtham Naraharisetty, R. Bhattarai, S. Armstrong and R. Gupta. "Introducing an Update to the Cover Crop Decision Support Tool." farmdoc daily (11):18, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, February 4, 2021. https://farmdocdaily.illinois.edu/2021/02/introducing-an-update-to-the-cover-crop-decision-support-tool.html

Extension Newsletters

- Zimmer, M. and Johnson, B. 2020. Soil Residual Herbicides and Establishment of Cover Crops in The Fall. Purdue University Extension. https://extension.entm.purdue.edu/newsletters/pestandcrop/article/soil-residual-herbicides-and-establishment-of-cover-crops-in-the-fall/

- Armstrong, S.D. 2021. How cover crops, along with nitrogen timing, affected yield in tile-drained fields. https://www.illinoisnrec.org/how-cover-crops-along-with-nitrogen-timing-affected-yield-in-tile-drained-fields/

- Armstrong, S.D. 2020. Is Cereal Rye before Corn Recommended? https://www.illinoisnrec.org/is-cereal-rye-before-corn-recommended/

Research publications

- Nevins, C., Lacey, C. L., & Armstrong, S. D. 2021. Cover crop enzyme activities and resultant soil ammonium concentrations under different tillage systems. *European Journal of Agronomy*. (Accepted)
- Sadeghpour, A., Adeymi, O., Hunter, D., Lua, Y., & Armstrong, S. D. (2021). Precision planting impacts on winter cereal rye growth, nutrient uptake, spring soil temperature and adoption cost. *Renewable Agriculture and Food Systems*. https://doi.org/https://doi.org/10.1017/S1742170520000411
- Thompson, N. M., Armstrong, S. D., Roth, R. T., Ruffatti, M. D., & Reeling, C. J. (2020). Short-Run Net Returns to a Cereal Rye Cover Crop Mix in a Midwest Corn-Soybean Rotation. *Agronomy Journal*, *112*, 1068–1083.
- Lacey, C., Nevins, C. J., Camberato, J. J., Kladivko, E. J., Sadeghpour, A., & Armstrong, S. D. (2020). Carbon and nitrogen release from cover crop residues and implications for cropping systems management. *Journal of Soil and Water Conservation*, *75*(4), 505–514.

- Hodgskiss, C. L., Young, B. G., Armstrong, S. D., & Johnson, W. G. (2021). Evaluating cereal rye and crimson clover for weed suppression within buffer areas in dicamba-resistant soybean. *Weed Technology*, 1–29.
- DeSimini, S. A., Gibson, K. D., Armstrong, S. D., Zimmer, M., Maia, Lucas O. R., & Johnson, W. G. (2020). Effect of cereal rye and canola on winter and summer annual weed emergence in corn. *Weed Technology*, *34*(6), 787–793. https://doi.org/10.1017/wet.2020.51
- Thompson, N. M., Reeling, C. J., Michelle Fleckenstein, Prokopy, L. S., & Armstrong, S.D. (2020). Examining Intensity of Conservation Practice Adoption: Evidence from Cover Crop Use on U.S. Midwest Farms. *Food Policy*. (Accepted)

Graduate students and post-docs
- 5 Ph.D. students, 6 M.S. students,

Ongoing Research

Ongoing studies by Dr. Eileen Kladivko (kladivko@purdue.edu):
- Long-term cover crop impacts on soil health and crop yield. Dr. Kladivko continues her long-term (10-yr) project assessing the impact of cereal rye on soil health and corn and soybean yields. She also continues to monitor cover crop growth as affected by subsurface drainage intensity on our 38-yr drainage study.

Ongoing studies led by Dr. Shalamar Armstrong (sarmstro@purdue.edu) and graduate students
- Resolving spatiotemporal soil nutrient fluxes and response to BMPs by continuous in situ N and P monitoring to achieve state and regional nutrient loss reduction goals

- The long-term influence of cover crop species on soil phosphorus sorption, residue P release, and the dynamics of soil phosphorus enzymatic activity.

- Quantifying the soil fate of nitrogen from cereal rye root and shoot biomass using ^{15}N stable isotope techniques and the synchrony of residue N release with corn N demand.

- Optimization of Next Generation Cover Crop and Nitrogen Management for competitive crop yield and water quality. Two new research projects have been established in multiple locations across the state of IN (1) investigating precision planting cover crops and nitrogen management and their impacts on crop yield and water quality; (2) swine manure injection and red clover inclusion rate after wheat impact on nitrogen rate needed for optimum corn yield.

- Conservation Economics: Quantifying farmer risk associated with cereal rye inclusion in the Midwest.

- The effect of mass cover crop adoption on water quality at a watershed scale: A paired watershed experiment in the Lake Bloomington watershed.

- Enhancing the Sustainability of US Cropping Systems through Cover Crops and an Innovative Information and Technology Network. Indiana is participating in common experiments, on-farm trials (Shalamar Armstrong), data architecture and tools (Ankita Raturi), social science (Linda Prokopy), and MCCC and leadership team (Anna Morrow, Eileen Kladivko).

- Evaluating remote sensing techniques to rapidly estimate winter cover crop adoption in the Midwest of the united states

Ongoing studies 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 studies by Dr. William Johnson addresses the following 3 topics:

- Utilizing cover crops and in crop cultivation for weed suppression in no-till soybeans and corn. Goal is to see if we can obtain weed control benefits to using cereal rye and cereal rye + balansa clover based cover crop systems. We have a new cultivator newer cultivator we plan to evaluate in 2021.

- Impact of cover crops on residual herbicide degradation. Goal is to see if cover crops speed up degradation of residual herbicides.

- Impact of planting green on weed suppression and crop yield. Goal is to determine optimal management practices to control weeds and protect crop yield.

Extension/Education/Outreach/On-farm trials

- Cover crop interest and adoption continue to be strong in Indiana. Purdue Extension is an active partner in the Indiana Conservation Partnership (NRCS, Soil and Water Conservation Districts (SWCD), Conservation Cropping Systems Initiative (CCSI), Indiana State Department of Agriculture (ISDA), State Soil Board, and Purdue Extension and College of Agriculture). The Partnership continues to provide core cover crop training and advanced soil health and cover crop trainings to conservation field staff, and to host or partner on numerous workshops and field days aimed at farmers. We also work with farmers conducting on-farm trials of cover crops vs. no cover crops and often use those farmers as part of the training cadre for field staff and farmers. Education about soil health is embedded within almost all activities and educational events. Mr. Joe Rorick is the Conservation Agronomist working with CCSI and Purdue; others heavily involved with CCSI programs

include Stephanie McLain and Barry Fisher (NRCS), Lisa Holscher (CCSI, SWCD), and Eileen Kladivko, Shalamar Armstrong, and Walt Sell (Purdue).

- In 2020, CCSI provided technical, logistical and promotional support for 38 events, reaching nearly 4650 Individuals.

    - Soil Health Podcasts with Hoosier Ag Today continued – typically featuring a soil health farmer + an ag/conservation professional.

    - Provided every county in Indiana with infield assessment and soil health demonstration kits and plan to hold trainings/workshops in 2021 to develop consistent use and messaging among Purdue Extension.

    - CCSI-SARE PDP Train the Trainer series hosted four training events with approximately 180 attendees.

    - Stephanie McLain, Indiana NRCS State Soil Health Specialist and Joe Rorick, Purdue Extension CCSI Agronomist infield soil health diagnostics program was presented at the Indiana CCA Conference, Kentuckiana Crops Conference, IASWCD Annual Conference, Environmental Educators Association of Indiana Annual Conference, and elsewhere to 500+ attendees.

    - CCSI launched "The Root Project" graphics that we developed of common cover crop species and their rooting structures. The Root Project is available for download from our website CCSIN.org.

- Dr. Kladivko: 8 in-person Extension presentations pre-Covid-19; 8 virtual presentations/workshops during Covid-19.

- Dr. Armstrong: 15 virtual presentations and reached over 1,200 individuals.

- Dr. Johnson: 12 virtual presentations and reached over 900 individuals.