

Matt Ruark, Associate Professor, Department of Soil Science

Projects:

1. Fall cover cropping in corn silage rotations with fall manure in Wisconsin.
2. Assessing the nitrogen credit of frost seeded red clover
3. Assessing the nitrogen credit of interseeded red clover

Publications:

Ruark, M.D., M. Chawner, M. Ballweg, R. Proost, F. Arraiaga, J. Stute. 2018. Does cover crop radish supply nitrogen to corn? *Agronomy J.* 110:1-10.

Erin Silva, Associate Professor of Plant Pathology

Cover crops and soil health. Soil health – the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans – has been increasingly recognized throughout agriculture as a critical component to the maintenance of our agricultural productivity and food security. As a complex interaction of physical, biological, and chemical factors, our further understanding of the optimization of soil health and associated agricultural practices is imperative to ensure that best management practices (BMPs) are recognized by both farmers and policymakers. To this end, my research program has become an international leader in the development of a key practice to ensure the maintenance and improvement of soil health in organic systems: cover crop-based reduced tillage. The BMPs developed through my research allow for the production of organic soybeans without soil disturbance, while achieving superior weed management and maintaining yields comparable to traditionally-produced organic soybeans. Reported through federal Organic Census data, in the most recent four-year period alone, the adoption of organic no-till acres increased 400%. This translates into significant reduction in variable costs to the farmers of \$75 per acre and a 50% decrease in labor and fuel inputs. Further, this system is estimated to allow for 86-89% reduction in soil loss as compared to typical organic production practices, protecting our land and water resources and improving soil health.

Beyond organic no-till practices, a deeper understanding of the impacts of production approaches on soil health is needed to further guide the development of BMPs and agricultural policy. These indicators include soil microbial activity, soil aggregation, and soil carbon and nitrogen pools. My research program, as part of interdisciplinary efforts with collaborators in the UW-Madison Departments of Plant Pathology, Agronomy, and Soil Science, has investigated changes in these critical aspects of soil health upon modification in tillage, cover cropping, crop rotation, and fertility practices. This research, conducted by my graduate student funded through a National Science Foundation fellowship, highlighted the importance of adopting a systems-based approach to improving soil health, as longer-term change in soil health requires a more holistic strategy versus a singular change in practice. Further, this work demonstrated changes in both carbon and nitrogen cycling and soil microbial communities under different management approaches, providing baseline data to allow for the further optimization of both organic and conventional management to obtain soil health goals. This area of research will

continue to serve as a major thrust of my research program, with a new \$1.1 mill federal award in 2018 which integrates new interdisciplinary collaborations with the Department of Biological Systems Engineering.

Silva, E.M. and L. Vereecke. 2019. Optimizing organic cover crop-based rotational tillage systems for early soybean growth. *Organic Agriculture*.

Kevin Shelley, University of Wisconsin Nutrient and Pest Management Program
2018 Cover Crop Research and Outreach activities

- a.) Continued a long-term (7th year) research and outreach trial at the Arlington Agricultural Research Station comparing crop yields (corn silage, rye forage and cover crop biomass) and economics associated with corn silage followed by a winter rye cover crop, a spring-harvested winter rye forage crop and no rye; Kevin Shelley and Matt Ruark.
- b.) Conducting a comparative economic and environmental compliance analysis of the three practices above using data from the trial. This will be developed into an educational publication through the UW Nutrient and Pest Management Program as well as a Master's thesis by a student in the UW Agroecology Program; Kevin Shelley, Nicholas Gallagher and Paul Mitchell.
- c.) Completion of a new educational publication, Planting cover crops after corn silage for spring forage harvest: Opportunities and challenges as told by dairy farmers and their consultants in Wisconsin. The publication presents the results of four focus group interview sessions conducted by UW Extension colleagues Liz Binversie, Heidi Johnson, Randy Shaver and Kevin Shelley with dairy farmers and their nutrition and agronomy consultants. Interview and data analysis methods were developed with assistance from UW Division of Extension Program Development and Evaluation. The publication, reflecting the study's objectives, intends to help educators and conservation professionals better understand the motivations, challenges and successes associated with fall-planted cover crops as spring harvested forages. Further, it provides farmer thoughts and insights about management requirements for cover crop forages and also identifies needs for additional research and resources. The publication is available on the Nutrient and Pest Management (NPM) website at https://ipcm.wisc.edu/download/pubsNM/CoverCropsSummary_FINAL.pdf.

Jaimie Patton, UW-NPM

In 2018, 88 soil health talks to youth, farmers, agency and agri-business professionals and tribal communities reaching 4,767 individuals.

Dan Smith, UW-NPM

Evaluating interseeding at V5 with a modified no-till drill, overseeding via broadcast application at V8, and overseeding- simulated aerial application. Preliminary results suggest no significant impact on grain yield. Mixed success depending on species. Depending on application time: red clover, oats, winter rye, and radish produce the most above ground growth.

John Grabber, USDA-ARS

- Osterholz, W.R., M.J. Renz, W.E. Jokela, and J.H. Grabber. 2018. Interseeded alfalfa reduces soil and nutrient runoff losses during and after corn silage production. *J. Soil Water Conser.* 74:85-90
- Osterholz, W.R., J.H. Grabber, and M.J. Renz. 2018. Adjuvants for prohexadione-calcium applied to alfalfa interseeded with corn. *Agron. J.* 110:2687-2690.
- Osterholz, W.R., M.J. Renz, J.G. Lauer, and J.H. Grabber. 2018. Prohexadione-calcium rate and timing effects on alfalfa interseeded into silage corn. *Agron. J.* 110: 85-94.