USDA Agricultural Research Service
U.S. DEPARTMENT OF AGRICULTURE

Research Brief

Cereal Rye Cover Crop Termination At or Before Soybean Planting Has Minimal Effect on Soybean Yield Across the U.S. Midwest

Louis Hesler and Shannon Osborne
USDA-ARS North Central Agricultural Research Laboratory, Brookings, SD
and 10 research collaborators across the Midwest

Key Findings:

- Cereal rye biomass increased when termination was delayed.
- Cover crop termination timing had inconsistent effects on soybean yield implying flexible termination options for cover crop adoption.
- The absence of substantial yield benefits underscores the importance of considering both short-term costs and long-term sustainability goals.

USDA is an equal opportunity provider, employer, and lender.

Stay up to date with ARS at www.ars.usda.gov

Background

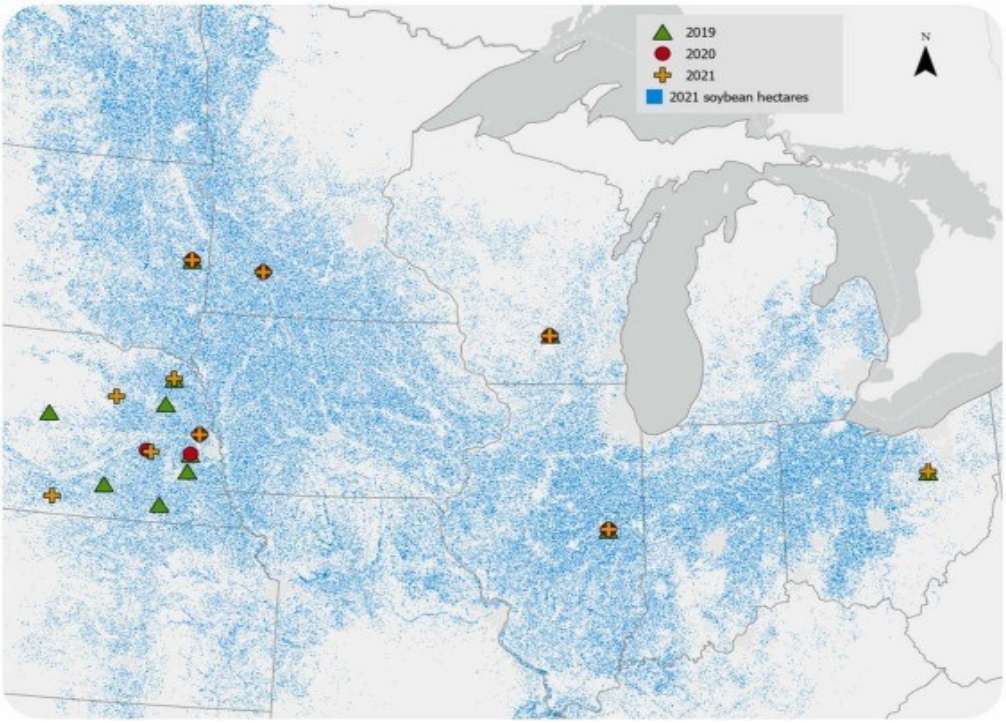
Interest is growing among farmers in the Midwestern U.S. about the potential benefits of establishing cereal rye (*Secale cereale*) as a cover crop that may precede either soybean or corn. However, there are concerns about the implications and potential tradeoffs of this practice, particularly in regard to soybean yield.

Objective

We sought to evaluate the effects of cereal rye cover crop termination at or before soybean planting on soybean seed yield.

Methods

Field experiments were conducted from 2019 to 2021 across 28 location-years in the Midwestern U.S., including the Eastern South Dakota Soil & Water Research Farm near Brookings. Treatments consisted of no cereal rye, cereal rye termination before soybean planting, and cereal rye termination at soybean planting. Cereal rye was chemically terminated at the respective termination times. Cereal rye biomass and soybean yield were assessed.



Map of the soybean experimental locations between 2019 and 2021 and soybean planted area in 2021.

Results

Delaying cereal rye termination in soybean systems increased rye biomass, but its impact on soybean yield was inconsistent. Results showed that delayed termination did not reduce soybean seed yield in 25 of 28 location-years compared to a no cover crop treatment. There was no clear evidence indicating that a threshold level of cereal rye biomass accumulation reduced soybean seed yield.

Our results suggest that farmers who adopt cereal rye as a winter cover crop in the examined region have a flexible management window for terminating cereal rye, as the timing of termination had minimal effect on soybean seed yield. However, there were no significant soybean seed yield benefits that would justify the associated cost with the use of cover crops.

For more about our study, check out this article:
Silva, T.S., S. Mourtzinis, A.J. McMechan, G.I. Carmona, B.D. Potter, K.J. Tilmon, **L.S. Hesler**, N.J. Seiter, R. Wright, **S.L. Osborne**, T.E. Hunt, S.P. Conley. 2024. Cereal rye cover crop termination at or before soybean planting has minimal effect on soybean yield across the Midwestern US. *Field Crops Research* 312: 09393.
https://doi.org/10.1016/j.fcr.2024.109393

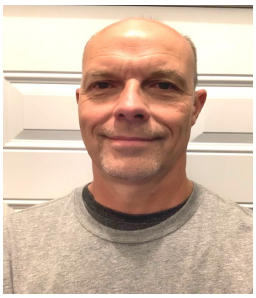
Soybean plants growing amid terminated rye cover crop.

Next Steps

- Conducting long-term studies in the future is highly recommended to better understand how cereal rye cover crops can influence soybean seed yield and soil properties over time.
- Further studies should also investigate the aspect of non-chemical rye management to assess its potential cost-saving effects for farmers adopting this system.

Louis Hesler
Research Entomologist

Email: Louis.Hesler@usda.gov
Phone: 605-693-5228



Shannon Osborne
Research Agronomist

Email: Shannon.Osborne@usda.gov
Phone: 605-693-5234

About NCARL

The North Central Agricultural Research Laboratory (NCARL) is a USDA Agricultural Research Service laboratory located in Brookings, SD. The goal of NCARL is to develop, document, and promote soil, crop, and pest management practices that are ecologically sustainable while maintaining producer profitability.

USDA is an equal opportunity provider, employer, and lender.