

Using a Cereal Rye (*Secale cereale* L.) Cover Crop to Mitigate Effects of Climatic Stresses on a Corn-Soybean (*Zea mays* L. – *Glycine max* L. Merr.) Rotation in Indiana

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Introduction and Rationale

Cover Crops in the Midwest:

- May improve soil health and crop productivity, as well as increase resiliency to climate stresses in corn-soybean rotation systems

Work is Needed in the Midwest:

- To quantify benefits and risks of cover crops, including soil health and organic matter, nutrient cycling, and crop productivity
- Sustainable Corn Team includes 10 cover crop locations

Site Established in 2011:

- Southeast Purdue Agricultural Center (SEPAC) in Butlerville, IN
- No-till corn-soybean rotation with and without cereal rye cover crop

Objectives:

1. Measure soil stability in rye vs. no rye treatments
2. Assess dry matter production and nitrogen (N) uptake of cereal rye aboveground biomass
3. Measure cash crop yields and compare rye vs. no rye treatments

Experimental Procedure



SEPAC field site



Rye cover vs. no cover effects on surface soil erosion



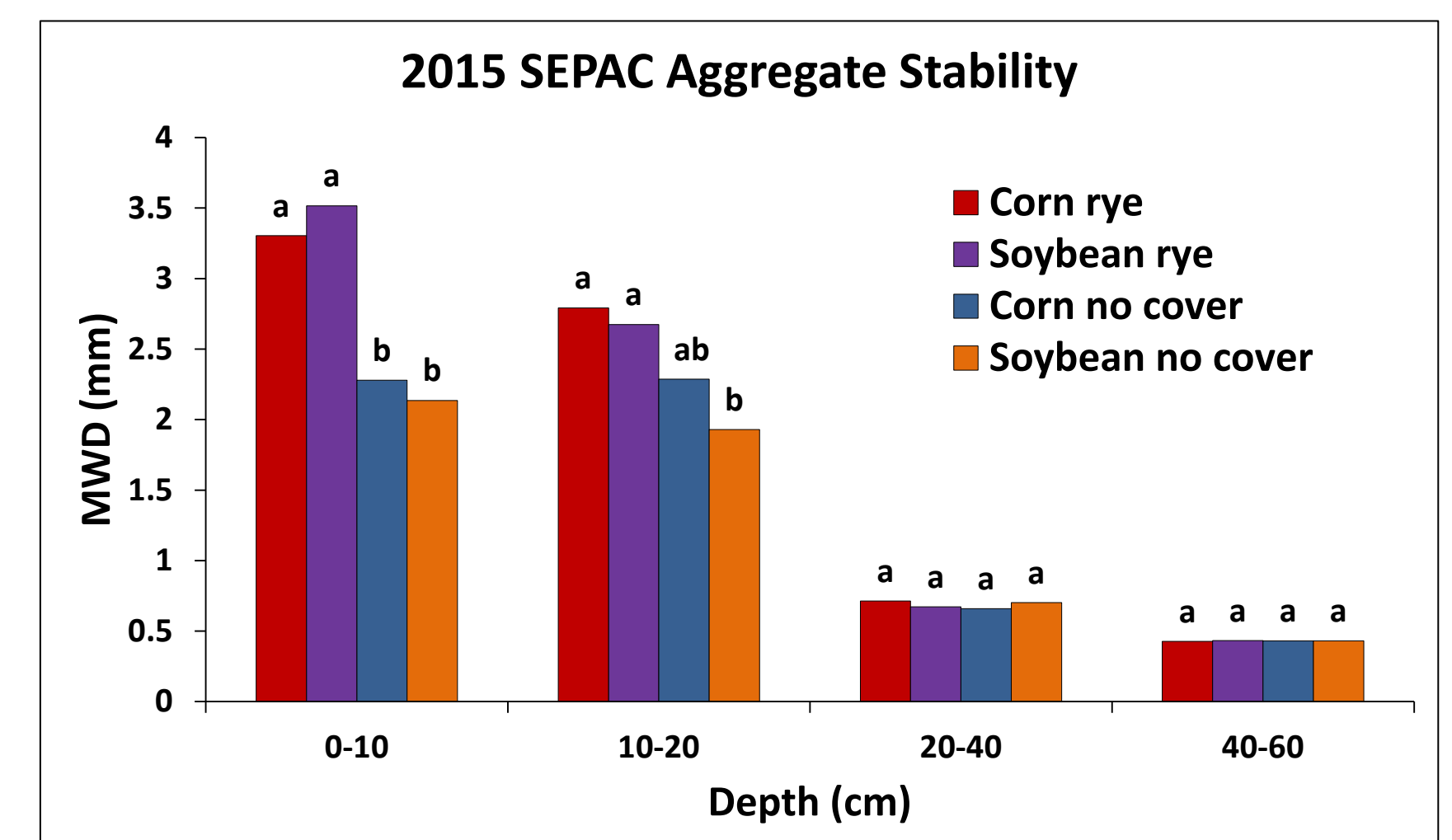
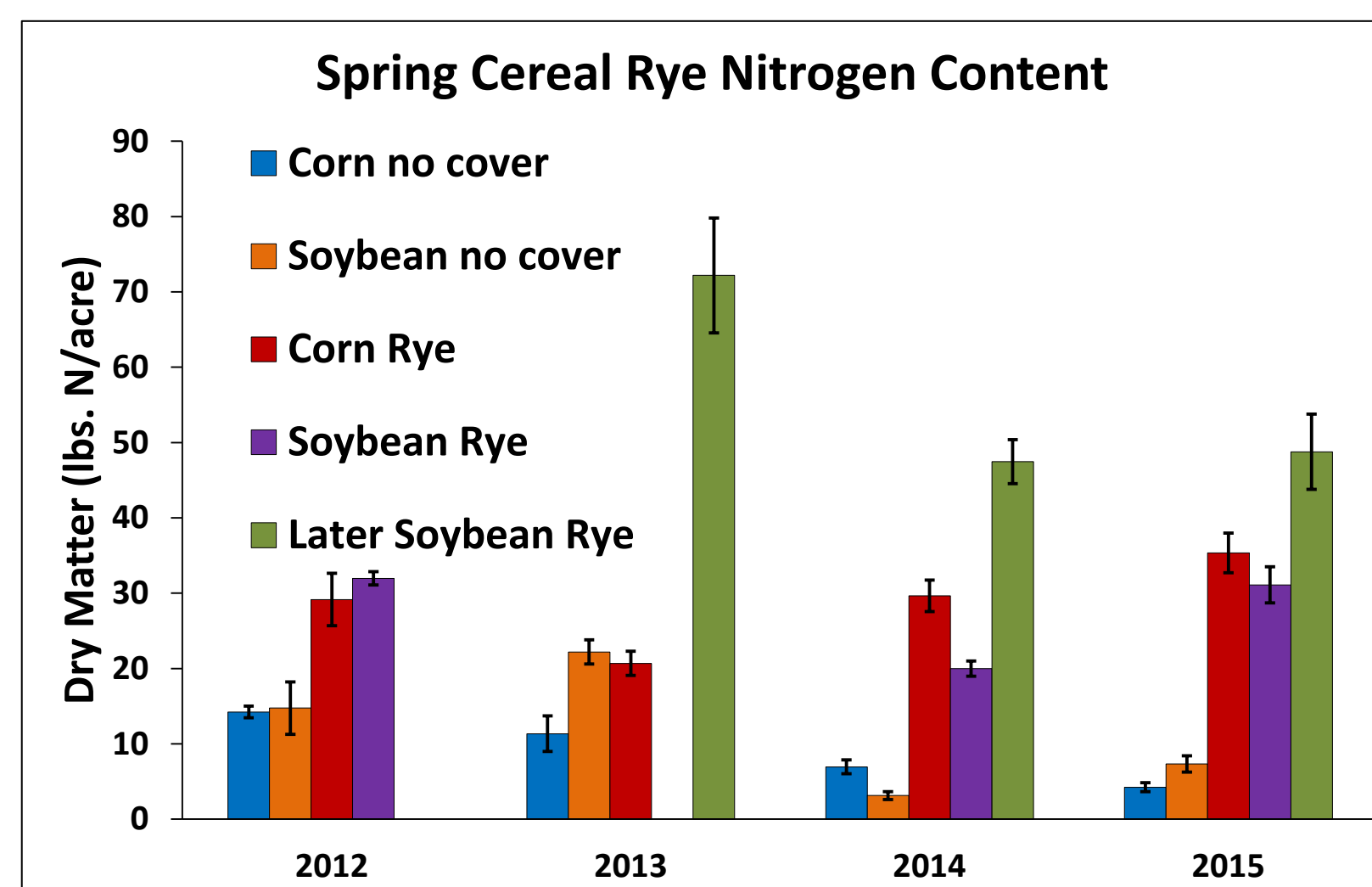
Soil aggregation; wet sieving method

Results and Discussion



- Cereal rye at termination before corn vs. two weeks longer before soybeans (700 vs. 2500 lbs./acre)
- Rye grown longer before soybeans because a) more growth provides greater soil improvements, and b) rye management is easier before soybean than before corn

- Spring weed biomass (370 lbs./acre) at rye termination before corn



Means within a depth followed by the same letter are not significantly different at the P≤0.05 level.

- Determines scavenged nitrogen that otherwise could have been lost to potential leaching through the soil profile
- In years 2013-2015, rye scavenged additional N when grown two weeks longer before soybean than before corn

- A soil quality indicator based on how well soil aggregates resist breakdown by water
- Average mean weight diameter (MWD) was greater in rye treatments than in the no cover treatments in the upper soil profile, in general
- Better soil structure leads to greater water infiltration, increased water-holding capacity, less erosion, decreased surface crusting, and greater plant rooting ability
 → Greater Resilience

Conclusions

- Cereal rye increased soil aggregate stability in the upper soil profile compared to no cover treatments
- Rye accumulated more dry matter and scavenged additional N when grown longer before soybeans
- Cash crop yields generally unaffected by cover treatment during this study
- Cereal rye may be an effective way to improve system sustainability

Recommendations

- Allow cereal rye to grow longer for more biomass accumulation and scavenging of N
- Patience and persistence: on-farm benefits accrue over long term

Acknowledgements

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