

Corn Yield Response to a Red Clover Cover Crop: A Meta-analysis

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In short...

- When corn followed wheat, a red clover cover crop increased corn yield by 12% on average compared to no cover
- Corn yield response to cover crop ranged from 96% to 140% with a 68% probability that yield response falls in the range of 102-122% compared to fallow
- One-half of the responses (n=64 cases) exceeded a 10% yield response

What's the Question?

What is the impact of a red clover cover crop on yield of corn grown the following year?

Why Does it Matter?

Interseeding (frost seeding) red clover in winter wheat has proven to be a successful and mostly consistent way of establishing a legume cover crop before corn. This relay cropping system mitigates the risk of cover crop stand failure associated with post-harvest establishment frequently attributed to dry summer conditions. Additionally, interseeding red clover can capture the second half of the season-long growing degree day accumulation, provide soil cover, and contribute nitrogen (N) to the following corn crop. In no-till systems, its growing tissues and subsequent residue protects the soil from wheat canopy closure through corn harvest.

The nitrogen credit to corn from this cover crop is frequently cited as the major economic benefit from the practice. However, there is growing evidence that properly managed cover crops can also increase yields in the following cash crop. This positive “rotational effect” has been attributed to several factors including improved soil health, soil moisture retention, weed suppression and reduced disease incidence.

A recently completed study, funded by the National Wildlife Federation examined the economic performance of red clover interseeded into wheat in the upper Mid-west. This publication discusses important findings of the study related to yield effects. Economic implications can be found at:

<http://michaelfields.org/wp-content/uploads/2018/01/Economic-Analysis-of-Cover-Crops-January-2018.pdf>

What are the Results?

A meta-analysis of all reported studies in the North Central Regions (Michigan, Ohio, Western Ontario, Western Pennsylvania and Wisconsin) was conducted to determine the effect of adding red clover to a wheat-corn rotation. The data set included 31 site-years of data and 128 individual comparisons where corn followed wheat with and without (+/-) red clover and where N fertilizer was applied

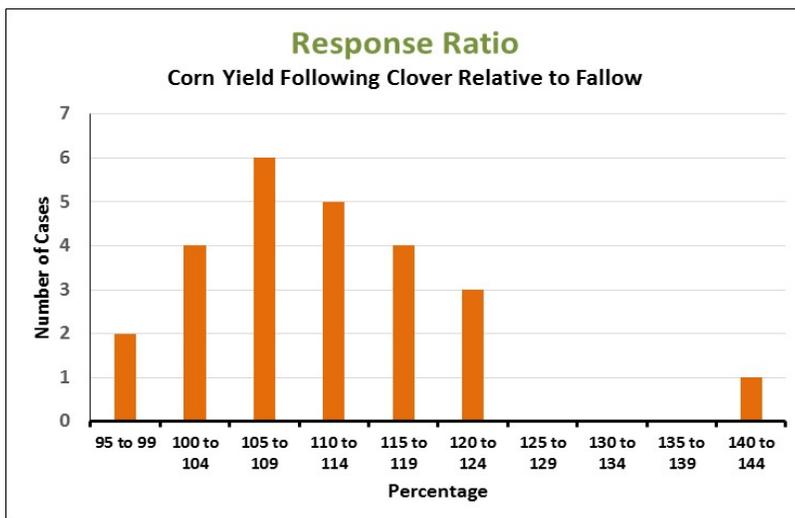


Figure 1. Corn yield response to a red clover cover crop compared to fallow. Data presented by individual site-year.

at rates which met or exceeded University Extension recommendations. This ensured that N was not a limiting factor at any of the sites. A response ratio of corn yield following wheat + clover to corn yield following wheat alone was used to estimate the rotational effect. On average there was a 12% increase in corn yield (values ranged from 96 to 140%) with the inclusion of clover, with half of values falling above 10%. Standard deviation was used to consider variability in the data. The distribution of yield response is shown in Figure 1, summary statistics in Table 1. Results of this analysis demonstrate the yield-enhancing effect of a red clover cover crop on corn.

Table 1. Response ratio* summary statistics from the analysis.

Mean:	1.12
Median:	1.10
Coefficient of Variation (CV, %):	9.10
Maximum:	1.40
Minimum:	0.96
Standard Deviation (SD):	0.10
Range (+/- 1 SD):	1.02 – 1.22

* multiply all values by 100% (except CV) to arrive at a percentage.

What's the Status of the Research? Are there Updates?

This research was completed in 2017. We are currently investigating rotational yield effects and N credits at several locations in southern Wisconsin in collaboration with the University of Wisconsin Department of Soil Science and the Nutrient and Pest Management Program. The authors gratefully acknowledge the National Wildlife Foundation for funding this project. Recommendations for clover establishment and management can be found in several University Extension publications including the University of Wisconsin Nutrient and Pest Management Program publication “Frost seeding red clover in winter wheat” http://ipcm.wisc.edu/download/pubsNM/RedClover_0109.pdf