FARMING PRACTICE
COVER AND CATCH CROPS

IMPACT: GHG EMISSIONS

Reference 10

Jian, Jinshi; Lester, Brandon J.; Du, Xuan; Reiter, Mark S.; Stewart, Ryan D. 2020 A calculator to quantify cover crop effects on soil health and productivity Soil and Tillage Research 199, 104575 10.1016/j.still.2020.104575

Background and objective

Many producers use cover crops as a means to increase soil health and agricultural productivity, yet benefits of this practice vary depending on environmental and management conditions. In an effort to objectively evaluate how cover crops affect soil properties and crop production across climates and systems, we compiled data from 269 studies that compared cover crop treatments versus no cover crop controls. (1) analyze response of soil health/productivity indicators to cover crop usage across a range of climates, soil types, and cropping systems; and (2) develop a predictive calculator that estimates cover crop effects on 13 key parameters associated with soil health and crop productivity. The results from this study provide a valuable tool for farmers, planners, and regulators to evaluate potential benefits from including cover crops within rotations.

Search strategy and selection criteria

Data used in this study came from a global soil health database known as SoilHealthDB (Jian et al., 2020a), and included responses of 38 soil health indicators to cover crop usage. In total, 4024 comparisons were collected from 269 individual studies . Literature were compiled from: the Soil Health Institute "Research Landscape Tool"; cover crop meta-analyses focused on South America (Alvarez et al., 2017), Africa (Sileshi, 2009) and global-scale responses (Gattinger et al., 2012; Poeplau and Don, 2015); and a literature search using ISI Web of Science, Google Scholar, and the China National Knowledge Infrastructure. Not specified

Data and analysis

The results suggested that many RRs did not have normal distributions. For these indicators, we used a bootstrapping method to estimate the mean and 95 % confidence interval; however, the bootstrapping results were found to be very similar as the results from one sample t-tests. Therefore, the t-test results were used directly without further modification. For the one sample t-tests, the null hypothesis was that the mean RR is zero, indicating no difference between cover crop treatments and no cover controls. An indicator therefore had a significant response to cover cropping if its 95 % confidence interval excluded zero ($p < 0.05$).

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
269	Data from North America, Europe, Africa, and Asia, specifically eastern China; Cash crop type: corn, soybean, wheat, vegetable, corn-soybean rotation, corn-soybean-wheat rotation, and other	Cover and catch crops (legume, grass, multi-species mixture, and other)	No cover/catch crop	Metric: 1) CH_4 emission; 2) N_2O emission; Effect size: Logarithm of ratio of the considered metrics in the intervention to the considered metrics in the control	62.5

Results

- Cover crops significantly increased greenhouse gas (i.e., CO_2, CH_4, and N_2O) emissions.
- NULL
- NULL
- NULL
- NULL

Factors influencing effect sizes

- No factors influencing effect sizes to report

Conclusion

Cover crops significantly increased greenhouse gas (i.e., CO_2, CH_4, and N_2O) emissions.