2018 Long-term Cover Crop Trials

Background:

Cover crops potentially provide soil and environmental benefits in fields where they are adopted. Those benefits include reduced soil compaction, nutrient sequestration, reduced soil erosion, better water infiltration, improved soil health and ultimately, better yields. Moreover, many of these parameters improve incrementally over several production years. For that reason, the Iowa Soybean Association On-Farm Network® instituted a long-term cover crop project in 2016 to monitor benefits of cover crops over a five-year period. 2018 marked the second harvest season for this project.

Protocol:

Cover crops are established in strips during the fall by ground seeding or drilling. Rye or oat seed blends are provided to growers. Use of overwintering species is encouraged. Strips alternate with unseeded check strips of the same width. GPS verification ensures that cover crops and unseeded checks are placed in precisely the same location over years. All other management operations remain the same across the trial area, except perhaps planting accommodations to ensure optimum seed placement of the cash crop.

Outcome:

Long-term effects of cover crops on soil attributes will be measured in year 3 and year 5 of this study and are not included in this report.

While two-year results from these studies show a negative yield advantage when using cover crops, some perspective on these trials is warranted. In Iowa many farmers are very successful at incorporating cover crops into their system without yield penalty, and sometimes realize a yield increase from cover crops.

Effects of cover crops on soybean yield for two seasons are shown in Figure 1. The cover crop dramatically reduced soybean yield in 2017 at location ST2017IA0010. At this site, soybeans were planted into a robust stand of cereal rye and termination occurred a week after planting. Total seasonal precipitation was 10 inches below normal for this location. Plausibly, there was greater drought stress in the cover crop treatments at this site due to the late termination of the cereal rye and used up valuable moisture in this dry year.

Yield losses in 2017 at locations ST2017IA002 and ST2017IA006 are explained by poor soybean stands in the cover crop treatments. Stand gaps from planting soybeans too shallow were evident across the cover crop treatments. The On-Farm Network agronomists attribute this yield decline to farmers learning how to manage residue when planting into cover crops and not a direct impact of cover crops on soybean yield.

The yield advantage for cover crop usage ahead of corn is shown in Figure 2. At location STIA20170019 there was a large yield reduction associated with cover crops. Two factors could explain the yield disadvantage at this location. The stand of cover crop was robust and terminated at a height of 12 inches. Part of the nitrogen was applied as broadcast UAN at termination. Published studies show this practice is ineffective due to greater nitrogen volatilization in the high residue cover crop treatment areas. Nitrogen was likely limiting in the cover crop treatment due to how the nitrogen was managed. Yield might have been greater had the nitrogen been applied into the soil or with an inhibitor. Further, seasonal rainfall at this location was about 12 inches less than the 30-year average. Nitrogen and moisture stress likely explain the large yield loss at this location.

Location ST2017IA008 also exhibited a large yield disadvantage for cover crops before corn in 2017. At this location, the nitrogen management practice was broadcast urea. Previous research has shown that broadcast urea in a no-till situation can result in significant nitrogen loss via volatilization. Seasonal precipitation at this location was also 10 inches below normal. We associate the yield loss from cover crops at this site to nitrogen and moisture stress.

Cover cropping systems must be managed differently than conventional systems. In corn production, adequate nitrogen must be available to the crop in the early vegetative stages to overcome immobilization of nitrogen in the cover crop residue. Starter nitrogen or early sidedress applications of appropriate forms of nitrogen are necessary to achieve high yields in corn following cover crops.

While significant stand losses in corn following cover crops were not observed, there were, at some locations, significant stand reductions in soybeans following cover crops. Most of the poor stands in soybeans following cover crops are attributed to shallow planting depth. This highlights the importance of checking planting depth when planting into cover crops. This study will be repeated for three more years at the same sites.

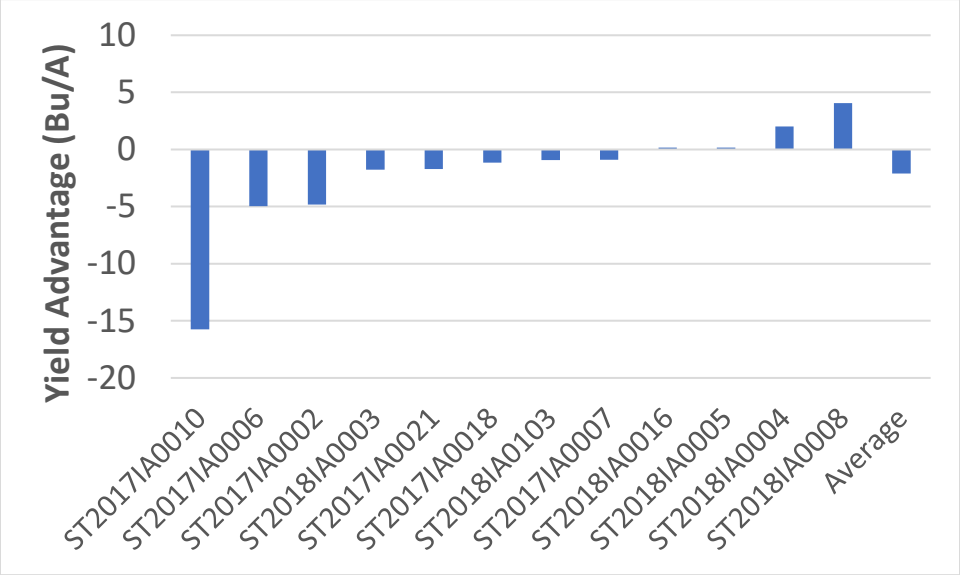

Figure 1. Yield advantage of soybeans following cover crops versus soybeans following no cover crop.

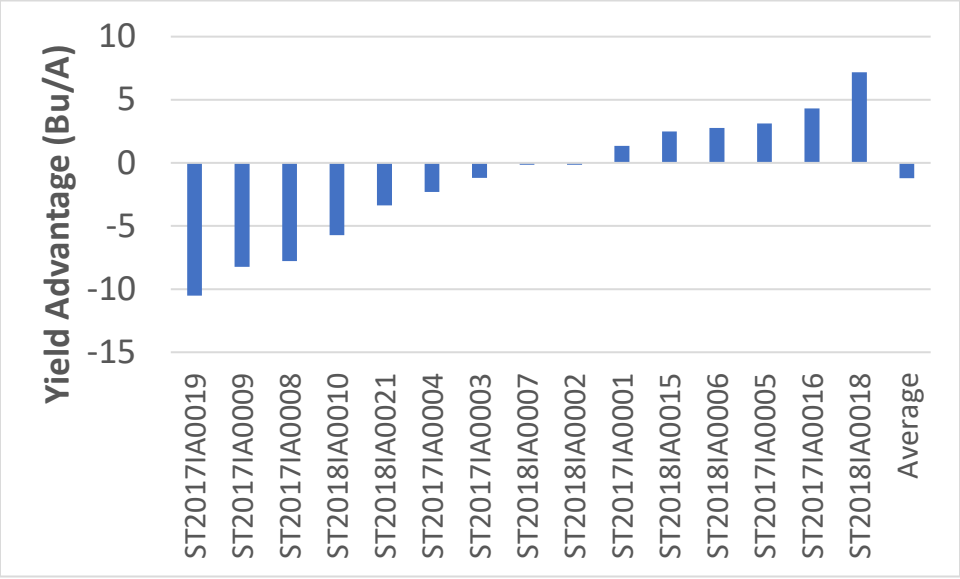

Figure 2. Yield advantage of corn following cover crops versus corn following no cover crop.