

In this reporting period, we continued two major activities: 1) analysis of soybean yields following Iowa Nitrogen Initiative trials, and 2) identifying crop year 2024 Iowa Nitrogen Initiative trial participants who will be rotating to soybeans this crop year (2025) and have planted cover crops following crop year 2024 corn harvest. At present, we have not identified an effect of residual soil nitrate levels or corn yield (as a proxy for corn residue production) on the following soybean yield. Our database has excellent ranges of residual soil nitrate levels. However, one limitation of our analysis has become apparent: the Iowa Nitrogen Initiative trials, despite a wide range of nitrogen fertilizer inputs, have a relatively limited range of crop residue levels. Hence, we have been able to reject the hypothesis that residual soil nitrate levels, ranging from less than 10 to greater than 100 lbs N per acre, have a consistent, measurable effect on soybean yield; however, we cannot interpret any potential effect or lack of effect of corn residue production on soybean yield.

As part of our work, we have also analyzed the effect of cover crop following soybean on pre-plant soil nitrogen levels in corn and the economic optimum nitrogen fertilizer rate to corn. Soil nitrate plus ammonium levels following soybean with a rye cover crop compared to following soybean without a rye cover crop were significantly lower following soybean with the rye cover crop post-cover crop termination but prior to corn planting but significantly higher following soybean with the rye cover crop at the V6 corn growth stage. This analysis indicates that soil N retained by the rye cover crop is released during corn growth but perhaps later than ideal because despite the significantly higher N levels at V6, the economic optimum N fertilizer rate to corn was higher following soybeans with a rye cover crop vs. following soybeans without a rye cover crop. These results point to the importance of early-season N availability following soybean with rye cover crop. However, there may also be pre-existing differences in fields that are and are not cover-cropped. We are currently exploring these possibilities during the current reporting period.

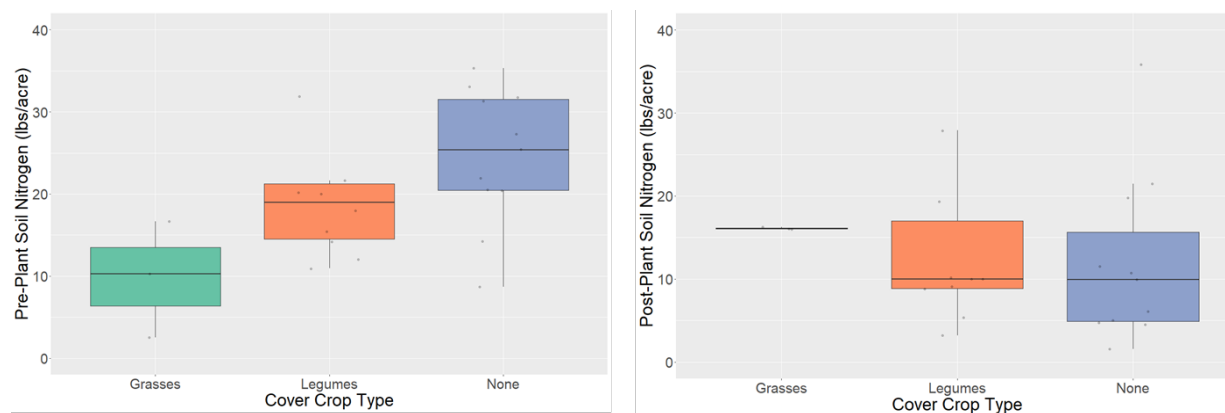


Figure 1. Soil nitrate levels following a soybean crop with grass cover crops (mostly rye), legume cover crops, or no cover crops at spring pre-plant and post-plant (V6-V9) stage.

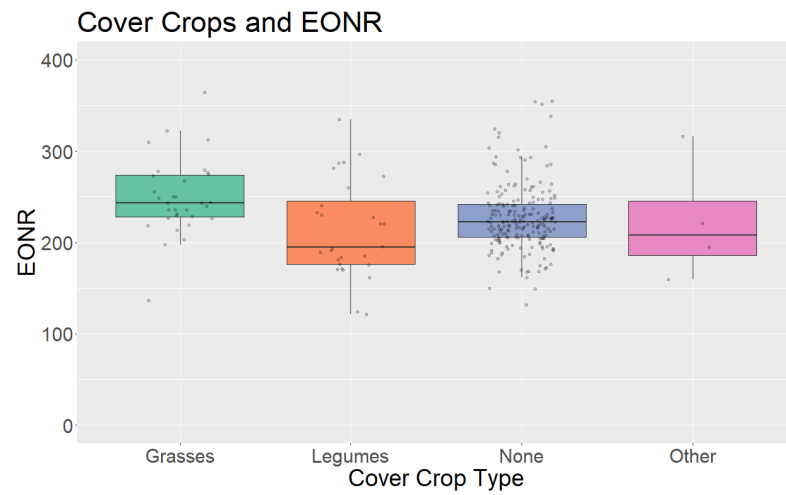


Figure 2: The effect of cover crop planting on the economic optimum N rate (EONR) to corn following soybean.