Report Form

Summary: (Describe your project, its objectives and results in one or two sentences) The objectives of this project were to determine variable rate seeding (VRS) prescription methods (i.e., determine how to make VRS maps), and 2) evaluate how plant architecture is altered by seeding rate. Preliminary results include: 1.) High density grid-soil sampling was most predictive of seeding rate zones, 2.) Soybean plant architecture was significantly altered by seeding rate with plants seeded at lower rates being shorter, having thicker and tougher stems, and producing more branches than soybeans planted at higher rates.

What was done? (One paragraph describing the goals, experiments and how they were performed)

The overall goal of this project was to increase overall farm sustainability by properly implementing variable rate technology to target ideal soybean seeding rate. In 2017, four on-farm trials were established in Lorain County, Morrow County, Delaware County, and Preble County, Ohio. We worked with the farmer co-operators to create seeding rate zones within each field based on the farmers' interest (i.e., by yield history, soil series, etc). Three uniform seeding rate strips (low, moderate, and high) were replicated 3 to 5 times per field depending on field size. A stand count was conducted approximately 21 days after planting and just prior to harvest. Just prior to harvest, soybeans were collected for plant architecture measurements including stem hardness, stem diameter, plant height, lowest pod height, number of nodes, number of branches, number of pods on stem, number of pods on branches, stem seed number, stem seed weight, branch seed number, and branch seed weight. At harvest, data were collected from the combine including yield, moisture, and fuel usage. A classification and regression tree analysis was used to understand how successful different prescriptions were at delineating homogenous zones. Each farmer provided his variable rate seeding prescription for the field and gave an overview of the information they used to generate the prescription. The input variables for the tree were the chemical and physical soil properties from half acre grid soil sampling and the farmer-provided variable rate seeding prescription was the output variable.

What were the results? (One paragraph on the outcome of the experiments, what was learned from them)

Seeding rate prescriptions that were generated using high-density soil sampling (0.5-acre grid) created more homogenous zones than prescriptions based off of low-density soil sampling or soil map units from the SSURGO database. As a result, we recommend high-density soil sampling to create VRS prescriptions. All plant architecture measurements

were significantly different among seeding rates with plants seeded at lower rates being shorter, having thicker and tougher stems, and producing more branches than soybeans planted at higher rates. Farmers reducing their seeding rate will need to considered the impact of harvesting plants with varying plant architecture and adjust combine setting accordingly.

How have the results contributed or will they contribute to sustainable agriculture?
(One paragraph on how will farmers uses this research information and what difference will it make on their farms.)

Farmers will use this research to improve their VRS prescription methods. They will use less seed in high productivity areas of the field thereby reducing the high carbon costs associated with soybean seed production. Additionally, at low seeding rates, they will adjust the combine setting to account for plants with different plant architecture (more branches, thicker stems, and lower pod height.) These practices will increase both environmental sustainability and economic sustainability of their farming operations.