Program 5SB-2

▸ Soybean And Corn Response In A Crop And Tillage Rotation

Presented by Dr. Normie Buehring
Superintendent/Senior Research Agronomist, MSU

Most often soybeans have shown a yield response in a rotation with corn. However, little information has been published in regard to corn yield response in a rotation with soybean. The objective of this study was to evaluate both corn and soybean yield responses in a rotation and alternating years with a one-pass tillage system. The study (2001-2011) was conducted on an upland Blackbelt Prairie clay soil (Catalpa silty clay loam) with a 2% slope. The 11-year (2001-2011) average yield was 140 bu/acre for no-till corn following no-till soybean in an every other year corn-soybean rotation. This was 21 bu/acre (18%) higher than continuous no-till corn. The yield was 144 bu/acre for no-till corn following no-till soybeans that had received a previous fall applied chisel-harrow (high clearance chisel equipped with colters in front of each staggered chisel shank on a three-bar toolbar with a chain harrow attached to the rear of the implement), one-pass tillage operation. This was 25 bu/acre (21%) higher than continuous no-till corn and 4 bu/acre (3%) higher than no-till corn following no-till soybeans.

The 11-year average yield for no-till soybeans following no-till corn in an every other year corn-soybean rotation was 43 bu/acre, 6 bu/acre (15%) higher than continuous no-till soybeans. The soybean yield average for the fall applied colter-chisel harrow (one-pass tillage) to the previous crop of no-till corn was 47 bu/acre, 9 bu/acre (24%) higher than continuous no-till soybean; and 3.4 bu/acre (8%) higher than no-till soybean in rotation with no-till corn. These results indicate corn and soybean in a rotation are complementary with each other with an 18 to 21% and 15 to 24% yield increase, respectively. In addition to the soybean-corn rotation yield benefits, through the use of herbicides that are of different family chemistries for each of these crops, the rotation also offers potential for good weed resistance management strategies. The one-pass chisel-harrow tillage operation applied in the fall to no-till corn in an every other year rotation, not only showed a positive yield impact on the following year stale seedbed soybean crop, but also the succeeding year's no-till corn crop.

Program 1SB-2

▸ Fall Versus Spring Fertilizer Applications In Soybeans

Presented by Donna S. Morgan
Associate Area Agent, Louisiana Master Farmer Program, Dean Lee Research & Extension Center

Traditional methods of applying fertilizer to cropland primarily include fall applications of Phosphorus (P) and Potassium (K), which are usually broadcast, and then may be incorporated if conditions permit. Nutrients are then left on the soil surface, or slightly beneath, for 6-7 months prior to planting of the crop. Soybeans, for example, are categorized as legumes and therefore fix their own nitrogen, but do require adequate amounts of P and K, if soil tests results recommend it (this is based on soil type and texture, soil pH, previous crops, and other variables). A medium soil type (such as a silt loam or clay loam) would normally require the application of 200#/acre of 0-18-36. If these nutrients are applied this far in advance of planting, is it really beneficial to the crop and to the environment to do so? What happens to the nutrients during typical, heavy winter rainfall events? What if the soil has a high pH (such as those found in the Red River Alluvial soil class) and the Phosphorus becomes bound to the soil particles, thereby becoming unavailable to the plant when it needs it the most? Do you apply the nutrients anyway? Or is a spring application more beneficial? These are some of the questions that prompted a study at the Dean Lee Research Station to determine if fall and spring fertilizer applications, as well as the application methods, had any impact on agronomic traits, yield, and water quality.

The Louisiana Soybean and Grain Research and Promotion Board funded a project titled "The Effect of Phosphorus and Potassium Application and Timing Methods in Soybeans on Yield and Water Quality". This project was funded in 2011 and will continue through harvest in 2012. Dr. Brooks Blanche, (former LSU AgCenter cotton and soybean agronomist), and J Stevens, LSU AgCenter state soil specialist, cooperated with me on this project to ensure accurate agronomic data would be collected and nutrient recommendations would be applicable to this project. This study was implemented in November, 2010 and included a fall broadcast treatment (FBT) of P and K, a spring broadcast treatment (SPT), a spring liquid injected treatment (SLI), as well as an untreated check (UTR). Included in these 12 plots were automatic water sample collectors, also known as ISCO samplers, which were programmed to collect 200 ml of runoff every 5 minutes for four hours. The fall and winter months produced fairly significant rainfall events, where several collections were able to be made. After spring treatments were applied and a Maturity Group V soybean (Pioneer 95Y01) was planted, a lengthy drought ensued, which severely limited the water quality data that was able to be collected and analyzed. Growing conditions were fair to good for most of the growing season, with the exception of the summer months. Stand counts, plant heights, tissue samples, and soil samples were collected throughout the growing season to determine if any differences were seen in high pH conditions with each treatment. The plot was harvested on September 21, 2011 with average grain yields ranging from 32-34 bushels per acre.

Data collected was analyzed and results showed no statistical differences in yield, plant heights, plant stand populations, and soil and plant tissue P and K levels. Plants heights and stands all fell within acceptable ranges to maximize yields. Soil samples (regardless of timing of sample collection) showed higher levels of Phosphorus across all treatments and adequate levels for Potassium. Phosphorus levels in many of the fields at the Dean Lee Research Station have continued to increase because of the limiting crop removal rate with these nutrients being applied annually. Tissue samples collected at the R3 growth stage showed the plants had sufficient levels of P and K during that growing period. And even though the soybeans visually appeared healthy, yields were compressed across all treatments with the onset of lengthy dry conditions.

Field variability, equipment failure, and lack of field runoff limited the water sample collections and make comparisons for each treatment difficult, to say the least. Analysis showed no differences in the amount of total Solids, total Phosphorus, and Phosphates that left the field during rainfall events. Even though 31 inches of rain fell from November, 2010 to September, 2011, the majority of events were not sufficient to cause high volumes of runoff from plots. Total Solid levels were high in every treatment, primarily because the field had been sub-soiled after the previous crop harvest, and was bare during the winter months. This was due to lack of residue, cover crop, and even natural vegetation during this time period.

One statistical difference that was noted was the level of Potassium that left the field in water sample collections. The fall broadcast treatment levels were significantly higher than those of the untreated and spring broadcast. No differences were seen in fall broadcast and spring injected. At this point, conclusions cannot be drawn from one year of data collection, but it is a possibility that Potassium levels were higher in fall treatments due to the high volume of rainfall that occurred during that time period. Potassium is also very water-soluble and this may have affected the levels found in the sample collections. Additional replications of this trial would be needed in order to determine any trends in application timings or methods.

Though this particular study, under these specific field and environmental conditions, and proved no differences in most of the parameters, does not mean the information can't be useful. If multiple years of data are collected, and no statistical differences are determined, wouldn't that prove useful to a producer in his nutrient management plans? Variables such as post-harvest field conditions, fertilizer prices, cropping systems, and application equipment all affect when and how nutrients are applied. This also has an effect on how many nutrients enter the surrounding water bodies and contribute to water quality issues related to production agriculture. Conducting studies such as this will not only help producers answer these questions to maximize their nutrients, but minimizing water quality and environmental impacts as well.