# AGRONOMY

## AGRONOMIC EVALUATION OF SOYBEAN/CORN ROTATION WITH TWIN-ROW PRODUCTION AND INCREASED NUTRIENT MANAGEMENT

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THIS RESEARCH, SPONSORED IN PART BY THE MISSISSIPPI SOYBEAN PROMOTION BOARD, LOOKS TO DEMONSTRATE THE NEED FOR FOLLOWING SOIL TEST RECOMMENDATIONS AND THE BENEFITS OF CROP ROTATION WITH TWIN-ROW PLANTING SYSTEMS.

Rotations involving corn and soybean have been occurring around the country especially in the Midwest and much of the Corn Belt. The literature has been filled with documentation of the "rotation effect" with many potential explanations as to why the effect occurs. Many fields have been continuously cropped to cotton for decades in the Mid-south. In recent times, corn has replaced cotton, irrigation has replaced dryland or rain-fed production, and soybean has moved from the last crop planted to the early soybean production system with planting in March and April rather than May and June. Raised beds remain the choice for most producers in the Delta on the lighter textured soils. Large-tired equipment and the presence of cotton still push producers toward wide-row planting systems while many variations in planting patterns continue to be developed and evaluated. Twin-row planting systems help to combine the wide-row and narrower-row technology into a viable alternative for Mid-south production systems. Twin-row production (two rows on a single bed) allows for more rapid ground cover and yet maintains adequate waterways for surface drainage and irrigation.

As grain yields increase, nutrient uptake and subsequent nutrient removal is increased. With higher yields and no supplemental fertilizer nutrients, soil levels continue to decline. Nutrient removal is generally higher for corn and soybean compared to cotton (as much as 2 to 3 times). Should the stover be removed for energy generation the decline in soil-available nutrients is even greater. The purpose of this research is to combine the technologies into a management system that can optimize yields and increase profitability.

The overall objectives of the study were 1) determine the agronomic implications of soybean/corn rotations in twin-row planting systems under standard and high management with irrigation, and 2) evaluate the economic impact of the above systems on whole-farm enterprise profitability.

Six-year field studies were established at two locations in 2012. Two rotation system were included: 1/1 soybean/corn (SB/CR) rotation (one year SB followed by one year CR) and a 2/1 system (SB/SB/CR, two years of SB followed by one year CR). Planting seed selection has been based on the latest technology with seed price as a component of the economic analysis. Standard fertility practices have been defined as those based on soil test recommendation for the crop being grown. The high fertility has then been defined as

20-25% above recommended levels for each fertilizer nutrient. Plots have been maintained uniformly across all treatments when possible.The 2015 corn and soybean production on the sandy loam site is summarized in Table 1 with grain yield corrected for moisture. There was no significant difference between the soybean yields as affected by the previous crop or fertility regime. Corn yields following soybean at the high fertility level were significantly higher (Table 1) but were not significantly different. At the standard fertility level, corn following two years of soybean were 40 bu/acre higher (28.8%). Soybean and corn yields on the sandy loam site were lower than those observed in earlier years. The site was planted later than planned due to errors at planting.

The results from the clay site had similar corn and soybean yields compared to the sand site. The corn crop on the clay soil site was adversely affected by wet soil conditions early in the season but held up better with irrigation and dry weather later into the growing season. The results are summarized in Table 2.

Soybean yields were higher than the yields from the sandy loam site with no response to increased fertility. Soil tests show the area to be above levels expected to respond to additional fertilizer. Stands were acceptable for the field even after planting into the old stubble from the previous year. Fall and spring tillage can be delayed due to wet soils. Corn yields on the clay averaged about the same as the sand but the range in yields was much narrower. There was no difference observed in either corn or soybean on the clay site with respect to rotation or fertility level.

Soil samples were again collected after harvest from each plot. These samples were dried, ground, and then analyzed for nutrient content and other soil test components by the Soil Testing and Plant Analysis Laboratory at MSU. These results are used to determine fertility recommendations for the study. This was the fourth year of a six-year study and will be continued in 2016. This project has been supported in part by the Mississippi Soybean Promotion Board and their support is greatly appreciated.

| TRT | Crop Sequence | 2015 Crop | Fertility (lb/acre) | | | Soybean Yield (bu/acre) @ 13.0% | | Corn Yield (bu/acre) @ 15.5% | |
|---|---|---|---|---|---|---|---|---|---|
| | | | N | P | K | | | | |
| 1 | CR-SB | SB | 0 | 0 | 0 | 49.3 | | | |
| 2 | SB-CR | CR | 220 | 0 | 0 | | | 139.0 | b |
| 3 | CR-SB-SB | CR | 220 | 0 | 0 | | | 179.0 | a |
| 4 | SB-CR-SB | SB | 0 | 0 | 0 | 48.6 | | | |
| 5 | SB-SB-CR | SB | 0 | 0 | 0 | 47.5 | | | |
| | | | | | | | | | |
| 6 | CR-SB | SB | 0 | 26.2 | 50 | 49.9 | | | |
| 7 | SB-CR | CR | 260 | 26.2 | 50 | | | 184.1 | a |
| 8 | CR-SB-SB | CR | 260 | 26.2 | 50 | | | 197.1 | a |
| 9 | SB-CR-SB | SB | 0 | 26.2 | 50 | 49.0 | | | |
| 10 | SB-SB-CR | SB | 0 | 26.2 | 50 | 49.3 | | | |
| | | | | | | | | | |
| | LSD (0.05) | | | | | 4.3 | | 35.0 | |
| | Prob > F | | | | | 0.8877 | ns | 0.0232 | |

| TRT | Crop Sequence | 2015 Crop | Fertility (lb/acre) | | | Soybean Yield (bu/acre) @ 13.0% | | Corn Yield (bu/acre) @ 15.5% | |
|---|---|---|---|---|---|---|---|---|---|
| | | | N | P | K | | | | |
| 1 | CR-SB | SB | 0 | 0 | 0 | 50.7 | | | |
| 2 | SB-CR | CR | 220 | 0 | 0 | | | 173.9 | |
| 3 | CR-SB-SB | CR | 220 | 0 | 0 | | | 166.4 | |
| 4 | SB-CR-SB | SB | 0 | 0 | 0 | 53.4 | | | |
| 5 | SB-SB-CR | SB | 0 | 0 | 0 | 52.2 | | | |
| | | | | | | | | | |
| 6 | CR-SB | SB | 0 | 26.2 | 50 | 53.2 | | | |
| 7 | SB-CR | CR | 260 | 26.2 | 50 | | | 184.8 | |
| 8 | CR-SB-SB | CR | 260 | 26.2 | 50 | | | 175.1 | |
| 9 | SB-CR-SB | SB | 0 | 26.2 | 50 | 53.5 | | | |
| 10 | SB-SB-CR | SB | 0 | 26.2 | 50 | 52.6 | | | |
| | | | | | | | | | |
| | LSD (0.05) | | | | | 3.3 | | 13.4 | |
| | Prob > F | | | | | 0.4836 | ns | 0.0741 | ns |

***Table 1, far left:*** *Summary of grain yields corrected for moisture for evaluation of soybean/corn rotation in twin-row production on a sandy loam soil.*

***Table 2, left:*** *Summary of grain yields corrected for moisture for evaluation of soybean/corn rotation in twin-row production on a clay soil.*