crop cotton. Wheat stubble compared to mono-crop cotton had little effect on cotton first flower date. However, cotton planted in the wheat stubble environment had 36% lower yield than mono-crop cotton with the same planting date and mono-crop cotton planted mid-May.

▸ Cotton/Corn Rotations: Yield Response Variations And Factors That Influence Them

Presented by Dr. M. Wayne Ebelhar
Research Professor and Agronomist, Mississippi State University

Multi-year research was initiated in the Mississippi Delta at the Delta Research and Extension Center (DREC, Bosket very fine sandy loam [Mollic Hapludalf]) and at the Tribbett Satellite Farm (TSF, Forestdale/Dundee silty clay loam [Typic Ochraqualfs/Aeric Ochraqualfs]) in 2000 to examine the interaction of nitrogen (N) rates and potassium (K) rates in cotton/corn rotation systems. The studies were designed to examine both the benefits and problems associated with corn/cotton rotations on different soil types. Changes in farm legislation has allowed producers the flexibility to shift from continuous mono-crop cotton production to alternative crops and cropping sequences to replace some of their traditional cotton acres while using rotation to improve soil productivity and yield. As cotton acres decrease and both corn and soybean acres increase, the benefits from rotation may become even more evident. The objectives of these studies included a) determining the effects of N and K nutrition on cotton lint yields and corn grain yields, and b) determining rotational effects of corn on cotton production and the implications of these rotations on whole farm economics. Research areas were established on each research that could be rotated over a 3-year period with one year planted to corn and the two subsequent years planted to cotton. Each of the three sections had a factorial arrangement of N and K rates. The corn and cotton sections consisted of 4-row (40-in spacing) plots, 90 to 100 feet in length, with either four (TSF) or five (DREC) replications. Nitrogen rates were 60, 90, 120, 150, and 180 lb N/acre for cotton and 120, 160, 200, 240, and 280 lb N/acre for corn with the fertilizer N applied as urea-ammonium nitrate solution (32% N). Potassium rates for all rotations were 0, 40, 80, and 120 lb K/acre applied as 0-0-16 (1.3 lb K/gal). Nitrogen was applied at a uniform rate (60 lb N/acre for cotton, 120 lb N/acre for corn) prior to or near planting with the various N rates determined at the time of sidedress N application. Potassium was applied at the same time as the sidedress N with the same equipment. High yield potential corn and cotton cultivars were planted at each location and maintained throughout the growing season. Soil moisture sensors were used to measure soil water and the data used to initiate, schedule, and terminate irrigations for both corn and cotton whenever possible. Crops were harvested by use of commercial harvesters modified for plot harvest with grab-samples taken for laboratory analyses and ginning. Seedcotton grab samples taken at harvest were ginned through a 10-saw micro-gin for calculation of lint percent. Data were summarized and statistically analyzed using SAS (Statistical Analysis Systems) with mean separations by Waller Duncan K-ratio t-tests and Fisher=s Protected Least Significant Difference (LSD).

Main effects means across N rates and K rates were used to evaluate the benefits from corn in the production systems since there was no significant N rate by K rate interaction. Comparisons were made of cotton following cotton and cotton following corn and used to measure the actual benefits from corn in the system. Both corn and cotton have shown significant responses to increasing N rates in most years while neither has shown significant increases with increasing K rates in the presence of adequate K levels. The response to rotation has been variable with differences ranging from an -14.1% to +51.7% at the DREC location. Total lint yield has averaged 889 lb/A/yr where cotton followed cotton and 988 lb/A/yr where cotton followed corn. This translates to an 11.1% increase (98 lb/A/yr) where cotton followed corn in rotation. The TSF location has seven years of data with an average lint yield of 939 lb/A/yr where cotton followed cotton and 1047 lb/A/yr for cotton following corn. The response to rotation has ranged from an -5.1% to +50.1% with an average response of 11.4% (108 lb/A/yr).

Several factors have affected the rotational benefits with the primary influence coming from climate/weather related phenomena. Specifics included rainfall total and distribution, solar radiation and cloudiness, humidity and wind (air movement), and physical limitations such as drainage or irrigation. During the time of these studies, rainfall in August has set all time records for the least (0.0 in, 2000) and most (8.47 in, 2001) in back-to-back years. Total rainfall has ranged from more than 18 inches above normal to more than 13 inches below normal for the region. There has also been as much as ten inches difference between the locations in the same year leading to different response in the same year. The DREC location has had more problems with timely irrigation and severe insect infestations compared to the TSF location. The largest rotational responses (percent) have occurred in years where severe droughts occurred and where irrigation was not timely or sufficient. In other years, excessive rainfall and the associated cloudy days resulted in photosynthetic stress and subsequent fruit shed. Heavy vegetative growth has also resulted in severe boll rot that was more pronounced in cotton following corn compared to cotton following cotton. Production-related problems such as delayed planting (related to harvest windows), weed competition in rotation system, antagonistic pesticides, and pesticide drift have also contributed to variations from year to year. In rotations, some residual herbicides cannot be used due to the potential for carryover in following crops. Increased pressure from perennial grasses such as bermudagrass and johnsongrass has resulted in lower yields for cotton following corn as compared to cotton following cotton. Many of the problems have been cleaned up in the second year of cotton following corn. Bio-technology offers some solutions for the problems that have been identified and have been incorporated into the studies. In the last two years, the dynamics of rootknot and reniform nematodes has become the center of attention. Rotations involving corn lead to a decrease in reniform nematodes in many cases.

▸ Soil Acidity And pH As Influenced By N-Fertilization And Irrigation

Presented by Dr. J. Scott McConnell
Environmental Scientist, Western Illinois University

Soil pH is an indicator of soil acidity and is the single most informative soil test regarding the overall productivity of a field. pH-values below seven are considered to be acidic; pH-values near seven are considered neutral; and pH-values greater than seven are considered basic. pH is calculated using logarithmic p-functions. The p-function is the logarithm of a number multiplied by negative one. Therefore, the pH of a system is the negative logarithm of the hydrogen ion concentration. Acid soils are typically defined as having soil pH values less than optimum for plant growth. Generally, soils with pH values below 5.5 tend to impede plant growth. The source of soil acidity may be classed as either geologic or agricultural. Geologic soil acidity results from the weathering of sulfide and aluminum bearing minerals. Agriculturally produced soil acidity may be generated from the application of ammoniacal-nitrogen fertilizers, sulfur and sulfide fertilizers, and the removal of basic cations of the soil with crop harvest. Irrigation water with high salt content is known to add basic cations to soils and thereby raise the soil pH and reduce the soil acidity. Caution should be exercised in the use of soil pH values. Since pH is a logarithmic function, it may not be averaged, but must be converted to acidity for statistical analysis.

Long-terms studies were conducted to determine the effect of ammoniacal-nitrogen fertilizer treatments in conjunction with irrigation methods on cotton. These studies were conducted in side-by-side irrigation blocks at the Southeast Branch Experiment Station at