TITLE:

Irrigation Water Management: Irrigation Scheduling and Application Methods

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INTRODUCTION AND BACKGROUND:

Water is often the most important limiting factor in peanut production in the Texas Southern High Plains. In coordinated studies conducted at the Western Peanut Growers Association Research Farm we are investigating water management strategies to make efficient use of limited irrigation resources, while producing peanuts at desirable yield and quality. Irrigation application rates (including target rates of 50%, 75%, 100%, and 125% estimated crop evapotranspiration replacement) are included in the study in an effort to refine our understanding of irrigation water requirements and irrigation capacity limitations which should be considered in crop rotation planning. Irrigation application methods, including two Low Energy Precision Application (LEPA) and two Low Elevation Spray Application (LESA) methods, are being compared for performance and crop response. This work is a continuation of projects initiated in the 2000 growing season.

METHODS AND PROCEDURES:

Location: Spans 5-7, East Circle
Variety: Flavorunner 458
Planted: May 16-17, 2001
Dug: October 18-20, 2001
Small plots harvested: October 27-29, 2001
Combined: November 5-6, 2001
Fertilizer applied: 60 lb/ac N, split into 3 applications of 20 lb/ac
Irrigation applied in-season (base irrigation rate): 27.18 inches
Precipitation received in-season: 6.0 inches
Average yield: 3612 lb/ac (yield mapping combine); 3711 lb/ac (small plot samples)

Irrigation Application Rates

Irrigation application rates targeting 50%, 75%, 100% and 125% evapotranspiration replacement were applied through LEPA irrigation through the 2000 and 2001 cropping seasons. Standard LEPA practice included application of drag hoses in alternate furrows, circular planting pattern to match traffic of the center pivot irrigation system, and furrow dikes (to the extent practical) to improve in-furrow water application uniformity. Yield was determined through plot sampling (2 rows by 20 ft. for each

treatment and replication block) and with a yield mapping combine. Samples were graded in the laboratory to determine whether different irrigation treatments effected differences in product quality.

Irrigation Application Methods

Throughout the 2000 and 2001 cropping seasons two LEPA methods (drag hoses and bubbler-mode nozzles) and two LESA methods (low drift spray and wobbler-type nozzles) were used to apply water at a base target irrigation rate of 75% crop evapotranspiration replacement. Yield was determined through plot sampling (2 rows by 20 ft. for each treatment and replication block) and with a yield mapping combine. . Samples were graded in the laboratory to determine whether different irrigation treatments effected differences in product quality.

RESULTS AND DISCUSSION:

Irrigation Application Rates

Surprisingly we did not find statistically significant differences in yield or grade responses to different irrigation application rates during the 2000 or 2001 crop seasons. This was attributed in part to high spatial variability (soil differences) within the year 2000 study area, which may have masked effects of the different irrigation rates. A distribution uniformity test performed early in the 2001 season indicated variability in application depth within the irrigation rate study area; hence a more detailed analysis is warranted. Field slope in the year 2001 study area was more pronounced, generating concern that the higher irrigation application rates were washing out furrow dikes more severely, and hence the application rates (to the field surface) may have been somewhat different from the effective irrigation (into the soil profile). More detailed spatial and slope-specific analyses are underway to investigate these issues further.

Irrigation Application Methods

In the 2000 cropping season, yield results from LEPA irrigation application treatments were significantly better than those from LESA irrigation treatments. The LEPA treatments (drag hoses and bubbler nozzles) were not different from each other. The LESA treatments (low drift spray and wobbler spray) were not different from each other. The yield advantage of LEPA over LESA in 2000 was consistent with results from deficit irrigation studies conducted at another site in Dawson County over the period 1995-2000. This yield advantage of LEPA over LESA irrigation methods observed in the 2000 cropping season was not observed in 2001. In 2001, yield was not significantly different between or among LEPA and LESA irrigated peanuts. In fact sample peanut grades from the spray irrigated peanuts were somewhat better than the LEPA irrigated peanuts. (Grades from LESA irrigated peanut samples were 75.5 to 76.2; grades from LEPA irrigated peanut samples were 71.5 to 73.8.) These differences, however, did not result in a significantly different crop value per acre basis (mean crop value was approximately $1,143/ac using quota loan rate prices).

In considering the 2000 and 2001 cropping seasons, there are a few differences that may explain the mixed experimental results. In 2000, a late season foliar necrosis was observed to occur rapidly and severely in the spray-irrigated (LESA) peanuts, but was essentially non-existent in the LEPA irrigated peanuts. The problem apparently affected overall yield, and obviously affected harvest losses. Investigators are still considering water quality and potential fungal effects or interactions to explain this occurrence. In the 2001 season, the plants showed little or no sign of this foliar damage. During the 2001 season, there was little or no precipitation, and the research team was especially concerned that limited lateral water movement from wet furrows across the planted rows may have been inadequate to support good conditions for pegging and pod development. Base irrigation treatments on the circle outside the irrigation study area were converted to spray irrigation to support soil fertility and plant breeding research; irrigation study treatments were left intact to preserve the study. Investigators plan to enhance the study in year 2002 to investigate whether there is a yield and/or quality benefit to converting between LEPA and LESA within the season to balance the water efficiency benefits of LEPA with the apparent better pegging conditions supported by LESA irrigation.