TITLE: Peanut Physiology/Precision Ag Studies at Western Peanut Growers Research Farm. 2002.

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METHODS AND MATERIALS:

Planting Date:	April 25-30, 2002
Variety:	FlavorRunner 458, Tamrun96, Florunner @ 100 lb/ac
Insecticide:	None.
Rhizobium:	Nitragin "Implant +" granular inoculant applied in seed drill (5 lb/ac)
Irrigation:	50%, 75%, & 100% ET Low Energy Precision Application (LEPA).
	75% ET LEPA early with Low Elevation Spray Application (LESA) during pod development period.
	75% ET LESA.
	75% ET Medium Elevation Spray Application (MESA) (wobblers).
Soil:	Brownfield loamy sand.
Fertilizer:	30-24-0 lb/ac N-P-K preplant.
	48 lb/ac N (split into 2 applications)
Harvest Date:	Dug October 17 & 21. Threshed November11, 14, & 18.

In the accompanying report entitled “Irrigation Management Strategies for Peanut Production in the Texas Southern High Plains”, Dr. Dana Porter discussed results of irrigation research at WPGRF. This research examined the effects of different irrigation strategies and application amounts on FlavorRunner 458, Tamrun 96, and Florunner peanuts. Precision Agriculture (PA) tools were used in that research and in other research projects at WPGRF and at other field sites in the area. PA tools and approaches include Global Positioning System (GPS) referencing of observation and measurement locations in the field, GPS-referenced yield mapping using the Peanut Yield Mapping System (PYMS) developed by University of Georgia research engineers and scientists, and Geographic Information System (GIS) computer software to analyze site-specific results. As Dr. Porter discussed, we were able to assign statistical confidence to apparent differences in peanut yield for some treatment combinations using the large number of data sites supplied by the PYMS, in contrast to yield averages obtained from only four replications of small plot samples per treatment using traditional sampling strategies. PA approaches can also be used to correlate data or observations to peanut yields at those specific sites.

We also collected data on temperature and relative humidity in peanut canopies and soil moisture levels associated with different irrigation treatments. Plants were collected weekly to determine if the different irrigation regimes affected growth and development, especially fruit development.

RESULTS AND DISCUSSION:

Data collected during harvest using the peanut combine equipped with the Peanut Yield Mapping System (PYMS) was used to construct the yield map for the irrigation experiments shown in Figure 1. Specific points from this map were used to analyze yield data to determine if average yields from the different irrigation regimes reflected real differences or were only apparent differences that came from averaging a range of yields from each treatment. We could not be certain that apparent yield differences were real from small plot data, but could make those judgments using the PYMS data.

Yield maps can be used with maps of other site-specific characteristics of the field to determine the influence of those characteristics with productivity of that part of the field, which in some cases can point to remedies to increase the yields in problem areas. Figure 2 shows an example of that using a combined peanut yield map for the 2000, 2001, and 2002 crops in the east circle of WPGRF along with a map for the calcium content of the surface 6 inches of the soil. This combination of maps indicates the relationship of caliche spots and low yielding areas in the southwest portion of the field.

Another example of the power of these PA tools relates to yellow strips in portions of the peanut areas. At times during planting, we were apparently having a problem with one of the boxes that was applying the inoculant; this showed up as an occasional portion of a row in which the peanut plants were more yellow than those in nearby rows. Jacob Reed identified the position of those yellow strips using GPS and examined enough plants to convince us that indeed they had fewer nitrogen-fixing nodules than their green neighbors. By comparing yields of small circles centering on yellow areas with nearby circles centered on green plants, he was able to determine that yield reductions caused by the lack of nodulation were not likely to cause problems with experiments being conducted in those areas.

In our continuing effort to understand how irrigation affects peanut plant development, we hope to gain insight into how to best utilize the finite resource of irrigation water to produce profitable yields of high quality peanuts. To that end, we measured temperature and relative humidity in the peanut canopy from June 10 to September 5, 2002. We also had a recording rain gage in the LESA area near the temperature-RH recording devices. We were, therefore, able to identify when we had either irrigation or rainfall and track its effect on temperature and relative humidity within the plant canopy. Both temperature and relative humidity potentially impact peanut fruit-set and development. Figure 3 indicates the effects of LESA and LEPA irrigation on temperature within the plant canopy during the hours following a late-night, mid-day, and early-morning irrigation. In these examples, the late-night and mid-day LESA irrigations lowered canopy temperatures compared to LEPA for a period of 3-4 hours. Also canopy temperatures tended to be slightly cooler throughout the entire 8-12 hour period shown. We will continue to analyze data for both temperature and relative humidity for all irrigation and rainfall events throughout the measurement period and to compare this data with other data collected during the season.

We initiated the use of a new method for continuously measuring soil moisture using heat-pulses between two wires inserted in the soil. Although the technology was reputed to be essentially ready to go off the shelf, we are still struggling with interpretation of the data in consultation with the manufacturer. At this time, it appears that we will be able to get information from the efforts last season, despite our earlier worries that the instrumentation did not function properly under our soil conditions.

We collected whole plant samples at essentially weekly intervals throughout much of the 2002 season at WPGRF and AG-CARES. Data for plant weights, growth stages, and mapping of fruiting positions are being analyzed to help us understand the effects of irrigation regime on plant development. Although unfinished at this time, we believe this data, in combination with other data from this and past crop years and locations, with add to our understanding of many of the specific effects of irrigation strategy on peanut production.

Figure 1. Western Peanut Growers Research Farm yield map determined using the Peanut Yield Mapping System in 2002.

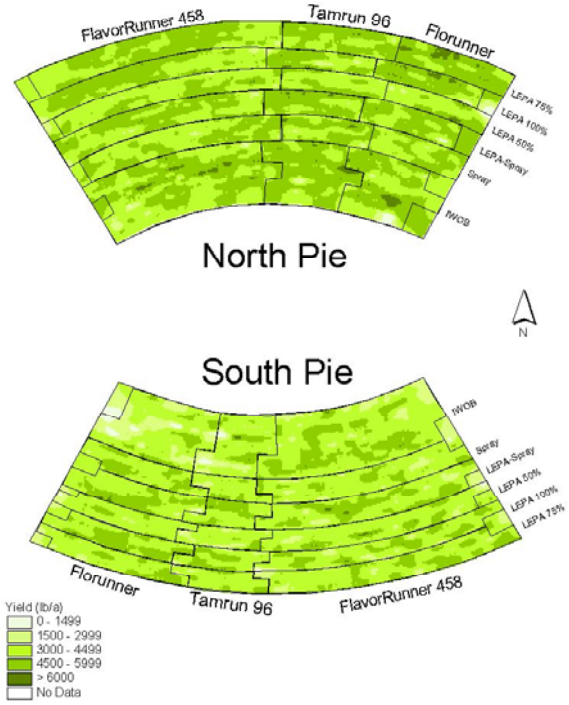


Figure 2. Combined yield map from 2000, 2001, and 2002 with corresponding map of calcium content in the surface 6 inches of the soil. WPGRF.

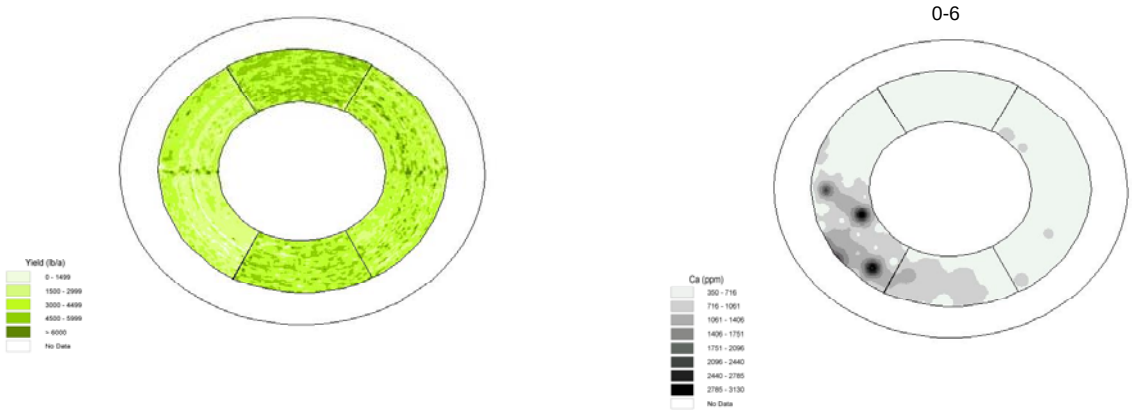
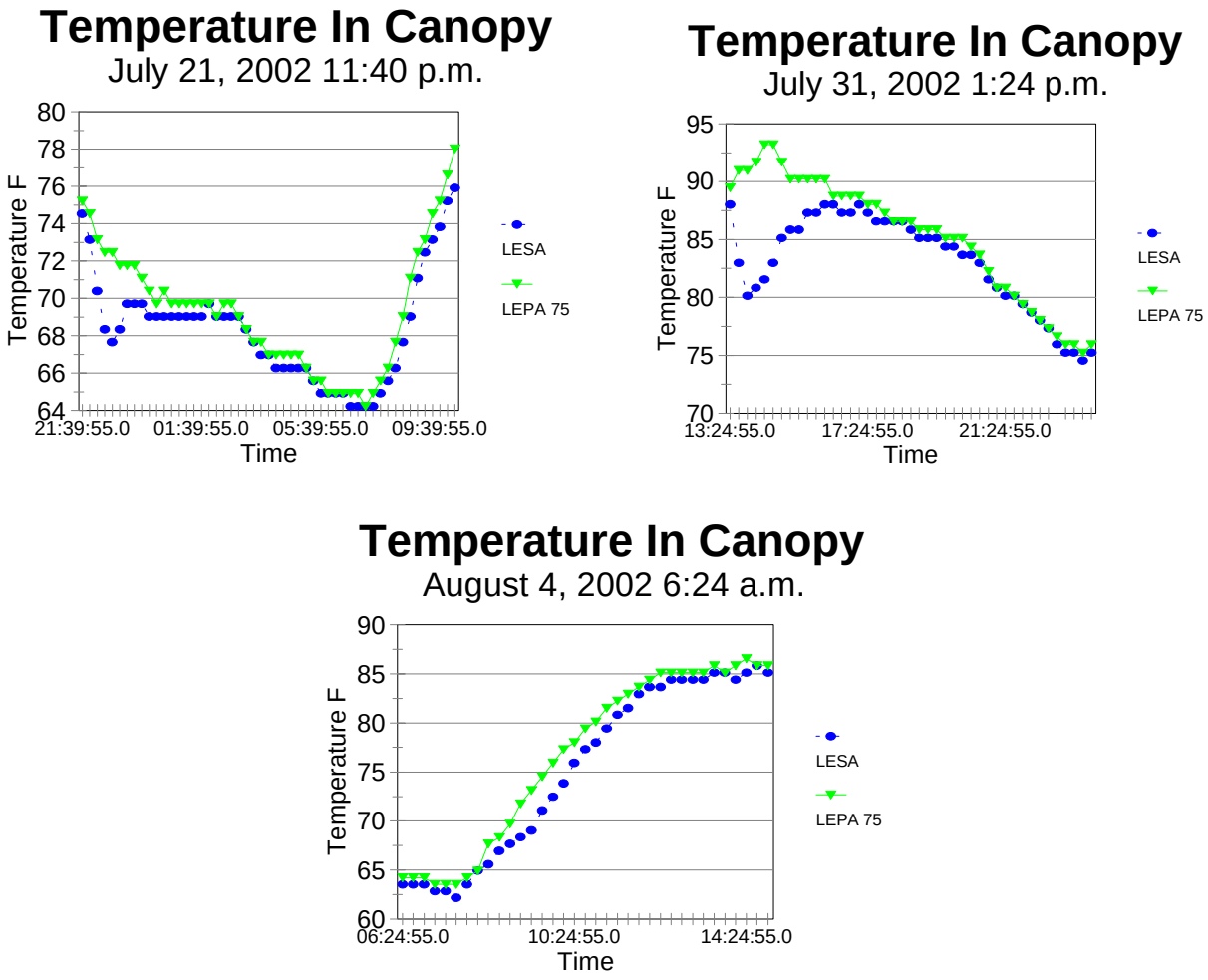


Figure 3. Effects of LEPA and LESA irrigation of temperature within the plant canopy following irrigation. WPGRF. 2002.



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