The Use of AZSCHED to Schedule Irrigation on Cotton Safford Agricultural Center - 1992

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Abstract

AZSCHED Irrigation scheduling software was used on Pima and upland cotton with irrigations being scheduled at 40, 50 and 60% water depletion. Around 8 inches of rain fell during the growing season so no statistical differences were seen between treatment yields.

Introduction

Efficient use of irrigation water is an important consideration for economical crop production throughout the arid parts of the world. In response to the need, an irrigation scheduling program has been developed for use by farmers and agricultural researchers. It has been tested over the past few years and found to be effective at predicting crop water use on both long and short staple cotton. This study is a continuation of the previous studies to see if it continues to function well under different weather patterns. The AZSCHED software has now been officially released and is cited in reference number 1. The AZSCHED program runs on IBM-PC or compatible computers running DOS 2.0 or higher and required less than 512 Kilobytes of RAM.

Materials and Methods

The AZSCHED software has been demonstrated at the Safford Agricultural Center in the past (2) and this year's research was to verify the effects seen in the past by changing the Management Allowed Deficiency (MAD) over a range from 40% to 60%. An irrigation efficiency of 80% was used throughout this trial. Two experiments were designed, one with upland cotton (Delta Pine 90) and the other with Pima cotton (S-6). Each experiment had four replications and the irrigations were applied as close to the prediction dates as was possible for each of the treatments. More than 8 inches of rain fell during the growing season and its effect was nearly as important at the irrigation water applied. Both irrigation and rainfall were entered into the software to determine the crop water needs. The amount of water applied was the amount necessary to get water to the ends of the rows and in most cases this was less than what the software called for.

Crop History for: Long staple trial	: **Short staple trial**
Soil type: Grabe clay loam	: Grabe clay loam
Previous crop: Wheat	: Cotton
Planting date: 6 April 1992	: 7 April 1992
Planting rate: 25 lbs/ac	: 25 lbs/ac
Herbicide: Treflan, preplant	: Treflan, preplant

Fertilizer: 200 lbs/ac 16-20-0 on green manure crop, 150 lbs N per acre sidedressed
Irrigation: Furrow, according to AZSCHED schedule; 40, 50 or 60% depletion
Insecticide: Pyrethrin applied 3 times, organo-phosphates applied twice; pink boll worms and aphids

Pix/Prep: None		: None
Defoliation: Dropp		: Dropp
Harvest:	1st Pick - 26 September	: - 23 September
	2nd Pick - 25 November	: - 30 November
Plot size: 6 - 36" rows by 200 feet, 3 replicates		:6 - 36" rows by 200 feet, 3 replicates

Plots were separated by a border to prevent water from crossing into adjacent plots. The center two rows of each were harvested and weighed in a basket scale.

Results and Discussion

The 1992 cotton season was much wetter than normal with 8.77 inches of rain falling between April 1st and the end of September. The average rainfall for that period is 5.14 inches. The bulk of the difference was in May, which received 2 inches more than normal and August, which received nearly 3 inches more than normal. September, on the other hand, received nearly an inch less than normal. Table 1 shows the data on the long staple test. Yields were not significantly different between the 40, 50 and 60% depletion treatments, nor were any of the other parameters measured. The calculated percent depletions can be seen in Figure 1, and it can be noted that the 40 and 50% depletion curves did not vary much until the end of July and during this time the 40% treatment was allowed to get drier than the software called for on three occasions. The irrigation amounts were very similar between treatments as were the efficiencies, measured in lint per acre inch of water applied.

Table 2 shows the data for the short staple irrigation trial. Similar to the long staple trial, the yields were not separable statistically, but a strong trend was seen from the 60% treatment to the 40% treatment. At the 11% level of probability, the 40% treatment yielded more than the 60% treatment. The curves of calculated depletion levels are shown in Figure 2. More separation between treatments are seen early in the season and less later in the season.

Compared with the trial in 1991 (2), fewer differences were seen between treatments in 1992. This is partially attributable to the increase in rainfall during the growing season for 1992 and partially due to our inability to apply as much water as called for by the program. Nevertheless, it is felt that the AZSCHED software accurately tracked the water needs of the cotton plants and called for irrigations at optimal times according to the instructions that were given to it. At this point, the same crop.dat file is used for both long and short staple cotton.

References

1. Fox, Fred, Tom Scherer, Don Slack and Lee Clark. 1992. AriZona irrigation SCHEDuling software, version 1.01. The University of Arizona Cooperative Extension and Department of Agricultural and Biosystems Engineering. Tucson, AZ Publication number -

2. Clark, L.J., E.W. Carpenter, and D.C. Slack. 1992. The use of AZSCHED to schedule irrigation on cotton, Safford Agricultural Center, 1991. Cotton, A College of Agriculture Report, University of Arizona, Tucson, AZ. Series P-91, pp83-7.

Table 1. Long staple seed cotton yield and other agronomic and irrigation parameters for irrigation trials grown on the Safford Agricultural Center, 1992.

Treatment	Yield (lbs/ac)	% 1st Pick	Pl Ht (in)	Irr (in)	Leach (in)	Effic (#lnt/acin)
LS 40% Depleted	3158.2 a*	74.0 a	31.5 a	24.1	1.65	42.5
LS 50% Depleted	2798.7 a	74.1 a	30.2 a	24.8	1.89	37.7
LS 60% Depleted	2901.1 a	80.1 a	28.8 a	22.9	1.69	42.3
Average	2952.7	76.1	30.2	23.9	1.73	40.8
LSD(05)	534.7	7.05	3.95			
C.V.(%)	8.00	6.73	5.97			

* Values within a column followed by the same letter are not significantly different at the 5% level using Duncan's Multiple Range test.

Table 2. Short staple seed cotton yield and other agronomic and irrigation parameters for irrigation trials grown on the Safford Agricultural Center, 1992.

Treatment	Yield (lbs/ac)	% 1st Pick	Pl Ht (in)	Irr (in)	Leach (in)	Effic (#lnt/acin)
SS 40% Depleted	4962.2 a	95.6 a	29.0 a	28.3	1.65	58.4
SS 50% Depleted	4648.6 a	95.5 a	31.7 a	28.1	1.69	55.1
SS 60% Depleted	3940.5 a	96.1 a	28.7 a	26.4	0.98	49.8
Average	4517.1	95.7	29.8	27.6	1.44	54.4
LSD(05)	1023.7	2.05	7.38			
C.V.(%)	12.28	0.78	9.90			

* Values within a column followed by the same letter are not significantly different at the 5% level using Duncan's Multiple Range test.

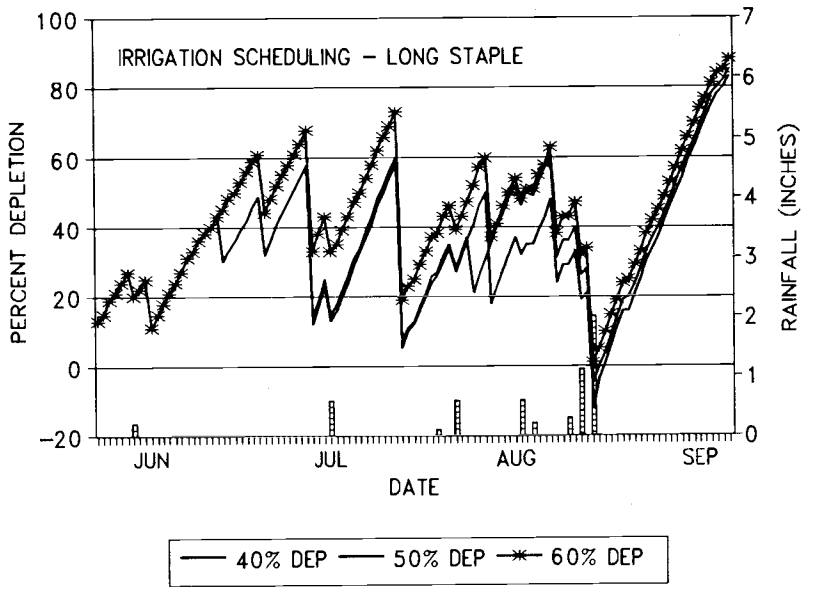

Figure 1. Line graphs of AZSCHED calculated percent soil water depletion and bar graph of rainfall received from June 1st to September 15th on long staple cotton trial.

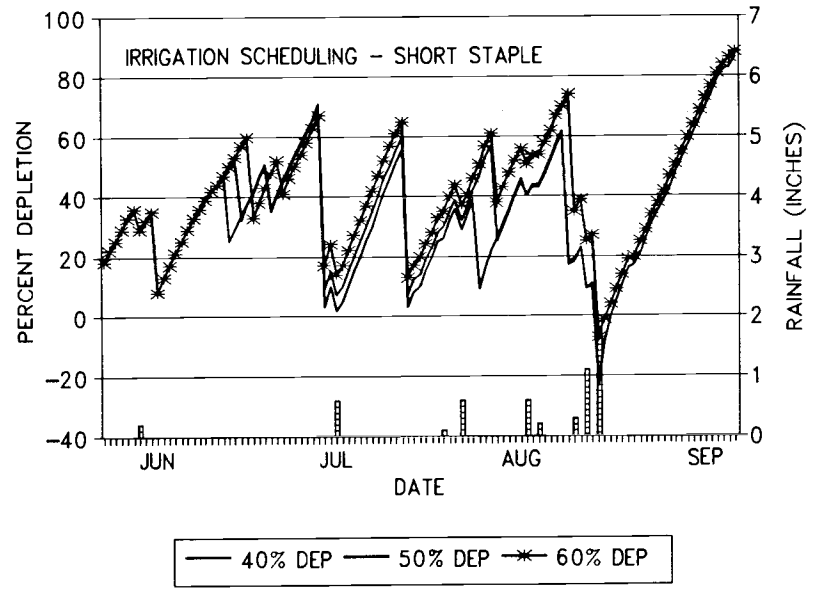

Figure 2. Line graph of AZSCHED calculated percent soil water depletion and bar graphs of rainfall received from June 1st to September 15th on short staple cotton trial.