BEST PRACTICE COTTON SYSTEMS

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OBJECTIVES: To develop the criteria for 'best practice' cotton production systems. To test experimental component subsystems and the interrelationship of cotton production subsystems including rotational crops. To demonstrate for technology transfer 'best practice' systems.

PROCEDURE: Four systems were identified for inclusion in a field study resulting from a factorial of two systems categories: row spacing and tillage. The 'best practice' row spacing was selected as 30 inch as compared to the common practice of 38/40 inch spacing. As the 'best practice' tillage, the zone system with precision tillage and controlled traffic was selected to be compared to the common broadcast tillage system. The factorial arrangement allowed: 1) a 'farmer practice' 38/40 inch system; 2) a 'farmer practice' adaption using 30 inch row spacing; 3) a zone system treatment using 38/40 row spacing; and 4) the best practice system using both zone concepts and 30 inch row spacings. Treatment 1 and 3 were managed with 6 38-inch row equipment and were 12 rows wide. Treatment 2 was managed with 8 row 30 inch equipment and was 16 rows wide. Special equipment was developed for the best practice treatment #4 using 9-row 30-inch row equipment with wide furrows every three rows for traffic. In 1989 the south portion of the study was planted using a factorial layout with 6 replications of plots arranged in such a way that cross tillage could be applied to the two farmer practice treatments. The plot size varied by treatment in width with all treatments approximately 300 feet long. In 1990 the north portion was planted using the same arrangement with a different randomization to allow a rotation variable with alternate years. Sampling consisted of soil and petiole fertility, soil and plant water stress and yield.

RESULTS: Measurement of petiole samples shows that the best practice treatments were nitrogen deficit at the end of the growing season compared with the farmer treatments. We surmise that the best practice treatments with the increased water infiltration allowed greater percolation of water and thus greater loss of nitrogen by leaching. Attempts at differential irrigation based upon soil or plant water stress were frustrated by the approximate 7 to 10 day irrigation demand confounded with the need for dry periods for cultivation and water scheduling. Due to obvious and extreme variability in plant growth within plots a covariant was sought. There appeared to be a correlation between sandy areas in the plots and plant height therefore each plot was mapped and the percentage sand soil calculated. With a covariance analysis the estimate of the sand effect was -3.45 (lbs/a)/(% sand) for the 1989 yield data and -3.25 for 1990 in the south test. No correlation was evident for the north test.

Using contrasts among the least square means for the south test and contrasts among the GLM means for the north test, the yield data show important differences among treatments. The first year data for both the south and north tests show that the 38 inch systems yields were 4 to 7 percent greater than the 30 inch systems. Also for the first year both tests indicated no difference in yield between zone and broadcast systems. During the second year (which can be determined only for the south test) the trends reversed: 1) there was no detectable difference between row spacings and 2) the zone system yielded 8.6% more than the broadcast. The change from no difference to a difference between zone and broadcast can be explained by noting that the treatment effect did not exist at the initiation of the plots but was developed during the first year. The 30 inch vs 38 inch differences is difficult to explain since most studies on the station have shown substantial increases with 30 inch spacing.

FUTURE PLANS: The study became a nightmare in management. The size of the field test, the time to convert equipment, constraints on irrigation timing and lack of personnel and funds for collecting and processing samples compromised the study and no reasonable solution within the resources available could be found. Therefore the study was abandoned with plans to develop a small scale study to evaluate in depth certain of the questions identified by the large study.

SUMMARY OF CORE STUDY YIELDS

SOUTH CORE 1989

SOURCE	F VALUE	Pr > F
REPS	10.85	.0002
TREAT	17.39	.0001
SAND	28.93	.0001

Estimate of SAND regressor
-0.0069 (b/a)/(% sand)

LSMEANS (means corrected for sand)

	30"	38"	ave
ZONE	2.10 a	2.42 c	2.26 a
STAND	2.23 b	2.24 b	2.24 a
ave	2.17 a	2.33 b	

CONTRASTS

	F VALUE	Pr > F
38" vs/ 30"	25.86	.0002
ZONE vs/ STAND	0.39	.5407

NOTES:
Skips due to poor planting corrected using a factor of .9.

SOUTH CORE 1990

SOURCE	F VALUE	Pr > F
REPS	1.41	.2772
TREAT	5.68	.0156
SAND	4.52	.0595

Estimate of SAND regressor
-0.0065 (b/a)/(% sand)

LSMEANS (means corrected for sand)

	30"	38"	ave
ZONE	2.51 a	2.54 a	2.52 a +8.6%
STAND	2.24 b	2.42 a	2.32 b
ave	2.38 a	2.48 a	

CONTRASTS

	F VALUE	Pr > F
38" vs/ 30"	2.88	.120
ZONE vs/ STAND	10.05	.010

NOTES:
There were 4 missing plots due to scale malfunction.

NORTH CORE 1990

SOURCE	F VALUE	Pr > F
REPS	0.61	.696
TREAT	7.04	.0040
SAND	0.03	.862

No regression with SAND

MEANS (GLM w/o covariant)

	30"	38"	ave
ZONE	2.76 b	2.78 ab	2.77 a
STAND	2.65 c	2.86 a	2.76 a
ave	2.70 a	2.82 b	

CONTRASTS

	F VALUE	Pr > F
38" vs/ 30"	14.22	.0019
ZONE vs/ STAND	.16	.692

NOTES:
Since SAND was not significant, a second GLM model was fitted without the covariant.

GENERAL NOTES:

The percentage of poor growth for each plot was measured in 1990 and used as a covariant. It was assumed that the poor growth was caused by a variations in sand content since an abrupt change in growth occured at the boundaries consistent with sand streaks. All interpretations are based on the type III SS (ie, F values and probability)