removed the possibility of harvesting the cotton a few hours after application of the material, thus making it no better than many of the defoliants already being used.

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HARVEST SCHEDULING

Marshall M. Machado, Research Associate in Agricultural Engineering

Plot experiments and Extension Service recommendations have suggested the timing of operations for defoliant application and harvest usually as a percent bolls-open. Application of these recommendations indicates the need for a good method of accurately determining crop maturity.

A method of determining the crop maturity rate and a yield prediction method would permit evaluation of alternative harvest schedules. Such an evaluation several weeks prior to actual harvest would permit the cotton grower to make and to act upon selected harvest schedules.

To establish a method of determining crop maturity and to use the crop maturity curve for making yield predictions were objectives of this study. Samples were taken from the buffer rows of Marana Field A-3 on Deltapine 5540 cotton for the 1966 and 1967 crops. A sample consisted of 13'-1" of one 40" row.

Percent bolls-open figures were computed weekly by dividing the number of bolls-open by the total number of bolls in the sample. A cumulative crop maturity curve was developed from this data. The crop maturity curve was approximately linear in the range used for making the yield predictions, 6 to 40 days after 20% bolls-open. Predicted yield was computed by multiplying the expected number of bolls-open on the pick date by the average boll weight.

Statistical interpretation of the data showed that yield predictions made for the period from 6 to 40 days after 20% bolls-open have a potential accuracy of within 10% of the actual yield. Harvest schedules developed at 20% bolls-open allow optimization of return and scheduling the sequence of fields to be harvested.

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A COMPUTER PROGRAM FOR COTTON

H. N. Stapleton, Agricultural Engineer

During the past year we have been able to develop a program for the digital computer which "simulates" the cotton plant. When completely developed,

this simulation will allow the integration of research results and grower practices in the search for alternatives which produce "best" results.

The present program uses the environmental inputs of solar energy, photoperiod, and temperature and "phases in" the cotton plant through a planting date. The program emerges, squares, and flowers the plant, and matures bolls. Yield, as in the real system, is a count of mature bolls.

The data for the program have been developed from the reports of research of cooperating departments, and a search of the literature of cotton-related research. Insect infestations are the result of arbitrary values supplied by cooperators in Entomology. As usable data from all sources are developed, it will be integrated in the program. Testing must then be done to prove the accuracy of the simulation so that we may be assured that its performance truly represents the cotton plant.

In the present program, an improper selection of planting date requires the "computer cotton" to be replanted. The program shows that 10-14 days after first flower is a very critical time for the fruiting plant if there are any "disturbance inputs" to the system near this period. The lag-delay in the plant system from either disturbance or correction is indicated to be about 5 days for the appearance of "visible" effects. When the "pink bollworm subroutine" is used with an initial infestation of one pair of moths at 1st square, in 110 days the program is terminated and the computer prints, "THE PINK BOLLWORMS HAVE TAKEN OVER THE FIELD." In 1967, infestations were more massive than this, and the time required to terminate a grower's crop may have been less than 110 days from 1st square.

The time required to grow a crop of "computer cotton" is from 20 seconds to 9 minutes, depending on the computer used and the amount of data printed for examination. This method will allow a considerable number of alternatives to be examined under identical conditions, a circumstance not usually possible with field plots, and certainly not with comparable speed. Simulation offers a tool for the use of the research worker and the grower in developing management schemes for cotton production.

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