Will Variable-Row Spacing Cut Cotton Costs and Save Water?

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Cotton growers in the Southwest are constantly looking for ways to reduce costs, increase yields, and use less water. Each new idea is carefully considered to see if it can be made a part of a successful cotton production system.

There are many things to consider—planting, weed and insect control, irrigation, harvesting . . . and many more.

At the 1965 Western Cotton Production Conference, Dr. Longenecker of the Texas Agricultural Experiment Station at El Paso, reported on his research studies of variable-row cotton. Two observations had stimulated his interest:

1. **Water losses by evaporation occur from the soil in the unshaded furrow.**
2. **In skip-row cotton fields, the outside row is taller and produces more cotton — and 70% to 80% of the bolls on the outside row are on the skip side!**

Could these facts be utilized to help cotton growers? The object of the Texas research project was to answer this question. Variable rows — like those in Figure 1 — were tried.

Results of the Texas studies encouraged several Arizona cotton growers to try the system. In 1966, Travis Jones, a grower near Buckeye, planted 125 acres on a 27 inch - 53 inch spacing and 175 acres on a 34 inch - 46 inch spacing. Using machinery on hand, he shaped a bed similar to that used by Longenecker; the same narrow irrigation furrow but a shallow, non-irrigated furrow instead of the wide bed.

Jones estimated a water savings of 1.6 acre-feet per acre over the conventional system with every-row irrigation. He reported a more uniform boll set than in previous years. Excavation revealed as much or more root development on the dry side of the row as on the furrow side.

These observations may be related to soil aeration. The 27-53-inch crop was picked with a modified one-row International Harvester; the 34-46-inch with a Rust picker. In spite of very heavy pink bollworm damage, the yield was 900 pounds of lint per acre.

Mr. Jones planted on a 30 inch - 50 inch spacing in 1967. There were some harvesting problems but these undoubtedly can be overcome. He plans to plant variable-row cotton in 1968. Russell Schlittenhart, near Casa Grande, planted about 75 acres of 30 inch - 50 inch in 1966 and estimated a yield increase approximately equivalent to plant 4, skip 4.

Chuck Farr, Maricopa County Agent, and Extension Specialists took soil samples in the Jones field on a profile grid to study salt concentration and distribution. Results show the variable-row method can help reduce the salt in the planted row during germination and emergence. (See Figure 2.) This happens because moisture from the furrow sweeps salt past the plants and into the bed.

An experiment was conducted on The University of Arizona Experiment Farm at Marana in 1967 to compare the normal 40-inch row spacing with a variable-row spacing of 30-50 inches. Two varieties were used with four replications. One replication was discarded for yield comparisons as a large portion was heavily infested with Cotton Root Rot.

The two varieties were Stoneville 213 and Arizona Experimental 6024, which is a sister line and very similar to Hopicala. The variable row planting is shown in Figure 3.

The entire field received a pre-planting irrigation. The 40-inch spacing treatment was irrigated four times during the season; the variable-row was irrigated five times. Siphon tubes were calibrated and measurements made to determine water delivery to each spacing treatment and replication. Varieties within a spacing replication were not divided by a border and could not be irrigated separately. The 40-inch plots were irrigated in every furrow except for the first two irrigations which were alternate-furrow.

Approximately 14.5 inches of water were delivered to the variable-row; about 17.5 inches to the 40-inch treatment. These amounts were in addition to the pre-planting irrigation. The last irrigation of the variable-row on August 29 was primarily for the 6024, since it is later in maturity than Stoneville 213.

No severe harvesting problems were encountered using one-row spindle pickers. Small areas were gleaned to determine the field losses. Statistical

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analysis indicated that there was an actual yield difference between the spacing treatments in favor of the regular 40-inch planting. Calculated yield with the 40-inch spacing was 974 pounds of lint per acre compared to 839 pounds for the 30-50-inch cotton, a difference of 135 pounds of lint per acre.

The varieties were also significantly different. Yields of Stoneville 213 and Arizona Experimental 6024 were 979 and 833 pounds of lint per acre respectively; thus 146 pounds in favor of Stoneville 213. There was no significant interaction between spacing and variety.

Irrigation timing is obviously an important consideration. Since less water was applied to the variable row at each irrigation than to the 40-inch planting, the variable row was irrigated more frequently and required one extra irrigation. Thus, the relationship between soil moisture, atmospheric conditions and the plant fruiting patterns differed for the two treatments. These considerations, which would vary from field to field and from year to year undoubtedly affect yield results.

In summary, there have been both positive and negative results from variable-row spacing. In areas of high water cost or water shortage it is an alternative method to consider. Further research with the practice may define improved methods of managing variable-row cotton for reduced costs and a lower water requirement.

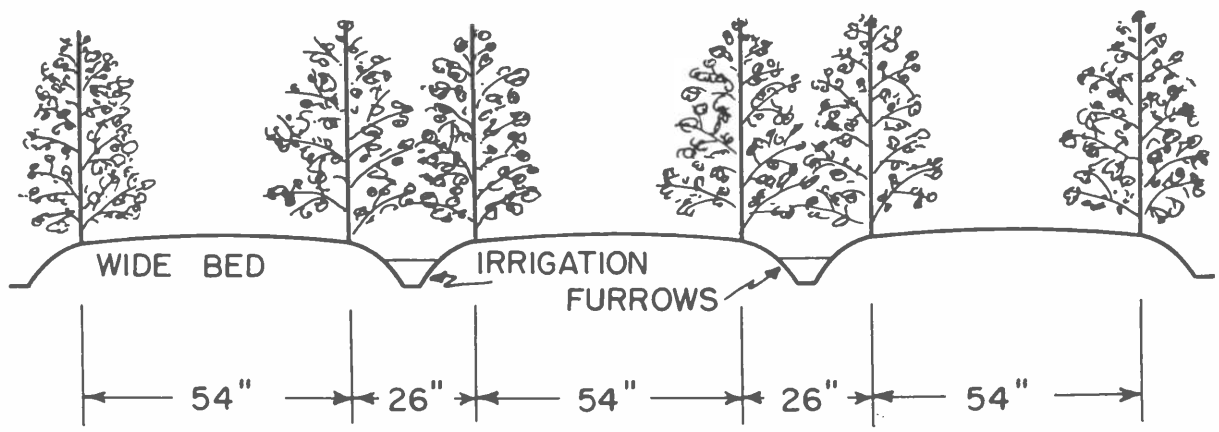

FIGURE 1 — Sketch of Variable-Row Cotton Spacing.

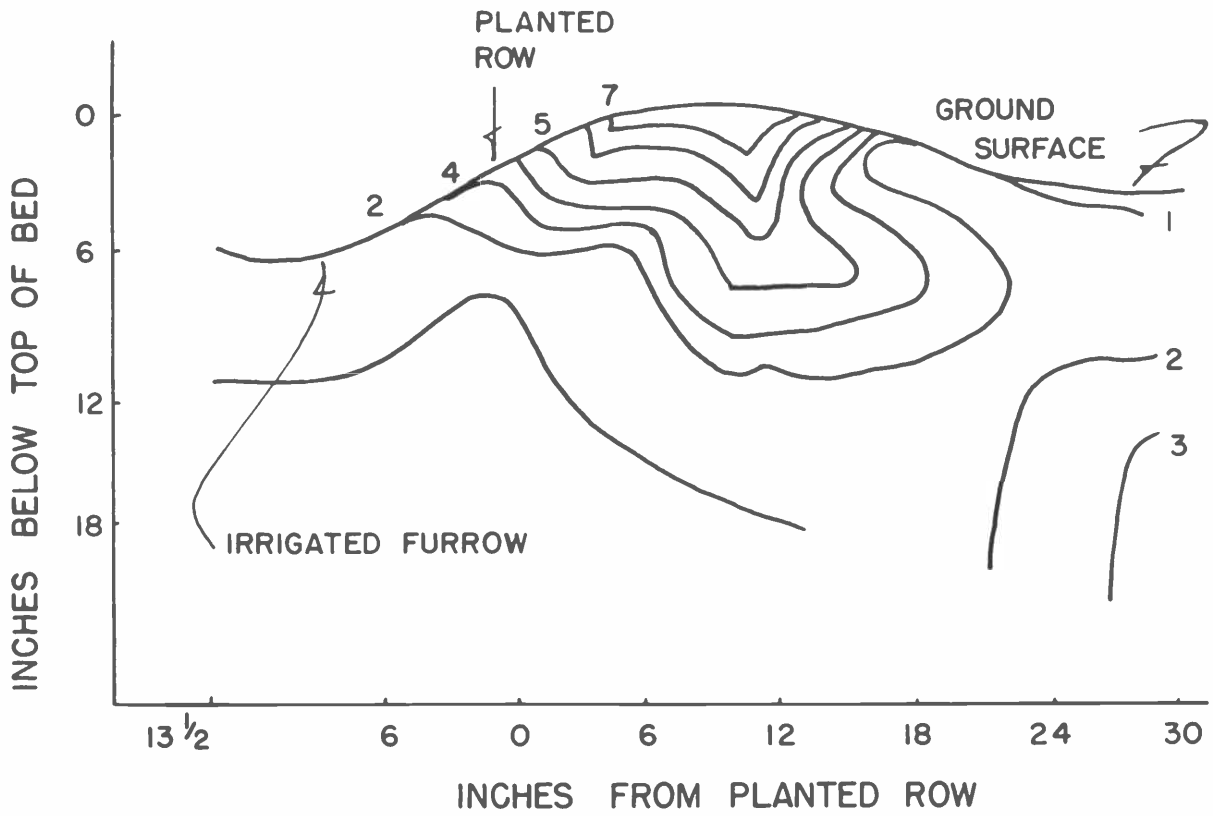

FIGURE 2 — Salt Distribution in Bed Profile. (Extressed as $EC_e \times 10^3$)

FIGURE 3 — Variable-Row Cotton at Marana, 1967.