

Flowering, Boll Set, and Yield in Drip Irrigated
Cotton in Arizona

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Increased water costs and water conservation are of prime concern to agriculture in the desert southwest. Drip irrigation provides one of the best means of water conservation. Drip irrigation for cotton production has been researched in Arizona previously, however, it has only been in the past few years that cotton has been commercially produced with drip irrigation systems in Arizona.

In 1982, research was conducted at the Sundance Farms, Casa Grande, Arizona comparing conventional furrow irrigation with an above-ground drip system with one drip line for two rows of cotton and a below-ground drip system with one drip line under each row of cotton. The cotton was planted in 40-inch rows in all tests.

Deltapine 62 (DPL-62) and Deltapine 90 (DPL-90) were included in each of the two drip irrigation systems and only DPL-90 was studied under furrow irrigation. The total amount of water applied throughout the growing season was approximately 35 acre inches for the below-ground drip irrigation system, 42 acre inches for the above-ground drip irrigation system and 60 acre inches for the conventional furrow irrigated system. Each irrigation system was located in a different field and managed separately. Thus a direct comparison between tests should not be made.

Test plots consisted of 7-foot single rows replicated six times in each of the five combinations of irrigation systems and varieties. All open flowers were tagged using dated Kwik-Lok labels attached to the pedicel from first flower, 6 June, to 30 September, a total of 17 weeks.

Starting in late August, the open bolls on each of the plots were harvested by hand on a weekly basis until late October then bi-weekly until late November, for a total of 12 harvests. A final harvest which was made in late December is not included.

Flowering, boll set, and lint yield are presented in Figures 1 to 5. The boll set curves are incomplete because the last harvest data are not included in this report. Flowering of the furrow irrigated DPL-90 cotton followed the typical pattern and reached a peak 6 to 7 weeks after flowering began (Fig. 1). The peak flowering week, produced an average of 28,136 blooms/acre/day. After this peak bloom, flowering dropped off rapidly as plants went into the so called "cut out" period typical for cotton produced in the lower desert regions. Flowering resumed in late August.

The early flowering patterns of both the DPL-62 and DPL-90 cotton under both drip irrigation systems were remarkably similar during the season (Fig. 2 to 5). Flowering in both drip systems began earlier and was more intense than the furrow irrigated cotton. Flowering increased rapidly with a broad flowering peak that lasted 3 to 4 weeks. For example, in the above-ground system, DPL-62 produced an average of 35,959 blooms/acre/day during the peak flowering week (Fig. 2). There was a rapid cutout of flowering in all of the drip irrigated cotton about 5 or 6 weeks after flowering had begun. Flowering was very low in all of the drip systems for essentially a 1-month period before flowering resumed in mid-August. Both varieties in the above-ground drip system began to flower very rapidly after mid-August (Fig. 2 and 3) approaching a flowering pattern similar to that at the beginning of the season. Few flowers that bloomed after 15 September matured to make open bolls.

The calculated lint yield from the 12 hand harvesting dates are shown in Table 1.

Furrow irrigated DPL-90 produced 2,019 pounds of lint per acre (4.21 bales with 480 pounds lint/bale). Since the entire furrow irrigated field had a yield of 3.25 bales per acre, it is obvious our plots in this test were located in the most productive area of the field.

In both the above- and below-ground drip irrigation systems, the yield of DPL-90 was higher than DPL-62. Sequential harvest data in Table 1 shows almost 3½ bales of cotton were open at the first picking, 27 August, with DPL-90 in the above-ground drip system. Over four bales were open by 17 September which was also true for the DPL-62 in the above-ground drip system. The highest total yield of 2,596 pounds of lint (5.41 bales) per acre was obtained with DPL-90 with the above-ground drip system.

In the below-ground drip irrigation system with DPL-90, three bales were open by 3 September with four bales open by 24 September. The open cotton with DPL-62 in the below-ground system was somewhat less than other treatments under the drip systems. Three bales of cotton were not open until 24 September and four bales until 28 October 1982. The heavy plant population in the below-ground drip system appeared to be detrimental in 1982 particularly with DPL-62. With a very dense canopy and approximately 7 inches of rainfall from late July to early September, humidity in the microclimate remained very high. Early maturing bolls did not open rapidly resulting in a considerable amount of boll rot. We assume this explains part of the yield pattern of DPL-62 in the below-ground drip system. The

plants of DPL-90 stood much more erect than DPL-62 resulting in better aeration and less boll rot even with conditions favoring high humidity.

Cotton produced under drip irrigation requires more careful management than conventionally irrigated cotton. Excellent lint yields up to 5.4 bales/acre were obtained while saving significant amounts of water. It was interesting to note that a drastic flowering cutout period took place several weeks after the peak bloom period even though careful water and fertilization management was used in both of the drip irrigation systems.

Future studies are needed to include irrigation scheduling and amount, plant population, varieties, and fertility requirements with drip irrigation.

The ultimate success of drip irrigation for cotton production will depend on such factors as the cost and installation of the drip irrigation system; the cost of water; significantly increased yields; and the price of cotton.

Table 1. Cumulative lint yield (pounds per acre) of cotton produced under above- and below-ground drip irrigation systems and furrow irrigation, Casa Grande, 1982.

Picking Date	Above-ground drip		Below-ground drip		Furrow DPL-90
	DPL-62	DPL-90	DPL-62	DPL-90	
27 Aug.	1,162	1,624	659	1,034	952
3 Sep.	1,682	1,863	1,118	1,463	1,375
10 Sep.	1,760	1,901	1,245	1,663	1,604
17 Sep.	1,942	1,974	1,420	1,831	1,747
24 Sep.	2,053	2,044	1,609	1,922	1,830
1 Oct.	2,078	2,100	1,714	2,011	1,866
7 Oct.	2,092	2,121	1,764	2,037	1,878
15 Oct.	2,102	2,140	1,810	2,067	1,892
22 Oct.	2,127	2,217	1,897	2,106	1,904
28 Oct.	2,156	2,272	1,948	2,131	1,909
12 Nov.	2,228	2,422	2,073	2,203	1,944
22 Nov.	2,424	2,596	2,237	2,310	2,019

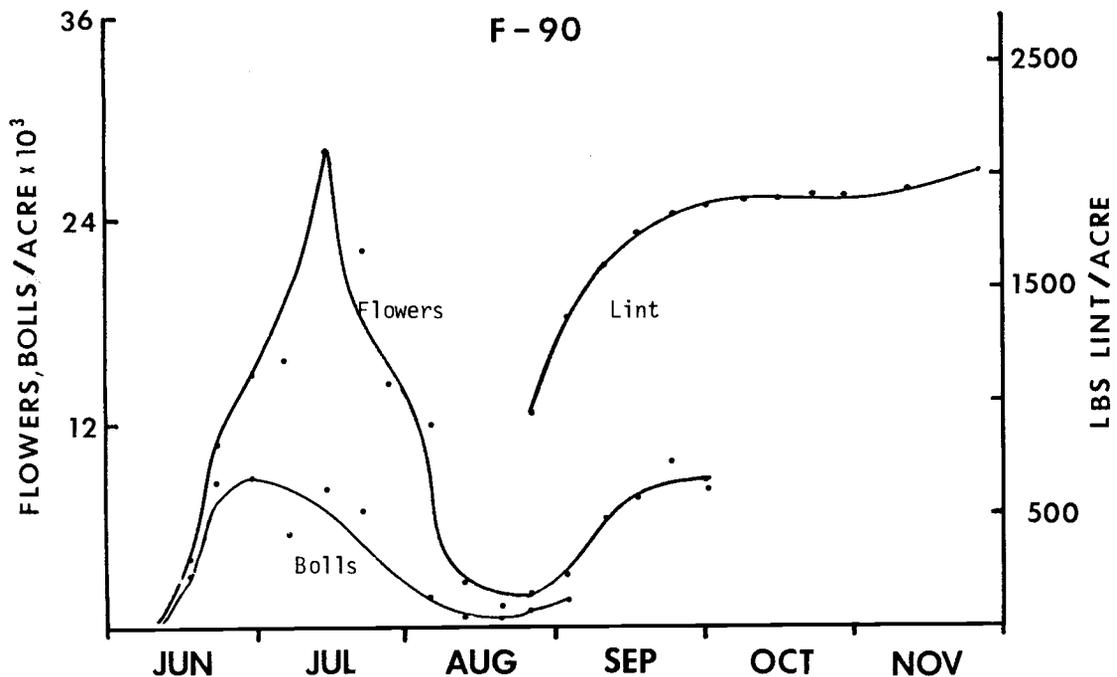


FIGURE 1. Flowering, boll set, and lint yield of furrow irrigated DPL-90 (F-90) cotton, Sundance Farms, Casa Grande, AZ, 1982.

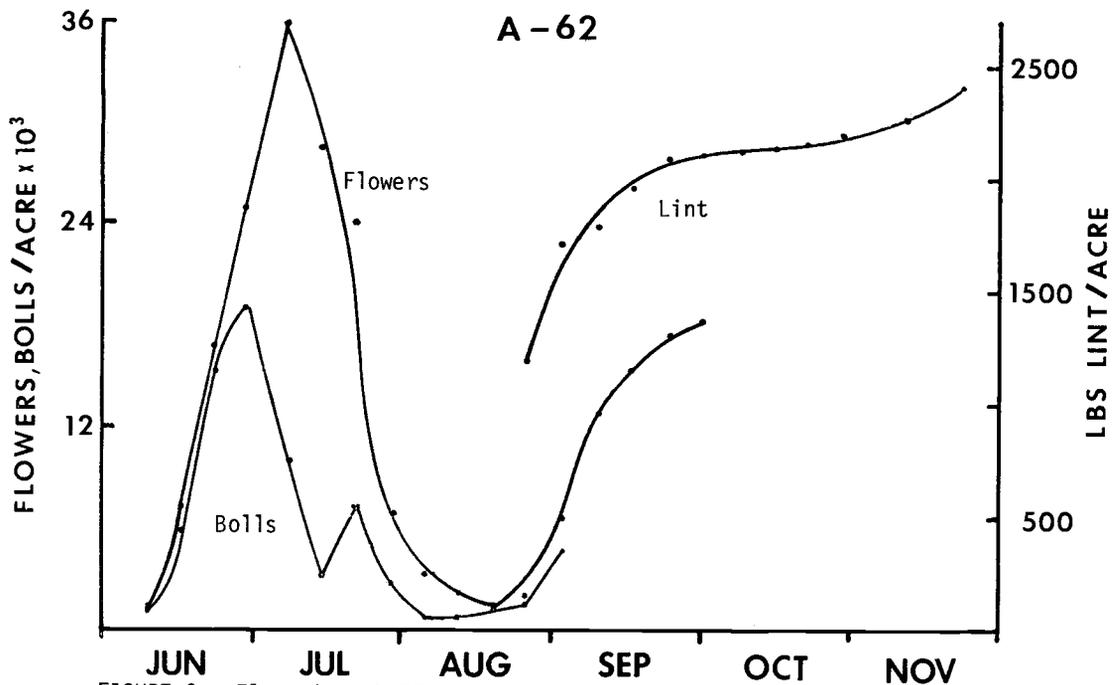


FIGURE 2. Flowering, boll set, and lint yield of above-ground drip irrigated DPL-62 (A-62) cotton, Sundance Farms, Casa Grande, AZ, 1982.

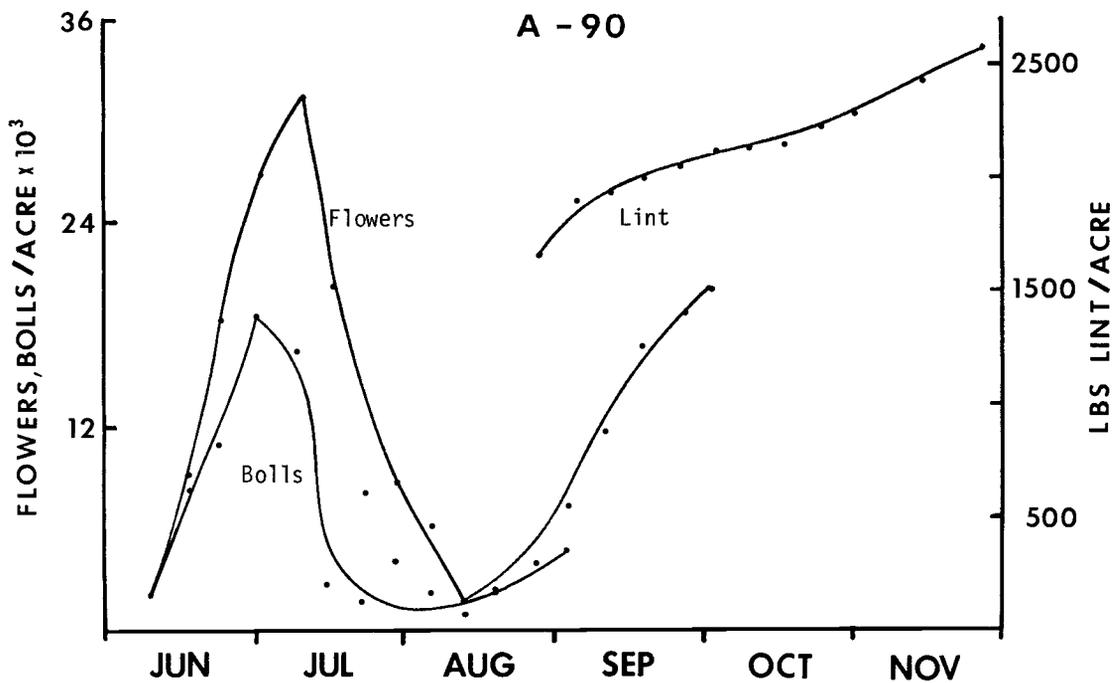


FIGURE 3. Flowering, boll set, and lint yield of above-ground drip irrigated DPL-90 (A-90) cotton, Sundance Farms, Casa Grande, AZ, 1982.

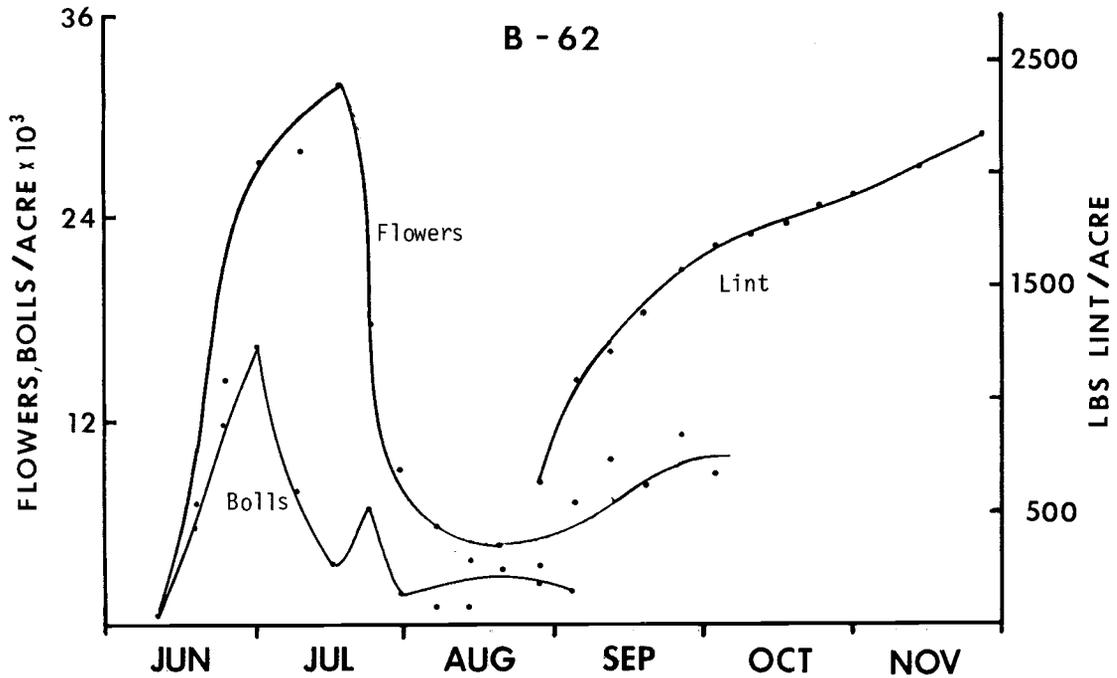


FIGURE 4. Flowering, boll set, and lint yield of below-ground drip irrigated DPL-62 (B-62) cotton, Sundance Farms, Casa Grande, AZ, 1982.

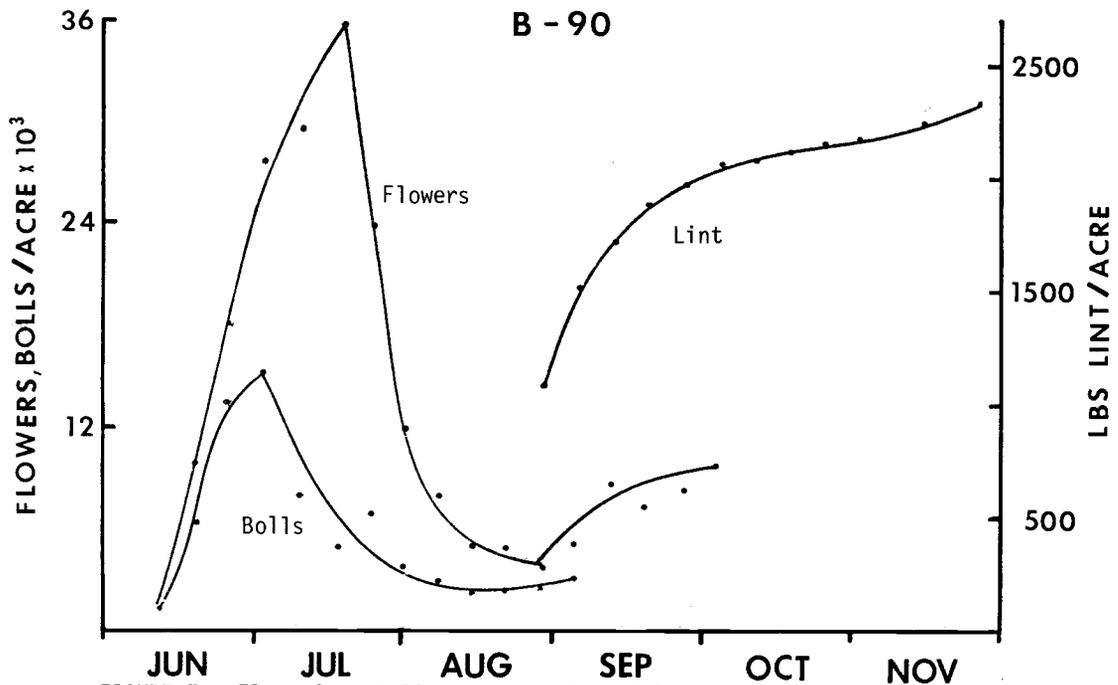


FIGURE 5. Flowering, boll set, and lint yield of below ground drip irrigated DPL-90 (B-90) cotton, Sundance Farms, Casa Grande, AZ, 1982.