on June 9. These plots were irrigated for the second time on June 30 when plots in the S_2 series were irrigated for the first time. In general, these results are similar to those observed in the 1966 study. Where most of the available water was removed prior to an irrigation, a rapid rise in the tensiometer reading resulted where plots were irrigated only in alternate furrows (see treatment F_3S_2, graph 2). This is to be expected since less total water is available in the soil profile following an irrigation with this system.

Plant growth

Plant height measurements were made periodically in both test years as a measure of the degree of moisture stress imposed by individual treatments. Height measurements obtained July 28 and August 3 were selected to illustrate the results of stress conditions after treatments were imposed for the two test years (table 1).

During 1966 the vegetative growth rate was most rapid under the I_1 treatment. Delaying the date of the first irrigation (treatment I_3) caused some reduction in the growth rate; however, the delayed second irrigation (treatments I_5 and I_7) caused the greatest reduction in growth under a system of irrigating every furrow. Greater stress was imposed by the alternate furrow systems, as was suggested by the extraction patterns. The greatest reduction in plant growth, resulting from irrigation of alternate furrows, occurred with the longest time interval between the first and second irrigations (see treatments I_5 and I_6).

In the second test year, treatment F_3S_2 resulted in a 16 per cent reduction in plant height by August 3 as compared with F_1S_1 (the low-stress treatment, irrigated in every furrow). The F_3S_2 treatment received 6.4 inches less water prior to July 26 but all treatments were irrigated alike following this date. Other treatments resulted in stress levels intermediate between these two.

TABLE 1. COTTON PLANT HEIGHTS AS INFLUENCED BY IMPOSED MOISTURE STRESS LEVELS

1966—7/28		1967—8/3	
Irrigation treatment	Plant height	Irrigation treatment	Plant height
	cm		cm
I_1	115 a*	F_1S_1	96 a
I_2	105 bc	F_1S_2	92 ab
I_3	110 ab	F_2S_1	92 ab
I_4	107 bc	F_2S_2	87 bc
I_5	106 bc	F_3S_1	93 ab
I_6	92 d	F_3S_2	81 c
I_7	104 c		
I_8	96 d		

* Means not followed by the same letter differ at the 5% probability level.

TABLE 2. INFLUENCE OF ALTERNATE FURROW IRRIGATION AND MOISTURE STRESS LEVEL ON TOTAL LINT YIELD, YIELD OF FIRST PICK, AND PER CENT OF TOTAL LINT HARVEST AT THE FIRST PICK, 1967

Treatment	Total lint yield	First pick lint yield	Per cent of first pick
	lbs/acre	lbs/acre	%
F_1S_1	977 a*	866 a	89 a
F_1S_2	962 a	817 ab	85 ab
F_2S_1	947 a	841 ab	89 a
F_2S_2	941 a	795 ab	85 ab
F_3S_1	996 a	875 a	88 a
F_3S_2	928 a	762 b	82 b

* Treatment means not followed by the same letter differ at the 5% probability level.

Cotton yield

Cotton yield relationships for the two studies are presented in graph 3 and table 1. The two highest yielding treatments in 1966 were irrigated with an alternate furrow system and had second seasonal irrigations on June 27 (graph 3). These treatments received an average of 6.9 inches less water than comparable treatments receiving water in every furrow and show, not only a higher absolute yield, but also more yield per inch of water added. The influence of an excessive water stress condition (treatments I_6 and I_8) is illustrated in reduced yield where water is added in alternate furrows with a delayed second irrigation.

Total lint yields from the variously treated plots in the 1967 test did not differ appreciably (table 2). An excessive moisture deficit or "stress" early in the season may result in a delayed maturity of the cotton plant. This was illustrated by treatment F_3S_2, where only 82 per cent of the total yield was harvested in the first pick. Under less favorable fall weather conditions for maturing the late-set bolls, the yield from this treatment would have been reduced appreciably. However, irrigating with alternate furrows for the first two irrigations (treatment F_3S_1)—without an excessive moisture deficit—was most favorable.

Results of these investigations demonstrate the feasibility of an alternate furrow irrigation system as a means of regulating the degree of moisture stress on cotton. However, since the entire soil zone is not all used for water storage, care must be taken to prevent excessive stress conditions from developing.

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PRUNING *bearing*

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Sweet cherry trees in many commercial California orchards have been allowed to grow excessively tall. This practice tends to elevate the bearing area with subsequent loss of much of the lower fruiting wood. Cultural and harvesting operations then become more inefficient and expensive. Height of young bearing trees can be controlled and maintained by pruning. A reduction in yield often results from pruning bearing trees and is generally proportionate to the severity of pruning. However, this reduction in yield may be partially offset by somewhat larger fruit size, more efficient cultural and harvesting operations, and slightly increased tree vigor.

FRUITS OF THE SWEET CHERRY are borne laterally on spurs which may be productive for ten years or more. Since these spurs are long-lived, the cherry tree needs very little pruning to maintain satisfactory production once the basic framework is developed. Consequently, many cherry trees in California have received little or no pruning after the third year in the orchard, except for the removal of dead, diseased, or broken limbs.

This lack of pruning and the upright growth habit of cherry trees have resulted in many trees reaching heights of 25 to 40 ft. On such large trees, most of the lower branches often lack fruiting spurs due to shading and natural mortality, and therefore few fruits are produced within 8 to 10 ft of the ground.

Over the past four years, studies were conducted to determine whether the height of bearing cherry trees could be lowered and then maintained at this level without severely reducing production. The possibility of minimizing the loss of lower fruiting wood in order to maintain the bearing area closer to the ground was also studied.

methods for sweet cherry trees

Pruning methods

Two types of pruning were studied in an effort to reduce tree height. One test simulated mechanical topping, which consisted of cutting all limbs at a certain height, as would be done by a horizontal tree-topping saw (see photo). The other type of pruning was a selective removal of uppermost limbs in the tree by cutting to more desirably located laterals. In these tests tree height was maintained at 18 to 20 ft.

Topping as a single treatment was too nonselective, leaving many stubs. After such a treatment, additional hand pruning was required to remove these stubs as well as dead, diseased, broken and interfering branches.

Removing the tall, upright limbs in tree tops, combined with thinning out a few low and relatively unfruitful branches, resulted in a shorter tree with improved exposure of lower leaves to sunlight. From these limited observations, this thinning-out appeared preferable to nonselective or mechanical topping as a means of controlling and maintaining tree size and shape.

A comparison between delayed-dormant (bud-swell) and midsummer pruning was made for controlling tree size. Dormant pruning tended to have an invigorating effect on the tree, while summer pruning (in July and August) was generally devitalizing. The invigorating effect of dormant pruning was observed even in some old trees of low vigor. Dormant pruning of young vigorous trees often induced new shoots of excessive length from just beneath the cuts. When pruning was done in midsummer, little growth occurred during the remainder of that season. Summer pruning generally resulted in shorter shoot growth during the following season. Therefore, the time of pruning generally should be based on tree vigor and the response desired.

There is some evidence that pruning during the rainy season may increase the number of disease infections through pruning wounds. Past experience has shown that trees pruned during the period between delayed dormant and early bloom or just prior to leaf fall in autumn responded similarly to those pruned when fully dormant. To reduce the possibility of disease infection, the dormant pruning generally was done in the period of between bud-swell and early bloom in these tests.

Lowering the height drastically, by removing 10 to 15 ft of top growth from tall old trees which have lost their low fruiting wood, can cause a large reduction in bearing area. It is very difficult to re-establish lower fruiting wood in such trees since most of the new growth following pruning is upright and generally arises from just below the large cuts. By such dehorning, the bearing area is reduced but may not be effectively lowered. With these prospective results a grower may find it more profitable to replant such an orchard.

Severe pruning (removing approximately 15 per cent or more of the bearing area), which is often needed to reduce the height of mature trees, can cause a marked reduction in yield. A light annual pruning (removing about 5 per cent or less of the bearing area) should cause only slight, if any, yield reduction. In these tests, pruning generally decreased yield proportionately to the amount of wood removed, with moderate to heavy pruning reducing yield about one-third. In order to minimize yield reduction, tree height should be lowered gradually by not more than 2½ to 3 ft per year. The long-range effects on yield of such pruning were not obtained in this study. However, there were indications that yield would return to near prepruning levels a few years after a moderate-to-heavy pruning. Part of the disadvantage of reduced yields may be compensated by slightly larger fruit size, more uniform ripening, and increased tree vigor.

When tree size has been established at a desirable height, pruning may need to be an annual operation in order to maintain this height. In such an operation, pruning should be just severe enough to renew about 10 per cent of the fruiting spurs, control height and maintain reasonable vigor. Experience indicates that light annual pruning is preferable to severe periodic pruning for controlling tree size.

When contemplating a pruning program, growers should begin with only a few trees to determine the response to pruning treatment in particular orchard conditions. Once the degree of response is established, the remainder of the orchard can be pruned accordingly.

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This tree was nonselectively topped at 18 ft. Such topping can leave excessive amounts of stubs and branches in treetops, and may require additional hand pruning to remove this growth. However, excessive pruning in any one season can cause a serious loss of production and an inordinate amount of growth.