Prune Orchard Irrigation

tests on influence of irrigation on the productive life of French prune on myrobalan root in Yolo loam soil

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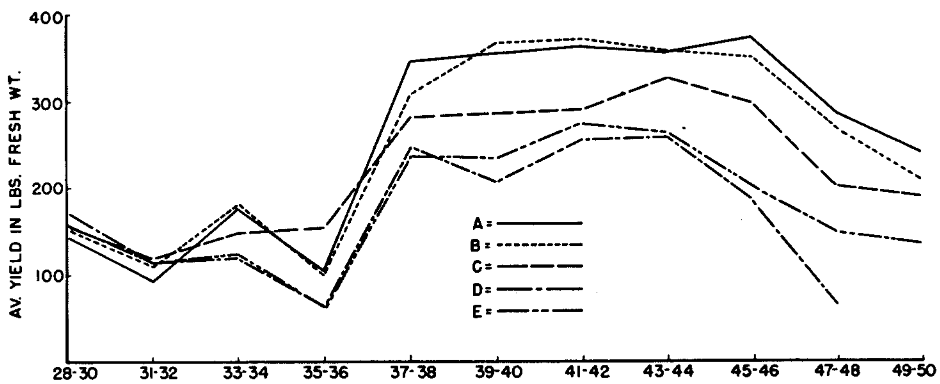
Three irrigations a year—between June and September—of 7.5 acre inches each seemed to constitute an adequate irrigation program for French prunes in Yolo loam during a 16-year test at Davis.

The investigation was conducted with French prune trees on Myrobalan root planted 24 feet apart on the square system. The soil is classified as a Yolo loam, having a field moisture capacity of about 22%, and a permanent wilting percentage of 11%.

Differential irrigation treatment was started when the trees were 10 years old and had received uniform treatment prior to that time. Circumference measurements of the trunks had been obtained each year, and yields were recorded as soon as the trees began to bear. The measurements obtained during the four years preceding the test were used in the layout of the various plots. Each plot consisted of three rows of 10 trees each. Eight trees in the center row—guarded on both sides and both ends by trees receiving the same treatment—were used in obtaining the experimental results.



Average yields of prune trees arranged by two-year periods. The downward trends in 1931–32 and 1935–36 were due to severe frosts.

Five treatments of either three or four replications were used.

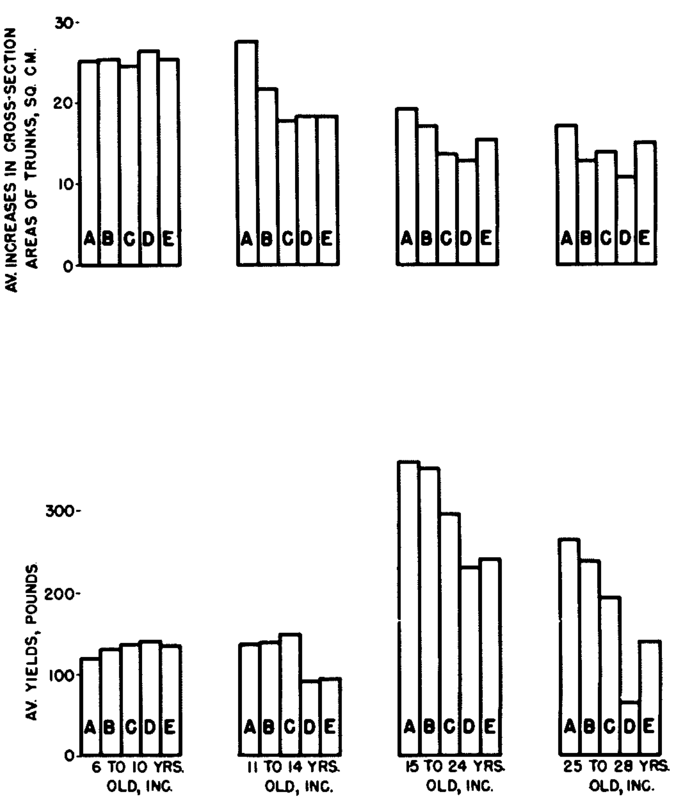
Treatment *A* kept the range of readily available moisture high. The plot was irrigated when the soil in the top three feet was reduced to about 15% except in a few cases, when other orchard operations, such as picking, did not permit applying water exactly on time. However, the soil moisture was not allowed to fall below about 13%.

Under treatment *B* the plot was irrigated when the soil moisture in the top three feet reached the permanent wilting percentage. Here again, because of harvesting operations, the trees could not always be irrigated on time and sometimes were subjected to dry soil conditions for periods that did not exceed about three weeks.

Treatment *C*—in effect—was the intermediate of the five treatments. The plot was irrigated the same as in treatment *A* until about the middle of July, after which no water was applied. This plot was therefore subjected to dry soil conditions in late summer but this dry period was not so long as those in treatments *D* and *E*.

The plot under treatment *D* was not irrigated during the growing season. On a number of occasions it was necessary to irrigate plot *D* in early spring when the soil was not wetted to a depth of six feet by the winter rainfall. This treatment subjected plot *D* to dry soil conditions beginning late in June or early in July each year.

Treatment *E* was similar to *D*, except in that it provided one irrigation, usually in September, after the crop was picked. The plot was subjected to dry soil condi-



Average increase in cross section areas of trunks of prune trees and average yields during four age periods.

Following the initiation of differential irrigation treatment, the yields for the 4-year period—represented by the second block in the lower row remained about stationary in the *A*, *B* and *C* treatments, while the *D* and *E* treatments were considerably less.

The next period—third block in the lower row—yields from *A* and *B* were about equal, and far ahead of the dry plots, *D* and *E*. Treatment *C* was intermediate.

The last period indicates a downward trend in all treatments. The trees in treatment *D* were removed half way through this period.

A French prune tree in an irrigated plot, *left*, at 11 years of age, *center*, the same tree in its prime at 17 years and, *right*, at 26 years.

tions from about the first of July to the middle or last of September.

The above soil moisture conditions were attained by the following number of irrigations of about 7.5 acre inches at each application: *A*, four or five; *B*, three; *C*, two; *D*, none and *E*, one, after harvest.

Results

In the first four-year period under differential irrigation plots receiving treatments *A*, *B*, and *C*, produced about as much fruit as they did during the five-year period before the treatments were started—when the average yield was 133 pounds of fresh fruit per tree.

The dry plots, *D* and *E*, which were not irrigated while the crop was on the trees, dropped considerably below the irrigated ones in yield. The lack of readily available soil moisture during the growing season was shown immediately after differential treatment started by a reduction in crop in treatments *D* and *E*.

During this period all treated trees continued fairly vigorous growth as indicated by the average increase in cross-section areas. Trees under treatment *A* made the largest increase, averaging about 27 square centimeters gain. Treatment *B* trees were second with approximately 22 square centimeters. Trees receiving treatments *C*, *D*, and *E* increased, on the average, about 18 square centimeters.

The amount of new growth was associated with the soil moisture conditions during the growing season.

The trees with treatment *A*, which kept the soil moisture above the permanent wilting percentage, made the largest growth. In the plot under treatment *B* where the soil moisture was allowed to reach the permanent wilting percentage before the supply was replenished but on several occasions—particularly during harvest when it was not practical to irrigate—dry soil conditions prevailed for short periods. The plot with treatment *C*, while irrigated twice a season, reached the permanent wilting percentage early enough in the season to affect the growth of the trees. Plots *D* and *E* were without readily available soil moisture usually after the first week in July. In general this period was characterized by medium sized crops and continued growth of the trees.

During the next 10-year period, the trees were in their prime. Following the vigorous growth up to that time, the trees yielded heavily. Treatments *A* and *B* were essentially equal in production, and far

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A French prune tree in an unirrigated plot, *left*, at 10 years of age, *center*, the same tree at 17 years and, *right*, at 26 years of age, just before its removal from the orchard.

MARKETING

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from 1.4¢ to 4.6¢ per box, while administrative and office costs range from 3.5¢ to 5.9¢ per box.

Fixed costs for land, buildings, and equipment range from 7.8¢ to 14.4¢ per box even under the assumptions of current replacement values and of a uniform length of season.

As the tables suggest even the best operated houses can improve efficiency in some operations and, conversely, houses with relatively high total costs usually are fairly efficient in some practices. Plant volume is an important factor, and is one of the aspects of efficiency covered by the current studies. Each plant consists of many small operations and improving efficiency requires change and adjustments in these small operations.

A reduction in shipping point costs will result, not from a single sweeping adjustment, but from a step-by-step approach and the combination of these steps into well-integrated totals.

Following reports in this series will compare house operations, methods, equipment, and arrangements. The comparisons may be used to establish standards for efficient operation. With minor modifications, the results of these studies can be applied to many of the problems of packing and processing other fruits and vegetables.

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Selected Costs of Handling Cannery Fruit in 11 California Pear Packing Plants, 1950[a]

Plant	Tons per hour [b]	Cost per ton of cannery fruit—dollars								
		Direct labor cost [c]					General operating [d]	Office and administration	Fixed costs [e]	Grand total
		Receive and dump	Grade	Package, truck and load	Supervision and miscellaneous	Subtotal				
L	1.9	1.42	1.99	3.60	0.91	7.92	1.93	2.44	2.49	14.78
M	5.4	0.94	0.76	2.49	0.43	4.62	0.46	1.54	1.93	8.55
N	2.0	1.29	1.38	2.09	0.45	5.21	1.36	1.89	2.88	11.34
P	2.1	0.78	1.52	1.25	0.54	4.09	1.70	1.47	4.08	11.34
Q	....	....	....	....	....	....	....	....	....	....
R	9.9	0.90	1.02	1.30	0.79	4.01	0.60	2.04	2.09	8.74
S	7.3	0.81	1.25	2.55	0.55	5.16	1.29	1.82	1.55	9.82
T	13.9	0.90	0.52	1.26	0.70	3.38	1.28	1.82	1.61	8.09
U	3.9	0.85	1.05	1.05	0.43	3.38	1.18	1.80	2.36	8.72
V	10.7	0.45	0.89	1.10	0.30	2.74	1.02	1.56	2.18	7.50
W	12.0	0.68	0.93	1.41	0.76	3.78	1.22	1.99	2.24	9.23

[a] Computed on the basis of 8-hour days with typical hourly rates of output. As such, these cost estimates will differ from average costs for a season.
[b] Typical hourly rates of output, in tons of cannery fruit.
[c] Adjusted to reflect uniform wage rates typical for the industry.
[d] Includes general supplies, fuel, power, light, and miscellaneous costs.
[e] Based on thirty 8-hour days of operation per season, current replacement values for building and equipment, and uniform methods of allocating plant and equipment costs between fresh and cannery fruit.

IRRIGATION

Continued from preceding page

ahead of the dry plots, *D* and *E*. Treatment *C* was intermediate.

During this period—while the trees were 15 to 24 years old—the average yields were remarkably consistent, within each of the five treatments, when analysed in consecutive two-year periods. Plot *A* averaged 357 pounds; *B*, 350 pounds; *C*, 295 pounds; *D*, 230 pounds, and *E*, 240 pounds. The plots, *A*, *B*, and *C*, retained the averages through the entire 10 years, but *D* and *E* showed a tendency to decline in yields after the eighth year.

On the whole this period was characterized by maximum yields for the various treatments and relatively small increases in cross section areas.

Last Period Declines

In the last period while the trees were in their 25th to the 28th years, yields on all plots were materially reduced. Treatments *A* and *B* still yielded best with an average of 262 and 238 pounds respectively; *C* was third with 193 pounds; *D* dropped to 66 pounds; and *E* produced 141 pounds.

Because of low yields and the death of trees, treatment *D* was discontinued after the first two years of the final period, and the trees were removed. Thus, after 16 years of no irrigation during the growing season, this part of the experiment ended. From a commercial standpoint, the trees had probably ceased to be profitable several years before their removal. In growth, treatments *A* and *B* averaged slightly less than in the previous period, while treatments *C*, *D*, and *E* were about the same.

Growth and Yield

During the period of the first four years of differential treatment the irrigated plots showed marked increases in growth, but not in yields. The differences in growth and yields, between the irrigated and unirrigated treatments, or those without readily available water for considerable periods, were due to the slower growth and smaller yields of the dry plots. Increased yields from the irrigated plots followed, after the trees had attained large size.

The trees in all treatments seemed to be in their prime—during the 10-year period from 15 to 24 years old—although there was a tendency for the yields from the treatments to decrease a few years before the end of this period.

In this period the trees in treatments *A* and *B* seemed to reach a maximum average production—when averaged at two-year intervals to reduce the great variability due to alternate bearing—of 357 and 350 pounds per year respectively. When studied in the same way, the average maximum yield for treatment *C* was 295 pounds. Treatments *D* and *E* reached considerably lower average maximums.

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