

ECONOMICS OF HARVEST MECH



Harvesting starts in the early morning and continues until the heat of the day. These people are working on the "receiving" and "sorting" half of the two-unit harvester.

AN ECONOMIC ANALYSIS of mechanical harvesting of cling peaches is being conducted by the Farm Production Economics Division, Economic Research Service, of the U. S. Department of Agriculture in cooperation with the University of California. Peach harvesting machines were observed during the 1970 season, using Modesto as the study area center. Following the harvest, interviews were conducted with farmers employing hand crews and with those using mechanical harvesting equipment. The objectives of the study are to analyze the effects of labor-machinery substitution, and to provide farmers with a frame of reference in adjusting to the changing technology. Preliminary observations about the experience of 16 machine operators are reported here, pending a full report on the study which is to be published later this year.

About 10% of California's cling peach production was harvested mechanically in 1970. There are two basic types of harvesting machines in use in the Modesto area: single-unit and two-unit machines. The two-unit catching frame employs two drivers, and encloses the tree from both sides. These units have separate functions. One unit has the shaker arm and the other the receiving and grading equipment. The single-unit catching frame has one driver, and shakes the trees on either side of the row.

A minimum crew for the machines is three or four men, which includes one or two drivers, a grader, and a bin handler. Crews also may include a second grader, a prop man, and the one or two tractor or lift drivers necessary to trans-

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port the fruit from the field. Some operators also use one or more workers as pole knockers when there are long hangers on the trees.

The crews are paid by the hour and according to skill and experience. During the 1970 season, machine operators were receiving \$2.00 to \$2.50 per hour, and other crew members, \$1.75 to \$2.00. Many crews were given an incentive bonus of some kind to improve efficiency and to hold the crew together for the season. These payments were from 8 to 10 cents per bin, and some were contingent on the crew staying together during the season.

Team work

The machine operators are the most important members of the team, for they control the quality of the fruit and the speed of the operation. Teamwork among all crew members is necessary, however, for any successful operation.

The cost of operation of a particular machine depends on the original investment in the machine, direct operating costs, repairs, and the length of useful life. Prices of the machines ranged from \$20,000 to \$30,000, depending on the year purchased, make, and extra equipment. The length of useful life is still a guess at this point, although several operators said that about seven years is a reasonable estimate for tax depreciation

purposes. Fuel and lubrication costs were not proportionately expensive—perhaps 5 to 8 cents per ton. Repair costs can be a sizeable item, however—ranging from minor basic costs amounting to \$100 to huge repairs of \$2,000 or more, for a season. Control of repair costs is a necessity. One hour per day was usually required to service equipment.

Working hours started between 3 a.m. and 6 a.m. and continued to around 2 p.m., or roughly an 8- to 10-hour day. About one minute per tree was required for shaking. Four to five acres a day was considered a good workload, and six acres a day was the maximum. Based on the lower 1970 yields, an output of six to 10 bins an hour was typical.

From 50 to over 100 acres were picked per machine during the season, with 90 acres as representative. From 750 to 1,500 tons was the usual yield per machine, with 1,300 to 1,500 tons indicating a long season. Several operators considered 100 acres per machine feasible as long as the varietal maturity dates were spaced to allow the machine to operate the greatest number of days. One operator worked 41 days during the period July 18 through September 8.

Contract operations were common with many operators, though apparently only a few considered them as a large part of their operation. Custom rates varied somewhat according to contractual considerations, but the most commonly mentioned rate was \$13 per gross ton. The usual contract crew of four men performed the same functions with the machines as the hand picking crew. The orchard owner furnished tractor and lift

MCHANIZATION OF CLING PEACHES



Single-unit machine, left photo, extends catching frame around tree hydraulically, and fruit is brought to rear on each side. Shaker half of two-unit machine, right photo, shown in position and shaking fruit.

operators as well as any other labor he desired to go with the machine. Until this study is complete, total costs of operation cannot be pinpointed. However, these costs may be reflected by the custom rates—assuming that the machine owner is using the custom work either for profit or to extend his season so that his fixed cost is spread over more tonnage.

The quality of fruit harvested mechanically has been questioned over the years. During this season (characterized by little or no brown rot or other damaging pest or disease problems), machine operators indicated that the quality of the fruit they harvested was as good as or better than that handpicked. Some processors were quick to point out, however, that the comparison was made with the grade-out based on current standards, which may not rule out fruit on which bruises do not appear until a number of hours after picking. Thus there are still problems of adequate grading of machine harvested fruit—involving the means by which processors can efficiently and economically handle the fruit.

To ensure efficient harvesting, machine operators agreed that long hangers should be cut back, because these limbs are hard to shake. Low branches on trees obscuring the location for shaker clamps at the base of the trunk should also be cut off. Fruit at the base of the trunk is usually too green for harvest anyway. The ground should be worked so that it is level and so that it provides a smooth surface for efficient machine operation. Some machine operators also indicated a desire for larger blocks of varieties, and

that trees be planted in longer rows, with wider turn rows.

Little damage

Most operators reported little outward damage to the trees, such as skinning and girdling. But the question of whether there is any lasting damage to the trees from shaking remained unanswered. There were reports of new vigor in old orchards shaken for the first time, however.

Most of the criticisms of the machines centered around undesirable features which are now being corrected on new models, such as “beefing up” points of stress. Operators generally considered the two-unit machine to be faster, because this machine moves straight down the row. The single-unit machine alternates between trees on either side of the row and has to back up for trees across the row. The single-unit machine was rated high, however, when trees could be approached on only one side—and only one operator was needed on this machine. Operators generally liked the machines, considering themselves freer to harvest fruit at the most appropriate time, without needing to depend on hand crew availability. Family units operated several of the machines, which allowed a more direct source of control over fruit quality.

This study showed no immediacy about mechanizing, and many growers said they would be slow to mechanize unless labor becomes short—or unless unionization results in labor contract difficulties. Labor was generally plentiful this season, and many farmers mentioned

that they had long-standing arrangements with their hand crews.

Prospective purchasers should pay close attention to factors which may limit the full operation of the machine. The most immediate limitation on the machine can be restrictions by processors on the quantity of machine-picked fruit they are able to accept and handle efficiently. Another factor to consider, from past history in other commodities, is that once the machine gains favor with producers and processors, there is a tendency to over-buy machines. Too many machines for the fruit industry may result in large capital losses for some owners.

If the grower or operator decides to mechanize, he should make as complete a comparison of alternative machines as possible. He may talk to company representatives, machine owners, and growers who have had their fruit custom-harvested. A machine should be suited to the particular operation, and adequate servicing should be available when needed. Some multi-use of the equipment is possible for fruit like prunes, and some operators have harvested successfully apricots and freestone peaches. Almonds and walnuts may be harvested using the catching frame, or using only the shaker unit. The shaker unit is also being used to a limited extent to mechanically thin peaches.

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