Harvesting Canning Tomatoes

survey indicates immediate savings in labor requirements and harvesting costs possible by use of improved methods

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Immediate reductions in labor requirements and the cost of harvesting canning tomtoes—by 20% to 30%—are possible.

The economic value of such savings would have been approximately five million dollars in the 1951 season when the tomato harvest yielded about 2½ million tons and required the employment of some 50,000 pickers.

A survey and an analysis of the harvesting operations as now performed were conducted during the 1951 season.

Improvements in harvesting are possible, particularly in achieving better utilization of labor and greater results from the picker's efforts. Mechanical aids in the form of materials-handling equipment appear to be practical possibilities. These would reduce the time as well as the number of laborers required by eliminating the materials-handling part of the job and leaving to the picker the picking operations.

Considering the variables affecting harvesting efficiency—type of tomato plant, methods of harvesting, material-handling methods and containers, field layout, number of pickings, labor type and availability, and the importance of various parts of harvesting process—leads to a number of courses of action that might be taken to improve harvesting operations.

Analysis of Findings

The picking operations—finding the fruit on the plant, removing it from the plant and delivery of the picked fruit to waiting lugs in the plant rows—take 80% of the time required for harvesting.

The materials-handling operations—delivery of lugs or containers to rows and stacking full lugs on trucks—take only 20% of the harvesting time.

An analysis of materials-handling indicated that tests should be performed to verify the possibility of the use of some form of bulk or semibulk handling and of mechanical aids.

A simple in-row type of conveyor—20′ long, having a 6″ canvas belt, a variable speed changer and driven by a gasoline engine—was used to test both bulk handling and mechanical aids to handling at the same time. The conveyor was operated by placing it in the rows between plants. Picking was done by four men—standing in the rows on the other side of the plants—who picked fruit and dropped it into the conveyor. A fifth man acted as loader placing empty lugs under the discharge end of conveyor and removing them as they were filled. When a 20-foot length of plant row was picked the conveyor, weighing approximately 250 pounds, was carried down the row another 20 feet. The conveyor picking was tested on three ranches in San Joaquin County.

Use of Conveyors

Quality checks, by growers and cannery representatives, made of tomatoes carried to lugs on the conveyor indicated no detrimental effects on quality.

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In-row conveyor used in field tests 1951. ***Left:*** **Four pickers place tomatoes on moving canvas belt, while the loader—behind the gasoline engine—places empty lugs under the discharge end of conveyor and removes them as they are filled.** ***Right:*** **The discharge end of conveyor where the tomatoes drop into the lug. The loader is not shown in this picture.**

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Conveying of the tomato directly on a belt is a suitable means of mechanically handling the fruit by bulk or semibulk methods.

The effect of picking on a conveyor is evaluated as resulting in an average savings in time of 32.7% and an average increase in production of 49.4% or a reduction in manpower of 49.4%. Since the conveying method will require additional manpower for operating equipment and loading fruit, the picking time of the tests is increased by 25% for this contingency. Since the operation would now compare with picking and stacking on a highway truck, 10% has been added to time for existing method to provide for this. Comparisons now indicate a savings in time of 23.6% and an increase in production of 31.4% or a reduction in manpower of 31.4%. All results include time spent on carrying conveyor down the rows as needed and as such are a more conservative estimate of the values of the conveyor studied.

The results of the preliminary tests of the conveyor indicate that eliminating materials-handling from harvesting will yield the results estimated. Materials-handling required 20% of harvesting process so eliminating it would produce a savings in time of 23% and an increase in production of 31%.

Tests for Conveyor Type

Two possible types of conveyors might be used in harvesting, the in-row type and a cross-row type.

A cross-row type could be mounted across the rows and travel down the rows at a predetermined rate of speed. The pickers could be stationed in each row between plants and pick plants on both sides, following the conveyor down the row.

Tests were performed to provide indications as to feasibility of the use of a cross-row conveyor. These tests involved: *1.* The movement of equipment over plants and down the rows between plants. *2.* Picking plants using a 2-man crew, one picker on each side of the plant. *3.* The use of folk-lift equipment to move pallets of lugs from trailer to truck.

In the first test a high tractor was used to drive down the rows between plants. Planting was Pearson tomato on a 6′ row by 3′ spacing. The tractor wheel span was opened to 6′ for the test. Additionally a short wheel-base truck having a 6′ wheel span was also driven down the rows between plants. Estimates of the damage to plants and fruit were then made. These turned out to be comparable to and smaller than most damage found after a group of pickers has been in a field.

In the test of a 2-man crew for picking, each man picked one side of a plant and placed the fruit into a common lug located next to the plant. A reduction in time of 6% was obtained. The same results should hold when picking on a conveyor and moving along behind it.

Fork-lift equipment was tested but the results were inconclusive because only very heavy equipment was available and while the job of transferring pallets was accomplished it was very time consuming.

Immediate Steps

Steps to improve productivity of harvesting practices which can be taken by all growers immediately are: *1.* Use 2-man crews for picking, one picker on each side of plant-row. *2.* Pick directly into lugs and have lugs carried out after one or two are filled rather than all at once. *3.* Give more training to low-producing pickers to bring up their skills. *4.* Carry out some selection of pickers. It is not merely a matter of using low producers but actually a matter of increasing yield by reducing waste due to trampling of plants and fruit. 5. Take steps to improve working conditions, such as providing a supply of cold water at work areas and salt tablets in containers at each water barrel; requiring the use of rest periods in mid-morning and mid-afternoon; and experimenting with moving the working time during the day so that harvesting starts at a very early hour and is completed in the early afternoon to reduce the effects of heat.

Conveyors Compared

Experience during the 1951 survey indicated that the in-row type of conveyor may not be as satisfactory as the cross-row type. There may be losses in picking time associated with moving the conveyor from one row to the next. These losses can result in reducing the savings as evaluated in the survey.

Estimates of the value of the use of conveyors in harvesting based on tests during the survey are 15% to 25% savings in time and 25% to 30% reduction in labor or increase in production.

The survey reported here, should be considered as preliminary. Many questions having a bearing on the efficiency of harvesting operations are still unanswered. Some of them need further study—planning and developing conveyors, bulk handling, new plant types, mechanical picking, field layout, preparation and irrigation, work efficiency in regard to rest periods, working time and period, fatigue studies and cost studies.

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CHICKS

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pasting-up, maximum-minimum temperatures in room and brooder temperatures. The same data were recorded in both tests. The table on page 9, Comparison of Electrical Brooding Methods, combines the results of both tests.

Results of Tests

The table shows the relatively large amount of electricity used by the infrared lamps. The kilowatt hours per chick in the infrared lot was double that for the control lot in the first test. In the second test the current consumption was seven times as large as in the control lot. The difference in current consumption between winter and fall brooding was four fold. The birds in the fall test grew much faster and suffered less mortality than those in the winter test.

A simple comparison of current consumption for the different units may not be quite fair. For example, the large radiant panel brooder was operated at 57% of its chick capacity while the control unit was at 80% of its capacity. On an adjusted basis these two units would have about the same current consumption per chick.

A 125-watt infrared lamp will care for 50 to 75 chicks when the room temperature is not below 55° F. On this basis the infrared lamps in the present tests were operating at near 100% rated capacity, with the manual voltage regulator, the night voltage was reduced five volts per week. The daytime voltage was approximately 15 volts lower than the night setting.

Comparison of Methods

The results confirm that infrared brooding has advantages and disadvantages as compared with conventional electric brooding.

Advantages	Disadvantages
1. All chicks are readily visible.	1. Operating costs much higher.
2. Initial cost very low.	2. Voltage regulator required to reduce operating cost expensive.
3. Lamps permit early roosting.	3. Removal of moisture by ventilation becomes a serious problem.
4. Less tendency for birds to pile up.	4. Outages become a more serious problem.
5. Easier to start poults to eat.	

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