Machines for Harvesting Fruit

ALL FRUIT once was picked—one fruit at a time—by hand and handled in small containers, also one at a time by hand. Few growers thought that fruit could be harvested by machines, because most fruit bruises easily, ripens unevenly, grows on trees of different sizes and shapes, even in the same orchard, and is harvested in a short season. The labor needed to harvest our 17 million tons of fruit has become costlier and scarcer each year since the Second World War. The cost of harvesting and handling by hand such crops as blueberries and cherries amounted to more than 50 percent of the cost of production.

The Department of Agriculture recognized the need for mechanizing the fruit harvest and in the fifties began research in cooperation with Michigan State University, the University of California, and Washington State University. It soon became apparent that complete systems would be needed—that handling could not be separated from harvesting. If fruit was separated from the tree mechanically, the rate of harvest would be too rapid for handling it in small containers one at a time. Bulk systems, which would be faster and cheaper, would be needed. Two such bulk handling systems were developed—bulk boxes for handling such fruit as apples, pears, peaches, prunes, and oranges, and the water handling of cherries. Both have come into widespread use. In Washington, for example, bulk boxes for handling fruit were nonexistent in 1957, but growers in 1960 handled about 14 million bushels of apples (more than half their crop) in bulk boxes. About 50 million pounds of tart cherries were handled in water in 1960 in the United States. A bulk box is a combination pallet and container, which holds 18 to 25 bushels of fruit. The pallet—platform—is part of the box. The filled bulk boxes weigh 800 to 1,500 pounds and must be handled with forklift equipment. Forklift units for orchard and field operation were not available in 1950. More than 25 companies now manufacture lift attachments for both front and rear mounting on tractors. In water handling of cherries, the fruit is put into pallet tanks, tank trailers, or tank trucks of cold water.

Some fruit crops that are destined for processing outlets can be separated from the tree by machines, which shake the tree. More than 55 percent of the fruit produced in this country is canned, frozen, dried, or processed into juice. Much of the 400 thousand-
An experimental machine for use in picking apples.

A boom-type shaker, collecting frames, and pallet tanks are used in harvesting tart cherries.

Harvesting blueberries with two-row equipment.

This is a bazooka-type impact harvester used in picking clingstone peaches.

Forty bushels of apples can be handled in bulk boxes like these.
ton crop of prunes in California is harvested by machines. Harvest equipment consists of self-propelled collecting frames and tree shakers. Each frame is 10 by 20 feet and is constructed with flaps, which seal around the tree trunk. One catching unit is used on each side of the tree. As the fruit is removed from the tree by a mechanical tree shaker, it falls on the catching frame and is conveyed into bulk boxes. A three-man crew can harvest 60 trees an hour. Labor costs are about 2 dollars a ton, compared with 12 dollars a ton for hand harvesting. A new model developed by Department engineers has a gasoline motor that furnishes power for moving the frame from tree to tree, operating the conveyor, and powering the tree shaker, which is mounted on the frame.

New equipment and methods for harvesting tart cherries are like those used for prunes, except that the cherries are conveyed or moved into pallet tanks or tank trailers of water instead of bulk boxes. About 3 million pounds were harvested mechanically in 1960. Six men can do the work of 33 handpickers at a cost of one-half cent to 2 cents a pound, as against 3 cents a pound for handpicking. Hand-held shakers have been developed for harvesting cultivated blueberries. The ripe berries are shaken into small collecting frames. The shaking head has fingers that move the canes through an amplitude of one-eighth inch at a rate of 800–900 cycles a minute. The units are driven by a portable gasoline electric generator or a portable air compressor. About 25 percent of the blueberry crop in Michigan was harvested by machines in 1960. The labor cost of harvesting is reduced from 8 cents a pound for handpicking to 3.5 cents a pound; one worker can harvest the same amount of berries (350 pounds) in a day that once took six workers to do by hand.

Mechanical picking aids are being developed for workers who pick tender fruit that is to be marketed fresh. A picker can almost double his output if he drops the apples immediately instead of putting them in a picking bag. An average picker spends about one-fourth of his time in nonpicking operations, such as climbing up and down the ladder. Equipment is being developed that utilizes most of the advantages of the pick-and-drop method and eliminates some of the nonpicking operations. It consists of a self-propelled machine with an adjustable-height platform, which positions the picker in the tree. Apples drop through a canvas funnel mounted in front of the picker and through a chute into a bulk box carried on the machine.

Harvesting fruit with machines is new and many problems exist, but growers have accepted the fact that mechanization is necessary. The development of mechanized harvesting methods and equipment and their commercial uses will be accelerated and will eventually replace most handpicking operations. (Jordan H. Levin)