The number of fruits and vegetables harvested by machine has increased rapidly along with changing conditions in farm economics and labor procurement. Tomatoes and prunes are among the most recent of these crops to pass from the experimental to the commercial harvesting stage. Each crop presents special problems in removal of fruit from the plant and in subsequent handling. One problem common to many such crops is the need for selective—and often several—harvests of fruit as it matures, without damaging remaining plants. The University-designed harvesters for lettuce and cantaloupes, described here, show two different approaches to selective harvesting.

ing upon how growers want to handle their lettuce. It can be lifted into a basket or bin for further trimming and packing in a shed, or the harvester can be more elaborately designed for maintaining the position of the head for mechanical trimming and packing. This process has not been worked out yet, but packing in the field seems to be preferred.

Another consideration in designing a selective harvester is the possibility of injuring the harvested heads or those left in the field. Tests with this machine show that the four or five pounds of pressure applied by the selector is not harmful to a lettuce head. Most lettuce heads can withstand static pressures up to 14 lbs without damage.

Questions about the rate at which the machine can harvest and the economics involved, including purchase price, must be left to individual manufacturers. The University's role in such projects is to engineer ideas for use by the industry that will then be developed by private manufacturers. Indications are that this machine will harvest lettuce satisfactorily. The single row unit used in the tests could harvest one acre of lettuce in about seven hours, but a manufactured machine would no doubt be a multi-row machine with greater capacity.

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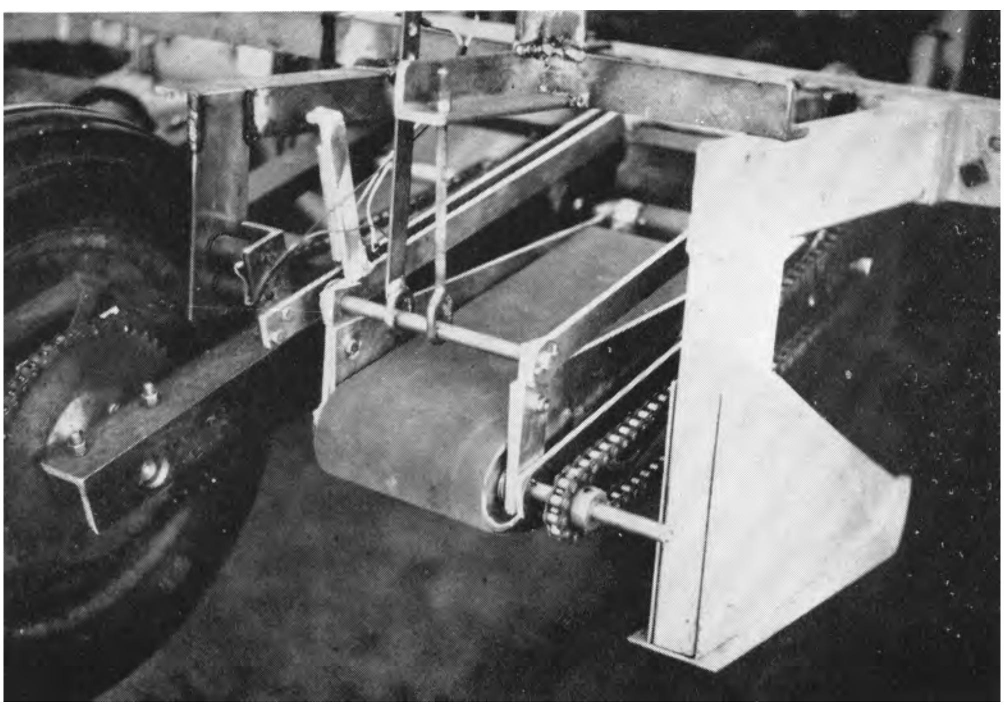

Close-up of selector mechanism of U.C. lettuce harvester. The rubber belt "feels" the firmness of the head as it runs over the row and records the position to activate the cutter as it passes.

Cantaloupes

MICHAEL O'BRIEN

The experimental harvester for cantaloupes described in this report has a conveyor belt allowing vines to be lifted as many as six or seven times with tension-removal of ripe fruit without damage to melons remaining, or plants.

MECHANICAL HARVESTING for cantaloupes requires some means of automatic selection, because the ripening time of melons from one vine may vary from one to two weeks. The harvesting problem was approached with a plan for selective harvesting of mature melons several times during the ripening season. Exploratory research was done during the 1962 season to determine the reaction of melon vines to training and to successive handling. The forces needed to remove the mature cantaloupes while leaving the immature melons were also investigated. Tests showed that the vines could be trained successfully to one side of the row during the growing period before the first-set melons reached 1½-inch diameter. The vines with melons could be lifted by a conveyor belt while still attached to the ground and laid back down for as many as six or seven subsequent handlings without excessive damage.

Elements of a mechanical harvesting system were designed for testing during the 1963 season. The harvest system includes planting near the edge of the bed

Basic elements of an experimental, selective, mechanical harvester for cantaloupes, shown in the Department of Vegetable Crops field plots at Davis. The melons deposited at the edge of the bed here would be elevated on a multi-row prototype harvester and deposited in containers.

and mechanically training the vines laterally across the beds so as to facilitate harvesting. The actual harvest of the mature melons is accomplished by lifting vines and melons on a sloping rubber cleated conveyor belt which is cantilevered under the vines from the side opposite the trunk and roots. As the vines with melons are lifted, a tension force is applied on the melon-vine abscission layer by friction between the belt and melon. An additional separating force is applied by gravity as a series of small parallel belts passes under and supports the vines while the mature melons drop.

These two removal forces take nearly all the mature fruit from the vines. Fruit removed from the vines is recovered by means of a cross conveyor under the rear separating belts and is conveyed to the side for subsequent sorting and handling. The immature fruit is carried over and laid down with the vines in almost their original position until the next harvest.

Three plots of six rows each were harvested during the 1963 season. Harvesting data show that 96% of the harvestable melons were removed without damage, but nearly 20% of the remaining immature fruits showed some damage in successive harvests. Recovery of salable fruits varied from 25 to 10% less than by hand harvesting. However, the numerous changes made in the machine elements during the tests make the significance of this data questionable.

At this point it appears that selective mechanical harvesting of cantaloupes is possible. It is not possible to predict field capacity, however. Further machine development and cultural changes need to be made. The number of pickings must be reduced below those presently made by hand harvesting to aid the economics of the system. Time of planting, irrigation, fertilization and weed control practices will also be important factors in mechanizing the cantaloupe harvest.

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Strip Cutting
LYGUS BUG

V. M. STERN

This progress report of research indicates lygus bug control is possible by strip cutting alfalfa to keep the bugs in the alfalfa where they do little harm, and allow survival of natural enemies. Further investigations are necessary, particularly on the agronomic, economic and long-range ecological aspects of strip cutting, before the pros and cons of this harvesting method can be fully evaluated. However, the end result could well be a very considerable saving to California farmers, and perhaps even more importantly, a significant reduction in pesticide hazard problems.

LYGUS BUGS are among the most destructive insect pests in California. They attack a wide variety of crops, including cotton, many seed crops, beans, pears and strawberries. In 1961, crop losses caused by these bugs in California were estimated at $13½ million, and about $5 million were spent for chemical control. Lygus bugs are particularly injurious because they attack the reproductive parts of the plants, that is, the flowers, bolls, seeds and fruit.

There are three injurious lygus species in California. However, *Lygus hesperus* Knight is by far the predominant species in most agricultural areas. Lygus can reproduce on a variety of wild and cultivated plant species. However, in many areas alfalfa is the key breeding place and overwintering habitat. During favorable periods, lygus populations increase to great numbers in this crop.

An important feature of the lygus problem is that they are very rarely a pest of alfalfa hay. However, when the alfalfa is cut, the adults fly to adjoining crops and to prevent crop loss, chemical treatments are often necessary to suppress the invading pest.

Since alfalfa is a key crop in California agriculture, it would be impossible to eliminate alfalfa as a means of reducing lygus populations. The problem then is how to stabilize the alfalfa hay environment to prevent or lower the probability of lygus adults leaving the alfalfa habitat where they do little or no damage.