

# Raisin Grapes

## study shows way to reduce picking operations and speed up harvest

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*The following article is a condensation of a progress report on a Motion and Time Study of the Methods of Harvesting Raisin Grapes, conducted by members of the University of California's Division of Mechanical Engineering, with the coöperation of Dr. H. R. Wellman, Director of the Giannini Foundation, College of Agriculture Experiment Station, Berkeley, and N. D. Hudson and R. A. Break, College of Agriculture Extension Service, Fresno County.*

**An increase of 38%** per man in labor output during the picking of raisin grapes can be achieved without altering the harvesting operations of selecting and cutting the grape clusters from the vine.

This increase was obtained in studies undertaken in 1948 in the Fresno area to determine whether the techniques and practices of Industrial Engineering could be applied to agriculture. Since most of the raisin grapes are Thompson Seedless, the study was concentrated on the methods used in harvesting this variety.

The techniques used were those of Time Study and Motion Study—commonly employed in industry in developing new and better methods of performing necessary operations.

### Tray Carrier

As a result of the studies a new piece of equipment—a Tray Carrier—was introduced for use in the picking operation which made it possible to discontinue the practices of dropping off books of paper trays in the row; the carrying of loaded pans from under the vines into the rows; the getting, opening, and spreading of trays; the emptying of the picking pans onto trays; and the spreading of the grape clusters on the trays.

The Tray Carrier is lightweight, sturdy and designed to hold enough trays for a row of vines. It will permit the top tray to be slipped out without disturbing those remaining. The Carrier can be made of plywood or of resawn slats and has overall dimensions of 38" × 25". It is enclosed on three sides by a 2" × 2" rim. The back rim has steel-pointed spring grippers for holding the trays in place and the front edge is rimless permitting trays to be slipped off without disturbing the grapes.

### Picking Labor Lessened

The existing method of picking and tray placing requires 19 operations and 11 transportations—consuming the most time and the greatest expenditure of effort on the part of harvesters.

The use of the new Tray Carrier re-

duces these to 11 operations and five transportations—a 38% increase in the number of trays picked per man-hour.

In addition to increasing the productivity per man, the new shorter and improved method of picking provides for better quality because the clusters are placed directly on the tray.

The picker takes a few books of paper trays from the bundle in the main aisle and loads them onto his Tray Carrier which is then placed under the first vine in the best position to catch falling berries. The picker then grasps a cluster, cuts it free, and puts it in its proper place on the tray.

When the tray is completely loaded, it is dragged off the Carrier to its position in the row and left to dry in the sun.

The picker, returning to the vine, picks up the Tray Carrier, carries it to the next vine, and is ready to commence picking again.

### Analysis of Existing Methods

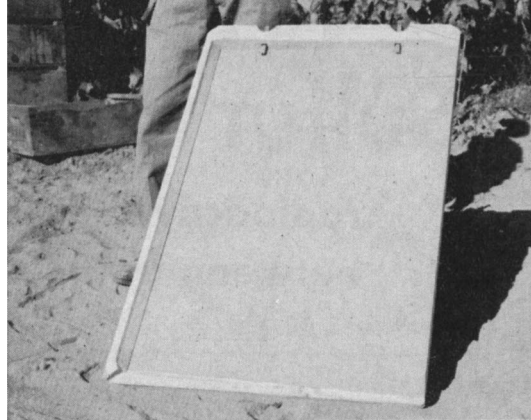
A Flow Process Chart was made of the picking and tray placing procedures.

The other harvesting operations were left substantially alone because of the lack of opportunity to make sufficient observations and to collect the required data. Detailed investigation will need to be delayed until the next harvesting season.

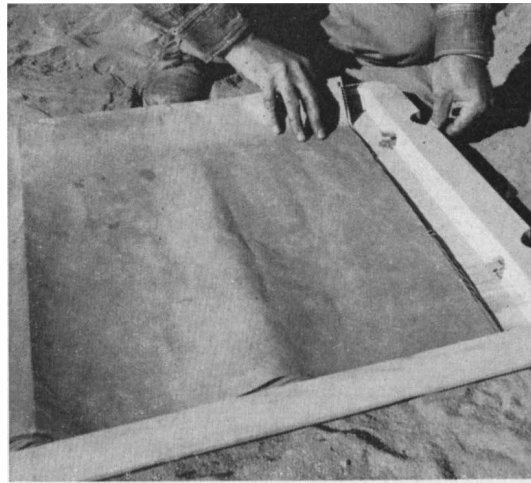
The Flow Chart provided a breakdown of the procedures into standardized events—or actions—such as operations, inspections, transportations, delays, and storages. The breakdown makes it possible to collect detailed information about each event in the procedure for the purpose of: 1, Eliminating unnecessary events; 2, Combining events; 3, Changing sequence of events, if this will benefit the entire procedure; 4, Simplifying remaining essential events which have not been improved by the first three steps.

The possibility of eliminating, combining, or changing sequence appeared likely for all operations, and associated transportations with two exceptions—the inspection of the vines for fruit and the

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Above. New Tray Carrier developed for faster harvesting of raisin grapes. Below. Clamping books of paper trays into position.



Above. Loading grapes directly on top paper tray. Below. Dragging loaded tray off Carrier to drying position in row.



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operation of selecting, grasping and cutting a grape cluster.

These exceptions are the focal points in the entire procedure and so additional analysis was undertaken to simplify them.

An analysis by means of an Operator Chart indicated that the bulk of the work in the operation of selecting, grasping and cutting, is now done by one hand while the picker's other hand remains idle for a good part of the time.

### Cutting Device

A cutting device is being developed which will balance the work load equally between the hands and keep them both busy during the entire operation.

The method of picking grapes using the cutting device is to be identical with that of using the knife except for the cutting operation. In the cutting operation, a cluster is isolated and grasped in each hand. Each cluster is held in the cupped hand, supported by the lower three fingers. With each cluster thus supported, the thumb and index finger place the cutting device about each stem and cut the stem. The cut clusters are then deposited on the tray below the vine.

Factors such as the end of the season and insufficient time to train pickers in the use of the cutting device made it impossible to collect quantitative data on its efficiency. Additional data will need to be collected in the next harvest season.

From past experience in converting one-handed jobs to two-handed jobs, an increase in output of 30%-40% can be expected with such a change.

### Recommendations

The adoption of the Tray Carrier is recommended as standard equipment to be supplied and maintained by the grower. Standardization of method and usage may be achieved if the grower supplies and maintains these trays and eliminates the continued use of the picking pan, supplied by the picker.

Trays should be placed in the aisles on both sides of the rows so that a picker can work down one row and up the next.

Working conditions in the very hot fields could be improved by a minimum remedy which would result in greater productivity—if the case of steel mills can be used as a guide—which is the provision of cold drinking water and salt-tablet dispensers in the main aisles of the fields. The cost is insignificant and the resulting increased productivity would compensate the grower by getting the crop off the vine more quickly.

The use of two-handed cutting-devices for cutting grape clusters needs more

study. Before specific recommendations can be made more investigations should be conducted on: 1, the Turning operations; 2, the purpose and need for Bundling or Rolling; and 3, the possibilities of combining Bundling and Boxing and of the methods of Boxing.

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## BEANS

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been conspicuous because of the chlorotic foliage in contrast to the dark green of the normal plants. By September 9th, this appearance was reversed as the normal plants were yellowed from maturity and the treated area was comparatively darker in color because of delay in maturity.

Zinc deficiency symptoms frequently are markedly accentuated in old corral sites within little leaf areas. In other areas this deficiency is often found only in corral sites or Indian camps. Trees in such areas have shown striking response to zinc.

### Deficiency Suspected

Zinc deficiency has been suspected a few times in annual plants in San Joaquin County, but prior to the treatments on these beans, there had been no known recorded case of response to zinc applications in any California annual. Soils in which fruit and nut trees will become worthless if not supplied with zinc usually are excellent for a wide variety of annual crop plants, including those known to develop deficiency symptoms elsewhere.

The bean field under observation adjoins an orchard district where little leaf is not known to be a problem.

No abnormality in the previous bean crops had been noted, although it had been observed that previous plantings of barley lodged badly in the corral area and in some years were crowded out by excessive weed growth.

Beans had been planted on this field since 1941, with the exception of 1944 and 1945 when the field was planted to grain.

The history of the land is known back to 1850 when the barn and corral were constructed. In 1900 the barn and corrals were removed and until 1940 the land was cropped to hay, grain and pasture. It was levelled for irrigation in 1940.

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## NUTRITION

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an allowance of 18% seems wise, especially if the roughage is of low quality. Probably under most conditions a 16% or 18% mixture will be adequate. When the hay is largely nonlegume the higher level should probably be chosen. When good alfalfa hay is fed a mixture of farm-grown grains furnishing about 12% protein is probably adequate.

### Calcium and Phosphorus

Milk is a rich source of both calcium and phosphorus. One pound of milk contains, on the average, 0.54 gm. of calcium and 0.45 gm. of phosphorus. Experimental work has shown that high-producing cows can not assimilate enough calcium and phosphorus to meet their needs during the early part of lactation. The needs for milk production are met by drawing minerals from the bones. This loss is made up during the lactation period and during the dry period. The heavy drain on the calcium and phosphorus reserves necessitates a liberal feed supply.

Considerable work has shown that furnishing approximately double the amounts of calcium and phosphorus in the milk is sufficient to cover the needs. This allowance is in addition to the maintenance requirement of 10 grams per 1,000 pounds.

In a number of cases accurate estimates of the nutritional requirements must await further research.

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## INSECTICIDES

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control. Such a practice is likely to be hazardous, because the disadvantages associated with the chlorinated hydrocarbons frequently become more pronounced as the amounts applied are increased.

With these new insecticides there are many problems that have as yet not been completely solved. They must be used with a degree of caution, and the most good, with resultant satisfaction, can be obtained if they are applied only where needed, and then at a concentration no higher than necessary to produce control.

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