Grape Packer-Supply Operations

study of costs and efficiency in fresh table grape packing houses indicates potential savings by changes in some plants

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The following article is one of a series of reports of studies on Efficiency in Fruit Marketing *made co-operatively by the University of California, Giannini Foundation of Agricultural Economics, and the Agricultural Marketing Service, U. S. Department of Agriculture, under the authority of the Research and Marketing Act. Detailed reports are available by addressing the Giannini Foundation, 207 Giannini Hall, University of California, Berkeley 4, California.*

Operating conditions in plants packing California fresh grapes vary widely. Studies of individual plants showed a variation in length of season of from three to 16 weeks per year; in size of plant from a capacity rate of 200 to 1,100 standard lugs packed per hour; in season average proportion of cull fruit from 9% to 47% of the total fruit run; and in the season average rate of packer output the variation was from four to 31 lugs per packer hour.

This wide range in operating conditions affected costs in the individual plants, particularly with respect to receiving incoming fruit, supplying it to the packers, and disposing of culls. The costs of these operations—defined as the packer-supply operations—also varied with the work methods and type of equipment used.

The principal variations between plants in type of equipment used in the packer-supply operations occur in the transportation of incoming fruit and culls, in the method of delivering full field boxes of fruit to the packers, and in handling empty field boxes. Transporting full and empty field boxes is done with fork truck equipment in some plants and with hand trucks in others. In some plants relatively few mechanical aids are used in the packer-supply operations. In these plants full field boxes are transported to points adjacent to the packing stations, where individual boxes are set up manually on inclined racks adjacent to the packing stands. Culls collected in cull boxes at each packing station and the empty field boxes are placed manually in separate stacks for transport to a temporary storage area. Later the cull boxes are emptied into a highway truck and the empty field boxes are reloaded on the field trucks. A number of plants using this system have partially mechanized the packer-supply operation by providing a conveyor which carries culls from the packing stations to a cull-box filling station. The cull boxes are handled manually as described above. In other plants the culls are conveyed directly to an overhead cull bin from which they are periodically emptied by gravity chute to a highway truck. A few plants are still more mechanized by the addition of conveyors which transport empty field boxes from the individual packing stations to a central point where they are set off and stacked for reloading on the field truck. The diagram below illustrates the packer-supply operations and equipment layout involved with manual setup of full field boxes but with mechanized handling of culls and empty field boxes. The shaded areas in the diagram relate to packing house operations that are not a part of the packer-supply operation and are not considered in this study.

A still different category of plants includes those using a conveyor system for supply of full field boxes to the packers as well as conveyors of the type described above for culls and empty field boxes. With this system the field boxes are set at the end of the conveyor-supply line and the boxes are automatically distributed to the packers as required. Cull and empty field-box conveyors are an integral part of the packing line.

As the degree of mechanization increases with either system—the manual-supply or conveyor-supply system—the investment in equipment required for a given size plant rises sharply. Similarly, equipment and investment requirements rise as packer output rate decreases. This is evident since a low rate of output per packer means that relatively more packers—hence more packing stations and more conveyor equipment—are required for a given plant output rate than when output rate per packer is high.

Whether increased mechanization of the packer-supply operations is economical depends on the extent to which direct operating costs are reduced and on the total season volume of output over which the increased fixed costs for equipment are distributed. Since total season volume is greater in a plant of given capacity as length of season increases, the use of mechanical aids in the packer-supply operations becomes more economical as length of operating season is extended.

Detailed studies of the costs with dif-

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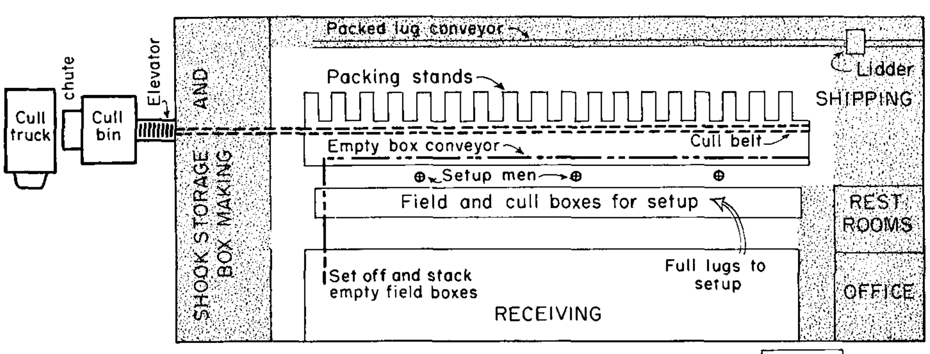

Equipment layout in grape-packing house.

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MITE

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per 100 gallons, have generally resulted in satisfactory seasonal control of this mite. Sulfur should not be applied during or immediately preceding periods of hot weather, and treatment should be separated from an oil application by at least 60 days.

Chlorobenzilate applications—at the rate of 10 pounds of a 25% formulation per 100 gallons of spray—may be used to control the citrus flat mite during the times when it is inadvisable to apply sulfur. A thorough distribution type of coverage is necessary for good control.

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POTATOES

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potatoes down to storage conditions, after which the ventilation was reduced to maintain inside temperatures as uniformly as possible. During the mild fall weather, some temperature readings were taken to observe day and night fluctuations and comparative temperatures for individual locations.

To begin with, temperatures recorded by the thermocouples were observed hourly. This frequency was found to be seldom necessary, so in most cases, intervals were extended to an average of about three hours. In mild weather, even this time was expanded or readings discontinued temporarily. When extremely cold weather arrived, the hourly interval was resumed and maintained to obtain complete sets of data. Extra readings were taken at high and low temperature periods, so as to best define the maximum and minimum measurements.

The critical periods are those of lowest temperatures. Intermediate temperatures pose no special problem for this type of potato storage. Lowest temperatures were awaited, as providing the really significant conditions and data. The coldest occurrence in several years proved to be –18°F. At this time the most useful data were collected. Humidity, condensation, and frosted interiors were also studied.

The sawdust and rockwool insulated walls proved satisfactory for small-volume storage. Safe potato temperatures were maintained.

The 13″ concrete block cavity wall also was adequate, being nearly equal to the well-insulated frame walls.

The 8″ concrete block wall proved unsatisfactory because it cooled too much, frost formed on the inside surface, nearby potatoes froze, and some were spoiled.

Temperatures inside the concrete blocks and the insulation materials revealed the progression of changes within the various parts of the walls, at several hours during the day. Outside minimum wall temperature was –18°F. The temperature lag within the wall material was especially apparent with the concrete blocks. The interior was warmed by the heat of respiration of the potatoes together with a small amount of supplementary artificial heat. Although having different characteristics, the cavity wall was about as effective as the insulated frame walls.

In contrast, the 8″ block wall remained too cold on the interior surface all day long, ranging from 19°F to 28°F—dangerous temperatures for the safe storage of potaotes. Frost was seen only on this one wall section.

Additional temperature recordings in the concrete walls showed an obvious relationship between the 8″ and the 13″ walls. The superiority of the cavity wall was clear. The cold interior surface of the single 8″ wall was the feature which caused potato damage.

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The experimental cellar is a co-operative project and part of Agricultural Engineering Project 400-D.

PACKING HOUSE

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ferent methods showed that relative costs with different methods also are affected by plant capacity and proportion of cull fruit.

In general, the nonmechanized methods were found to be the most economical with short season operation—250 hours per season—low cull proportions, and low rates of packer output. On the other hand, the highly mechanized equipment was found to be most economical with long-season operation—750 hours per season—a high proportion of culls, and high rates of packer output. Between these extremes in operating conditions, a rather broad range was found in which the cost differences between the mechanized and nonmechanized methods are relatively small.

The effect of variation in the factors affecting the costs of the packer-supply operations can be illustrated by reference to several specific results of the cost comparisons. For example, with a given length of season and proportion of culls, the costs of the packer-supply operations decrease as the size of the plant increases. Thus with 250 hours operation per season, a packer output rate of five lugs per hour, and 30% culls, costs with efficient operation are about 5¢ per lug in a small plant, 4¼¢ per lug in an average-size plant, and 4¢ per lug in a large plant. A similar, although smaller, effect is evident with long-season operation.

When output rates of five and 30 lugs per packer hour are compared, the effect of the high output rate is to reduce costs by about 1¢ per lug when the length of season is 250 hours and ¼¢ to ¾¢ per lug—depending on the proportion of culls—when the season length is 750 hours.

When output rates of five and 30 lugs costs rise about 1¢ per lug as culls increase from 10% to 30%; and there is an additional 1½¢ increase as culls rise from 30% to 50%. With 750 hours' operation per season, the variation in costs as the proportion of culls changes is less regular but approximates ½¢ per lug as culls increase from 10% to 30% and an additional 1¢ per lug as culls rise from 30% to 50%.

Comparing the most efficient methods at a culling rate of 30%, costs with short season operation—250 hours per season— are about 1¾¢ per lug higher than with long-season operation of 750 hours. At 10% culls, this difference is 1½¢ and at 50% culls it is about 2¢ per lug.

While substantial differences in costs are associated with the wide range in operating conditions, these costs differences do not necessarily indicate savings potentials. In general, only limited adjustment in the factors affecting the costs of the packer-supply operations is possible for individual shippers. Some adjustment in proportion of cull fruit might be attained through changes in cultural, picking, or marketing practices. Increased packer output rates might be achieved in some plants through adoption of an incentive wage plan. In some areas, size of plant and hours of operation per season might be increased through consolidation of small plants. Such changes, however, would ordinarily involve shifts through only a part of the range in operating conditions and frequently would be economical only as existing plants are worn out.

Some of the changes involved in reducing the costs of the packer-supply operations would affect the costs of other operations. The costs of packer labor would be affected by any change in packer wage plan; changes in practice necessary to reduce the proportion of packing house culls probably would affect picking, hauling, and cultural costs.

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