

Costs of Field Packing Lettuce

comparative study made of three methods of field packing lettuce in Salinas-Watsonville area for interstate shipments

Frank J. Smith and R. V. Enochian

Almost three quarters—73%—of the head lettuce shipped from Salinas in 1954 was field packed and vacuum cooled as compared to 20% in 1952.

The rapid shift—from formerly standardized shipping-point operations—to field packing and vacuum precooling has developed a number of variations in procedure and equipment, but three methods—ground pack, machine pack, and trailer pack—are in common use.

With the ground-pack method, a truck carrying a carton-making unit precedes the crew through the harvest strip. Assembled cartons are distributed from truckside by hand. Cutter-trimmers follow and select mature lettuce, trim off defective leaves, and place the trimmed head back on the planting bed. Usually,

one cutter-trimmer harvests two beds. Packers—generally one packer for two cutter-trimmers—transfer the trimmed head from the bed to the carton. A crew of carton closers follow the packers and staple the carton top. Finally, packed cartons are carried by hand to a flat-bed truck moving through the strip.

With the machine-pack method, the carton maker, packers, and closers are transported through the field on the machine. Carton making and stapling of packed cartons are performed on a special platform centered on the truck. Packers are supplied empty cartons by wheel conveyor from this platform, and a power conveyor returns full cartons to it for closing and stapling. The cutter-trimmers—each man taking one plant-

ing bed—precede the machine which passes over the trimmed heads. The pickup men, walking immediately behind the machine, transfer the trimmed heads to packing tables on the machine. Closed cartons are carried by gravity conveyor to a flat-bed truck moving through the field with and beside the packing unit.

The trailer-pack method is functionally similar to the machine method but uses a much smaller crew. The packers, carton maker and closers ride on the trailer drawn by a flat-bed truck. Pickup men, working on either side and behind the packing unit, transfer trimmed heads to packing tables extending from the sides of the trailer. Packers then place the lettuce in cartons. Carton making and the stapling of packed cartons are done at the forward end of the trailer. A slide is used to supply packers with empty cartons. Full cartons are pushed to the closing unit along a roller conveyor. Closed cartons go forward by gravity conveyor to the truck, where they are loaded on pallets.

The Effect of Work Method and Harvest Density on Cost of Labor and Equipment for Field Packing Two-Dozen-Size Cartons of Lettuce with an Hourly Rate Wage Plan in the Salinas-Watsonville Area, California, in 1953-54, Excluding Materials, Precooling, and Overhead.

Method and crew organization ^a	Harvest density, cartons per acre ^b	Output, cartons per packer hour	Cost per crew hour		Cost per carton		
			Harvesting and packing labor	Equipment and operating ^c	Harvesting and packing labor	Equipment and operating	Total cost
TRAILER PACK:							
8 cutter-trimmers, 4 pickup men, 4 packers, 1 full carton folder, 1 closer, 1 loader, 1 carton sticher, 1 row boss, 2 truck drivers	100	26			21.1¢	9.2¢	30.3¢
	150	31			17.7	7.3	25.4
	200	34	\$21.92	\$ 9.58	16.1	7.0	23.1
	250	35			15.5	6.8	22.3
MACHINE PACK:							
16 cutter-trimmers, 8 pickup men, 8 packers, 2 full carton folders, 1 closer, 2 loaders, 1 empty carton folder, 1 carton sticher, 1 row boss, 2 truck drivers, 1 machine, driver	100	25			20.2	7.6	27.8
	150	30			16.8	6.4	23.2
	200	33	40.37	15.26	15.3	5.8	21.1
	250	35			14.4	5.4	19.8
GROUND PACK:							
30 cutter-trimmers, 15 packers, 2 carton distributors, 4 closers, 4 loaders, 1 empty carton folder, 1 carton sticher, 2 row bosses, 2 truck drivers, 1 carton unit driver	100	18	58.30		22.1	5.3	27.4
	150	19	58.30		20.2	4.9	25.1
	200	21	58.30	13.97	18.3	4.4	22.7
	250	23	60.38 ^d		17.3	4.0	21.3

^a Wage rates paid hourly rate crews in the Salinas-Watsonville area: Row boss: \$1.075; cutting, packing, carton distribution, closing (ground pack), loading: 87.5¢; carton making, carton closing (machine pack): \$1.575; truck and equipment drivers: \$1.65.

^b Harvest density per acre is the number of cartons harvested per acre in a given cutting.

^c Costs of major equipment items: Replacement costs (1953 prices): carton sticher: \$500; field-packing machine: \$15,000; packing trailer: \$1,750; truck: \$7,500. Annual charge of replacement costs on all items (depreciation): 12.5%; interest on investment: 3%; fixed repair: 3%. Annual charge for taxes, license, and insurance fees: packing trailer: \$42; sticher: \$13; field-packing machine: \$395; truck: \$370. Operating costs per hour (gasoline, oil, tires, repair, and miscellaneous): packing trailer: 18¢; sticher: 16¢; field-packing machine: \$1.86; truck: \$1.32.

^d The addition of 1 carton-sticher operator at this harvest density permits a greater output per packer hour and lower cost.

Production Standards

The primary sources of data—used in analyzing costs with the different methods of field packing—are engineering studies of labor and equipment requirements. These data were used to

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estimate net labor requirements for individual jobs.

For each job, production standards typical of operation under relatively efficient conditions were derived from the estimates of net labor requirements by adding allowances for personal time, unavoidable delay, and turn-around time at the ends of each harvest strip. The job with the lowest output rate per hour with a given crew organization—the bottleneck job—was taken as the production standard for the entire crew. Separate production standards were developed for work under piece rate and hourly rate wage plans.

Cost Estimation

Cost data based on the hourly rate wage plan given in the table on page 2 include costs per hour for the harvesting and packing labor, for equipment used in the field operations and in transporting packed lettuce to the precooler. The costs do not include packaging materials, precooling and carloading, field supervision, and general overhead. These items do not significantly vary with the different field-packing methods studied. Costs per carton are obtained by dividing the hourly totals by the crew production standard.

Harvesting and packing labor costs per crew hour were obtained by multiplying the number of men in each job category by the wage rate for that job typical of the Salinas-Watsonville area. Costs for the jobs listed at the wage of 87.5¢ per hour were inflated by 11% to cover camp costs. The costs of labor at other wage rates were inflated by 5% to cover social security and workmen's compensation taxes.

Labor costs of operating field-packing machines and trucks were based on the field-operating time plus an allowance for highway travel to and from the field. The labor costs of truck drivers hauling packed cartons to the precooler include allowances for waiting and loading time in the field, unloading at the precooler, and an average observed travel time between field and precooler of about 60 minutes per round trip.

Annual charges for equipment were reduced to costs per field hour on the basis of a 1,280-hour season—32 weeks per year, 40 hours per week. This length of season is applicable to the Salinas-Watsonville area. The operating season is shorter in the winter lettuce areas, and higher equipment costs per carton will occur in these areas unless alternative uses are found for the equipment during other seasons of the year. Similarly, a longer use period for firms operating

in both areas would reduce equipment costs per carton, although the rate of reduction for use above 1,280 hours per season would be small.

Many factors can affect output rates and costs—in packing from a particular field—such as the work method and equipment used; the wage plan; harvest density, defined as the number of cartons harvested per acre at a given time; differences in skills among different workers and crews; the policy of a given firm, with respect to quality of pack; the quality of lettuce harvested; ground conditions; and the number of times the field had been previously cut. Only the effects of work method, wage plan, and harvest density are specifically considered in this report, and the results reflect the average industry experience with regard to the unmeasured factors.

Because costs per carton vary with harvest density, this factor must be considered in making cost comparisons with different methods. At a harvest density of 200 cartons per acre—the average harvest density for the industry during the period of the field studies—the hourly rate machine-pack method had the lowest unit costs—21.1¢ per carton. This is 2.3¢ per carton less than with the trailer-pack method and 1.6¢ per carton less than with the ground-pack method. About the same relationships apply at the high harvest density of 250 cartons per acre. With a low harvest density of only 100 cartons per acre, unit costs are lowest with the ground-pack method—27.4¢ per carton. This is 0.4¢ per carton lower than with the machine-pack method and 3.1¢ per carton less than with the trailer-pack method.

Unit Costs

Studies of packing under the piece-rate wage plan indicated unit costs for the harvesting, packing, and hauling operations of about 25.0¢ per carton, with relatively little variation in unit costs due to change in harvest density or method. The lack of variation with respect to these factors is largely due to the fact that all the harvesting and packing labor costs with the piece-rate wage plan were established at a fixed rate per carton, which did not vary with harvest density and was subject to only minor variation among the different work methods. With the piece-rate wage plan, therefore, the main source of change in unit costs, as harvest density varies, is the unit equipment costs, and this effect is not large. When the two wage plans are compared, costs with the hourly rate plan are lower with all methods, except with low harvest densities.

The relatively small differences between methods in costs per carton at given densities assume much greater sig-

nificance when comparisons are made on a carload or seasonal basis. For example, with a harvest density of 200 cartons per acre, the 1.6¢ per carton difference between costs with the machine and ground-pack methods under the hourly rate wage plan amounts to \$10.24 per car—a difference of \$10,240 per season for firms shipping 1,000 cars annually, a volume exceeded by many shippers. A similar comparison between the low- and high-cost methods—hourly rate machine pack versus piece-rate machine pack—indicates a difference in cost of \$26,240 per year.

Costs in Other Districts

The data given in the table are based on conditions typical of the Salinas-Watsonville district. Some adjustments would be required to make the data applicable to the winter lettuce areas of the Imperial Valley of California and to the Yuma and Phoenix districts of Arizona.

In the winter lettuce areas, harvesting and packing wage rates were about 20% lower, and the packing season is shorter than in the Salinas-Watsonville district. A shorter season would tend toward higher unit costs in these districts than are shown in the table, while lower wage rates would reduce costs. These differences between districts also affect the relative costs with different methods since unit equipment costs, with a given method, rise as equipment use per season decreases.

If the costs in the table are adjusted for differences in wage rates between the two districts and equipment costs are based on a shorter operating season, costs per carton with different methods range from 3% to 10% lower than those given in the table.

The studies show that a change by some shippers to the machine-pack method would result in sizable reductions in packing and shipping costs in the Salinas-Watsonville district. In the winter lettuce districts, such reductions would be small unless alternative uses are found for equipment during other seasons.

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