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USDA STATISTICAL BULLETINS

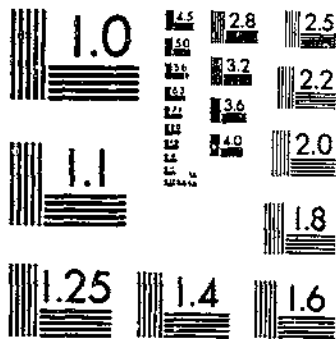
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FARM LABOR USED FOR FRUITS AND TREE NUTS, 1964

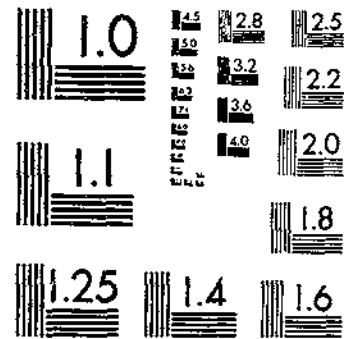
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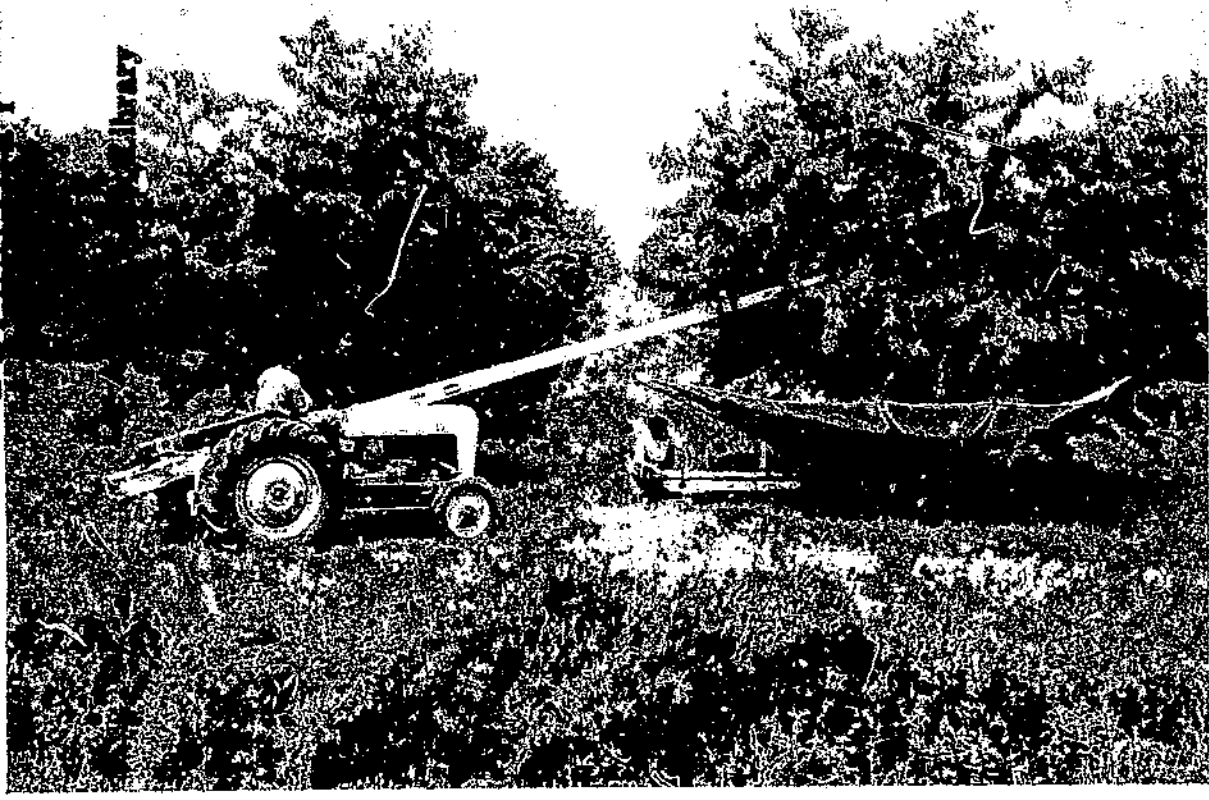
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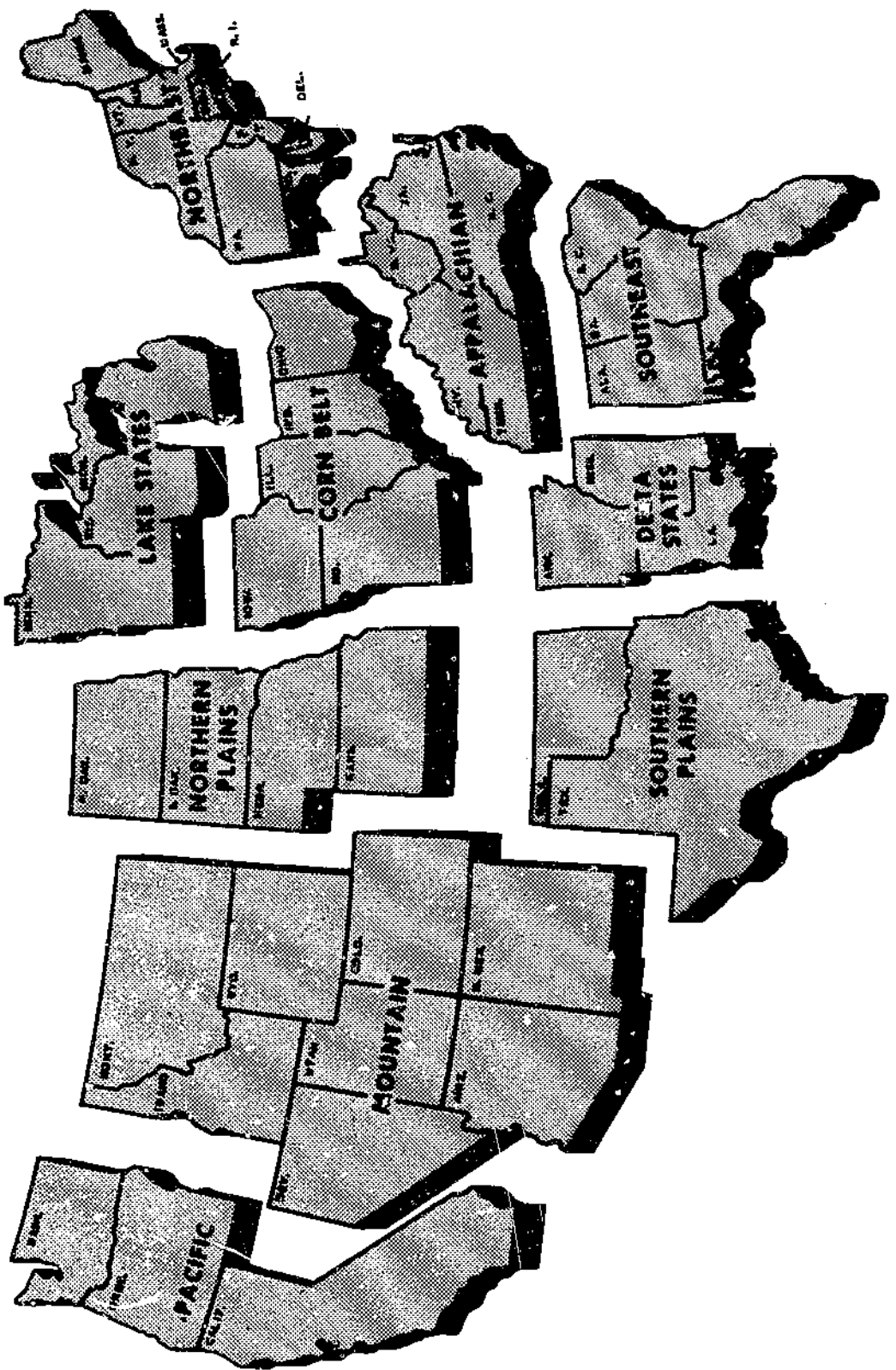
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FARM LABOR USED FOR FRUITS AND TREE NUTS, 1964

DEPOSITORY



FARM PRODUCTION REGIONS



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TERMINOLOGY

ALL HARVEST LABOR

The average number of man-hours used to pick, load, and haul to storage or processor, and to farm grade, pack, and haul to market the products from an acre of fruit or tree nuts weighted by the proportion of crop that is farm graded and packed.

The amount listed in tables and tabulations as "all harvest labor" was determined by the following method. The average number of man-hours used per acre to farm grade, pack, and market a crop was multiplied by the percentage of the State's crop that was farm graded and packed. The product was added to the average number of man-hours to pick, load, and haul to storage or processor. This sum represents the amount of all harvest labor per acre for the State. The man-hours used for the region and the U.S. totals were weighted by amount of acreage of the specified crop in each State.

Example: All harvest man-hours per acre in 1964 for apples in Maine were 72.

Calculation (based on figures in table 2): $.75 \times 44 = 33 + 39 = 72$

0.75--percentage of Maine's apple crop farm graded and packed.

44--average number of man-hours used per acre if 100 percent of crop was farm graded and packed.

39--average number of hours per acre used in Maine to pick, load, and haul to storage or processor.

ANNUAL AVERAGE NUMBER OF MAN-HOURS PER NONBEARING ACRE

The average number of man-hours per acre required per year from time of planting to bearing age.

BEARING ACREAGE

Acreage of trees or vines having reached bearing age.

BEARING AGE

The age at which 20 percent or more of estimated full production is reached.

FARM GRADING, PACKING, AND MARKETING

The time required to farm grade, pre-package, or box the crop for the market; haul it to market; and dispose of off-grade products. Farm grading for both fresh and processing market is included. The data provide estimates of labor performed by the farmer, or a crew under his supervision, on his own crop and in his own storage or packing shed. They do not include estimates of labor performed by workers in nonfarm packing sheds.

HARVEST LABOR

The handling of the crop from picking to primary market.

MAN-HOURS TO ESTABLISH ORCHARD

The number of man-hours spent in land preparation, marking, planting, fertilizing, irrigating, protecting from frost, controlling weeds and pests, and other cultural practices during the year in which the orchard was planted.

MAN-HOURS TO MAINTAIN ORCHARD

The average annual number of man-hours used per acre to perform such cultural practices as cultivating, fertilizing, spraying, pruning, and shaping the orchard until bearing age.

NONBEARING ACREAGE

The acreage of trees or vines that have not reached bearing age.

PERCENTAGE OF CROP FARM GRADED AND PACKED

The part of the crop that is graded and packed on the farm by farm crews.

PICKING, LOADING, AND HAULING

The labor used to distribute boxes, and to pick, load, and haul the crop to either farm or community storage or to a processing plant, and crew supervision.

PREHARVEST LABOR

The labor used per acre for all work prior to harvest. It includes such jobs as land preparation and seeding cover crops, pruning, brush disposal, fertilizing, spraying, irrigating, mowing, thinning, propping, and protecting from frost. Preharvest labor does not include the time used to plant or maintain interplanted crops.

TOTAL MAN-HOURS PER ACRE

The sum of preharvest and all harvest labor.

TOTAL MAN-HOURS TO BEARING AGE

The number of man-hours required to establish an orchard plus the sum of the

man-hours needed to maintain the trees until they reach bearing age.

TREES OR VINES PER ACRE, BEARING ACREAGE

The average number of bearing trees or vines per acre, excluding any replacements not yet in production.

TREES OR VINES PER ACRE, NONBEARING ACREAGE

The number of trees or vines originally planted when an orchard was established.

YEARS TO MAINTAIN ORCHARD

The average number of years after the planting year until the trees reach bearing age.

YIELD PER ACRE

Data from the 1964 Census of Agriculture were used to estimate yields for all States except California. The yields for California are estimates published by the California Crop and Livestock Reporting Service. The Crop Reporting Board of the United States Department of Agriculture publishes State estimates of production, but not acreage, of the principal fruits and tree nuts. Therefore, official estimates of State average yields per acre are not available for States other than California.

FARM LABOR USED FOR FRUITS AND TREE NUTS, 1964

By

Walter L. Ferguson, Agricultural Economist,
Farm Production Economics Division, Economic Research Service

INTRODUCTION

The year 1964 marked the beginning of mechanical harvesting for certain fruits and nuts. In 1964, such crops as apples, grapes, and some of the citrus were mechanically harvested in an experimental way. More widespread use of mechanical harvesting equipment was made for some of the nut crops, especially almonds, filberts, and improved pecans. With labor becoming more expensive and less available, much greater use will be made of mechanization in future years.

Timeliness of spraying, pruning, thinning, harvesting, and so forth is one of the major factors affecting the quantity and quality of the crop. The amount of labor must be anticipated so that an adequate labor force is available when needed. Data developed for this report will be of primary use to research workers needing information on State, regional, and nationwide labor requirements. This information should also help orchardists and labor supervisors in determining how many workers to recruit and what transportation and housing will be needed.

This report contains tables showing State average man-hours of farmwork per acre in 1964 for each fruit and edible tree nut for which production is estimated annually by the Statistical Reporting Service.¹ For most crops, estimates are given for both bearing and nonbearing acreages.

The labor requirements shown in the tables were developed from available data collected

by State and Federal agencies. The amount of labor used on individual farms may be considerably above or below the State average due to conditions peculiar to those farms.

In some instances, estimates were made by modifying data from nearby States having similar topographical, cultural, and climatic conditions.

Estimates of the man-hours required per acre include labor needed for direct work, such as planting, spraying, fertilizing, pruning, thinning, picking, farm grading, packing, and marketing. The estimates do not include time required for indirect labor such as service and maintenance of equipment, fences, and buildings.

Number of trees per acre (as listed on tables) were based on 1964 estimates by Statistical Reporting Service. Yield per acre estimates were derived by using 1964 Census figures for bearing trees and production. Therefore, labor estimates are for the 1964 crop and thus require adjustment for different size crops in other years.

LABOR REQUIREMENTS OF FRUITS AND NUTS AS SEPARATE GROUPS

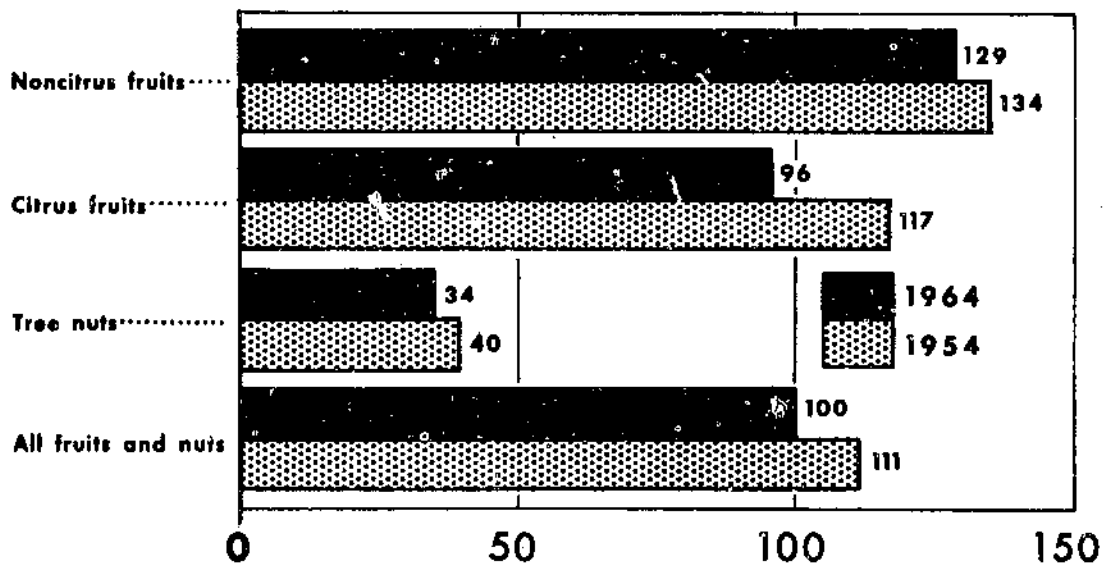
In 1964, the weighted average amount of labor required per bearing acre of all fruits and tree nuts was 100 man-hours. This represents a 10-percent decrease from the 1954 man-hour requirements (fig. 1).² Each of the three groups--noncitrus fruit, citrus fruit,

¹ U.S. Department of Agriculture Statistical Reporting Service Reports 407, Fruits, Noncitrus by States, 1959-64; 380, Citrus Fruits by States, 1964-65 and 1965-66; and 295, Tree Nuts by States, 1964 and 1965.

² To compare with 1964 estimates, see U.S. Department of Agriculture Statistical Bulletin 232, Labor Used for Fruits and Tree Nuts, issued in 1958.

FRUITS AND TREE NUTS

Man-hours Used per Bearing Acre



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Figure 1

and tree nuts--required less labor in 1964 than in 1954. In spite of a larger crop in 1964 for each group. Yield per acre, a major factor determining harvest labor, had increased significantly by 1964 (table 1). Some 15 of 23 fruits and four of five nut crops had a greater yield per acre in 1964 than in 1954. Factors responsible for less labor being needed in 1964 included appreciably greater use of mechanical preharvest, harvest, and handling equipment, and more efficient use of hand labor.

Labor requirements for each of the three groups differed widely from the average in both 1954 and 1964. The noncitrus group required the greatest amount of labor and tree nuts the smallest. Noncitrus fruits required 129 man-hours per acre in 1964, or 29 percent more labor than average. Citrus fruits required 96 man-hours per acre, or slightly less than the average. Tree nuts, which are generally more easily adapted to

mechanization, require less intensive culture, and have a lower yield per acre, required only 34 percent as much labor as the average.

Many factors determine the amount of labor needed for the various crops. Some of the more important elements in determining preharvest labor needs are: number of trees per acre, size and shape of tree, resistance to insects and disease, growth habits, and adaptability to climate. Size of fruit, yield, resistance to bruising, and extent to which the crop is handled by the producer in preparing it for market also help to determine harvest labor requirements. Many of the crops within the three groups had one or more dissimilar factors which caused their labor requirements to differ from others in the same group.

In estimating labor requirements, it was assumed that the fruit or nut trees were the only occupants of orchard land.

NONCITRUS FRUITS

Labor requirements for noncitrus fruits averaged 129 man-hours per bearing acre in 1964, but ranged from a low of 56 for avocados to a high of 394 for dates (fig. 2). Of the total man-hours required for the bearing acreage, preharvest labor, as a percentage of the total, varied widely. For cranberries, for example, 74 percent of the total required man-hours was used for preharvest cultural operations while only about 10 percent of the total was needed for preharvest labor for sweet and sour cherries.

Great dissimilarities in plant growth requirements are much more evident in this group. This becomes apparent with the location of the different noncitrus fruit crops. Commercial production of apples and peaches, for example, is widely adaptable and is reported by 34 States; persimmons, pomegranates, olives, dates, and figs, however, are only grown commercially in the warm temperate climate of California.

Of the 17 crops reported in this group, 15 are tree fruits and two are vine fruits. Among the tree fruits, size of tree ranges from the low avocado and fig trees to the tall date palms. There are vast differences in growth habits and labor requirements of the two vine fruits, grapes and cranberries.

Most of the noncitrus fruits are highly susceptible to insect pests and diseases. Apples, for example, require six or more timely sprays to prevent or control insect infestations and diseases.

Growth habits differ for each of the 17 noncitrus fruits and for the different varieties of each kind of fruit. Some of the fast growing noncitrus fruits, such as apricots and pears, require that over 50 percent of the preharvest labor be spent in pruning, while others need very little or no pruning. Many of the noncitrus crops bloom and set fruit so heavily that part of the fruit must be removed to prevent damage to the tree and to allow the remaining fruit to attain proper size. The thinning operation is performed in several ways. Some fruits may be thinned successfully with a chemical spray or mechanically shaken off; others must be thinned or knocked off by hand.

Climate determines to a considerable extent the number of man-hours required per acre for noncitrus fruit. Many of the noncitrus fruits are grown in areas in which natural rainfall is insufficient and labor is required for irrigation. Although frost protection is less important for noncitrus than for citrus fruits, some form of frost protection is required for several of the noncitrus fruits. Cranberry growers must flood the area, and apricot growers must burn smudge pots to prevent untimely frosts from killing buds and reducing yields.

One of the most important factors that determines the harvest labor requirements is yield per acre. A low yielding crop, such as avocados, requires far less labor than a high yielding crop like dates. Some crops, such as cranberries, are resistant to bruising. Other crops such as sweet cherries, peaches, and nectarines must be handled with great care to prevent bruising of their tender flesh. Most noncitrus crops bruise easily and require much more care in handling than do the citrus or nut crops.

Much of the noncitrus fruit produced is ready for market by the growers. Some exceptions are sour cherries, wine grapes, and olives. In some areas, growers of apples, peaches, cranberries, and several other fruits have cooperative or consolidated storage-packing organizations which take field-run fruit from the grower and prepare it for the market. Much farm labor, however, is needed to prepare noncitrus fruits for market.

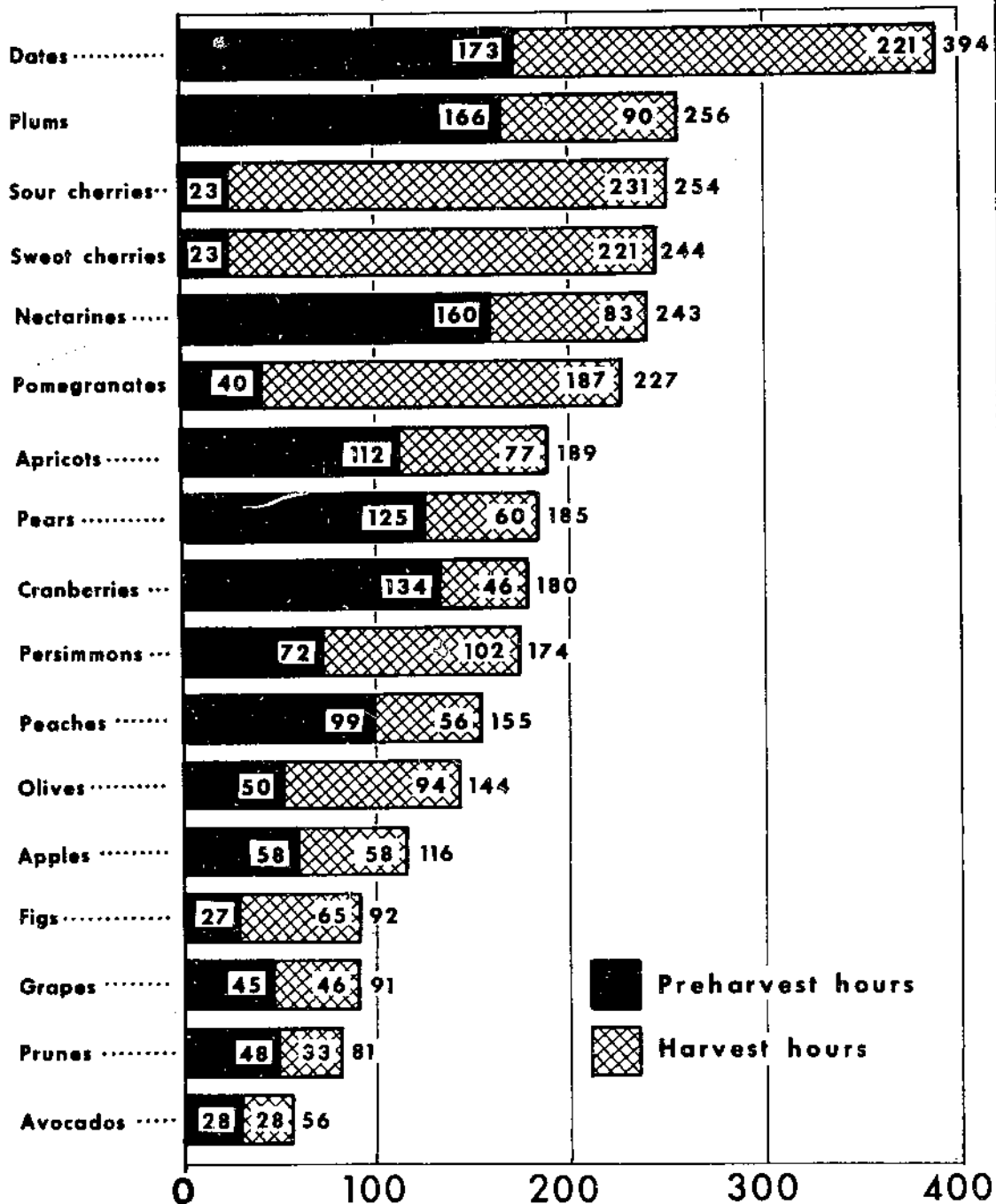
APPLES

Apples are widely grown in the United States. They are grown commercially in 34 States, with Washington, New York, Michigan, California, Pennsylvania, and Virginia accounting for approximately 71 percent of the production in 1964.

The number of man-hours used to produce an acre of apples in 1964 was 116 per bearing acre; 29 hours was used on each nonbearing acre (table 2). It took 0.4 hour to produce a bushel in 1964 compared with 0.7 hour 10 years earlier. This labor productivity was achieved with more widespread use of

NONCITRUS FRUITS

Man-hours Used per Bearing Acre, 1964



U. S. DEPARTMENT OF AGRICULTURE

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Figure 2

mechanical pruners, bulk bins, and application of chemicals in thinning fruit and weed control. These innovations were coupled with greater supervisory and management skills. The difference in yield per acre of 185 bushels in 1954 and 285 bushels in 1964 meant that more hours of labor were required per acre in 1964; because of improved techniques, however, less labor was required per bushel of apples produced. Another reason why labor was less per bushel of apples harvested in 1964 was that many orchardists made more extensive use of dwarf varieties for replacements. Dwarfs generally require less labor per acre.

For most of the country, preharvest labor ranged from 35 to 65 man-hours per bearing acre, but in States in the Mountain and Pacific regions, it ranged from 80 to 125 man-hours per acre. The greater number of trees per acre in the West meant that more time was required for pruning and spraying. Most western orchards are irrigated and need added labor to supply water. Rainfall is usually sufficient in most eastern orchards, and irrigation there is seldom practiced.

Yields ranged considerably higher in the irrigated regions of the West with a high of 587 bushels per acre in California. In contrast, Arkansas and Tennessee grew fewer than 100 bushels an acre.

The hilly topography of eastern orchards restricts the size and type of mechanical handling equipment that can be operated safely. Spraying, pruning, thinning, harvesting, and hauling of fruit are more difficult on steep hillsides than on rolling or level land. Operators of western orchards located on level or gently rolling land find much of the new equipment well adapted to their conditions and needs.

Total labor requirements per nonbearing acre varied from a low of 142 hours in the Appalachian region to a high of 234 hours in the Pacific region. Irrigation requirements and more trees per acre in the Mountain and Pacific regions account for the additional time required to establish and maintain the orchard to bearing age.

APRICOTS

Commercial production of apricots in 1964 was reported in Utah, Washington, and California. California produced approximately 94 percent of the output on about 95 percent of the bearing acreage. Man-hours used on bearing acreages for the United States averaged 189 hours per acre of which 112, or 59 percent, were needed for preharvest work (table 3).

Apricot culture is similar to peach culture except that removing part of the fruit does not increase the size of the remaining fruit. Therefore, selective pruning of apricots is necessary to thin the fruit buds--the only practical way of increasing the size of the fruit. Pruning is done with shears from ladders. In some areas, however, post-harvest or fall topping of trees by machines, has greatly reduced the amount of handwork needed with no apparent harm to the trees.

Estimated yields ranged from 6,655 pounds per acre in Utah to 11,101 pounds in California, with an average of 11,019 for the three States. In 1964, harvest labor requirements averaged 0.7 man-hours per hundred-weight compared with 1.4 in 1954. The larger per acre yield in 1964 was partly responsible for less time being required per hundred-weight for harvesting in that year.

The average annual labor requirements on nonbearing acreage was about the same for all three States. It ranged from 41 hours in California to 46 hours in Washington, with a weighted average of 41 hours for the three apricot-producing States.

AVOCADOS

Florida and California are the only two States that have commercial avocado production. California had approximately 64 percent of the 37,400 tons produced in 1964. It took a total of 49 man-hours to grow and harvest an acre of avocados in California compared with 84 in Florida (table 4). The difference was partly due to the fact that 50 percent of

the crop in Florida was graded and packed by the farm crew, while none of the California crop was so handled. Another contributing factor was that California's lower yield required less time to harvest--California's yield in 1964 was an estimated 4,270 pounds per acre as compared with Florida's yield of 5,204 pounds.

Preharvest culture of avocados varies with growers. Some clean cultivate (till the soil around the trees); others maintain a year-round sod cover. Preharvest labor was approximately 10 man-hours less a year in groves on permanent sod than in those that were tilled.

Differences in labor used per nonbearing acre are attributed largely to two factors--trees per acre and irrigation. In Florida, 70 trees were planted per acre, as compared with 100 in California. Yearly maintenance labor averaged 30 man-hours per acre in Florida compared with 40 in irrigated California groves.

Pruning and shaping of trees required more labor than other jobs. Mechanical pruning of tops at a given height and side-hedging have been tried on an experimental basis but have not become common practice.

CHERRIES, SOUR

Sour cherries are grown commercially in 11 northern States. Michigan produced approximately 70 percent of the total crop in 1964. Climate plays a major role in the geographic location of commercial cherry orchards. Control of insects and disease is so difficult in the warmer parts of the United States that commercial production has been located in northern States where cooler climate reduces the infestation of insects and incidence of disease, and where extreme changes in temperature are moderated by large bodies of water. In the East, sour cherries are produced near the shores of the Great Lakes. In the far West, the fruit is grown primarily in areas where the climate is moderated by the Pacific Ocean.

Labor requirements for bearing orchards ranged from 190 man-hours per acre in Utah to 314 in Pennsylvania and averaged 255

for the United States as a whole (table 5). Man-hours needed to pick, load, and haul a hundredweight of sour cherries dropped from 3.6 in 1954 to 3.4 in 1964. The decrease was due mainly to a higher level of mechanization and greater yield per acre in 1964. Most harvest labor was used in picking the crop and hauling it to a processing plant. Only 3 percent of the 1964 crop was graded and packed on the farm.

As most sour cherries go to the processor for canning or freezing, they are picked without stems. Mechanical tractor-mounted tree shakers in combination with self-propelled catching frames were used in some commercial orchards.

An annual average of 48 man-hours per acre was used on nonbearing acreage in 1964. The hours ranged from 36 in New York to 61 in Colorado and Utah. The additional labor necessary on a greater number of trees per acre and for irrigation mainly accounted for the additional hours required in Colorado and Utah.

CHERRIES, SWEET

Sweet cherries require the same general climate, soil conditions, and culture that sour cherries do. Yet, the most important sweet cherry producing sections are in the Pacific Coast States where sour cherries are not grown extensively. Production in Washington, Oregon, and California accounted for approximately two-thirds of the total sweet cherries produced in 1964. Michigan and New York are also important as sweet cherry growing areas.

Labor requirements to grow and harvest an acre of sweet cherries were 244 hours in 1964 (table 6). This was somewhat higher per hundredweight than for sour cherries as more care is required in harvesting. Most sweet cherries are picked with stems attached. When they are to be sold on the local fresh-fruit market or shipped to a distant market, the stems must be left on. If they are separated from the stems, the juice will ooze from the fruit and cause rapid decay. To obtain uniform quality of this perishable crop, several pickings must be made at the proper

stage of maturity. Approximately 38 percent of the 1964 crop was sold on the fresh market which required that more time be spent in farm grading and packing.

Preharvest man-hours per acre for the Mountain and Pacific regions averaged 10 hours higher than the 15 or 16 hours required in the Northeast region and Michigan. The main reason for the differences was the additional labor necessary for irrigation.

On nonbearing acres in 1964, an annual average of 62 hours an acre was required. The range in hours was from 77 in Washington to 36 in New York. Labor needs on nonbearing acres were decidedly higher on the irrigated orchards of the West.

CRANBERRIES

Commercial production of cranberries was reported in five States with Massachusetts producing more than 50 percent of the annual crop. The other States were New Jersey, Wisconsin, Washington, and Oregon.

In 1964, 180 man-hours per acre were required to produce a yield of 64 barrels (table 7). Preharvest work averaged 134 man-hours per acre or 59 fewer hours than were needed in 1954. There have been substantial changes in certain of the preharvest cultural operations. Weeding, for example, is now done mainly by dropping herbicides from aircraft or by ground machines. Insects and diseases are controlled through the water system. Ten years earlier, much hand labor was involved in weeding and spraying. Preharvest labor still uses a large percentage of the total man-hours required. Maintaining dikes and checking dams to control erosion by wave action and rainfall are continuous and laborious jobs. The tunnelling of muskrats is sometimes a problem. Bogs must be sanded to provide media for new root growth; this helps to control weeds and to prevent the vines from tearing out when berries are raked in the fall. Flooding of the bogs takes considerable labor also. The water is applied either by pump or gravity, but close supervision is needed if the correct depth of water is to be attained at the proper time to kill insects and diseases and to prevent injury

from frost. Also, too much water for too long a period will harm the plants.

The harvesting of cranberries required an average of 46 man-hours an acre and ranged from 30 in New Jersey to 69 in Wisconsin. Low yields in New Jersey accounted for the low harvest-labor requirements there. Harvesting was done mostly by automatic picking machines in 1964, whereas picking was done by hand or with the use of scoops 10 years earlier. Machines harvested 95 percent of the 1964 crop in Massachusetts, and eliminated about three-fifths of the hand labor needed in harvesting for all five States. Hand scoopers were still needed, however, for picking along ditches and uneven terrain where machines could not operate. Replacing full boxes with empties on machines, wheeling off, loading, and unloading required most of the hand labor used in harvesting.

To establish and bring a new cranberry bog into production requires an average of 637 man-hours per acre. It takes more than 400 man-hours an acre to scalp the sod, level the bog, build dikes, sand, plant the cuttings, and weed the stand. Maintaining the new bogs takes 70 man-hours an acre annually to weed, prune, fertilize, and flood.

DATES

Commercial production of dates is reported only in California. For proper maturing of the fruit, the date requires prolonged summer heat without rain or high humidity during the ripening period. Seedling date palms can also be grown in the Gulf States from Texas to Florida, but climatic conditions seldom permit the fruit to ripen.

In 1964, 394 hours were needed to grow and harvest an acre of dates (table 8). The preharvest operation requiring the most man-hours include bagging fruit, pollinizing, thinning, tying bunches, irrigating, and pruning. Harvest work averaged 221 man-hours an acre, of which 196 were used in picking, loading, and hauling to storage an average yield of 11,540 pounds of dates.

Picking time is affected by the type of date and age of the tree. The soft dates require more care in handling after they are picked

than do the firmer types. As the date trees become older, picking becomes more of a problem. Ladders of increasing length are used as the palms grow taller. Extension ladders of lightweight metal are favored for palms over 25 or 30 feet high. A picking belt is used to hold the worker safely suspended and allows him to pick with both hands. New devices for harvesting the fruit mechanically are being developed and are coming into commercial use. Mechanical harvest involves delay until most of the fruit on a bunch is mature. The bunch is cut, fruit is removed with a mechanical shaker, and is run through a separator into pallet bins. Dates are stored in bulk bins until needed in the packing house.

The mechanical harvesting system which has proved most practical, and has been widely used, consists of hydraulically operated towers to raise men to the level of the bunches for cutting and then to lower the bunches to shakers on the ground. Various types of towers have been used that were adapted locally from machinery developed for tree pruning, servicing electric power lines, etc. However, this machinery is expensive and requires many acres to justify its use.

The nonbearing acreage of dates required an annual average of 59 man-hours in 1964. Establishment of a date garden took 72 man-hours to prepare the ground, plant and warp the shoots, cultivate, and irrigate. After establishment, 55 man-hours per acre yearly were necessary to maintain trees to bearing age.

Labor used per acre for bearing acreage of dates in 1964 is given in the following tabulation:

State.....	California
Region.....	Pacific
Trees per acre.....	50
Man-hours used per acre	
Preharvest.....	173
Harvest	
To pick, load, and haul ¹	196
To farm grade, pack, and market ² ..	123
All harvest.....	221
Total preharvest and harvest.....	394
Percentage of crop farm graded and packed.....	20
Yield per acre (pounds).....	11,540

Labor used per acre for nonbearing acreage of dates in 1964 is given in the following tabulation:

State.....	California
Region.....	Pacific
Trees per acre.....	51
Man-hours used per acre	
To establish.....	72
To maintain	
Years.....	3
Hours per year.....	55
Total to bearing age.....	237
Annual average.....	59

¹ Dates required 1.5 to 2.0 hours per hundredweight to hand harvest, load, and haul to storage or processor. Machine harvest required only 0.2 hour per hundredweight based on a yield of 12,000 pounds per acre. Mechanical harvesting was minimal in 1964 due to high cost of machinery requiring many acres to justify its use.

² Grading and packaging was done on an estimated 20 percent of the date crop requiring an average of about 1.0 hour per hundredweight.

FIGS

Commercial production of figs in 1964 was reported only in California. Labor requirements per bearing acre of figs averaged 92 man-hours. Preharvest labor averaged 27 hours, and all harvest labor required 65 man-hours per acre. Preharvest labor varies with the variety of figs grown. Adriatics require only about three-fourths as much preharvest work as the other three main varieties. Calimyrnas require the largest number of man-hours because of the additional work of caprifying (pollinating) the crop. Of the 67,000 tons produced in 1964, approximately 85 percent were sold as dried fruit. An average of 34 man-hours per acre was needed for the 90 percent of the crop that was picked up, dried, graded, and packed on the farm.

Tree numbers varied from 25 to 75 trees per acre depending upon variety, and averaged 50 trees per acre. Fifty-five man-hours were required to establish an acre of figs. Maintenance for the four nonbearing years averaged 20 man-hours a year.

Labor used per acre for bearing acreage of figs in 1964 is given in the following tabulation:

State	California
Region	Pacific
Trees per acre	50
Man-hours used per acre	
Preharvest	27
Harvest	
To pick, load, and haul ¹	34
To farm grade, pack, and market ..	34
All harvest	65
Total preharvest and harvest	92
Percentage of crop farm graded and packed	90
Yield per acre (pounds)	6,740

Labor used per acre for nonbearing acreage of figs in 1964 is given in the following tabulation:

State	California
Region	Pacific
Trees per acre	50
Man-hours used per acre	
To establish	55
To maintain	
Years	4
Hours per year	20
Total to bearing age	135
Annual average	27

¹ Depending on yield, figs generally required from 0.45 to 0.55 hour per hundredweight to pick, load, and haul to storage or processor, and 0.50 hour per fresh hundredweight to farm dry, pack, and haul to market.

GRAPES

In 1964, grapes required an average of 91 man-hours a bearing acre for the 14 States reporting commercial production (table 8). Of this total, 45 man-hours were required for preharvest operations. Labor requirements for grapes vary according to the type of grape grown. Three major types of grapes are produced in the United States: the European type, which is grown in the Mountain and Pacific regions; the native American or fox type, which is grown in the Northeast and along the Great Lakes; and the muscadine type, which is grown in the Southeast.

Preharvest labor needs for European and fox grapes was similar, ranging from 55 to 65 man-hours an acre. Somewhat less preharvest labor was needed for muscadines. Their shallow root systems restrict cultiva-

tion, and the fewer, but larger vines per acre reduce time needed for pruning.

Harvest labor requirements also vary with the type grown. Muscadines grow in clusters of from four to ten berries each and yields are usually low. As the clusters shatter badly, pickers must exercise care in harvesting to avoid excessive loss. In 1964, growers in the Southeast used approximately 3.0 man-hours of labor to harvest a hundred pounds of muscadines. The other two types produce larger bunches of tightly clinging berries and are harvested with only a fraction of the labor necessary for muscadines. Growers in the Northeast and in the Pacific States used 0.8 and 0.3 man-hours of harvest labor, respectively, per hundred pounds of grapes.

The intended market outlet also affects the amount of harvest labor necessary. Grapes harvested for raisins or juice are harvested more rapidly than those destined for the fresh market.

Mechanical grape pickers were used only in an experimental way in 1964. Development and adjustment of vineyards for mechanical harvest and improvements in machinery will vastly affect labor requirements in future years. The shift to mechanical harvesting will not be easy, however. Hilly sites, run-down vineyards, standard trellises, and conversion costs are all obstacles that must be overcome, but substantial reductions in labor costs are expected to induce growers eventually to switch to mechanical harvesting.

Nonbearing grapes used an average of 62 man-hours an acre in 1964. The number of vines planted per acre largely determine the number of man-hours used in establishing a vineyard. In the Southeast, where muscadines are grown, establishing an average of 311 vines per acre took 109 man-hours. In New York, where American-type grapes are grown, 178 man-hours were needed to establish 691 vines per acre. California growers used only 55 man-hours of labor to plant an average of 515 European-type vines per acre. Large vineyards and considerable labor-saving equipment enabled California growers to bring new vineyards into bearing with an annual average of only 56 man-hours of labor an acre in 1964.

NECTARINES

California is the only State that reported commercial production of nectarines in 1964. On bearing acreage, 243 man-hours per acre were required, of which 160 hours were used in preharvest cultural operations. The two biggest jobs were pruning and thinning which together made up approximately 80 percent of the man-hours required in preharvest labor. Nectarines, which are very similar to peaches in appearance and genetic makeup, require essentially the same amount of labor as peaches in California.

Harvest labor requirements for nectarines amounted to 83 man-hours per acre yielding 8.16 tons of fruit. For the 5 percent of the crop graded and packed on the farm, almost as much labor was required as was needed for picking, loading, and hauling to a packing shed or storage. Nectarines are highly susceptible to bruising and must be handled carefully if they are to withstand shipment.

The nonbearing acreage of nectarines required an annual average of 46 man-hours an acre in 1964. New plantings of 108 trees per acre required 60 man-hours to establish. Annual maintenance for 3 years averaged 42 man-hours an acre, or 7 more than for peaches. Four years are necessary for both nectarines and peaches to reach bearing age.

Labor used per acre for bearing acreage of nectarines in 1964 is given in the following tabulation:

State.....	California
Region.....	Pacific
Trees per acre.....	81
Man-hours used per acre	
Preharvest.....	160
Harvest	
To pick, load, and haul ¹	80
To farm grade, pack, and market....	69
All harvest.....	83
Total preharvest and harvest.....	243
Percentage of crop farm graded and packed.....	5
Yield per acre (tons).....	8.16

Labor used per acre for nonbearing acreage of nectarines in 1964 is given in the following tabulation:

State.....	California
Region.....	Pacific
Trees per acre.....	108

Man-hours used per acre	
To establish.....	60
To maintain	
Years.....	3
Hours per year.....	42
Total to bearing age.....	186
Annual average.....	46

¹To pick, load, and haul a ton of nectarines to storage or processor required from 8 to 12 hours, depending on yield per acre. Farm grading, packing, and hauling to market required an additional 8 to 10 hours a ton.

OLIVES

Olives are grown commercially along the "thermal belt" west of the Sierra foothills in California. The hot, dry climate is essential for controlling black scale, the fruit's most destructive insect pest. Planting on the slope is advisable for frost protection. Although olive trees withstand both drought and flooding, irrigation is necessary to provide moisture throughout the growing period. These two operations, irrigation and spraying for olive and black scale, require the most preharvest labor. Preharvest work required 50 man-hours per acre of the total 144-hour labor requirement for bearing acres in 1964.

Man-hours to pick, load, and haul olives to a processor required 50 man-hours per ton as compared with 60 necessary in 1954. The respective yields were 1.89 tons in 1964 compared with 1.79 in 1954.

The nonbearing acreage of olives required an average of 16 man-hours annually. To establish a new grove of 68 trees an acre, an average of 20 man-hours an acre was needed. A yearly average of 15 man-hours an acre for 5 years was required to maintain the trees to bearing age.

Labor used per acre for bearing acreage of olives in 1964 is given in the following tabulation:

State.....	California
Region.....	Pacific
Trees per acre.....	60
Man-hours used per acre	
Preharvest.....	50

Man-hours used per acre--Continued

Harvest	
To pick, load, and haul ¹	94
To farm grade, pack, and market ²	--
All harvest	94
Total preharvest and harvest	144
Percentage of crop farm graded and packed	0
Yield per acre (tons)	1.89
Labor used per acre for nonbearing acreage of olives in 1964 is given in the following tabulation:	
State	California
Region	Pacific
Trees per acre	68
Man-hours used per acre	
To establish	20
To maintain	
Years	5
Hours per year	15
Total to bearing age	95
Annual average	16

¹ Harvest labor requirements took about 50 hours a ton to harvest and haul to a processor.

² Separate farm grading requirements were not established as more than 95 percent of the 1964 crop was delivered to processors.

PEACHES

Peaches rank along with apples as one of the most widely produced fruits; commercial production was reported in 34 States. Two-thirds of the peach acreage was located in three of the major peach producing States--California, South Carolina, and Georgia.

In 1964, bearing peach trees yielded an average of 244 bushels an acre and required 155 man-hours of labor (table 9). Preharvest labor averaged 99 man-hours an acre and ranged from 49 hours in the Northeast region to 163 in the Pacific region. One of the reasons for this was the greater amount of time required for thinning in the high-yielding irrigated orchards of the western States. (Thinning is accomplished with almond mallets, rubber-tipped poles, or by hand from ladders.) Hours per bushel to pick, load, and haul the crop to market or processor ranged from 0.15 a bushel in California to 0.52 in Alabama. The major reason for this difference was production per acre which varied from 534 to 27 bushels per acre, respectively, for the two States. Less than 1 percent of the crop was graded and packed on the farms in

California compared with an average of 40 percent for all States.

To establish an acre of new peach orchard having 92 trees required 43 man-hours. A yearly average of 35 man-hours a year for 3 years after the year of establishment was used to maintain the trees to bearing age.

PEARS

Although pears were widely grown throughout the South and in some of the midwestern States for home consumption in 1964, only 11 States reported commercial production of pears in that year compared with 30 States 10 years earlier.³ Diseases such as bacterial fireblight and pear decline, costly insect control, and high labor costs are major reasons why many growers in minor producing States abandon low-yielding orchards. California reported approximately 54 percent of the total commercial production in 1964.

Pears required an average total of 185 man-hours an acre in 1964, of which 125 hours were used in preharvest cultural operations (table 10). Preharvest labor ranged from 24 man-hours an acre in Texas to 172 in Washington. The major factor influencing the big difference in preharvest labor used is the amount of pruning required. In 1964, it took 100 man-hours to prune an acre of the irrigated orchards in California, while only 10 man-hours were used in Michigan.

Harvest labor requirements vary with yield and percentage of the crop that is farm graded and packed. Labor used in harvesting pears ranged from 23 man-hours an acre in Texas, which yielded 40 bushels an acre with 20 percent of the crop farm graded and packed, to 68 in California which averaged 485 bushels per acre with only 5 percent farm graded and packed.

The number of trees planted per acre in new pear orchards ranged from 126 in Washington to 50 in Texas. Labor required to establish an orchard varied nearly as much--47 man-hours in Texas compared with 92 man-hours in Washington. Nearly twice the

³ To compare with 1964 estimates, see U.S. Department of Agriculture Statistical Bulletin 232, Labor Used for Fruits and Trees Nuts, issued in 1958.

number of man-hours per acre are used on irrigated orchards in the Mountain and Pacific States as are used in the rest of the country.

PERSIMMONS

In 1964, a bearing acre of persimmons required 174 man-hours to grow and harvest 3.57 tons in California, the only State with commercial orchards. Preharvest work took 72 man-hours, with irrigation and pruning being the greatest labor-consuming jobs. Harvest labor requirements averaged 102 man-hours an acre. Picking, loading, and hauling the crop to storage, packing shed, or processor required 77 man-hours. When the crop was farm graded and packed, 50 man-hours an acre were required. As persimmons intended for fresh market use must be harvested when the flesh is softening, care must be taken to prevent bruising so that the crop will withstand shipment.

New plantings require very little labor. Only 25 man-hours were used to establish an acre in 1964, and the yearly maintenance to bearing age averaged only 9 man-hours a year. An annual average of 10 man-hours of labor was expended on an acre of nonbearing trees in 1964. Most of it was for irrigation.

Labor used per acre for bearing acreage of persimmons in 1964 is given in the following tabulation:

State	California
Region	Pacific
Trees per acre	95
Man-hours used per acre	
Preharvest	72
Harvest	
To pick, load, and haul ¹	77
To farm grade, pack, and market ²	50
All harvest	102
Total preharvest and harvest	174
Percentage of crop farm graded and packed	50
Yield per acre	3.57

Labor used per acre for nonbearing acreage of persimmons in 1964 is given in the following tabulation:

State	California
Region	Pacific
Trees per acre	228

Man-hours used per acre	
To establish	25
To maintain	
Years	9
Hours per year	8
Total to bearing age	97
Annual average	10

¹ Harvest labor requirements ranged from 18 to 23 man-hours a ton to pick, load, and haul to storage or processor.

² Approximately 14 hours per ton were required to farm grade, pack, and haul the crop to market.

PLUMS

Plums are produced commercially only in California and Michigan. The labor requirement for bearing acreage in California was 263 and in Michigan, 204 man-hours an acre. The 59 more man-hours in California was due mainly to three factors: California had a higher yield; twice as much of the crop was graded and packed on the farm in California; and California had a higher preharvest labor requirement because of irrigation (table 11).

To harvest 7,780 pounds an acre in Michigan in 1964, 47 man-hours were needed to pick, load, and haul the crop to packing shed, storage, or processor, and 52 man-hours were needed to grade and pack that part of the crop handled by farmers. In California, where the yield was about 1,300 pounds more per acre, 93 hours were used to harvest the crop, or 25 more than in Michigan. This difference was due mainly to the fact that 80 percent of the crop was graded and packed on the farm in California compared with only 40 percent in Michigan.

Establishing an acre of plum trees required 33 man-hours in California and 52 man-hours in Michigan. The difference was due partly to a slightly greater number of trees per acre in Michigan, but mainly because of wider use of labor-saving equipment in California. Another factor reducing the number of man-hours required in California is the State's drier climate. Insects and diseases that attack plums are less prevalent and more easily controlled in California than

in the more humid production areas of Michigan. The annual average labor used in establishing and maintaining an acre of plums to bearing age was 36 man-hours in Michigan and 29 in California.

POMEGRANATES

Pomegranates are grown commercially only in California. Although acreages planted in pomegranates have more than doubled in the past 10 years, there were only approximately 1,200 acres in 1964, which represented a very small part of the California noncitrus fruit industry.

Due to the fruit's adaptability to a wide range of soil types and only moderate irrigation requirements, many orchardists plant pomegranates on land unsuited to their major fruit crops. One of the limiting factors in pomegranate growing is temperature. Although more hardy than citrus, the tree is not in the same class as stone fruits and cannot endure temperatures lower than 8 to 15 degrees F. without serious damage, and is frozen to the ground by zero temperatures.

In 1964, labor requirements amounted to 227 man-hours an acre. Preharvest work took only 40 man-hours an acre, while harvest work involved in handling 3.62 tons took the remaining 187 man-hours. Field work--picking, loading, and hauling the crop to storage or processor--accounted for more than three-fourths of all labor used per acre.

On nonbearing trees, an average of 34 man-hours were required per acre annually. Establishment required 51 man-hours and annual maintenance per acre averaged 30 man-hours for the 4 years until commercial production started.

Labor used per acre for bearing acreage of pomegranates in 1964 is given in the following tabulation:

State	California
Region	Pacific
Trees per acre	124
Man-hours used per acre	
Preharvest	40
Harvest	
To pick, load, and haul ¹	174
To farm grade, pack, and market ² ..	18
All harvest	187
Total preharvest and harvest	227
Percentage of crop farm graded and	
packed	70
Yield per acre	3.62

Labor used per acre for nonbearing acreage of pomegranates in 1964 is given in the following tabulation:

State	California
Region	Pacific
Trees per acre	141
Man-hours used per acre	
To establish	51
To maintain	
Years	4
Hours per year	30
Total to bearing age	171
Annual average	34

¹Harvest labor requirements ranged from 40 to 50 hours a ton of pomegranates to pick, load, and haul the crop to storage or processor.

²An additional 5 to 7 hours a ton was required to grade, pack, and haul to market that part of the crop that was prepared on the farm for the fresh market.

PRUNES

Prunes are grown commercially in Idaho, Washington, Oregon, and California. The average total labor requirement on bearing acreage for the four States was 81 man-hours an acre in 1964. Of the total, 48 hours were used in preharvest activities (table 12).

Preharvest labor requirements for prunes is about one-third of that for plums. Over half of the cultural labor used on plums was for thinning. Prunes need little or no thinning. Generally, prunes require less irrigation than plums, and thus, less labor is needed for the fewer applications. Two operations, dragging and propping, are required for prunes but not for plums. As prunes are not harvested until after they have dropped, the land must be dragged and rolled smooth to facilitate pick up. The heavier yields of prunes also necessitate the propping of tree limbs.

Harvest labor requirements vary with yield and amount of farm grading and packing done. Washington had nearly three times the production of Idaho with almost the same total harvest labor requirements. The main difference was due to the much larger crop in Washington requiring about one-half the time per unit to harvest the crop. Also, the proportion of the Idaho crop graded and packed on the farm was 55 percent compared with less than 1 percent of the Washington crop.

Of the four States in which prunes are grown, fewest man-hours per acre were needed

to bring new orchards into production in California. Growers there used an annual average of 29 man-hours an acre as compared with 44 to 46 in the other three States. Larger units and modern planting machinery significantly reduced the amount of labor needed in California.

CITRUS FRUIT

In 1964, production of citrus fruit was only 77 percent of the average of the previous 10 years and was lower than any year within that period. Yet citrus production represented almost one-third of the total output of all fruits and nuts in 1964. Technological advances, especially in the field of processing, have continued to keep citrus fruit an important part of the agricultural economy.

In 1964, an average of 96 man-hours was spent per bearing acre on all citrus crops. The larger fruits--oranges and grapefruit--required significantly less labor per acre than did the smaller fruits--lemons and limes (fig. 3). Citrus averaged 17 fewer man-hours per acre than did noncitrus crops. One reason for this is that citrus fruits, except for limes, were not graded and packed on the farm. The larger the proportion of the citrus crop that is processed (approximately 35 percent in 1964) the lower the labor requirements.

In comparison with the 1954 citrus crop, 21 fewer man-hours per acre were required to harvest the 1964 crop. This was due to two major factors--a 25 percent smaller crop than in 1954 and more widespread use of mechanization. Per acre yields reported in the tables are for the 1963-64 crop year.

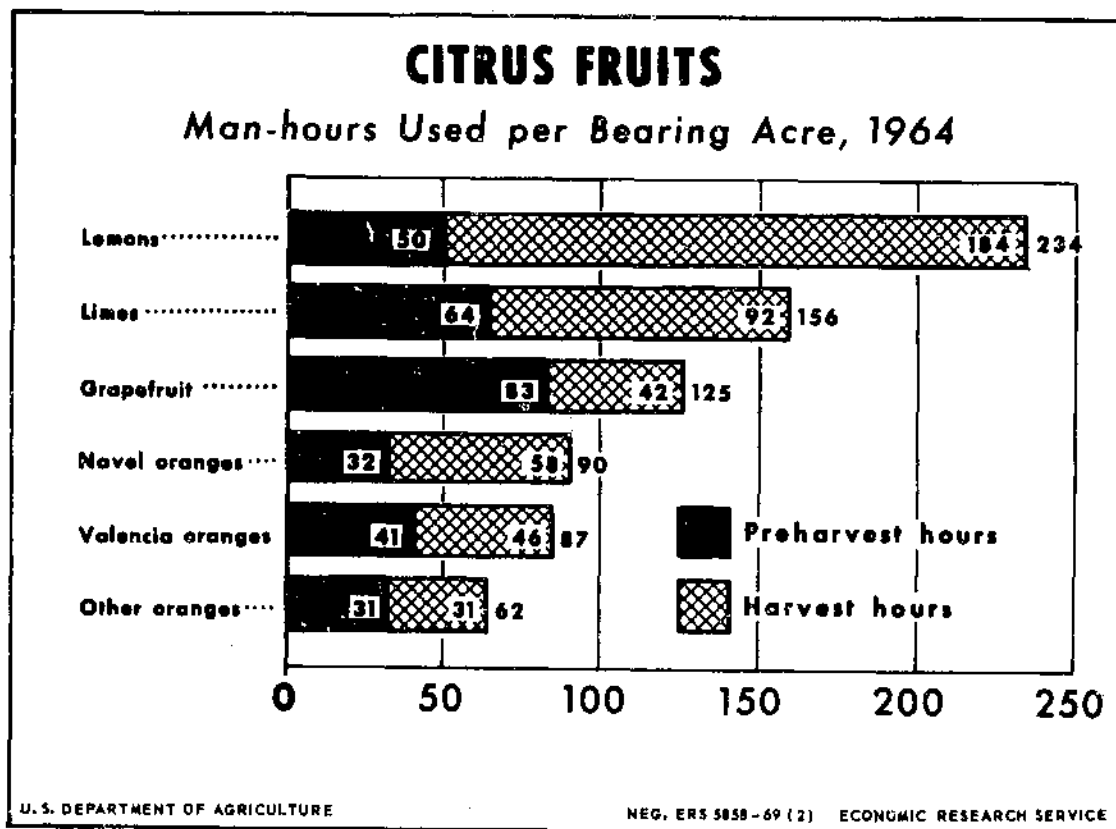


Figure 3

ORANGES, NAVEL

Navel oranges are produced commercially in California and Arizona. California produced approximately 94 percent of the 1964 crop. Total harvest labor averaged 90 man-hours an acre of which 32 hours were used in preharvest cultural operations (table 13). There was little variance between the two States in labor required for either preharvest or harvest operations.

Navel oranges do best on deep, well-drained soils in areas where the summers are hot and dry. In most locations, some form of frost protection is desirable. Wind machines are used to give protection against light frost; orchard heaters are needed for more severe freezes. Irrigation was the major labor-consuming job in 1964. It required over half of the preharvest labor input.

On nonbearing acreage, work associated with the greater number of trees per acre in California required 31 more hours to establish and 7 additional hours to maintain each year. The average annual hours per acre to bearing age was 50 in California and 39 in Arizona.

ORANGES, VALENCIA

In contrast with navel oranges, valencias grow best in a humid climate. They are produced in Florida and Texas, and in the more humid areas of Arizona and California. In 1964, an average of 87 man-hours were required to grow and harvest an acre of valencia oranges yielding 164 field boxes (averaging 86 pounds) an acre. This was only 3 hours less than the labor needed to harvest about twice as many 75-pound field boxes per acre of navel oranges. Preharvest labor requirements averaged 41 man-hours an acre and ranged from 37 man-hours in Florida to 53 in California (table 13).

Harvest labor requirements to pick, load, and haul the crop to the processor or storage ranged from 6 man-hours in Texas with a very low yield of 17 field boxes per acre to 63 man-hours in California with a yield of 250 field boxes per acre.

On nonbearing acreage, the average annual man-hours required ranged from 31 per acre

in Florida to 57 in California with an average of 35 for the four States. Trees in California were closely spaced requiring 144 man-hours to establish 180 trees, whereas the average for all States was 70 man-hours for 104 trees per acre. Yearly maintenance needs ranged from 24 man-hours an acre in Florida to 40 in California and 28 for the four States.

ORANGES, OTHER

Other oranges, which included tangerines, mandarins, and satsumas, were reported in Florida, Louisiana, Texas, and Arizona. In California, production of other oranges was included with the State's production of navel oranges.

Labor used per bearing acre of other oranges averaged 62 hours of which 31 were used in preharvest cultural operations (table 13). Preharvest labor for other oranges compared very closely with that for navel oranges. Other oranges required less harvest time than either navel oranges or valencias. This was due mainly to the much smaller yield of 116 field boxes per acre compared with 346 for navels and 164 for valencias. Yields ranged from 23 field boxes an acre in Texas to 332 in Arizona. The tree population of other oranges averaged only 67 trees per acre, whereas navel and valencia stands averaged 102 and 74 trees per acre, respectively. The fewer number of bearing trees per acre in Florida, where approximately 95 percent of the bearing acreage for other oranges was located, accounts for the low weighted average.

On nonbearing acreages, other oranges require a year longer to reach bearing age in Louisiana, Texas, and California than in Florida. The average annual labor required ranged from 22 man-hours an acre in Florida and Louisiana to 38 in Arizona with an average of 23 for the four States.

GRAPEFRUIT

Grapefruit are produced commercially in the four major citrus States--Florida, Texas, Arizona, and California. Florida accounted for approximately 78 percent of the 1964 production.

Total labor requirements averaged 125 man-hours an acre for the four States of which 83 were used in preharvest cultural operations (table 14). Yield per acre, the major factor in determining the harvest labor needed, varied widely with a range from a low of 35 field boxes an acre in Texas to 581 in Arizona.

Nonbearing acreage of grapefruit averaged 76 trees an acre with stands ranging from 70 in Florida to 98 in California. Labor needed to establish a grove ranged from 61 man-hours an acre in Florida to 108 in Texas and averaged 82 for the four States. Annual maintenance averaged 38 man-hours an acre, with Arizona using the most labor--50 man-hours a year.

LEMONS

Lemons are grown commercially only in California and Arizona. California reported approximately 89 percent of the 1964 production. Lemons had a higher harvest labor requirement than oranges, limes, or grapefruit. More than double the man-hours were used for them than for the other citrus crops. Total labor used per acre averaged 234 man-hours, 50 of which were in preharvest cultural operations (table 15). The major part of the preharvest labor was used for pruning, a task required for lemons every year. Occasionally, mechanical pruning, usually done on contract, was alternated with hand pruning.

The unevenness of maturity and ripening of the fruit necessitates several selective pickings. This repetition and the small size of the fruit are responsible for the large number of man-hours per acre needed in harvesting. By 1964, however, the following significant labor-saving changes had been made in picking practices (1) a longer interval was allowed between picks. Where formerly an orchard was picked from six to eight times during the year, the more recent normal practice was to pick four to six times; (2) Growers no longer required double clipping of the stems. Instead, pickers were allowed to use the single clip wherever possible. Long stems were still objected to but

clipper cuts no longer caused concern as they once did; (3) the fruit was dropped into the bag less carefully, and the bag was emptied into the box with less care than formerly; (4) the picker was not required to use the ring as much in determining size; (5) a specific color line was not held to so rigorously; and (6) ground fruit was picked up; processors formerly refused to accept such fruit.

Newly established lemon groves averaged 107 trees per acre and their establishment required 70 man-hours per acre for both States. In the remaining 5 years before commercial production, 50 man-hours were required annually. Irrigation, pruning, and protection from frost were responsible for most of the maintenance labor.

LIMES

Florida is the only State in which limes are produced commercially. Production is centered on the Keys and the lower mainland, where the climate is hot and humid. In 1964, an acre of limes produced an average of 9,147 pounds and required 156 man-hours of labor. Mature groves had an average of 65 trees an acre and required 64 man-hours of preharvest work. Harvesting of limes is similar to that of lemons in that the trees carry at the same time fruit in all stages from blossom to maturity. Repeated selective pickings are required to harvest the crop.

An average of 55 man-hours an acre was used to pick, load, and haul the limes from the trees to storage or packing sheds. When grading and packing was done on the farm, 73 additional man-hours an acre were used. With 50 percent of the crop graded and packed by commercial packing plants, an average of 92 man-hours an acre was used for all harvest work.

Nonbearing groves averaging 177 trees an acre required an average annual labor input of 29 man-hours a year from planting to bearing age. The labor required to establish an acre averaged 43 man-hours, while an average of 24 man-hours an acre was needed annually for maintenance.

TREE NUTS

Labor used per acre for bearing acreage of limes in 1964 is given in the following tabulation:

State.....	Florida
Region.....	Southeast
Trees per acre.....	65
Man-hours used per acre	
Preharvest.....	64
Harvest	
To pick, load, and haul ¹	55
To farm grade, pack, and market ² ..	73
All harvest.....	92
Total preharvest and harvest.....	156
Percentage of crop farm graded and packed.....	50
Yield per acre.....	9,147

Labor used per acre for nonbearing acreage of limes in 1964 is given in the following tabulation:

State.....	Florida
Region.....	Southeast
Trees per acre.....	177
Man-hours used per acre	
To establish.....	43
To maintain	
Years.....	3
Hours per year.....	24
Total to bearing age.....	115
Annual average.....	29

¹Labor used to pick, load, and haul a ton of limes to storage or processor required from 0.55 to 0.65 hour per hundredweight.

²Farm grading, packing, and hauling limes to market required from 0.75 to 0.85 hour per hundredweight.

The growth of the tree nut industry has been rapid since the early 1900's. From 1930 to 1964, almond production increased 459 percent; pecan production, about 212 percent, and walnut production, 198 percent. Percentage increases in filbert production were greater, but filberts comprised a very small part of total tree nut production.

The culture of the four tree nuts ranges from the intensive cultivation of almonds and walnuts, in which land preparation, irrigation, spraying, and pruning are common operations, to the extensive culture of wild pecans, where the only labor used is in mowing, and removing fallen limbs to facilitate harvesting. In 1964, the average amount of labor used per acre of nuts ranged from 17 man-hours for wild pecans to 59 for almonds and averaged 34 man-hours for the five types of edible nuts reported (fig. 4). Compared with citrus and noncitrus fruits, nut crops used very little labor. The average of 34 man-hours an acre for tree nuts was 66 man-hours less than the average for all fruits and nuts. These smaller labor requirements reflect the more extensive type of cultivation used and the lower yields of the nut crops.

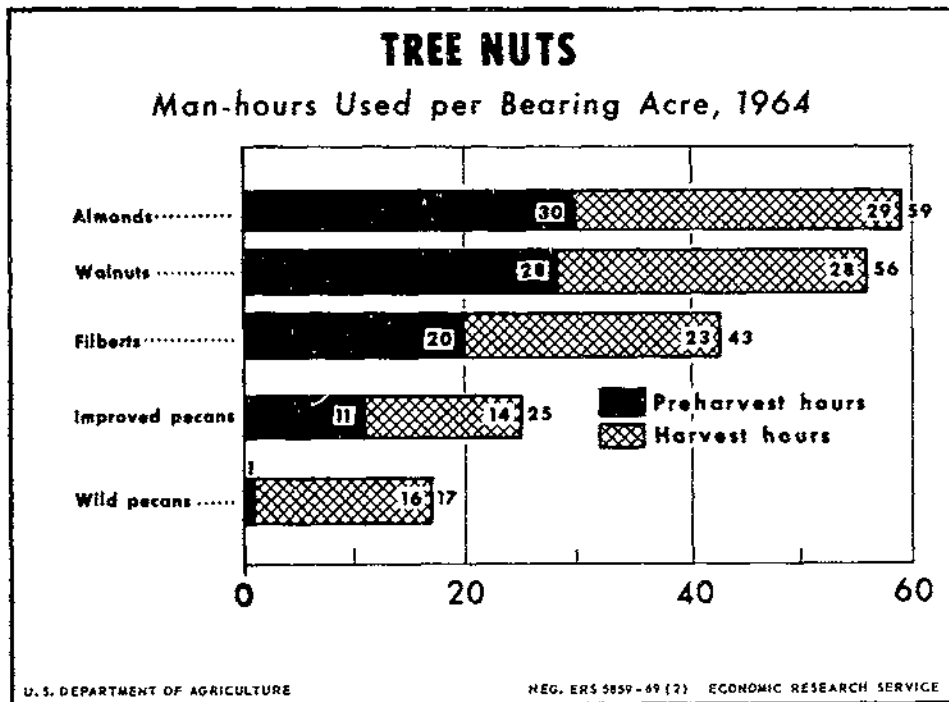


Figure 4

ALMONDS

Almonds are grown in several States, but commercial production is reported only in California. In 1964, a total of 59 man-hours were used to produce 1,412 pounds per acre. Preharvest labor required 30 man-hours and included such jobs as pruning, brush disposal, fertilizing, spraying, furrowing, disking, irrigating, and protecting from frost. Increasing use of mechanization has significantly reduced harvest labor requirements since 1954. In 1964, 2.05 man-hours per hundredweight were used compared with 3.96 man-hours 10 years earlier.⁴ Harvesting operations which included knocking, picking, and hauling out; hulling; and hauling to market required an average of 29 hours for the 1,412 pounds an acre in 1964.

Nonbearing groves averaging 75 trees an acre required an average annual labor input of 30 man-hours an acre from planting to bearing age. The labor required to establish a grove averaged 35 man-hours, and 28 man-hours per acre annually was needed for maintenance of the grove until bearing age. Irrigation used about half of the maintenance labor required.

Labor used per acre for bearing acreage of almonds in 1964 is given in the following tabulation:

State	California
Region	Pacific
Trees per acre	75
Man-hours used per acre	
Preharvest	30
Harvest	
To pick, load, and haul ¹	25
To farm grade, pack, and market ²	4
All harvest	29
Total preharvest and harvest	59
Percentage of crop farm graded and packed	90
Yield per acre	1,412

Labor used per acre for nonbearing acreage of almonds in 1964 is given in the following tabulation:

State	California
Region	Pacific
Trees per acre	75

Man-hours used per acre	
To establish	35
To maintain	
Years	3
Hours per year	28
Total to bearing age	119
Annual average	30

¹ The extensive use of mechanization has been very effective in reducing man-hours necessary for harvesting almonds. The number of hours to pick, load, and haul almonds ranged from 1.5 to 2.0 per hundredweight.

² An additional 0.25 to 0.30 hour per hundredweight was necessary to farm grade, pack, and haul to market.

FILBERTS

The filbert industry in the United States is very small, with an average annual production of approximately 5 percent of all edible tree nuts. Only Oregon and Washington reported commercial filbert production; Oregon produced 97 percent of the 1964 crop.

A total of 43 man-hours were used to produce and harvest an average yield of 986 pounds of nuts per acre (table 16). Preharvest labor accounted for 20 man-hours an acre in both States, with land preparation, pruning, and sucker control amounting to two-thirds of the total. Harvest labor needs depend on method of harvest and yield. In 1964, the majority of filberts were harvested by machine. As a result, only 2.0 man-hours were required to pick, load, and haul each hundredweight to storage or processor compared with 4.0 in 1954 (table 1).

Nonbearing acreage of filberts with an average of 97 trees per acre, required 43 man-hours to establish. Maintenance took 21 man-hours a year for an annual average of 25 man-hours an acre for the 5-year period.

PECANS, IMPROVED

Improved pecans, developed originally by grafting scions from wild species, made up approximately 31 percent of the total pecan production in 1964. Production of improved varieties were reported in 11 States. Georgia, Alabama, North Carolina, South Carolina, and New Mexico produced more pounds of improved than the wild pecans. New Mexico

⁴ To compare with 1964 estimates, see U.S. Department of Agriculture Statistical Bulletin 232, Labor Used for Fruits and Trees Nuts, issued in 1958.

reported no commercial production of wild pecans. Total harvest labor requirements ranged from 18 man-hours per acre in South Carolina to 143 on irrigated groves in New Mexico, with an average of 25 for the 11 States (table 17).

Preharvest labor averaged 11 man-hours per acre and ranged from 6 in Texas to 22 in New Mexico. Location is an important factor in reducing the harvest labor requirement. Generally, most of the larger groves are composed of improved varieties while the wild or seedling pecans are scattered through pastures, swampy areas, and even natural forests. Thus trees located in orchards lend themselves to a more organized hand or mechanical harvest requiring fewer man-hours per acre. The average amount of labor used in harvesting an acre yielding 107 pounds was 15 man-hours, 12 of which were needed to pick, load, and haul the crop. Farm grading, packing, and marketing required 3 man-hours per acre for more than 70 percent of the 1964 crop that was prepared for market by farmers or their crews. Harvest labor requirements varied according to yield, ranging from a low of 7 man-hours an acre in South Carolina to 102 in New Mexico.

Harvesting pecans has been primarily a hand operation with mechanical devices used only to shake trees in some orchards. Mechanical gathering of pecans was used mainly in an experimental way in 1964. Due to the alternating light and heavy production years of pecans, many groves are too small to permit economical use of mechanical harvesters. The large, irrigated groves in New Mexico, however, use mechanical harvesters to advantage.

Nonbearing acreage of improved pecans had an average of 14 trees an acre. Stands ranged from 11 trees an acre in the Appalachian and Southeast regions to 32 in New Mexico. New plantings averaged 6 man-hours an acre to establish; maintenance required 5 man-hours annually for 10 years in growing the trees to bearing age.

PECANS, WILD

Naturally seeded wild pecans, often referred to as seedling or native pecans, are

of commercial importance in 10 Southern States. In some States, production of wild pecans is much higher than of improved varieties. Oklahoma and Texas, for example, reported approximately 95 and 86 percent, respectively, of the 1964 pecan crop to be composed of the wild or seedling varieties.

As wild pecan trees are not uniformly situated according to prescribed planting distances; the acreage, yield, and man-hours cannot be determined without making certain assumptions. It is assumed here that (1) the number of trees per acre is the same as for improved pecans, and (2) only the minimal of preharvest operations, such as mowing under trees before harvest, are performed.

In 1964, an average of 17 man-hours were used per acre of wild pecan trees (table 17). The labor required ranged from 10 man-hours in North Carolina which had a yield of 44 pounds per acre to 31 in Florida which had a yield of 225 pounds per acre. For an average yield of 104 pounds an acre, 14 man-hours were required to pick, load, and haul, and 3 man-hours were used to prepare the crop for market when preparation was done on the farm.

WALNUTS

Walnuts are grown commercially in California and Oregon; California grew approximately 95 percent of the crop in 1964. A total of 56 man-hours were used to cultivate and harvest an acre of walnuts yielding 1,138 pounds (table 18).

Preharvest labor required 30 man-hours per acre in California as compared with only 12 in Oregon. A major reason for the difference is that an estimated 90 percent of the California walnut orchards are irrigated, but very few acres of walnuts are irrigated in Oregon. Labor for irrigation accounts for up to 30 percent of the preharvest labor. Also, the greater number of trees per acre in California means more time spent for pruning and spraying. Harvesting the walnut crop was a highly mechanized operation in some groves, but in others it was still largely a hand operation. Harvesting includes such jobs as knocking or shaking, raking, picking up nuts,

loading, hauling, hulling, drying, grading, packing, and marketing. In 1964, machines were used in shaking 85 percent of the crop and 75 percent were mechanically picked up. The bulk of the 1964 crop was delivered to cooperatives or commercial packing sheds for grading, packing, and marketing.

Nonbearing walnut groves in California had 10 trees more per acre than those in Oregon.

High density plantings of new varieties were made in California with up to 70 trees per acre. This number was reduced by half by the time the trees matured. Annual labor used per acre averaged 26 man-hours in 1964. Establishment required 34 man-hours; yearly maintenance until the trees reached an age to be commercially productive averaged 25 man-hours per acre.

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Apricots	3	24	Prunes	12	35
Avocados	4	25	Oranges (navel, valencia, and other)	13	36
Cherries, sour	5	26	Grapefruit	14	38
Cherries, sweet	6	27	Lemons	15	39
Cranberries	7	28	Filberts	16	40
Grapes	8	29	Pecans (improved; wild)	17	41
Peaches	9	31	Walnuts	18	43

ESTIMATING LABOR REQUIREMENTS FOR OTHER THAN BASE YEAR

Man-hours per bearing acre and unit of production for individual fruit and nut crops are summarized for the United States in table 1. For the researcher, labor placement official, or farmer who needs to know the amount of labor required for different size crops in other years, this table should prove valuable. The following example is given to show how total man-hours per bearing acre may be calculated for a specific year:

Assume that apple production in 1968 is 8 percent higher than in 1964. With the same bearing acreage, this would imply a yield in 1968 of 308 bushels an acre. Preharvest labor inputs are generally independent of yield, so the constant of 58 hours an acre is used. To this is added the labor to pick, load, and haul (308 bushels x 0.2 hours = 62 hours); and the labor to farm grade, pack, and market (308 bushels x 0.1 hour x 41 percent of the crop handled in this manner = 13 hours). Thus, for a 1968 apple crop of 308 bushels an acre, the estimated total average labor input would be 133 hours per bearing acre (58 + 62 + 13). The labor coefficients per unit of output generally are valid for yields which vary not more than 10 percent from the 1964 yields. For greater yield differences, the labor per unit to pick, load, and haul would have to be adjusted. Different labor productivities are presented for varying yield levels in a footnote to each individual crop table. For orchard conditions appreciably different from the U.S. average, State or regional data in individual crop tables may be more applicable.

TABLES

Table 1.—U.S. averages: Yield and labor per bearing acre for fruits and tree nuts, 1964

Crop	Yield per acre	Preharvest labor per acre	Labor to pick, load, and haul ¹		Labor to farm grade, pack, and market ¹		Percentage farm graded and packed
			Per acre	Per unit	Per acre	Per unit	
<u>Noncitrus:</u>	<u>Bu. or Cwt.</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Percent</u>
Apples.....	285 Bu.	58	44	0.2	40	0.1	41
Apricots.....	110 Cwt.	112	71	.6	63	.6	10
Avocados.....	44 Cwt.	28	25	.6	4	.1	10
Cherries, sour.....	68 Cwt.	23	230	3.4	30	.4	3
Cherries, sweet.....	56 Cwt.	23	213	3.8	50	.9	14
Cranberries.....	64 Cwt.	134	28	.4	59	.9	11
Dates.....	115 Cwt.	173	196	1.7	123	1.1	20
Figs.....	67 Cwt.	27	34	.5	34	.5	90
Grapes.....	130 Cwt.	45	46	.4	2	(²)	16
Nectarines.....	131 Cwt.	160	80	.6	69	.5	5
Olives.....	38 Cwt.	50	94	2.5	--	--	0
Peaches.....	244 Bu.	99	48	.2	11	(²)	40
Pears.....	349 Bu.	125	56	.2	39	.1	11
Persimmons.....	71 Cwt.	72	77	1.1	50	.7	50
Plums.....	89 Cwt.	166	45	.5	59	.7	75
Pomegranates.....	72 Cwt.	40	174	2.4	18	.2	70
Prunes.....	45 Cwt.	48	70	1.6	4	.1	56
<u>Citrus:</u>							
Oranges, navel.....	189 Cwt.	32	58	.3	--	--	0
Oranges, valencia.....	130 Cwt.	41	47	.4	--	--	0
Oranges, other.....	104 Cwt.	31	31	.3	--	--	0
Grapefruit.....	206 Cwt.	83	42	.2	--	--	0
Lemons.....	230 Cwt.	50	184	.8	--	--	0
Limes.....	91 Cwt.	64	55	.6	73	.8	50
<u>Nuts:</u>							
Almonds.....	14 Cwt.	30	6	.4	4	.3	90
Filberts.....	10 Cwt.	20	20	2.0	13	1.3	20
Pecans, improved.....	1 Cwt.	11	12	12.0	3	3.0	74
Pecans, wild.....	1 Cwt.	1	14	14.0	3	3.0	52
Walnuts.....	11 Cwt.	28	28	2.0	--	--	1

¹ See terminology for description of labor included.

² Less than 0.05.

Table 2.--Apples: Labor used per acre, by States and regions, 1964¹

State and region	Bearing acreage							Percentage of crop farm graded and packed	Yield per acre
	Trees per acre	Labor per acre					Total		
		Preharvest	Harvest						
			To pick, load, and haul ²	To farm grade, pack, and market ³	All				
	<u>Number</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Percent</u>	<u>Bushels</u>	
Maine.....	42	40	39	44	72	112	75	230	
New Hampshire.....	41	40	43	41	72	112	70	237	
Vermont.....	37	40	43	44	76	116	75	239	
Massachusetts.....	46	40	46	46	78	118	70	304	
Rhode Island.....	38	40	44	30	59	99	50	245	
Connecticut.....	36	40	41	29	63	103	75	207	
New York.....	40	35	43	34	45	80	30	267	
New Jersey.....	47	40	48	34	70	110	65	403	
Pennsylvania.....	40	40	43	42	56	96	30	258	
Delaware.....	47	40	41	32	62	102	65	218	
Maryland.....	44	35	42	36	65	100	65	249	
Northeast.....	41	38	43	37	55	93	41	270	
Michigan.....	50	35	47	46	68	103	46	316	
Wisconsin.....	50	30	40	22	51	81	75	143	
Minnesota.....	60	30	40	32	56	86	50	202	
Lake States.....	50	34	46	41	65	98	51	282	
Ohio.....	38	30	40	26	60	90	78	183	
Indiana.....	37	40	41	31	67	107	85	229	
Illinois.....	48	35	39	30	55	90	55	218	
Iowa.....	45	35	35	17	50	85	90	128	
Missouri.....	45	45	40	27	60	105	75	202	
Corn Belt.....	41	35	40	27	60	95	74	199	
Kansas.....	38	40	40	24	44	84	15	160	
Northern Plains.....	38	40	40	24	44	84	15	160	
Virginia.....	43	60	42	46	62	122	43	245	
West Virginia.....	41	50	38	45	60	110	50	270	
North Carolina.....	44	65	35	24	42	107	30	130	
Kentucky.....	40	65	31	17	39	104	50	115	
Tennessee.....	43	60	27	11	36	96	80	77	
Appalachian.....	43	58	39	35	56	114	45	219	
Arkansas.....	47	40	28	16	39	79	70	93	
Delta States.....	47	40	28	16	39	79	70	93	
Montana.....	62	80	26	10	30	110	40	70	
Idaho.....	73	80	46	58	92	172	80	304	
Colorado.....	67	100	46	59	93	193	80	304	
New Mexico.....	49	80	38	29	60	140	75	152	
Utah.....	70	100	41	27	52	152	40	188	
Mountain.....	64	89	43	45	77	165	72	240	
Washington.....	59	110	52	51	55	165	5	368	
Oregon.....	75	125	45	43	47	172	5	300	
California.....	68	90	59	43	71	161	29	587	
Pacific.....	62	107	53	49	58	165	10	410	
United States.....	48	58	44	40	58	116	41	285	

See footnotes at end of table.

Table 2.--Apples: Labor used per acre, by States and regions, 1964¹--Continued

Nonbearing acreage						
State and region	Trees per acre	Labor per acre to establish	Time to maintain	Labor per acre to maintain	Total labor per acre to bearing age	Annual average
	<u>Number</u>	<u>Man-hours</u>	<u>Years</u>	<u>Man-hours per year</u>	<u>Man-hours</u>	<u>Man-hours</u>
Maine.....	46	37	5	27	172	29
New Hampshire.....	45	37	5	25	162	27
Vermont.....	41	37	5	27	172	29
Massachusetts.....	49	35	6	26	191	27
Rhode Island.....	41	35	5	20	135	22
Connecticut.....	41	35	5	26	165	28
New York.....	48	34	6	25	184	26
New Jersey.....	49	34	5	25	159	26
Pennsylvania.....	42	35	5	27	170	28
Delaware.....	49	36	5	25	161	27
Maryland.....	46	36	5	25	161	27
Northeast.....	46	35	5	26	175	27
Michigan.....	54	37	6	27	199	28
Wisconsin.....	56	41	6	25	191	27
Minnesota.....	66	41	6	25	191	27
Lake States.....	55	38	6	27	197	28
Ohio.....	41	34	5	27	169	28
Indiana.....	40	34	5	27	169	28
Illinois.....	51	44	5	25	169	28
Iowa.....	48	36	5	25	161	27
Missouri.....	47	36	5	25	161	27
Corn Belt.....	45	37	5	26	167	28
Kansas.....	41	37	5	24	157	26
Northern Plains.....	41	37	5	24	157	26
Virginia.....	46	34	6	20	154	22
West Virginia.....	44	34	6	18	142	20
North Carolina.....	47	34	5	19	129	22
Kentucky.....	42	36	5	19	131	22
Tennessee.....	45	36	5	19	131	22
Appalachian.....	46	34	6	19	142	22
Arkansas.....	49	36	5	29	181	30
Delta States.....	49	36	5	29	181	30
Montana.....	68	49	4	35	189	38
Idaho.....	77	43	4	35	183	37
Colorado.....	73	46	4	35	186	37
New Mexico.....	57	42	6	35	253	36
Utah.....	76	43	5	26	173	29
Mountain.....	70	44	5	33	199	35
Washington.....	74	45	6	35	255	36
Oregon.....	80	49	7	39	322	40
California.....	74	46	6	25	196	28
Pacific.....	74	46	6	31	234	33
United States.....	57	39	6	27	191	29

¹ The labor shown in this table involves man-hour requirements for both standard and dwarf varieties. Both are also represented in trees per acre by weighting the acres of each to obtain an average. With the exception of California, the 1964 Census was used to obtain production. The derived yield per acre shown represents all varieties of both standard and dwarf trees.

² The number of hours needed to pick, load, and haul a bushel of apples to storage or processor ranged from 0.10 to 0.40 depending on many factors, the most important of which was yield per acre. Mechanical harvesters were used little in 1964 and only in an experimental way. However, innovations such as tractor forklifts, hydraulic platforms, and bulk boxes contributed substantially in reducing the amount of labor necessary. The range in hours per bushel with different yields was as follows:

<u>Yield per acre--bushels</u>	<u>Man-hours per bushel</u>
Less than 50	0.40
50-99	.30-.40
100-199	.20-.30
200-299	.15-.20
300-499	.10-.15
500 and over	.10

³ Apples that were farm graded, packed, and hauled to market usually required an additional 0.10 to 0.20 hour of labor per bushel. In States where prepackaging is done at farm levels, the upper range would be applicable; in States where a minimum of grading is done and bulk containers are used, the lower range would be more appropriate.

Table 3.--Apricots: Labor used per acre, by States and regions, 1964

Bearing acreage								
State and region	Trees per acre	Labor per acre					Percentage of crop farm graded and packed	Yield per acre
		Preharvest	Harvest			Total		
			To pick, load, and haul ¹	To farm grade, pack, and market ²	All			
Number	Man-hours	Man-hours	Man-hours	Man-hours	Man-hours	Man-hours	Percent	Pounds
Utah.....	96	83	53	25	64	147	42	6,655
Mountain.....	96	83	53	25	64	147	42	6,655
Washington.....	95	91	69	--	69	160	0	10,645
California.....	90	113	71	65	78	191	10	11,101
Pacific.....	90	112	71	63	77	189	10	11,085
United States...	90	112	71	63	77	189	10	11,019
Nonbearing acreage								
State and region	Trees per acre	Labor per acre to establish	Time to maintain	Labor per acre to maintain	Total labor per acre to bearing age	Annual average		
	Number	Man-hours	Years	Man-hours per year	Man-hours	Man-hours		
Utah.....	96	46	3	41	169	42		
Mountain.....	96	46	3	41	169	42		
Washington.....	95	52	4	45	232	46		
California.....	90	35	4	42	203	41		
Pacific.....	90	36	4	42	205	41		
United States...	90	36	4	42	205	41		

¹ The number of man-hours necessary to pick, load, and haul a hundredweight of apricots varied with yield as shown below:

Yield per acre--hundredweight

Under 50
50-69
70-89
90-110
110 and over

Man-hours per hundredweight
(fresh weight)

0.90
.80
.70
.65
.60

² Labor to cut, dry, and pack apricots for the dried market required 0.40 to 0.60 hours per hundredweight on a fresh-weight basis. Six pounds of fresh apricots are equivalent to 1 pound of the dried fruit.

Table 4.--Avocados: Labor used per acre, by States and regions, 1964

Bearing acreage								
State and region	Trees per acre	Labor per acre					Percentage of crop farm graded and packed	Yield per acre
		Pre-harvest	Harvest			Total		
			To pick, load, and haul ¹	To farm grade, pack, and market ²	All			
	<u>Number</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Percent</u>	<u>Pounds</u>
Florida.....	70	42	31	21	42	84	50	5,204
Southeast.....	70	42	31	21	42	84	50	5,204
California.....	92	25	24	--	24	49	0	4,270
Pacific.....	92	25	24	--	24	49	0	4,270
United States..	88	28	25	4	27	56	10	4,450
Nonbearing acreage								
State and region	Trees per acre	Labor per acre to establish	Time to maintain	Labor per acre to maintain	Total labor per acre to bearing age	Annual average		
	<u>Number</u>	<u>Man-hours</u>	<u>Years</u>	<u>Man-hours per year</u>	<u>Man-hours</u>	<u>Man-hours</u>		
Florida.....	70	52	5	30	202	34		
Southeast.....	70	52	5	30	202	34		
California.....	100	68	5	40	268	45		
Pacific.....	100	68	5	40	268	45		
United States..	97	66	5	38	258	43		

¹ The number of man-hours required to pick, load, and haul a hundredweight of avocados to storage or processor depended mainly on yield per acre as is indicated in the following ranges:

<u>Yield per acre--hundredweight</u>	<u>Man-hours per hundredweight</u>
Under 40	0.40
40-49	.50
50-59	.60
60-69	.70
70 and over	.75

² Farm crews spent 0.10 to 0.15 hour per hundredweight to grade, pack, and haul the crop to market.

Table 5.--Cherries, sour: Labor used per acre, by States and regions, 1964

Bearing acreage								
State and region	Trees per acre	Labor per acre					Percentage of crop farm graded and packed	Yield per acre
		Pre-harvest	Harvest			Total		
			To pick, load and haul ¹	To farm grade, pack, and market ²	All			
	Number	Man-hours	Man-hours	Man-hours	Man-hours	Man-hours	Percent	Pounds
New York.....	87	18	233	52	234	252	2	7,073
Pennsylvania.....	89	30	275	72	284	314	12	9,179
Northeast.....	88	22	246	58	249	271	5	7,717
Michigan.....	95	22	232	55	233	255	1	7,410
Wisconsin.....	100	29	223	40	225	254	5	4,967
Lake States.....	96	23	231	53	232	255	2	7,025
Ohio.....	70	33	212	41	217	250	12	5,308
Corn Belt.....	70	33	212	41	217	250	12	5,308
Montana.....	100	19	190	--	190	209	0	3,334
Idaho.....	100	18	269	31	273	291	13	6,115
Colorado.....	100	20	185	19	197	217	13	3,676
Utah.....	110	19	170	16	171	190	5	3,097
Mountain.....	105	19	189	16	191	210	8	3,575
Washington.....	90	33	223	--	223	256	0	4,363
Oregon.....	65	25	172	--	172	197	0	3,252
Pacific.....	68	26	178	--	178	204	0	3,373
United States.....	93	23	230	50	232	255	3	6,840

Nonbearing acreage						
State and region	Trees per acre	Labor per acre to establish	Time to maintain	Labor per acre to maintain	Total labor per acre to bearing age	Annual average
	Number	Man-hours	Years	Man-hours per year	Man-hours	Man-hours
New York.....	98	53	3	30	143	36
Pennsylvania.....	97	34	3	27	175	44
Northeast.....	98	47	3	36	153	39
Michigan.....	99	55	3	47	196	49
Wisconsin.....	109	58	3	51	211	53
Lake States.....	100	55	3	47	198	49
Ohio.....	70	44	3	47	185	46
Corn Belt.....	70	44	3	47	185	46
Montana.....	110	69	4	54	285	57
Idaho.....	110	69	4	54	285	57
Colorado.....	103	74	4	58	306	61
Utah.....	115	63	4	60	303	61
Mountain.....	109	68	4	59	303	61
Washington.....	96	55	4	54	271	54
Oregon.....	69	55	4	54	271	54
Pacific.....	72	55	4	54	271	54
United States.....	98	54	3	46	201	48

¹ Labor used to pick, load, and haul a ton of sour cherries depended on many factors. The two most important were mechanization of harvest and yield per acre. Labor used per acre with different yields and with the level of mechanization of 1964 was as follows:

Yield per acre--hundredweight	Man-hours per hundredweight
Under 30	6.0
30-49	5.0-6.0
50-69	3.7-5.0
70-89	3.1-3.7
90 and over	3.0

² Farm crew used additional labor to grade, pack, and haul to market the 3 percent of the 1964 crop that was sold fresh. This labor required 0.40 to 0.60 hour per hundredweight.

Table 6.--Cherries, sweet: Labor used per acre, by States and regions, 1964

Bearing acreage								
State and region	Trees per acre	Labor per acre					Percentage of crop farm graded and packed	Yield per acre
		Preharvest	Harvest			Total		
			To pick, load, and haul ¹	To farm grade, pack, and market ²	All			
	Number	Man-hours	Man-hours	Man-hours	Man-hours	Man-hours	Percent	Pounds
New York.....	56	12	228	77	240	252	15	6,003
Pennsylvania.....	45	22	167	45	174	196	15	3,477
Northeast.....	53	15	211	68	221	236	15	5,286
Michigan.....	77	16	218	70	228	244	15	5,465
Lake States.....	77	16	218	70	228	244	15	5,465
Montana.....	75	25	203	50	213	238	20	5,081
Idaho.....	50	23	178	41	186	209	20	4,126
Colorado.....	70	27	255	73	270	297	20	5,388
Utah.....	70	25	163	35	170	195	20	3,477
Mountain.....	65	25	180	42	188	213	20	4,045
Washington.....	62	35	261	--	261	296	0	7,464
Oregon.....	68	26	200	55	206	232	10	5,406
California.....	68	22	206	56	217	239	20	5,580
Pacific.....	67	26	217	43	224	250	12	5,598
United States.....	68	23	213	50	221	244	14	5,630

Nonbearing acreage						
State and region	Trees per acre	Labor per acre to establish	Time to maintain	Labor per acre to maintain	Total labor per acre to bearing age	Annual average
	Number	Man-hours	Years	Man-hours per year	Man-hours	Man-hours
New York.....	60	53	3	30	143	36
Pennsylvania.....	56	34	3	47	175	44
Northeast.....	57	48	3	35	152	38
Michigan.....	83	38	3	47	179	45
Lake States.....	83	38	3	47	179	45
Montana.....	83	72	4	54	288	58
Idaho.....	56	59	4	51	263	53
Colorado.....	80	75	4	57	303	61
Utah.....	73	55	4	53	267	53
Mountain.....	72	62	4	53	275	55
Washington.....	76	59	5	81	464	77
Oregon.....	74	52	5	74	422	70
California.....	71	40	5	40	240	40
Pacific.....	74	51	5	67	386	64
United States.....	75	49	4	60	289	58

¹ Labor requirements are somewhat higher for harvesting sweet cherries than for harvesting sour cherries because the trade demands bruise-free fruit with stems attached. Labor used to pick, load, and haul sweet cherries to storage or processor for different yields was as follows:

Yield per acre--hundredweight	Man-hours per hundredweight
Under 30	5.0
30-49	4.0-5.0
50-69	3.7-4.0
70-89	3.3-3.7
90 and over	3.3

² Labor used to farm grade, pack, and haul the crop to market ranged from 0.7 hour per hundredweight in the West to 1.0 hour in the East.

Table 7.--Cranberries: Labor used per acre, by States and regions, 1964

Bearing acreage							
State and region	Preharvest	Labor per acre				Percentage of crop farm graded and packed	Yield per acre
		To pick, load, and haul ¹	Harvest		Total		
			To farm grade, pack, and market ²	All			
	Man-hours	Man-hours	Man-hours	Man-hours	Man-hours	Percent	100-lb. barrels
Massachusetts.....	137	37	58	43	180	10	58
New Jersey.....	153	30	44	30	183	1	44
Northeast.....	141	35	55	40	181	10	55
Wisconsin.....	100	50	93	69	169	20	93
Lake States.....	100	50	93	69	169	20	93
Washington.....	170	42	--	42	212	0	72
Oregon.....	140	38	--	38	178	0	60
Pacific.....	159	41	--	41	199	0	68
United States...	134	28	59	46	180	11	64
Nonbearing acreage							
State and region	Labor per acre to establish	Time to maintain	Labor per acre to maintain	Total labor per acre to bearing age	Annual average		
	Man-hours	Years	Man-hours per year	Man-hours	Man-hours		
Massachusetts.....	425	3	68	629	157		
New Jersey.....	434	3	76	662	166		
Northeast.....	427	3	70	637	159		
Wisconsin.....	425	3	68	629	157		
Lake States.....	425	3	68	629	157		
Washington.....	434	3	76	662	166		
Oregon.....	434	3	76	662	166		
Pacific.....	434	3	76	662	166		
United States...	427	3	70	637	159		

¹ By 1964, machines had eliminated two-thirds of the hand labor but hand scoopers were still needed for picking along ditches and uneven terrain where machines could not operate. Hand labor was also used in loading, wheeling off, and loading and unloading the berries. Man-hour requirements per barrel were as follows:

Yield per acre--barrels	Man-hours per barrel
40 and under	0.70
40-49	.65-.70
50-69	.60-.65
70-89	.55-.60
90-109	.53-.55
110 and over	.50

² If a grower screened and cleaned his berries before he delivered them to a processor, an additional 0.50 to 1.0 hour of labor per barrel was used. Farm grading, packing, and hauling to market usually required 1.0 hours of labor per barrel.

Table 8.--Grapes: Labor used per acre, by States and regions, 1964

State and region	Vines per acre	Labor per acre					Percentage of crop farm graded and packed	Yield per acre
		Pre-harvest	Harvest			Total		
			To pick, load, and haul ¹	To farm grade, pack, and market ²	All			
Number	Man-hours	Man-hours	Man-hours	Man-hours	Man-hours	Percent	Pounds	
New York.....	675	67	63	19	64	131	3	7,769
New Jersey.....	550	61	49	13	52	113	21	5,392
Pennsylvania.....	595	60	65	20	66	126	5	7,971
Northeast.....	657	65	63	19	64	130	4	7,809
Michigan.....	440	63	58	18	59	122	5	7,176
Lake States.....	440	63	58	18	59	122	5	7,176
Ohio.....	600	58	56	18	58	116	9	6,960
Iowa.....	500	58	35	10	40	98	45	3,536
Missouri.....	500	58	50	15	51	109	5	5,510
Corn Belt.....	578	58	54	17	56	114	9	6,538
North Carolina.....	250	41	105	9	107	148	18	2,922
Appalachian.....	250	41	105	9	107	148	18	2,922
South Carolina.....	410	41	153	--	153	194	0	4,850
Georgia.....	190	41	46	--	46	87	0	1,125
Southeast.....	378	41	124	--	124	165	0	3,850
Arkansas.....	540	65	158	12	159	224	7	5,428
Delta States.....	540	65	158	12	159	224	7	5,428
Arizona.....	480	53	34	2	35	88	45	3,529
Mountain.....	480	53	34	2	35	88	45	3,529
Washington.....	570	55	64	--	64	119	0	13,081
California.....	505	42	43	--	43	85	0	13,827
Pacific.....	506	42	43	--	43	86	0	13,832
United States...	514	45	46	2	46	91	16	12,957

See footnotes at end of table, page 30.

Table 8.--Grapes: Labor used per acre, by States and regions, 1964--Continued

Nonbearing acreage						
State and region	Vines per acre	Labor per acre to establish	Time to maintain	Labor per acre to maintain	Total labor per acre to bearing age	Annual average
	Number	Man-hours	Years	Man-hours per year	Man-hours	Man-hours
New York.....	691	178	2	87	352	117
New Jersey.....	567	166	2	80	326	109
Pennsylvania.....	616	172	2	83	338	113
Northeast.....	662	176	2	85	347	115
Michigan.....	550	155	2	72	299	100
Lake States.....	550	155	2	72	299	100
Ohio.....	612	161	2	80	321	107
Iowa.....	510	161	2	80	321	107
Missouri.....	510	161	2	80	321	107
Corn Belt.....	578	161	2	80	321	107
North Carolina.....	295	103	2	60	223	74
Appalachian.....	295	103	2	60	223	74
South Carolina.....	484	109	2	63	235	78
Georgia.....	204	109	2	60	229	76
Southeast.....	311	109	2	61	231	77
Arkansas.....	510	138	2	78	294	98
Delta States.....	510	138	2	78	294	98
Arizona.....	498	62	2	64	190	63
Mountain.....	498	62	2	64	190	63
Washington.....	580	62	2	80	222	74
California.....	515	55	2	57	169	56
Pacific.....	517	55	2	57	170	56
United States..	521	68	2	62	192	64

¹ The number of man-hours required to pick, load, and haul a hundredweight of grapes to storage, packing shed, or processing plant depended on many factors. Two important ones were yield per acre and type of grape. Labor requirements for picking, loading, and hauling to storage or processor were as follows, with higher labor requirements in the South reflecting the influence of the muscadine type of grapes:

Yield per acre-- hundredweight	East	South	West		
	All types	All types	Raisin grapes	Table grapes	Wine grapes
	<u>Hours per hundredweight</u>				
10-20.....	1.26	4.05	0.59	0.65	0.54
20-39.....	1.08	3.60	.54	.63	.45
40-59.....	.90	3.15	.54	.61	.36
60-79.....	.81	2.83	.49	.58	.27
80-99.....	.63	2.55	.45	.55	.24
100-119.....	--	--	.40	.53	.22
120-139.....	--	--	.36	.49	.20
140 and over.....	--	--	.31	.45	.20

² Farm grading and packing labor ranged from a high of 0.20 hour per hundredweight in the East and South to a low of 0.05 hour per hundredweight in the West.

Table 9.—Peaches: Labor used per acre, by States and regions, 1964

State and region	Trees per acre	Labor per acre					Percentage of crop farm graded and packed	Yield per acre
		Pre-harvest	Harvest			Total		
			To pick, load, and haul ¹	To farm grade, pack, and market ²	All			
New Hampshire.....	80	45	63	45	104	148	90	226
Massachusetts.....	86	47	39	31	61	108	70	155
Rhode Island.....	90	45	43	33	68	113	75	167
Connecticut.....	90	45	40	34	67	112	80	172
New York.....	90	43	43	20	61	104	90	134
New Jersey.....	90	57	53	30	74	131	70	203
Pennsylvania.....	75	45	47	25	64	109	70	167
Delaware.....	90	49	69	55	83	132	25	276
Maryland.....	80	49	53	40	81	130	70	177
Northeast.....	83	49	49	28	69	118	72	178
Michigan.....	90	59	45	24	58	117	55	162
Lake States.....	90	59	45	24	58	117	55	162
Ohio.....	85	53	39	25	59	112	80	126
Indiana.....	75	49	46	34	75	124	84	170
Illinois.....	68	53	38	30	62	115	80	150
Missouri.....	70	46	37	22	55	101	80	114
Corn Belt.....	75	51	39	27	61	112	81	137
Kansas.....	80	50	34	15	40	84	40	90
Northern Plains...	80	50	34	15	40	84	40	90
Virginia.....	85	58	46	26	64	122	70	171
West Virginia.....	80	53	46	34	70	123	70	183
North Carolina.....	93	58	15	6	19	77	70	29
Kentucky.....	75	53	38	32	63	116	78	150
Tennessee.....	90	58	39	33	68	126	89	156
Appalachian.....	87	57	32	20	47	104	72	113
South Carolina.....	95	68	18	5	20	88	50	33
Georgia.....	90	68	21	6	24	92	50	42
Alabama.....	106	87	14	5	18	105	75	27
Southeast.....	94	70	19	5	21	91	52	36
Mississippi.....	50	63	23	10	30	93	70	46
Arkansas.....	80	65	40	26	60	125	75	106
Louisiana.....	85	78	44	30	65	143	70	142
Delta States.....	74	66	37	23	54	120	73	97
Oklahoma.....	60	63	30	13	39	102	70	67
Texas.....	70	63	28	30	55	118	90	69
Southern Plains...	68	63	28	27	52	115	86	69
Idaho.....	108	96	52	41	57	153	12	207
Colorado.....	105	92	42	24	45	137	14	163
Utah.....	110	100	41	25	51	151	41	131
Mountain.....	107	94	44	27	49	143	21	163
Washington.....	85	193	64	25	65	258	5	238
Oregon.....	85	200	44	24	47	247	14	115
California.....	103	160	80	--	80	240	0	534
Pacific.....	101	163	78	2	78	241	1	504
United States...	92	99	48	11	55	155	40	244

See footnotes at end of table.

Table 9.--Peaches: Labor used per acre, by States and regions, 1964--Continued

Nonbearing acreage						
State and region	Trees per acre	Labor per acre to establish	Time to maintain	Labor per acre to maintain	Total labor per acre to bearing age	Annual average
	<u>Number</u>	<u>Man-hours</u>	<u>Years</u>	<u>Man-hours per year</u>	<u>Man-hours</u>	<u>Man-hours</u>
New Hampshire.....	90	53	4	72	341	68
Massachusetts.....	94	54	3	56	222	56
Rhode Island.....	99	50	3	40	170	42
Connecticut.....	92	54	3	54	216	54
New York.....	97	57	3	54	219	55
New Jersey.....	94	55	3	45	190	48
Pennsylvania.....	81	57	3	37	168	42
Delaware.....	94	55	3	42	181	45
Maryland.....	94	55	3	45	190	48
Northeast.....	89	56	3	43	186	47
Michigan.....	97	57	3	48	201	50
Lake States.....	97	57	3	48	201	50
Ohio.....	85	53	3	48	197	49
Indiana.....	84	50	3	50	200	50
Illinois.....	72	53	3	50	203	51
Missouri.....	76	48	3	51	201	50
Corn Belt.....	81	52	3	49	208	50
Kansas.....	80	50	4	50	250	50
Northern Plains...	80	50	4	50	250	50
Virginia.....	87	22	3	18	76	19
West Virginia.....	80	40	4	14	96	19
North Carolina.....	98	23	3	22	89	22
Kentucky.....	78	21	3	21	84	21
Tennessee.....	94	18	3	19	75	19
Appalachian.....	88	26	3	19	85	20
South Carolina.....	99	24	3	22	90	22
Georgia.....	94	24	3	23	93	23
Alabama.....	106	20	3	16	68	17
Southeast.....	97	24	3	22	90	22
Mississippi.....	52	15	3	19	72	18
Arkansas.....	85	20	3	20	80	20
Louisiana.....	88	20	3	20	80	20
Delta States.....	76	19	3	20	78	20
Oklahoma.....	67	20	3	16	68	17
Texas.....	70	25	3	23	94	24
Southern Plains....	70	24	3	22	90	23
Idaho.....	118	64	3	46	202	50
Colorado.....	110	80	3	56	248	62
Utah.....	115	60	3	37	171	43
Mountain.....	112	72	3	55	237	59
Washington.....	85	68	3	41	191	48
Oregon.....	90	64	3	44	196	49
California.....	103	48	3	37	159	40
Pacific.....	101	50	3	38	163	41
United States....	92	43	3	35	148	37

¹ The number of man-hours required to pick, load, and haul a bushel of peaches to storage or processor was determined by many factors. One of the most important factors was yield per acre. The range in hours per bushel with different yields was as follows:

<u>Yield per acre--bushels</u>	<u>Man-hours per bushel</u>
Less than 50	0.50-.60
50-99	.40-.50
100-149	.30-.40
150-299	.25-.30
300-399	.20-.25
400 and over	.15-.20

² Peaches usually required an additional 0.10 to 0.15 hour of labor per bushel to farm grade, pack, and haul to market.

Table 10.—Pears: Labor used per acre, by States and regions, 1964

Bearing acreage								
State and region	Trees per acre	Labor per acre					Percentage of crop farm graded and packed	Yield per acre
		Pre-harvest	Harvest			Total		
			To pick, load, and haul ¹	To farm grade, pack, and market ²	All			
Number	Man-hours	Man-hours	Man-hours	Man-hours	Man-hours	Percent	Bushels	
Connecticut.....	73	26	40	30	55	81	50	164
New York.....	84	28	46	22	54	82	35	176
Pennsylvania.....	65	27	39	17	45	72	34	139
Northeast.....	79	28	44	22	52	80	36	167
Michigan.....	90	28	43	19	49	77	30	161
Lake States.....	90	28	43	19	49	77	30	161
Texas.....	50	24	22	6	23	47	20	40
Southern Plains.....	50	24	22	6	23	47	20	40
Idaho.....	108	157	48	35	60	217	35	192
Colorado.....	95	157	57	36	70	227	35	303
Utah.....	100	143	49	26	58	201	35	219
Mountain.....	99	151	52	31	63	214	35	249
Washington.....	98	172	48	24	49	221	5	198
Oregon.....	92	164	57	36	61	225	10	302
California.....	100	125	65	56	68	193	5	485
Pacific.....	75	146	59	43	61	207	6	369
United States.....	93	125	56	39	60	185	11	349

Nonbearing acreage						
State and region	Trees per acre	Labor per acre to establish	Time to maintain	Labor per acre to maintain	Total labor per acre to bearing age	Annual average
	Number	Man-hours	Years	Man-hours per year	Man-hours	Man-hours
Connecticut.....	79	52	6	21	178	25
New York.....	91	65	6	23	203	29
Pennsylvania.....	69	60	6	22	192	27
Northeast.....	85	64	6	23	200	28
Michigan.....	91	55	6	28	223	32
Lake States.....	91	55	6	28	223	32
Texas.....	50	47	6	23	185	26
Southern Plains.....	50	47	6	23	185	26
Idaho.....	108	100	6	47	382	55
Colorado.....	99	95	6	47	377	54
Utah.....	104	80	6	32	272	39
Mountain.....	101	92	6	44	356	51
Washington.....	126	92	6	43	350	50
Oregon.....	85	74	6	47	356	51
California.....	102	60	6	35	270	39
Pacific.....	102	71	6	40	311	45
United States.....	99	68	6	37	288	42

¹ The number of man-hours required to pick, load, and haul a bushel of pears to storage or processor depended primarily on yield per acre. The range in hours per bushel with different yields was as follows:

Yield per acre--bushels	Man-hours per bushel
Under 50	0.50-.60
50-99	.35-.50
100-149	.30-.35
150-199	.25-.30
200-299	.20-.25
300-399	.15-.20
400 and over	.10-.15

² Pears that were farm graded, packed, and hauled to market usually required an additional 0.10 to 0.20 hour per bushel, depending on the extent of grading and the efficiency of the packing operation.

Table 11.--Plums: Labor used per acre, by States and regions, 1964

Bearing acreage								
State and region	Trees per acre	Labor per acre					Percentage of crop graded and packed	Yield per acre
		Preharvest	Harvest			Total		
			To pick, load, and haul ¹	To farm grade, pack, and market ²	All			
	<u>Number</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Percent</u>	<u>Pounds</u>
Michigan.....	98	136	47	52	68	204	40	7,780
Lake States.....	98	136	47	52	68	204	40	7,780
California.....	90	170	45	60	93	263	80	9,106
Pacific.....	90	170	45	60	93	263	80	9,106
United States...	91	166	45	59	90	256	75	8,944

Nonbearing acreage						
State and region	Trees per acre	Labor per acre to establish	Time to maintain	Labor per acre to maintain	Total labor per acre to bearing age	Annual average
	<u>Number</u>	<u>Man-hours</u>	<u>Years</u>	<u>Man-hours per year</u>	<u>Man-hours</u>	<u>Man-hours</u>
Michigan.....	103	52	4	32	180	36
Lake States.....	103	52	4	32	180	36
California.....	90	33	5	28	173	29
Pacific.....	90	33	5	28	173	29
United States...	94	38	5	29	175	31

¹ The number of man-hours required to pick, load, and haul a hundredweight of plums to storage or processor generally ranged from 0.45 to 0.80. The influence of yield on man-hour requirements was as follows:

<u>Yield per acre--hundredweight</u>	<u>Man-hours per hundredweight</u>
Under 50	0.80
50-59	.70
60-79	.60
80-99	.50
100 and over	.45

² For that part of the crop that was farm graded, packed, and hauled to market, an additional 0.65 hour was required to conduct these operations.

Table 12.--Prunes: Labor used per acre, by States and regions, 1964

Bearing acreage								
State and region	Trees per acre	Labor per acre					Percentage of crop graded, and packed ³	Yield per acre
		Pre-harvest	Harvest			Total		
			To pick, load, and haul, ¹	To farm grade, pack, and market ²	All			
	Number	Man-hours	Man-hours	Man-hours	Man-hours	Man-hours	Percent	Pounds
Idaho.....	108	45	35	18	45	90	55	5,848
Mountain.....	108	45	35	18	45	90	55	5,848
Washington.....	115	45	46	--	46	91	0.	15,318
Oregon.....	87	40	30	10	33	73	30	4,733
California.....	88	48	28	4	30	78	60	4,020
Pacific.....	89	48	31	4	33	81	56	4,412
United States..	90	48	31	4	33	81	56	4,458
Nonbearing acreage								
State and region	Trees per acre	Labor per acre to establish	Time to maintain	Labor per acre to maintain	Total labor per acre to bearing age	Annual average		
	Number	Man-hours	Years	Man-hours per year	Man-hours	Man-hours		
Idaho.....	98	57	5	42	267	44		
Mountain.....	98	57	5	42	267	44		
Washington.....	115	71	5	41	276	46		
Oregon.....	93	58	5	42	268	45		
California.....	88	33	5	28	173	29		
Pacific.....	90	37	5	30	188	31		
United States..	90	37	5	30	187	31		

¹ Prunes required less thinning than plums and thus fewer hours labor for preharvest.

² The number of man-hours required to knock, pick, load, and haul to storage, drying shed, or processor varied with yield per acre as shown below:

Yield per acre-- hundredweight	Man-hours per hundredweight
Under 40	0.80
40-49	.70
50-59	.60
60-79	.50
80-99	.45
100-119	.40
120-149	.35
150 and over	.30

³ That part of the crop sun-dried on the farm required an additional 0.10 hour per hundredweight (fresh basis); the part sold to the fresh fruit trade required approximately 0.30 hour per hundredweight to farm grade, pack, and haul to market.

Table 13.--Oranges, Navel Valencia, and other: Labor used per acre, by States and regions, 1964

Navel oranges								
Bearing acreage								
State and region	Trees per acre	Labor per acre					Percentage of crop farm graded and packed	Yield per acre
		Preharvest	Harvest			Total		
			To pick, load, and haul ¹	To farm grade, pack, and market ²	All			
Number	Man-hours	Man-hours	Man-hours	Man-hours	Man-hours	Percent	Field boxes ³	
Arizona.....	105	29	62	--	62	91	0	269
Mountain.....	105	29	62	--	62	91	0	269
California.....	102	32	58	--	58	90	0	251
Pacific.....	102	32	58	--	58	90	0	251
United States.....	102	32	58	--	58	90	0	252

Navel oranges						
Nonbearing acreage						
State and region	Trees per acre	Labor per acre to establish	Time to maintain	Labor per acre to maintain	Total labor per acre to bearing age	Annual average
	Number	Man-hours	Years	Man-hours per year	Man-hours	Man-hours
Arizona.....	107	69	5	33	234	39
Mountain.....	107	69	5	33	234	39
California.....	180	100	5	40	300	50
Pacific.....	180	100	5	40	300	50
United States.....	178	98	5	40	296	49

Valencia oranges								
Bearing acreage								
State and region	Trees per acre	Labor per acre					Percentage of crop farm graded and packed	Yield per acre
		Preharvest	Harvest			Total		
			To pick, load, and haul ¹	To farm grade, pack, and market ²	All			
Number	Man-hours	Man-hours	Man-hours	Man-hours	Man-hours	Percent	Field boxes ³	
Florida.....	65	37	42	--	42	79	0	140
Southeast.....	65	37	42	--	42	79	0	140
Texas.....	87	42	6	--	6	48	0	17
Southern Plains.....	87	42	6	--	6	48	0	17
Arizona.....	100	43	60	--	52	95	0	198
Mountain.....	100	43	60	--	52	95	0	198
California.....	100	53	63	--	63	116	0	250
Pacific.....	100	53	63	--	63	116	0	250
United States.....	74	41	47	--	46	87	0	164

Valencia oranges						
Nonbearing acreage						
State and region	Trees per acre	Labor per acre to establish	Time to maintain	Labor per acre to maintain	Total labor per acre to bearing age	Annual average
	Number	Man-hours	Years	Man-hours per year	Man-hours	Man-hours
Florida.....	85	61	4	24	157	31
Southeast.....	85	61	4	24	157	31
Texas.....	90	91	5	31	246	41
Southern Plains.....	90	91	5	31	246	41
Arizona.....	108	105	5	33	270	45
Mountain.....	108	105	5	33	270	45
California.....	180	144	5	40	342	57
Pacific.....	180	144	5	40	342	57
United States.....	104	70	4	28	193	35

See footnotes at end of table.

Table 13.--Oranges, navel, valencia, and other: Labor used per acre, by States and regions, 1964--Continued

Other oranges⁷

State and region	Trees per acre	Bearing acreage					Percentage of crop farm graded and packed	Yield per acre
		Labor per acre						
		Preharvest	Harvest			Total		
			To pick, load, and haul ¹	To farm grade, pack, and market ²	All			
	<u>Number</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Percent</u>	<u>Field boxes³</u>
Florida.....	65	31	32	--	32	63	0	120
Southeast.....	65	31	32	--	32	63	0	120
Louisiana.....	100	33	22	--	22	55	0	68
Delta States.....	100	33	22	--	22	55	0	68
Texas.....	87	35	8	--	8	43	0	23
Southern Plains.....	87	35	8	--	8	43	0	23
Arizona.....	105	36	56	--	56	92	0	332
Mountain ⁴	105	36	56	--	56	92	0	332
United States.....	67	31	31	--	31	62	0	¹⁰ 116

Other oranges⁷

State and region	Trees per acre	Nonbearing acreage					Annual average
		Labor per acre to establish	Time to maintain	Labor per acre to maintain	Total labor per acre to bearing age		
			<u>Years</u>	<u>Man-hours per year</u>	<u>Man-hours</u>	<u>Man-hours</u>	
Florida.....	85	36	4	18	108	22	
Southeast.....	85	36	4	18	108	22	
Louisiana.....	100	39	5	18	129	22	
Delta States.....	100	39	5	18	129	22	
Texas.....	87	72	5	27	207	34	
Southern Plains.....	87	72	5	27	207	34	
Arizona.....	105	91	5	28	231	38	
Mountain.....	105	91	5	28	231	38	
United States.....	65	39	4	19	116	23	

¹ The number of man-hours required to pick, load, and haul a field box of oranges to storage or processor was determined by many factors. Two of the more important of these were type of orange and yield per acre. Navel and other oranges required slightly less man-hours to harvest per box than did valencias. The ranges in hours per box for different yields were as follows, with the lower limit for navel and other oranges and the upper limit for valencias.

Yield per acre--field boxes

Under 200

200-249

250-299

300 and over

Man-hours per box

0.30-.35

.27-.30

.23-.25

.18-.20

² Labor requirements for farm grading and packing of oranges were not estimated, as most of the crop was graded and packed off the farm by nonfarm workers.

³ Seventy-five pounds.

⁴ In California, "other" oranges were included with navel oranges.

⁵ Ninety pounds in Florida and Texas, 75 pounds in Arizona and California.

⁶ Determined by using 85 pounds as a weighted average for field boxes.

⁷ Included tangerines, mandarins, and satsumas.

⁸ Ninety pounds in Florida, Louisiana, and Texas; 75 pounds in Arizona.

⁹ California "other" oranges were included with navel.

¹⁰ Ninety-pound field boxes.

Table 14.--Grapefruit: Labor used per acre, by States and regions, 1964

Bearing acreage								
State and region	Trees per acre	Labor per acre					Percentage of crop farm graded and packed	Yield per acre
		Preharvest	Harvest			Total		
			To pick, load, and haul ¹	To farm grade, pack, and market ²	All			
	<u>Number</u>	<u>Man-hours</u>	<u>Man-hour</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Percent</u>	<u>Field boxes³</u>
Florida.....	65	79	46	--	46	125	0	290
Southeast.....	65	79	46	--	46	125	0	290
Texas.....	92	79	9	--	9	88	0	35
Southern Plains...	92	79	9	--	9	88	0	35
Arizona.....	80	95	67	--	67	162	0	581
Mountain.....	80	95	67	--	67	162	0	581
California.....	98	109	52	--	52	161	0	353
Pacific.....	98	109	52	--	52	161	0	353
United States...	75	83	42	--	42	125	0	4275

Nonbearing acreage						
State and region	Trees per acre	Labor per acre to establish	Time to maintain	Labor per acre to maintain	Total labor per acre to bearing age	Annual average
	<u>Number</u>	<u>Man-hours</u>	<u>Years</u>	<u>Man-hours per year</u>	<u>Man-hours</u>	<u>Man-hours</u>
Florida.....	70	61	5	24	181	30
Southeast.....	70	61	5	24	181	30
Texas.....	80	108	5	36	288	48
Southern Plains...	80	108	5	36	288	48
Arizona.....	80	98	5	41	303	50
Mountain.....	80	98	5	41	303	50
California.....	98	91	5	36	271	45
Pacific.....	98	91	5	36	271	45
United States...	76	82	5	30	231	38

¹ The number of man-hours required to pick, load, and haul a field box of grapefruit to storage or processor usually ranged from 0.10 to 0.25 hour, depending on yield per acre and size of fruit. The ranges in hours per box for different yields were as follows:

<u>Yield per acre--field boxes</u>	<u>Man-hours per box</u>
Under 100	0.25
100-299	.16-.20
300-499	.13-.16
500-699	.10-.13
700 and over	.10

² As grapefruit were usually graded and packed in commercial packing sheds, no farm labor requirements were developed for these operations.

³ Florida and Texas field boxes averaged 80 pounds; Arizona and California field boxes averaged 65 pounds.

⁴ Determined by using 78 pounds as a weighted average for field boxes.

Table 15.--Lemons: Labor used per acre, by States and regions, 1964

Bearing acreage								
State and region	Trees per acre	Labor per acre					Percentage of crop farm graded and packed	Yield per acre
		Preharvest	Harvested			Total		
			To pick, load, and haul ¹	To farm grade, pack, and market ²	All			
	Number	Man-hours	Man-hours	Man-hours	Man-hours	Man-hours	Percent	Field boxes ³
Arizona.....	85	50	187	--	187	237	0	312
Mountain.....	85	50	187	--	187	237	0	312
California.....	90	50	184	--	184	234	0	306
Pacific.....	90	50	184	--	184	234	0	306
United States...	89	50	184	--	184	234	0	307

Nonbearing acreage						
State and region	Trees per acre	Labor per acre to establish	Time to maintain	Labor per acre to maintain	Total labor per acre to bearing age	Annual average
	Number	Man-hours	Years	Man-hours per year	Man-hours	Man-hours
Arizona.....	103	70	5	50	320	53
Mountain.....	103	70	5	50	320	53
California.....	109	70	5	50	320	53
Pacific.....	109	70	5	50	320	53
United States...	107	70	5	50	320	53

¹ The number of man-hours required to pick, load, and haul a field box of lemons to storage or processor usually ranged from 0.50 to 0.65 hour, depending on yield per acre and size of fruit. The ranges in hours per box for different yields were as follows:

Yield per acre--field box	Man-hours per field box
Under 200	0.65
200-299	.60-.65
300-399	.55-.60
400 and over	.50-.55

² As lemons were usually graded and packed in commercial packing sheds, no farm labor requirements were developed for these operations.

³ Seventy-five pounds.

Table 16.--Filberts: Labor used per acre, by States and regions, 1964

Bearing acreage								
State and region	Trees per acre	Labor per acre					Percentage of crop farm graded and packed	Yield per acre
		Preharvest	Harvest			Total		
			To pick, load, and haul ¹	To farm grade, pack, and market ²	All			
	Number	Man-hours	Man-hours	Man-hours	Man-hours	Man-hours	Percent	Pounds
Washington.....	80	20	18	10	20	40	20	657
Oregon.....	80	20	20	13	23	43	20	1,007
Pacific.....	80	20	20	13	23	43	20	986
United States...	80	20	20	13	23	43	20	986
Nonbearing acreage								
State and region	Trees per acre	Labor per acre to establish	Time to maintain	Labor per acre to maintain	Total labor per acre to bearing age	Annual average		
	Number	Man-hours	Years	Man-hours per year	Man-hours	Man-hours		
Washington.....	95	43	4	21	127	25		
Oregon.....	97	43	4	21	127	25		
Pacific.....	97	43	4	21	127	25		
United States...	97	43	4	21	127	25		

¹ Labor required to pick, load, and haul a hundredweight of filberts was determined mainly by method of harvest and the yield. The majority of filberts in Washington and Oregon were machine harvested as indicated by the following ranges:

<u>Yield per acre--pounds</u>	<u>Man-hours per hundredweight</u>
Under 500	3.0
500-799	2.5-3.0
800-999	2.0-2.5
1,000-1,199	1.7-2.0
1,200 and over	1.5

² An additional 0.50 hour per hundredweight of filberts was required to farm dry, grade, pack, and haul to market.

Table 17.--Pecans, improved and wild: Labor used per acre, by States and regions, 1964

Improved pecans								
Bearing acreage								
State and region	Trees per acre	Labor per acre					Percentage of crop farm graded and packed	Yield per acre
		Preharvest	Harvest			Total		
			To pick, load, and haul ¹	To farm grade, pack, and market ²	All			
Number	Man-hours	Man-hours	Man-hours	Man-hours	Man-hours	Percent	Pounds	
North Carolina.....	10	11	13	2	13	24	20	105
Appalachian.....	10	11	13	2	13	24	20	105
South Carolina.....	10	11	7	0	7	18	90	44
Georgia.....	10	12	7	3	10	22	90	44
Florida.....	15	15	17	3	19	34	80	199
Alabama.....	10	10	11	1	12	22	80	70
Southeast.....	10	12	8	2	11	22	88	55
Mississippi.....	10	9	19	5	22	31	60	170
Arkansas.....	12	7	13	3	14	21	20	118
Louisiana.....	14	7	29	6	33	40	60	290
Delta States.....	11	8	21	5	24	32	54	195
Oklahoma.....	12	8	13	2	15	23	90	140
Texas.....	12	6	13	4	14	20	20	122
Southern Plains...	12	6	13	4	14	20	30	125
New Mexico.....	22	22	71	37	102	124	85	1,286
Mountain.....	22	22	71	37	102	124	85	1,286
United States...	11	11	12	3	14	25	74	107

Improved pecans						
Nonbearing acreage						
State and region	Trees per acre	Labor per acre to establish	Time to maintain	Labor per acre to maintain	Total labor per acre to bearing age	Annual average
	Number	Man-hours	Years	Man-hours per year	Man-hours	Man-hours
North Carolina.....	11	5	10	4	45	4
Appalachian.....	11	5	10	4	45	4
South Carolina.....	11	5	10	4	45	4
Georgia.....	11	5	10	4	45	4
Florida.....	15	6	10	4	46	4
Alabama.....	11	6	10	5	56	5
Southeast.....	11	5	10	4	49	4
Mississippi.....	11	6	10	5	56	5
Arkansas.....	13	5	10	5	55	5
Louisiana.....	15	6	10	7	76	7
Delta States.....	13	6	10	6	62	6
Oklahoma.....	15	7	10	5	57	5
Texas.....	13	6	10	6	66	6
Southern Plains...	13	6	10	6	65	6
New Mexico.....	32	10	10	7	80	7
Mountain.....	32	10	10	7	80	7
United States...	14	6	10	5	59	5

Table 17.--Pecans, improved and wild:⁴ Labor used per acre, by States and regions, 1964--Continued

Wild pecans								
Bearing acreage ⁵								
State and region	Trees per acre	Labor per acre					Percentage of crop farm graded and packed	Yield per acre
		Preharvest ⁶	Harvest			Total		
			To pick, load, and haul ¹	To farm grade, pack, and market	All			
	Number	Man-hours	Man-hours	Man-hours	Man-hours	Man-hours	Percent	Pounds
North Carolina.....	10	2	8	1	8	10	20	44
Appalachian.....	10	2	8	1	8	10	20	44
South Carolina.....	10	2	9	1	10	12	80	49
Georgia.....	10	2	13	4	16	18	80	75
Florida.....	12	1	27	7	32	33	70	225
Alabama.....	11	2	14	3	16	18	80	104
Southeast.....	11	2	15	4	18	20	79	102
Mississippi.....	8	2	24	5	28	30	80	200
Arkansas.....	12	2	19	5	22	24	60	146
Louisiana.....	12	2	24	5	28	30	80	200
Delta States.....	10	2	23	5	27	29	77	192
Oklahoma.....	10	1	14	3	16	17	80	103
Texas.....	12	1	13	3	13	14	15	84
Southern Plains....	11	1	13	3	14	15	45	93
United States..	11	1	14	3	16	17	52	104

¹ The number of hours required to pick, load, and haul a hundredweight of pecans depends primarily on method of harvest, yield, and whether pecans are improved or wild. In 1964, hand harvest was still the most prevalent method used in gathering pecans with the possible exception of New Mexico.

Yield per acre--pounds	Man-hours per hundredweight	
	Improved	Wild
Under 100	16.0	18.0
100-199	11.0	13.0
200-299	10.0	12.0
300-499	9.0	10.0
500-699	7.0	---
700-899	6.5	---
900-1,099	6.0	---
1,100-1,399	5.5	---
1,400 and over	5.0	---

² When farmers graded and packed their crop on the farm, an additional 0.10 to 0.20 man-hours labor per hundredweight was required.

³ Less than 0.05.

⁴ Includes native or seedling pecans.

⁵ Labor requirements were developed for bearing acreage only, as wild pecans are established by nature and have no establishment and maintenance labor.

⁶ Preharvest of wild or seedling pecans consisted mainly of moving under trees before harvest.

Table 18.--Walnuts: Labor used per acre, by States and regions, 1964

Bearing acreage								
State and region	Trees per acre	Labor per acre					Percentage of crop farm graded and packed	Yield per acre
		Pre-harvest	Harvest			Total		
			To pick, load, and haul ¹	To farm grade, pack, and market ²	All			
	<u>Number</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Man-hours</u>	<u>Percent</u>	<u>Pounds</u>
Oregon.....	18	12	23	2	23	35	10	648
California.....	26	30	28	-	28	58	0	1,186
Pacific.....	25	28	28	-	28	56	1	1,138
United States..	25	28	28	-	28	56	1	1,138

Nonbearing acreage						
State and region	Trees per acre	Labor per acre to establish	Time to maintain	Labor per acre to maintain	Total labor per acre to bearing age	Annual average
	<u>Number</u>	<u>Man-hours</u>	<u>Years</u>	<u>Man-hours per year</u>	<u>Man-hours</u>	<u>Man-hours</u>
Oregon.....	22	24	8	22	200	22
California.....	32	35	7	25	210	26
Pacific.....	31	34	7	25	209	26
United States..	31	34	7	25	209	26

¹ The number of man-hours needed per acre to pick, load, and haul a hundredweight of walnuts to storage or processor depended primarily on such factors as mechanization of harvest, yield per acre, and the number of operations performed by the farm workers. The number of man-hours for the very high level of mechanization in 1964 and yield per acre was as follows:

<u>Yield per acre--pounds</u>	<u>Man-hours per hundredweight</u>
Under 500	4.0
500-699	3.5
700-899	3.0
900-1,099	2.7
1,100 and over	2.4

² Farm grading, packing, and hauling to market required an additional 0.20 to 0.25 hour per hundredweight.

STATES SHOWING COMMERCIAL FRUIT PRODUCTION, 1964

Northeast

MAINE
Apples

NEW HAMPSHIRE
Apples
Peaches

VERMONT
Apples

MASSACHUSETTS
Apples
Cranberries
Peaches

RHODE ISLAND
Apples
Peaches

CONNECTICUT
Apples
Peaches
Pears

NEW YORK
Apples
Cherries, sour
Cherries, sweet
Grapes
Peaches
Pears

NEW JERSEY
Apples
Cranberries
Grapes
Peaches

PENNSYLVANIA
Apples
Cherries, sour
Cherries, sweet
Grapes
Peaches
Pears

DELAWARE
Apples
Peaches

MARYLAND
Apples
Peaches

Lake States

MICHIGAN
Apples
Cherries, sour
Cherries, sweet
Grapes
Peaches
Pears
Plums

WISCONSIN
Apples
Cherries, sour
Cranberries

MINNESOTA
Apples

Corn Belt

OHIO
Apples
Cherries, sour
Grapes
Peaches
Pears

INDIANA
Apples
Peaches

ILLINOIS
Apples
Peaches
Pears

IOWA
Apples
Grapes

MISSOURI
Apples
Grapes
Peaches
Pears

Northern Plains

KANSAS
Apples
Peaches

Appalachian

VIRGINIA
Apples
Peaches
Pears

WEST VIRGINIA
Apples
Peaches
Pears

NORTH CAROLINA
Apples
Grapes
Peaches
Pears
Improved pecans
Wild pecans

KENTUCKY
Apples
Peaches
Pears

TENNESSEE
Apples
Peaches
Pears

Southeast

SOUTH CAROLINA

Grapes
Peaches
Improved pecans
Wild pecans

GEORGIA

Grapes
Peaches
Pears
Improved pecans
Wild pecans

FLORIDA

Avocados
Pears
Oranges, valencia
Oranges, other
Grapefruit
Limes
Improved pecans
Wild pecans

ALABAMA

Peaches
Pears
Improved pecans
Wild pecans

Delta States

MISSISSIPPI

Peaches
Pears
Improved pecans
Wild pecans

ARKANSAS

Apples
Grapes
Peaches
Pears
Improved pecans
Wild pecans

LOUISIANA

Peaches
Pears
Oranges, other
Improved pecans
Wild pecans

Southern Plains

OKLAHOMA

Peaches
Pears
Improved pecans
Wild pecans

TEXAS

Peaches
Pears
Oranges, valencia
Oranges, other
Grapefruit
Improved pecans
Wild pecans

Mountain

MONTANA

Apples
Cherries, sour
Cherries, sweet

IDAHO

Apples
Cherries, sour
Cherries, sweet
Peaches
Pears
Prunes

COLORADO

Apples
Cherries, sour
Cherries, sweet
Peaches
Pears

NEW MEXICO

Apples
Improved pecans

ARIZONA

Grapes
Oranges, navel
Oranges, valencia
Oranges, other
Grapefruit

UTAH

Apples
Apricots
Cherries, sour
Cherries, sweet
Peaches
Pears

Pacific

WASHINGTON

Apples
Apricots
Cherries, sour
Cherries, sweet
Grapes
Peaches
Prunes
Filberts

OREGON

Apples
Cherries, sour
Cherries, sweet
Cranberries
Peaches
Pears
Prunes
Filberts
Walnuts

CALIFORNIA

Apples
Apricots
Avocados
Cherries, sweet
Dates
Figs
Grapes
Nectarines
Olives
Peaches
Pears
Persimmons
Plums
Pomegranates
Prunes
Oranges, navel
Oranges, valencia
Grapefruit
Lemons
Almonds
Walnuts

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