

Man Labor Requirements for
Cane Fruits and Tomatoes
In the Willamette Valley, Oregon

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STATION BULLETIN 422

JULY 1944

FOREWORD

During the wartime period, farm labor needs have assumed national importance. Particularly is this true for crops having highly seasonal labor requirements.

The results of a farm management survey of man labor requirements for cane fruits and tomatoes in the Willamette Valley of Oregon as set forth herein should prove of value to producers, processors, and handlers of these crops and to state and government officials interested in farm labor requirements.

WM. A. SCHOENFELD, Director
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Summary of Man Labor Requirements for Cane Fruits and Tomatoes

Table 1.

Enterprise	Estimated man labor requirements per average acre per year			Approximate number of pickers per acre picked	Average pounds picked per picker per 8-hour day
	Total labor	Picking*	All other labor		
	<i>Hours</i>	<i>Hours</i>	<i>Hours</i>	<i>Number</i>	<i>Pounds</i>
Red raspberries	544.0	382.6	161.4	5.0	70.5
Black raspberries ..	382.3	232.8	149.5	4.0	97.7
Boysenberries and youngberries	450.3	262.2	188.1	4.0	145.4
Loganberries	463.4	279.9	183.5	3.0	97.9
Tomatoes	191.2	136.3	54.9	1.0	1,528.0

* Does not include supervision, checking, or hauling pickers.

Man Labor Requirements for Cane Fruits and Tomatoes in the Willamette Valley, Oregon

By

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NEED FOR MAN LABOR REQUIREMENT DATA

THE existing shortage of farm labor makes it imperative that this reduced manpower be allocated in such a way as to obtain the best results. This shortage requires careful estimating of labor needs both by the farmer and by the various agencies concerned with the employment, housing, and transportation of farm workers. Such estimates are particularly important in the case of labor brought in from a distance for peak-load jobs.

To help meet this situation, man labor requirement studies were made in 1943 on red raspberries, black raspberries, boysenberries, youngberries, loganberries, and tomatoes, in which detailed data by individual crop operations and by months were obtained.

Although only a limited number of records were taken, the information here presented is considered adequate for the purpose of estimating the farm labor demand by seasons and by months. The number of farms studied was not, however, large enough to justify the use of the data for the purpose of determining detailed costs of production.

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Acknowledgments: The Oregon Agricultural Experiment Station and the authors sincerely thank the growers who cooperated in this study for the time and care they gave in supplying first-hand field data for this study. Acknowledgments are also made to County Agricultural Agents O. E. Mikesell, Linn County; W. S. Nibler, Marion County; S. B. Hall, Multnomah County; Rex Warren, Yamhill County; J. J. Inskip, Clackamas County; and P. S. Torvend, Washington County.

Appreciation is expressed to Victor Reis, Springbrook Packing Company; Roland Jory, United Growers Association; C. B. Spencer, Spencer Canning Company; John Ramage and Timothy Bjelland, North Marion Fruit Company; J. Harry Hugill, Hubbard Fruit Growers Association; and F. J. Becker, Gresham Berry Growers Association.

Credit is due to M. D. Thomas, assistant extension economist, Oregon State College; and E. F. Torgerson, Jr., statistician, Agricultural Adjustment Agency, U. S. Department of Agriculture. Appreciation for helpful suggestions on the manuscript is extended to Professor E. L. Potter, In Charge, Division of Agricultural Economics, Oregon State College.

The authors are indebted to John C. Burtner, extension editor, Oregon State College, for the cover picture and for the pictures used in Figures 2 and 9. Appreciation is also expressed to O. T. McWhorter, extension horticulturist, Oregon State College, for the pictures used in Figures 4 and 7.

METHOD OF STUDY

The field survey method was used. Forty cane fruit and twelve tomato growers supplied data on their 1942 crops. Adjustments were made where the 1942 operations deviated from the usual production practices. Man labor requirement data were obtained on bearing acreages only. In general, the farms studied were selected at random in those parts of the Willamette Valley where the acreages of the particular enterprises were most important.

In addition to the detailed man labor requirement data obtained on individual enterprise operations, other information, some of which is included in this report, was obtained on the operator's overhead labor, crop yields per acre, other crop acreages, livestock numbers, materials used, prevailing wage rates, relative labor performance on various tasks by persons of different ages and sex, and other general questions concerning the present emergency farm problem.

AREA STUDIED: THE WILLAMETTE VALLEY

The Willamette Valley is bounded on the north by the Columbia River and extends south approximately 150 miles. It is bounded on the east by the Cascade Range and on the west by the Coast Range. The valley floor averages about 25 miles in width.

The total average annual rainfall is about 42 inches and occurs mostly in the fall, winter, and spring months. July and August, however, are near drought months, the total precipitation in this 2-month period usually averaging less than 2 inches.

The soils of the Willamette Valley vary widely due to parent materials, texture, depth, and drainage, hence there is a great diversity among the agricultural crops grown.*

EXPLANATION OF TERMS

MAN HOURS PER ACRE COVERED is a rate-of-accomplishment figure that indicates the amount of labor required to complete an operation on one acre. It represents the total time required to cover an acre as many times as is indicated. To determine the time required to perform an operation, once over, divide the "man hours per acre covered" by the "average number of times over field." For example, if plowing required 4.4 "man hours per acre covered" with 1.3

* Selby, H. E., and Fryer, Leland, *Willamette Valley Land Adaptability*, Oregon Agricultural Experiment Station Circular 120, March 1937. To quote from this circular, page 3: "For the entire Valley there are 157 named soil types and these soils vary widely in their adaptability for crop production . . . More than 50 different agricultural crops are being successfully produced commercially."

"average number of times over field" the time required per acre to perform the plowing operation, once over, would be 3.4 man hours. (See The Red Raspberry Enterprise, Table 3, page 7.)

MAN HOURS PER AVERAGE ACRE is a figure that is applicable to the entire acreage of a crop within an area such as a county, and indicates the average amount of labor that may be required per acre for all of the acreage in that crop in the area even though each acre may not have been covered by every operation. It is calculated by multiplying the "man hours per acre covered" by the "per cent of the acreage covered." For example, if plowing required 4.4 "man hours per acre covered" with 33 "per cent of acreage covered," the "man hours per average acre" would amount to 1.5. (See The Red Raspberry Enterprise, Table 3, page 7.) This figure is the one to use in estimating either the total man labor required for all operations on a particular crop for an entire area, or the total man labor required for one or more individual operations on a particular crop for an entire area.

OVERHEAD MAN LABOR represents the time spent in management and general upkeep. It includes items not readily chargeable to specific operations.

THE RED RASPBERRY ENTERPRISE

Acreage and production

Nearly one-half of the total acreage of red raspberries in Oregon is grown in Multnomah County and during the past few years there has been little change in this acreage.* The concentration of red raspberry production in Multnomah County is attributed mainly to the favorable soil conditions and the early development of a marketing organization for this product.

The 1942 red raspberry yields on the farms studied averaged 3,680 pounds per acre and compared favorably with the 3-year (1940-1942) average yield on these same farms of 3,370 pounds per acre. The 1942 yields also compared favorably with the "normal" or usual yields on these same farms. It should be pointed out, however, that the 3-year average yield, previously referred to, is somewhat higher than the state average yield of 2,746 pounds per acre for the same period.†

* The total harvested red raspberry acreage in Oregon during 1942 was 2,500 acres of which 1,200 acres were in Multnomah County. In 1943 the harvested acreage in Oregon was 2,400 of which 1,150 was in Multnomah County. *Red and Black Raspberries*, Oregon State College Extension Circular 424, February 1944.

† Ibid.

Area studied

Nine growers located in Multnomah, Linn, Washington, and Marion counties furnished data on the 1942 crops. Practically all of the red raspberries were grown on the friable soils of the Chehalis, Newberg, Willamette, and Powell series. Approximately 9 per cent of the total 1942 bearing red raspberry acreage in Multnomah, Linn, Washington, and Marion counties is covered by the records taken in this study.

Varieties and plants

The Cuthbert and Newberg were the leading varieties of red raspberries reported by the growers at the time of this study.

Approximately one-third of the red raspberry acreage was planted with a spacing distance of 8 feet by 3 feet; one-third with a spacing distance of 8 feet by 4 feet; and one-third with a distance of $8\frac{1}{2}$ feet by $3\frac{1}{4}$ feet. These spacings require 1,815, 1,361 and 1,577 plants per acre, respectively. All growers combined averaged 1,593 plants per acre.

Land use

The nine farms studied averaged nearly 72 acres in size (see Table 2). Approximately 61 acres or 85 per cent of the total farm acreage was tillable.

Slightly more than one-third of the total farm land or about 40 per cent of the tillable land was planted to cane fruit. Red raspberries utilized approximately 23 per cent of the total land and averaged approximately 16 acres per farm.

Other crop land, which utilized slightly more than one-half of the total farm acreage, was devoted mainly to truck crop production. Potatoes, cabbage, lettuce, cauliflower, melons, beets, and broccoli are some of the more important truck crops produced.

Table 2. LAND USE ON NINE FARMS PRODUCING RED RASPBERRIES FOR CANNING AND THE FRESH MARKET, WILLAMETTE VALLEY, OREGON, 1942

Use of land	Average acres per farm	Percentage of total acreage
	<i>Acres</i>	<i>Per cent</i>
Red raspberries	16.4	22.8
Other cane fruit*	7.9	11.0
Other crop land	36.9	51.3
TOTAL CROP LAND (Tillable)	61.2	85.1
NONTILLABLE LAND	10.7	14.9
TOTAL	71.9	100.0

* Black raspberries, boysenberries, youngberries, loganberries, and blackberries.

Table 3. AVERAGE MAN LABOR REQUIREMENTS PER ACRE FOR RED RASPBERRIES IN THE WILLAMETTE VALLEY, OREGON, 1942*

Operation	Average number of times over field	Man-hours per acre covered†	Percent of acreage covered	Man-hours per average acre†	Monthly distribution of man hours per average acre											
					Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Removing old canes	1.0	38.8	100	38.8	12.7	14.8	3.2	.....	.....	.....	.....	.....	.....	.6	2.3	5.2
Topping	1.0	11.9	100	11.9	2.2	5.4	3.5	.....	.....	.....	.....	.8	.....	.....	.....	.....
Brush disposal	1.0	4.4	67	3.0	.2	1.1	1.7	.....	.....	.....	.....	.....	.....	.....	.....	.....
Repairing trellis	1.0	3.3	100	3.3	.8	.9	1.2	.....	.4	.....	.....	.....	.....	.....	.....	.....
Training	1.0	8.0	100	8.0	1.0	1.8	2.1	.....	.4	.8	.2	1.0	.4	.....	.1	.2
TOTAL FOR MAINTENANCE..	.....	.....	.....	65.0	16.9	35.0	11.7	.....	.8	.8	.2	1.8	.4	.6	2.4	5.4
Fertilizing (commercial)	1.0	2.7	75	2.0	.4	.2	1.0	.4	.....	.....	.....	.....	.....	.....	.....	.....
Manuring	1.0	9.8	18	1.8	.6	.6	.2	.....	.....	.....	.....	.....	.....	.....	.....	.4
Seeding cover crop	1.0	1.5	67	1.0	.....	.....	.....	.....	.....	.....	.....	.2	.8	.....	.....	.....
TOTAL FOR FERTILIZING ..	.....	.....	.....	4.8	1.0	.8	1.2	.4	.....	.....	.....	.2	.8	.....	.....	.4
Plowing	1.3	4.4	33	1.5	.....	.....	1.0	.5	.....	.....	.....	.....	.....	.....	.....	.....
Grape hoeing	1.0	4.0	100	4.0	.....	.....	.9	2.9	.2	.....	.....	.....	.....	.....	.....	.....
Disking	5.8	5.4	100	5.4	.....	.1	1.0	1.4	1.6	.7	.....	.1	.5	.....	.....	.....
Other machine cultivating....	4.0	3.0	56	1.7	.....	.2	.2	.3	.4	.6	.....	.....	.....	.....	.....	.....
Hand hoeing	1.3	20.4	89	18.2	.....	.....	.....	7.3	8.4	.8	.3	.5	.9	.....	.....	.....
TOTAL FOR CULTIVATING....	.....	.....	.....	30.8	.....	.3	3.1	12.4	10.6	2.1	.3	.6	1.4	.....	.....	.....
Baiting for weevil	1.0	3.5	67	2.3	.....	.....	.....	.....	.7	1.2	.4	.....	.....	.....	.....	.....
Picking .....	.....	382.6	100	382.6	.....	.....	.....	.....	.....	20.3	312.2	50.1	.....	.....	.....	.....
Supervising, weighing, and checking .....	.....	42.9	100	42.9	.....	.....	.....	.....	.....	2.3	35.0	5.6	.....	.....	.....	.....
Hauling pickers .....	.....	10.8	56	6.0	.....	.....	.....	.....	.....	.3	4.9	.8	.....	.....	.....	.....
Hauling berries .....	.....	10.3	89	9.2	.....	.....	.....	.....	.....	.5	7.5	1.2	.....	.....	.....	.....
Cleaning up camp	1.0	.6	67	.4	.....	.....	.....	.....	.....	.2	.2	.....	.....	.....	.....	.....
TOTAL FOR HARVESTING....	.....	.....	.....	441.1	.....	.....	.....	.....	.....	23.6	359.8	57.7	.....	.....	.....	.....
TOTAL FOR ALL OPERATIONS..	.....	.....	.....	544.0‡	17.9	25.1	16.0	12.8	12.1	27.7	360.7	60.3	2.6	.6	2.4	5.8

* Based on data obtained from nine growers in Multnomah, Marion, Linn, and Washington counties. The total acreage of red raspberries studied was 148, and the 3-year average yield (1940-1942) was 3,370 pounds per acre for berries in full production.

† See page 4 for explanation of terms.

‡ In addition to the 544.0 man hours per average acre, it is estimated that the overhead labor on red raspberries amounted to approximately 10 per cent.

Time and rate of performance*

The period of doing the different operations varied only slightly on the farms studied. This, at least in part, may be attributed to similar soil and climatic conditions. Approximately two-thirds of the total man labor utilized occurs during July when the bulk of the harvesting is done. (See Figure 1.)

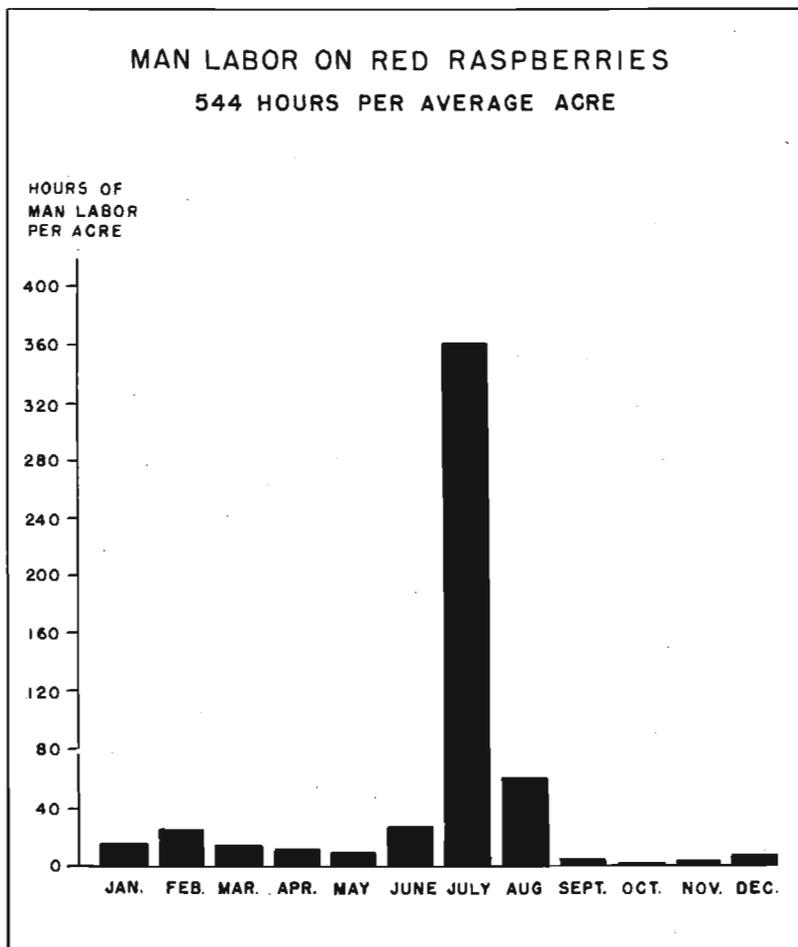


Figure 1. Distribution of Average Man Labor Requirements by Months for Red Raspberries in the Willamette Valley, Oregon, 1942. Based on data obtained from nine growers in Multnomah, Marion, Linn, and Washington counties. Three-year average yield (1940-42) was 3,370 pounds per acre on berries in full production. (Data from Table 3.)

* Man labor requirement data were obtained only on acreages in full production.

Some variability from year to year and from farm to farm in the total hourly requirement per acre and in the season of operations for the area is to be expected due to the influence of varying conditions.

The data here presented are intended to be representative of a period of years and the man hours shown represent hours of labor by adult workers.*

The data in Table 3 indicate the total labor requirements for each operation and the total labor requirements for each group of operations by months.

Preharvest operations

Removing old canes, topping, brush disposal, repairing trellis, and training, constitute the operations dealing with maintenance and together represent approximately 12 per cent of the total man labor requirement. Brush was gathered chiefly by horse and tractor-drawn rakes and by hand methods preparatory to burning although some growers disked in the canes.

Labor for all fertilizing operations represents only a small proportion of the total man labor requirement. Commercial fertilizer was applied either by hand or with attachments on the tillage machinery. Most growers used small grain drills for seeding the cover crop. A mixture consisting of oats and either vetch or Austrian winter field peas was seeded for a cover crop.

The plowing, grape hoeing, disking, other machine cultivating, and hand hoeing operations are included in the tasks of cultivating and represent approximately 6 per cent of the total man labor requirement. In general, tractor power was used for plowing, disking, and other machine cultivating, while both horses and tractors were used for grape hoeing.

Baiting for weevil was the only operation recorded for controlling pests at the time of this study. None of the growers sprayed during 1942 although a few growers had sprayed periodically during previous years.

Harvest operations

The labor for all harvest operations such as picking, supervising the pickers, weighing and checking the berries, hauling pickers, hauling the berries to a receiving station or a processing plant, and cleaning up the camp ground, represents slightly more than 81 per cent of the man labor required in red raspberry production. The

* Picking data were based on the grower's opinion of a normal crew, and therefore the figure includes some labor done by children.

operation of picking, alone, required 382.6 man hours per acre and represented 70 per cent of the total labor on red raspberries. (See Figure 2.) The bulk of this labor occurs during July.

The average picker harvested 70.5 pounds of red raspberries per 8-hour work day. Approximately 5 pickers per acre were used during 1942.



Figure 2. Children picking red raspberries in Multnomah County, Oregon.

THE BLACK RASPBERRY ENTERPRISE

Acreage and production

Black raspberries constitute an important crop on the hill-land soils of Yamhill, Washington, Clackamas, and Linn counties. Practically all of the black raspberries grown in Oregon are produced in these counties. Yamhill County contains nearly one-third of the total acreage in Oregon.*

Black raspberries are grown in Yamhill and Washington counties mainly as a "filler" crop in the newly planted walnut and filbert orchards. This filler crop enables the nut grower to receive an in-

* The total harvested black raspberry acreages in Oregon in 1942 and 1943 were 2,900 and 2,800 acres respectively. *Red and Black Raspberries*, Oregon State College Extension Circular 424, February 1944.

come that helps to defer the cost of establishing the nut orchard until it becomes productive.

During the past few years a slight but gradual increase has occurred in new plantings of black raspberries. This increase is attributed mainly to their usefulness as a "filler" crop in young nut orchards and their adaptability to the hill-land soils of these counties.

The 1942 black raspberry yields on the farms studied averaged 2,300 pounds per acre and were somewhat lower than the 3-year (1940-1942) average yield of 2,842 pounds per acre on these same farms. The 1942 yields compared favorably, however, with the "normal" or usual yields on these same farms. The 3-year average yield previously referred to is markedly higher than the state average yield of 1,855 pounds per acre for the same period.*

Area studied

Thirteen black raspberry growers, located in Yamhill, Washington, Clackamas, Linn, and Multnomah counties and representing both the canning and fresh market trade, furnished data on the 1942 crops. Approximately 5 per cent of the total 1942 bearing black raspberry acreage in the five counties surveyed is covered by the records taken in this study.

The topography of the farms ranged from gently rolling to rather steep slopes. A great deal of variability occurs in the soils of this area. They range from recent alluvial and old valley fillings to residual hill-land soils. The greater portion of the plantings studied were grown, however, on the residual hill-land soils of the Melbourne, Olympic, Aiken, and Carlton Series.

Varieties and plants

The Munger and Plum Farmer black raspberries were the principal varieties grown.

Planting distances varied considerably. This variation is attributed primarily to the planting of black raspberries in nut orchards as a "filler" crop. Approximately 25 per cent of the black raspberry acreage was planted with a spacing distance of 8 feet by 4 feet. Twenty per cent was spaced 8 feet by 5 feet and another 20 per cent was spaced 9 feet by 4½ feet. A spacing 8 feet by 4 feet required 1,361 plants per acre; 8 feet by 5 feet, 1,089; and 9 feet by 4½ feet, 1,076. All growers averaged 1,132 plants per acre.

* The total harvested black raspberry acreages in Oregon in 1942 and 1943 were 2,900 and 2,800 acres respectively. *Red and Black Raspberries*, Oregon State College Extension Circular 424, February 1944.

Land use

The thirteen farms studied averaged nearly 70 acres per farm. Approximately 89 per cent of the total farm land was tillable. (See Table 4.)

Table 4. LAND USE ON THIRTEEN FARMS PRODUCING BLACK RASPBERRIES FOR CANNING AND THE FRESH MARKET, WILLAMETTE VALLEY, OREGON, 1942

Use of land	Average acreage per farm	Percentage of total acreage
	<i>Acres</i>	<i>Per cent</i>
Black raspberries	10.2	14.8
Other cane fruit*	10.9	15.8
Other crop land	40.1	58.2
TOTAL CROP LAND (Tillable)	61.2	88.8
NONTILLABLE LAND	7.7	11.2
TOTAL	68.9	100.0

* Red raspberries, boysenberries, youngberries, loganberries, and blackberries.

Black raspberries averaged about 10 acres per farm. Other cane fruit crops utilized approximately the same proportion of the total farm land as black raspberries. Most of the hill-land farms were devoted to orchard crops such as walnuts, filberts, and prunes.

Time and rate of performance*

Black raspberry production requires labor the year around but June and July are the peak months. More than half of the total man labor requirement per acre occurred in July and the bulk of this is utilized in the harvesting operations. (See Figure 3.)

Some variability from year to year and from farm to farm in the total hourly requirement per acre and in the season of operations for the area is to be expected due to the influence of varying conditions. The data here presented are intended to be representative of a period of years and the man hours shown represent hours of labor by adult workers.†

The data in Table 5 indicates the total labor requirements for each operation and the total labor requirements for each group of operations by months.

Preharvest operations

Maintenance, which includes such tasks as removing old canes, pruning laterals, brush disposal, repairing trellis, and topping, utilized approximately 16 per cent of the total man labor required per acre. Brush was disposed of chiefly by hand although some growers disked

* Man labor requirement data were obtained only on acreages in full production.

† Picking data were based on the grower's opinion of a normal crew, and therefore the figure includes some labor done by children.

in the canes. Only a few growers used a trellis in black raspberry production.

Labor utilized for all fertilizing operations constituted only a small proportion of the total labor requirement. The greater portion of acreage manured and fertilized was done by hand methods. Broadcasting was the principal method of seeding a cover crop, although a few growers used small grain drills. A mixture of oats

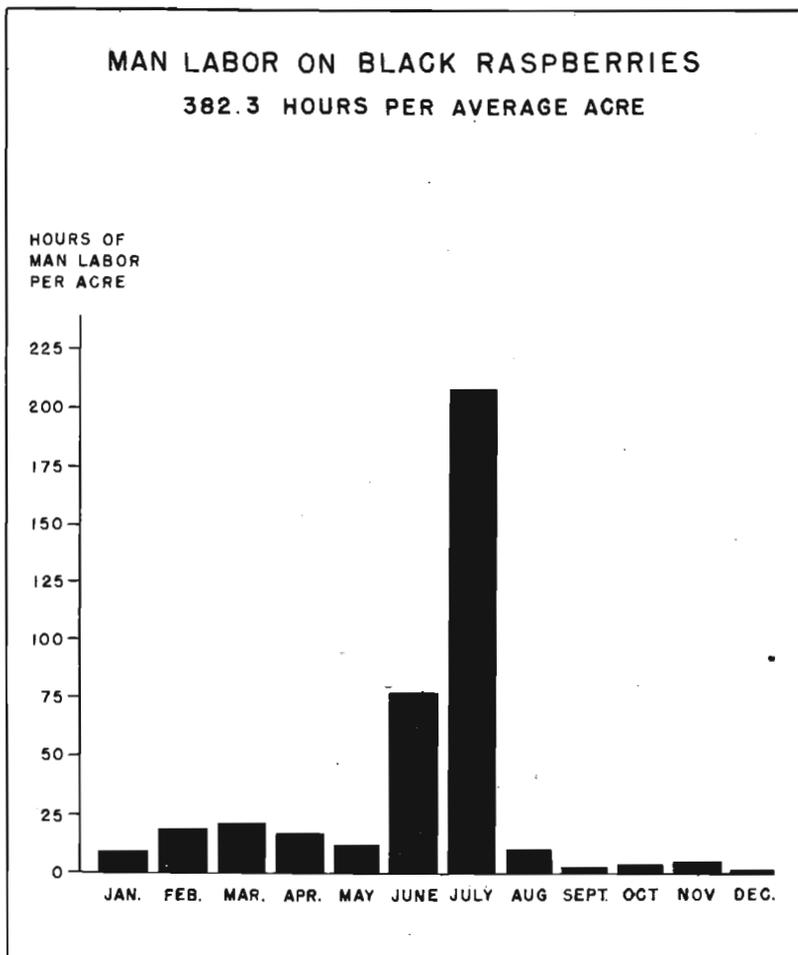


Figure 3. Distribution of Average Man Labor Requirements by Months for Black Raspberries in the Willamette Valley, Oregon, 1942. Based on data obtained from thirteen growers in Yamhill, Linn, Clackamas, Marion, and Multnomah counties. Three-year average yield (1940-42) was 2,842 pounds per acre for berries in full production. (Data from Table 5.)

Table 5. AVERAGE MAN LABOR REQUIREMENTS PER ACRE FOR BLACK RASPBERRIES IN THE WILLAMETTE VALLEY, OREGON, 1942*

Operation	Average number of times over field	Man-hours per acre covered†	Per cent of acreage covered	Man-hours per average acre†	Monthly distribution of man hours per average acre											
					Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Removing old canes	1.0	22.1	100	22.1	2.4	6.9	3.1	.8	.....	.....	2.7	4.3	.6	1.3	.....	.....
Pruning laterals	1.0	23.9	69	16.5	4.4	8.5	3.2	.....	.....	.....	.....	.....	.....	.....	.....	.4
Brush disposal	1.0	8.3	69	5.7	1.0	2.4	.7	.2	.....	.....	.6	.4	.....	.3	.....	.1
Repairing trellis	1.0	2.8	23	.6	.....	.2	.2	.....	.1	.1	.....	.....	.....	.....	.....	.....
Topping	1.0	17.2	85	14.6	.....	.....	.....	.5	3.7	9.9	.5	.....	.....	.....	.....	.....
TOTAL FOR MAINTENANCE .....	.....	.....	.....	59.5	7.8	18.0	7.2	1.5	3.8	10.0	3.8	4.7	.6	1.6	.....	.5
Fertilizing (commercial)	1.0	3.0	46	1.4	.....	.....	.....	.2	.....	.....	.....	.....	.1	.1	1.0	.....
Manuring	1.0	18.0	10	1.8	.2	.6	.6	.4	.....	.....	.....	.....	.....	.....	.....	.....
Seeding cover crop	1.0	1.5	54	.8	.....	.....	.....	.....	.....	.....	.1	.2	.4	.1	.....	.....
TOTAL FOR FERTILIZING .....	.....	.....	.....	4.0	.2	.6	.6	.6	.....	.....	.1	.2	.5	.2	1.0	.....
Plowing	1.4	5.7	38	2.2	.....	.2	.7	1.2	.1	.....	.....	.....	.....	.....	.....	.....
Disking	4.0	6.0	100	6.0	.....	.3	1.4	1.4	2.4	.3	.....	.1	.1	.....	.....	.....
Grape hoeing	1.3	5.0	46	2.3	.....	.2	1.0	.5	.4	.2	.....	.....	.....	.....	.....	.....
Harrowing (spring or spike tooth)	4.2	7.4	69	5.1	.....	.....	.3	1.9	2.1	.6	.....	.....	.2	.....	.....	.....
Cross cultivating	3.6	8.4	54	4.5	.....	.....	1.1	1.8	1.5	.1	.....	.....	.....	.....	.....	.....
Other machine cultivating	3.2	5.8	38	2.2	.....	.....	.....	.4	.5	.7	.2	.3	.1	.....	.....	.....
Hand hoeing	1.2	25.9	92	23.8	.....	.....	9.4	8.8	1.7	.....	.....	.....	.....	1.0	2.9	.....
TOTAL FOR CULTIVATING .....	.....	.....	.....	46.1	.....	.7	13.9	16.0	8.7	1.9	.2	.4	.4	1.0	2.9	.....
Spraying	1.0	1.6	8	.1	.....	.....	.....	.1	.....	.....	.....	.....	.....	.....	.....	.....
Baiting for weevil	1.0	3.2	9	.3	.....	.....	.....	.....	.3	.....	.....	.....	.....	.....	.....	.....
TOTAL FOR PEST CONTROL .....	.....	.....	.....	.4	.....	.....	.....	.1	.3	.....	.....	.....	.....	.....	.....	.....
Picking .....	.....	232.8	100	232.8	.....	.....	.....	.....	.....	54.7	173.6	4.5	.....	.....	.....	.....
Supervising, weighing, and checking .....	.....	27.8	100	27.8	.....	.....	.....	.....	.....	6.5	20.8	.5	.....	.....	.....	.....
Hauling pickers .....	.....	3.3	38	1.3	.....	.....	.....	.....	.....	.3	1.0	.....	.....	.....	.....	.....
Hauling berries .....	.....	10.4	100	10.4	.....	.....	.....	.....	.....	2.5	7.7	.2	.....	.....	.....	.....
TOTAL FOR HARVESTING .....	.....	.....	.....	272.3	.....	.....	.....	.....	.....	64.0	203.1	5.2	.....	.....	.....	.....
TOTAL FOR ALL OPERATIONS .....	.....	.....	.....	382.3†	8.0	19.3	21.7	18.2	12.8	75.9	207.2	10.5	1.5	2.8	3.9	.5

* Based on data obtained from thirteen growers in Yamhill, Washington, Linn, Clackamas, Marion, and Multnomah counties. The total acreage of black raspberries studied was 132.5, and the 3-year average yield (1940-1942) was 2,842 pounds per acre for berries in full production.

† See page 4 for explanation of terms.

‡ In addition to the 382.3 man hours per average acre, it is estimated that the overhead labor on black raspberries amounted to approximately 7 per cent.

and either vetch or Austrian winter field peas was seeded as a cover crop.

Total cultivating labor, which consists of plowing, disking, grape hoeing, harrowing, cross cultivating, other machine cultivating, and hand hoeing, used slightly more than 12 per cent of the labor required per average acre. Hand hoeing constituted more than one-half of the total cultivating requirement. Horses were used for the plowing and cross cultivating operations while tractors and horses were used intermittently for the other tillage operations.

Labor used for pest control was negligible. Only 9 per cent of the acreage was baited for weevil, while 8 per cent of the acreage was sprayed.

Harvest operations

Harvesting black raspberries, which begins during the first part of June and extends until the middle of August, utilizes approximately 71 per cent of the total man labor requirement per acre. It includes such tasks as picking, supervising the picking crew, weighing and checking, hauling pickers, and hauling the fruit to a receiving station or to a processing plant.

The operation of picking, alone, required 232.8 man hours per acre and represented approximately 61 per cent of the total labor on black raspberries. Nearly three-fourths of the picking occurred during July.

All pickers, including children as well as adults, picked 97.7 pounds of black raspberries in an 8-hour work day. Four pickers were used per acre on black raspberries during 1942, and in general growers indicated that the picking crews were nearly normal as to number and relative efficiency.

THE BOYSENBERRY AND YOUNGBERRY ENTERPRISE

Acreage and production

Boysenberries and youngberries are considered as one enterprise in this study due to similarity of production practices. The total man labor requirement is approximately the same for the two varieties of berries. Some growers, who raised both, reported nearly identical requirements and stated that over a period of years differences were not significant.

Marion County contains more than one-third of the combined boysenberry and youngberry acreage in Oregon.* Multnomah, Washington, and Clackamas counties grow the bulk of the remaining acreage.

The 1942 boysenberry and youngberry yields on the farms studied averaged 6,120 pounds per acre and were considerably higher than the 3-year (1940-42) average yield on these same farms of 4,764 pounds per acre. The 1942 yields were also higher than the "normal" or usual yields on these same farms. The 3-year average yield previously referred to is also considerably higher than the state average yield of 3,202 pounds per acre for the same period.†

Area studied

Twelve growers, located in Marion, Multnomah, and Washington counties, furnished data on their 1942 boysenberry and youngberry production. Approximately 8 per cent of the 1942 bearing boysenberry and youngberry acreage in the three counties surveyed is covered by the records taken in this study.

In general, the topography of the farms studied was level to gentle rolling. Most of the berries were grown on the light and friable soils of the Chehalis, Newberg, Willamette, and Powell series.

Varieties and plants

Forty per cent of all the boysenberry and youngberry acreage was planted with a spacing distance of 8 feet by 8 feet. This system of planting requires 681 plants per acre. All growers averaged 692 plants per acre.

Land use

The twelve farms studied averaged approximately 87 acres per farm. Tillable crop land averaged about 74 acres and represented approximately 85 per cent of the total farm land. (See Table 6.)

Boysenberries and youngberries combined averaged slightly more than 10 acres per farm while other cane fruit averaged nearly 4 acres. Other crop land, which consisted chiefly of legumes, grains, and some truck crops, averaged about 60 acres per farm. In general, the farms studied were diversified crop and livestock farms.

* In 1942 the combined total harvested acreage of boysenberries and youngberries in Oregon was 2,800 of which 800 were in Marion County. The 1943 harvested acreage of boysenberries and youngberries in Oregon was 2,600 of which 770 was in Marion County. *Loganberries and Boysenberries and Youngberries*, Oregon State College Extension Circular 427, March 1944.

† Ibid.

Table 6. LAND USE ON TWELVE FARMS PRODUCING BOYSENBERRIES AND YOUNGBERRIES FOR CANNING AND THE FRESH MARKET, WILLAMETTE VALLEY, OREGON, 1942

Use of land	Average acres per farm	Percentage of total acreage
Boysenberries and youngberries	10.2	11.7
Other cane fruit*	3.8	4.4
Other crop land	60.2	69.1
TOTAL CROP LAND (Tillable)	74.2	85.2
NONTILLABLE LAND	12.9	14.8
TOTAL	87.1	100.0

* Loganberries, blackberries, red raspberries, and black raspberries.

Time and rate of performance*

Approximately 58 per cent of the labor required per acre in boysenberry and youngberry production occurred during July and the greater portion of this labor was utilized in harvesting the berries. (See Figure 4.) Boysenberries and youngberries require some labor the year around. (See Figure 5.)

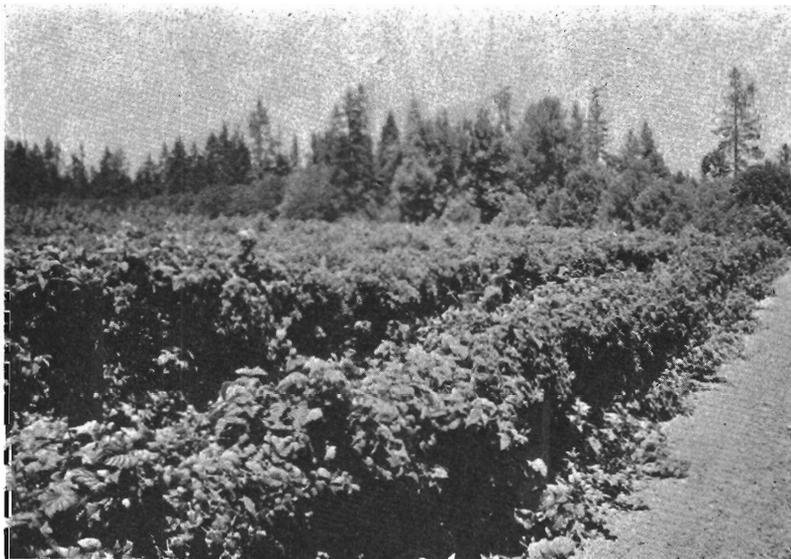


Figure 4. A boysenberry yard at harvest. The bulk of the picking is usually done in July.

Even though the boysenberry and youngberry acreages recorded in this study represent several localities in the Willamette Valley, most of the farms had similar conditions with respect to soils, yields, and tillage practices. Some variability from year to year and from farm to farm in the total hourly requirement per acre and in the season of operations for the area is to be expected due to the influence of varying conditions. The data here presented are intended

* Man labor requirement data were obtained only on acreages in full production.

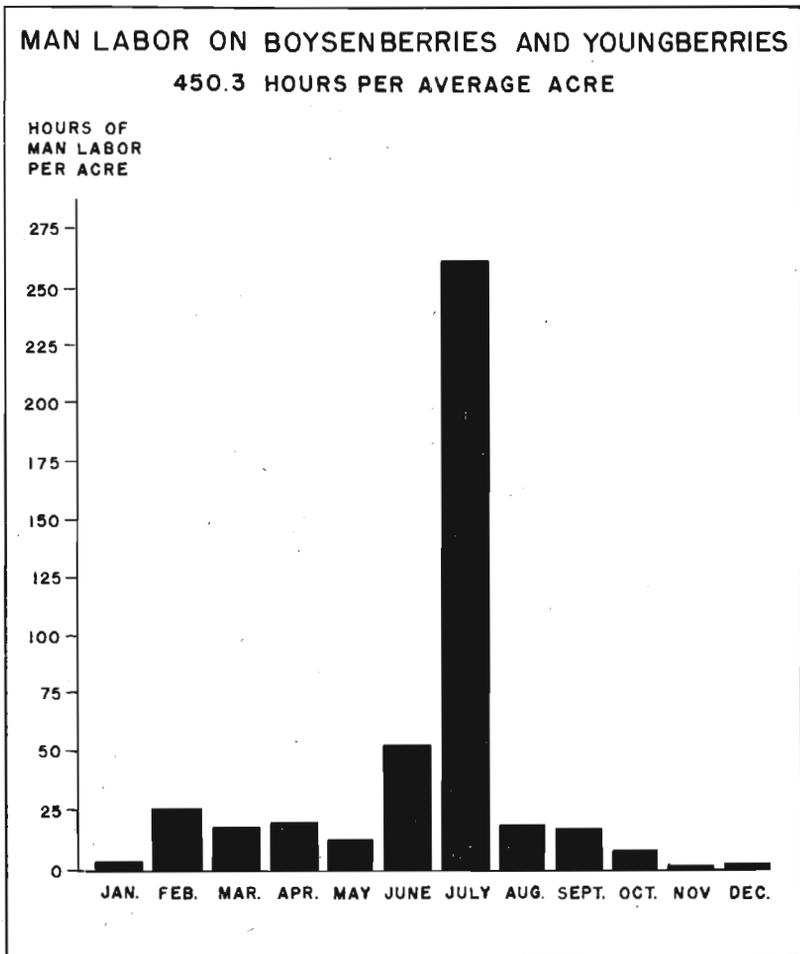


Figure 5. Distribution of Average Man Labor Requirements by Months for Boysenberries and Youngberries in the Willamette Valley, Oregon, 1942. Based on data obtained from twelve growers in Marion, Multnomah, and Linn counties. Three-year average yield (1940-42) was 4,764 pounds per acre for both kinds of berries in full production. (Data from Table 7.)

to be representative of a period of years and the man hours shown represent hours of labor by adult workers.*

The data in Table 7 indicate the total labor requirements for each operation and the total labor requirements for each group of operations by months.

* Picking data were based on the grower's opinion of a normal crew, and therefore the figure includes some labor done by children.

Table 7. AVERAGE MAN LABOR REQUIREMENTS PER ACRE FOR BOYSENBERRIES AND YOUNGBERRIES IN THE WILLAMETTE VALLEY, OREGON, 1942*

Operation	Average number of times over field	Man-hours per acre covered†	Per cent of acreage covered	Man-hours per average acre‡	Monthly distribution of man hours per average acre											
					Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
					Repairing trellis	1.0	3.4	100	3.4	.8	2.0
Pruning, brush disposal and training	1.0	47.4	100	47.4	.8	21.3	11.8	5.1	.....	1.3	.4	.4	1.3	3.4	.8	.8
Removing old canes	1.0	29.5	100	29.5	.....	1.2	1.2	.....	.....	.....	.6	12.1	11.1	3.3	.....	.....
Brush disposal (fall)	1.0	8.5	100	8.5	.....	.....	.6	.....	.....	.....	.2	3.5	3.2	1.0	.....	.....
Staking and laying back	1.8	19.1	83	15.9	.....	.....	.....	.....	2.8	8.8	1.9	2.2	.2	.....	.....	.....
Gathering stakes	1.0	3.4	83	2.8	1.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.7	.7
TOTAL FOR MAINTENANCE.....	.....	.....	.....	107.5	3.0	24.5	13.6	5.1	2.8	10.1	3.1	13.2	15.8	8.1	1.5	1.7
Fertilizing (commercial)	1.0	25.8	21	.5	.....	.....	.1	.3	.....	.....	.....	.1	.....	.....	.....	.....
Trucking manure to farm ..	1.0	16.0	3	.5	.....	.....	.....	.2	.....	.....	.....	.1	.2	.....	.....	.....
Manuring	1.0	11.0	32	3.5	.2	.4	1.5	.6	.....	.....	.....	.....	.4	.4	.....	.....
Hauling and spreading straw	1.0	8.0	8	.6	.1	.2	.....	.....	.....	.....	.....	.2	.1	.....	.....	.....
Seeding cover crop	1.0	1.4	75	1.1	.....	.....	.....	.....	.....	.....	.....	.4	.5	.2	.....	.....
TOTAL FOR FERTILIZING.....	.....	.....	.....	6.2	.3	.6	1.6	1.1	.....	.....	.....	.8	1.2	.6	.....	.....
Plowing	1.2	6.1	50	3.1	.....	.4	1.5	1.2	.....	.....	.....	.....	.....	.....	.....	.....
Grape hoeing	1.7	4.4	75	3.3	.....	.....	.8	1.6	.9	.....	.....	.....	.....	.....	.....	.....
Disking	5.7	7.4	100	7.4	.....	.....	.9	3.6	2.5	.4	.....	.....	.....	.....	.....	.....
Spring-tooth harrowing	5.7	5.7	58	3.3	.....	.....	.4	1.2	.8	.4	.2	.1	.1	.1	.....	.....
Other machine cultivating..	4.5	6.8	17	1.2	.....	.....	.....	.....	.2	.4	.....	.....	.3	.3	.....	.....
Hand hoeing	1.0	14.4	75	10.8	.....	.....	.6	4.2	5.4	.6	.....	.....	.....	.....	.....	.....
TOTAL FOR CULTIVATING.....	.....	.....	.....	29.1	.....	.4	4.2	11.8	9.8	1.8	.2	.1	.4	.4	.....	.....
Spraying	1.8	17.3	33	5.7	.....	.....	.....	2.6	.5	.....	.....	.5	1.6	.5	.....	.....
Baiting for weevil	1.0	6.7	8	.5	.....	.....	.....	.3	.2	.....	.....	.....	.....	.....	.....	.....
TOTAL FOR PEST CONTROL..	.....	.....	.....	6.2	.....	.....	.....	2.9	.7	.....	.....	.5	1.6	.5	.....	.....
Irrigating	1.0	4.0	8	.3	.....	.....	.....	.....	.....	.1	.2	.....	.....	.....	.....	.....
Picking .....	.....	262.2	100	262.2	.....	.....	.....	.....	.....	36.7	225.5	.....	.....	.....	.....	.....
Supervising, weighing and checking .....	.....	29.1	100	29.1	.....	.....	.....	.....	.....	4.1	25.0	.....	.....	.....	.....	.....
Hauling berries .....	.....	8.6	100	8.6	.....	.....	.....	.....	.....	1.2	7.4	.....	.....	.....	.....	.....
Hauling pickers .....	.....	3.3	33	1.1	.....	.....	.....	.....	.....	.1	1.0	.....	.....	.....	.....	.....
TOTAL FOR HARVESTING .....	.....	.....	.....	301.0	.....	.....	.....	.....	.....	42.1	258.9	.....	.....	.....	.....	.....
TOTAL FOR ALL OPERATIONS.....	.....	.....	.....	450.3‡	3.3	25.5	19.4	20.9	13.3	54.1	262.4	19.6	19.0	9.6	1.5	1.7

* Based upon data obtained from twelve growers in Marion, Multnomah, and Washington counties. The total acreage of boysenberries and youngberries studied was 122, and the 3-year average yield (1940-1942) was 4,764 pounds per acre for both varieties of berries in full production.

† See page 4 for explanation of terms.

‡ In addition to the 450.3 man hours per average acre, it is estimated that the overhead labor on boysenberries and youngberries amounted to approximately 9 per cent.

Preharvest operations

Maintenance, which includes such operations as pruning, brush disposal, removing old canes, repairing trellises, staking and laying back the canes, and gathering the stakes, utilized approximately 24 per cent of the total labor requirement. Most of this work is usually done during the early spring and fall months. Brush disposal is done chiefly by hand methods although a few growers used tractor drawn disks. In the staking operation, wooden or wire stakes are used to hold the canes along the rows in order to prevent damage to the new canes during tillage and other operations.

Labor for fertilizing, which includes such operations as applying commercial fertilizer, trucking manure to the farm, manuring, hauling and spreading straw, and seeding the cover crop, represents only a small portion of the total labor requirement per acre. Commercial fertilizer as well as barnyard manure was spread mainly by hand methods. The principal cover crop seeded was oats mixed with either vetch or Austrian winter field peas. Most growers used small grain drills to seed the cover crop.

The cultivating operations, such as plowing, grape hoeing, disking, spring-tooth harrowing, other machine cultivating, and hand hoeing, constituted approximately 6 per cent of the total man labor requirement. Plowing was done mainly by horse power while tractors were used for disking operations. Tractor and horse power was used interspersedly on other major tillage operations.

The labor of pest control, which includes baiting for weevil and spraying, represents only a small portion of the total requirement. Lime and sulphur was the main spray used and was applied with horse and tractor-drawn sprayers.

Only one grower irrigated boysenberries and youngberries and in this case the overhead sprinkler system was used.

Harvest operations

The harvesting operations, which consist of picking, supervising, weighing and checking, hauling berries, and hauling pickers, represent about two-thirds of the labor required in boysenberry and youngberry production. The greater part of this labor usually occurs during July.

The average berry picker harvested 145.4 pounds of boysenberries and youngberries in an 8-hour work day. Approximately 4 pickers were used per acre on boysenberries and youngberries during 1942.

THE LOGANBERRY ENTERPRISE

Acreage and production

Approximately one-half of the total acreage of loganberries in Oregon is grown in Marion County and the bulk of the remaining acreage is found in Clackamas and Multnomah counties.* During the past few years the loganberry acreage has been gradually decreasing. This is attributed mainly to the lower yield. More growers are producing boysenberries and youngberries since they have been outyielding loganberries during recent years.

The 1942 loganberry yields on the farms studied averaged 2,680 pounds per acre and were somewhat lower than the 3-year (1940-42) average yield of 3,425 pounds per acre on these same farms. The 1942 yields compared favorably with the "normal" or usual yield on these same farms. However, it should be pointed out that the 3-year average yield, previously referred to, is higher than the state average yield of 2,939 pounds per acre for the same period.†

Area studied

Six growers located in Marion, Clackamas, and Multnomah counties, furnished data on their 1942 crops. Loganberries were produced on soils ranging from hill land in the Olympic, Aitken, and Melbourne series to old valley fillings such as the Willamette and Powell series. Approximately 4 per cent of the 1942 bearing loganberry acreage in Marion, Clackamas, and Multnomah counties, combined, is covered by the records taken in this study.

Varieties and plants

Forty per cent of all the loganberry acreage was planted with a spacing distance of 8 feet by 8 feet. This system of planting requires 681 plants per acre. All growers averaged 692 plants per acre.

Land use

The six farms studied averaged nearly 60 acres in size. Total tillable land averaged 52 acres per farm and represented slightly more than 87 per cent of the total farm land. (See Table 8.) Loganberries averaged 7.4 acres per farm and other cane fruit 1.6 acres.

*The total harvested loganberry acreage in Oregon in 1942 was 1,500 of which 700 acres were in Marion County. In 1943 the total harvested acreage in Oregon was 1,350 of which 625 were in Marion County. *Loganberries and Boysenberries and Youngberries*, Oregon State College Extension Circular 427, March 1944.

† Ibid.

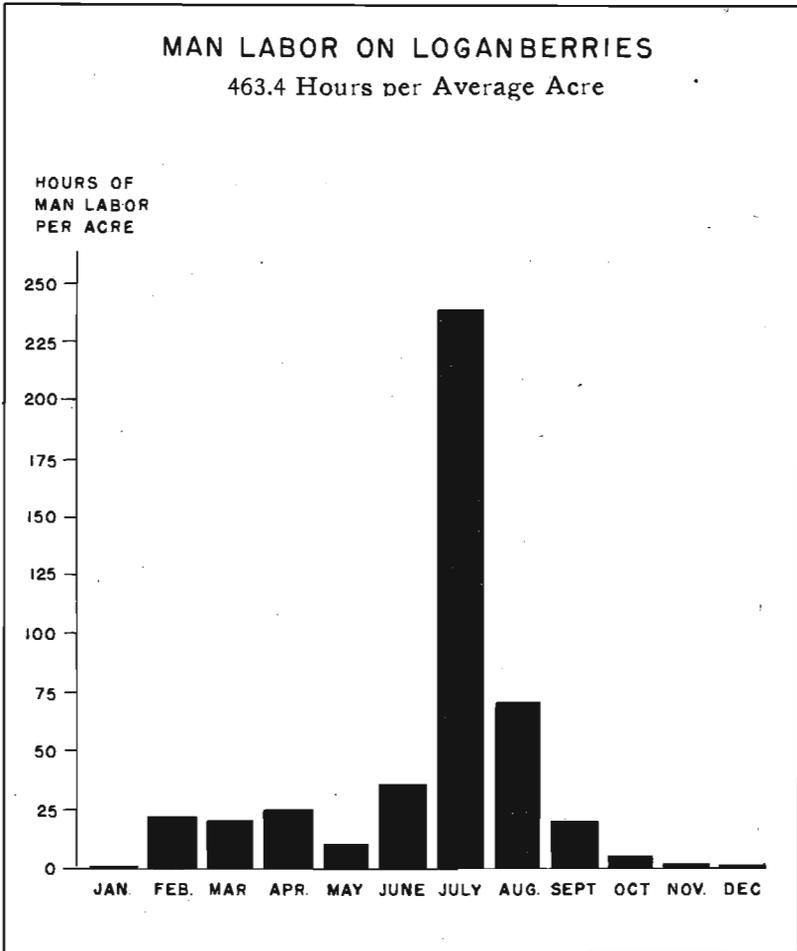


Figure 6. Distribution of Average Man Labor Requirements by Months for Loganberries in the Willamette Valley, Oregon, 1942. Based on data obtained from 6 growers in Clackamas, Marion, and Multnomah counties. Three-year average yield (1940-42) was 3,425 pounds per acre for berries in full production. (Data from Table 9.)

Time and rate of performance*

Loganberry production utilizes some labor the year round but more than one-half of the total man labor requirement occurs in July. (See Figure 6.)

* Man labor requirement data were obtained only on acreages in full production.

Some variability from year to year and from farm to farm in the total hourly requirement per acre and in the season of operation for the area is to be expected due to the influence of varying conditions. The data here presented are intended to be representative of a period of years and the man hours shown represent hours of labor by adult workers.*

Table 8. LAND USE ON SIX FARMS PRODUCING LOGANBERRIES FOR CANNING AND THE FRESH MARKET
WILLAMETTE VALLEY, OREGON, 1942

Use of land	Average acreage per farm	Percentage of total acreage
	<i>Acres</i>	<i>Per cent</i>
Loganberries	7.4	12.4
Other cane fruit*	1.6	2.7
Other crop land	43.0	72.3
TOTAL CROPLAND (Tillable)	52.0	87.4
NONTILLABLE LAND	7.5	12.6
TOTAL	59.5	100.0

* Boysenberries, youngberries, blackberries, red raspberries, and black raspberries.

The data in Table 9 indicate the total labor requirements for each operation and the total labor requirements for each group of operations by months.

Preharvest operations

Maintenance, which includes such operations as repairing trellis, pruning, brush disposal, training, staking and laying back, gathering stakes, and removing old canes, constitutes nearly 20 per cent of the total labor requirement. Brush disposal is done chiefly by hand methods. Both wooden and wire stakes were used to hold the canes along the rows so as to prevent damage to the new canes during tillage and other operations.

Labor for fertilizing, which includes such operations as applying commercial fertilizer, trucking manure to the farm, manuring, and seeding the cover crop, constitutes only a small portion of the total labor requirement per acre. Most of the acreage manured and fertilized was done by hand methods. A mixture of oats and either vetch or Austrian winter field peas was used as a cover crop. Most of the acreage was seeded with a small grain drill.

Total cultivating labor utilized nearly 8 per cent of the total labor requirement per acre and consisted of such operations as plow-

* Picking data were based on the grower's opinion of a normal crew, and therefore the figure includes some labor done by children.

Table 9. AVERAGE MAN LABOR REQUIREMENTS PER ACRE FOR LOGANBERRIES IN THE WILLAMETTE VALLEY, OREGON, 1942*

Operation	Average number of times over field	Man-hours per acre covered†	Percent of acreage covered	Man-hours per average acre‡	Monthly distribution of man hours per average acre											
					Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Repairing trellis	1.0	2.2	100	2.2	.2	2.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pruning, brush disposal and training	1.0	36.4	100	36.4	.....	16.8	16.9	1.9	.....	.2	.4	.2	.....	.....	.....	.....
Removing old canes	1.0	20.0	100	20.0	.....	1.0	.....	3.5	.....	.....	.....	1.7	10.4	1.1	1.2	1.1
Brush disposal (fall)	1.0	5.8	100	5.8	.....	1.0	.....	1.1	.....	.....	.....	.5	2.3	.9	.....	.....
Staking and laying back	2.6	28.9	83	24.0	.....	.....	.....	.....	.....	11.1	4.1	1.2	5.7	1.9	.....	.....
Gathering stakes	1.0	2.9	83	2.4	.....	1.2	1.2	.....	.....	.....	.....	.....	.....	.....	.....	.....
TOTAL FOR MAINTENANCE..	.....	.....	.....	90.8	.2	22.0	18.1	6.5	.....	11.3	4.5	3.6	18.4	3.9	1.2	1.1
Fertilizing (commercial)	1.0	2.3	67	1.5	.....	.....	.6	.5	.....	.....	.....	.....	.2	.2	.....	.....
Trucking manure to farm	1.0	10.9	12	1.3	.....	.....	.....	.3	.....	.....	.....	.1	.2	.....	.4	.3
Manuring	1.0	14.8	32	4.7	.....	1.4	1.0	1.9	.....	.....	.....	.....	.....	.4	.....	.....
Seeding cover crop	1.0	1.2	92	1.1	.....	.....	.....	.....	.....	.....	.....	.1	.7	.3	.....	.....
TOTAL FOR FERTILIZING....	.....	.....	.....	8.6	.....	1.4	1.6	2.7	.....	.....	.....	.2	1.1	.9	.4	.3
Plowing	1.2	5.8	100	5.8	.....	.....	1.0	3.8	1.0	.....	.....	.....	.....	.....	.....	.....
Grape hoeing	1.0	2.8	67	1.9	.....	.....	.....	.9	.5	.5	.....	.....	.....	.....	.....	.....
Disking	3.7	4.9	83	4.1	.....	.....	.....	.4	2.5	.7	.3	.....	.....	.....	.....	.....
Spring-tooth harrowing	5.1	6.2	67	4.2	.....	.....	.....	.4	1.5	1.3	.4	.....	.1	.1	.....	.....
Other machine cultivating..	6.3	10.9	50	5.5	.....	.....	.1	1.6	1.8	.6	1.2	.2	.....	.....	.....	.....
Hand hoeing	1.2	17.6	83	14.6	.....	.....	1.5	5.8	4.4	2.9	.....	.....	.....	.....	.....	.....
TOTAL FOR CULTIVATING....	.....	.....	.....	36.1	.....	.....	2.6	12.9	11.7	6.0	1.9	.2	.2	.6	.....	.....
Spraying	2.0	40.0	17	6.8	.....	.....	.....	3.4	.....	.....	.....	2.3	1.1	.....	.....	.....
Picking .....	.....	279.9	100	279.9	.....	.....	.....	.....	.....	16.8	204.5	58.6	.....	.....	.....	.....
Supervising, weighing, and checking .....	.....	31.1	100	31.1	.....	.....	.....	.....	.....	2.5	22.8	5.8	.....	.....	.....	.....
Hauling berries .....	.....	8.0	100	8.0	.....	.....	.....	.....	.....	.5	5.8	1.7	.....	.....	.....	.....
Hauling pickers .....	.....	4.2	50	2.1	.....	.....	.....	.....	.....	.1	1.6	.4	.....	.....	.....	.....
TOTAL FOR HARVESTING....	.....	.....	.....	321.1	.....	.....	.....	.....	.....	19.9	234.7	66.5	.....	.....	.....	.....
TOTAL FOR ALL OPERATIONS..	.....	.....	.....	463.4‡	.2	23.4	22.3	25.5	11.7	37.2	241.1	72.8	20.8	5.4	1.6	1.4

* Based upon data obtained from six growers in Marion, Clackamas, and Multnomah counties. The total acreage of loganberries studied was 42.5 and the 3-year average yield (1940-1942) was 3,425 pounds per acre for berries in full production.

† See page 4 for explanation of terms.

‡ In addition to the 463.4 man hours per average acre, it is estimated that the overhead labor on loganberries amounted to approximately 8 per cent.

ing, grape hoeing, disking, spring-tooth harrowing, other machine cultivating, and hand hoeing. Horse power was used for performing most of the major tillage operations.

One grower sprayed with a bordeaux mixture and used a tractor-drawn sprayer.

Harvest operations

The harvesting operations, which consist of picking, supervising, weighing, checking, hauling berries, and hauling pickers, represent approximately 69 per cent of the labor utilized in the production of loganberries. The operation of picking, alone, required 279.9 man hours per acre and represented 60 per cent of the total labor on loganberries. Most of this labor usually occurs during July.

The average picker harvested 97.9 pounds of loganberries in an 8-hour work day. (See Figure 7.) Approximately three pickers were used per acre on loganberries in 1942.



Figure 7. A worker picking loganberries in the Willamette Valley, Oregon.

THE TOMATO ENTERPRISE

Acreage and production

Tomatoes for canning and the fresh market represent an important crop on the bottomland soils of Linn and Marion counties. Although still a minor crop in the Willamette Valley, the tomato

acreage has shown a moderate increase during the past few years.* This may be attributed, at least in part, to the proximity of processing plants, favorable soil and climatic conditions, and the fact that tomatoes are seemingly well adapted to the needs of those growers who are devoting their time either to full or part-time farming, and want an intensive cash crop with a minimum of labor.

The 1942 tomato yields on the farms studied averaged 12.9 tons per acre and compared favorably with the 3-year (1940-42) average yield on these same farms of 13 tons per acre. The 1942 yields also compared favorably with the "normal" or usual yields on these same farms. It should be pointed out, however, that the 3-year average yield, previously referred to, is considerably higher than the state average yield per acre for the same period.†

Area studied

Twelve tomato growers, located in Linn and Marion counties and representing both the canning and fresh market trade, furnished data on their 1942 crops. An attempt was made to obtain farms on various soil types of this area, but tomatoes were practically all grown on bottomland soils of the Chehalis and Newberg series. The remaining acreage was found on the Willamette series. Approximately 20 per cent of the total 1942 tomato acreage in Linn and Marion counties is covered by the records taken in this study.

Varieties and plants

Bonnie Best and Wasatch Beauty were the only varieties of tomatoes grown for the canning and the fresh market trade by the growers studied. Some growers, however, indicated that they had formerly grown a few acres of the Pritchard and Marglobe varieties. Of the farms studied, 73 per cent of the total acreage was planted to Bonnie Best while the remaining 27 per cent was devoted to the Wasatch Beauty variety.

The variety of tomato grown is largely determined by the processing plants since they contract certain acreages and order the plants for growers. Only about one-fourth of the growers raise their plants because most growers do not have the necessary time and equipment under present conditions.

* The total tomato acreage in Oregon in 1942 for both processing and the fresh market was approximately 1,900 acres of which a little more than 30 per cent was in Linn and Marion counties. In 1943 the total acreage of tomatoes in Oregon was approximately 2,300 of which about 37 per cent was in Linn and Marion counties. *Snap Beans and Other Commercial Truck Crops*, Oregon State College Extension Circular 432, April 1944.

† The Bureau of Agricultural Economics, U. S. Department of Agriculture, reports a state average yield (1940-42) of 6.3 tons per acre for tomatoes for the *fresh market only*.

Approximately 30 per cent of the tomato acreage was planted with a spacing distance of 7 feet by 7 feet and 20 per cent was spaced 6 feet by 7 feet. A spacing 7 feet by 7 feet requires 889 plants per acre and a spacing 6 feet by 7 feet requires 1,037 plants. All growers averaged 1,279 plants per acre.

Table 10. LAND USE ON 12 FARMS PRODUCING TOMATOES FOR CANNING AND THE FRESH MARKET, WILLAMETTE VALLEY, OREGON, 1942

Use of land	Average acres per farm	Percentage of total acreage
Tomatoes	8.8	9.4
Other truck crops	26.1	28.0
Other crop land	23.8	25.6
TOTAL CROPLAND (Tillable)	58.7	63.0
NON-TILLABLE LAND	34.5	37.0
TOTAL	93.2	100.0

Land use

The twelve farms studied averaged about 93 acres in size and were slightly larger than the typical farm in the Willamette Valley. Total tillable land averaged nearly 59 acres per farm representing approximately 63 per cent of the total acreage. (See Table 10.)

Tomatoes and other truck crops utilized slightly more than 37 per cent of the total farm land or about 59 per cent of the total crop land. The tomato acreage used 15 per cent of the total crop land and averaged approximately 9 acres per farm.

Fifteen different truck crops were produced. Table beets constituted the chief truck crop and averaged nearly 11 acres per farm. Tomatoes ranked second in importance followed by carrots, potatoes, and spinach.

Time and rate of performance

The period in which the various operations in tomato production were performed extended from the first part of February to the latter part of October. The time of performing the operations varied only slightly on the farms studied. This similarity may be attributed to similar soil and climatic conditions. Most of the tomato plantings were located on bottomland soils and hence the time of performing the operations varied little. (See Figure 8.)

Some variability from year to year and from farm to farm in the total hourly requirement per acre and in the season of operation for the area is to be expected due to the influence of varying conditions. The data here presented are intended to be for a period of

years and the man hours shown represent hours of labor by adult workers.*

The data in Table 11 indicate the total labor requirements for each operation and the total labor requirements for each group of operations by months.

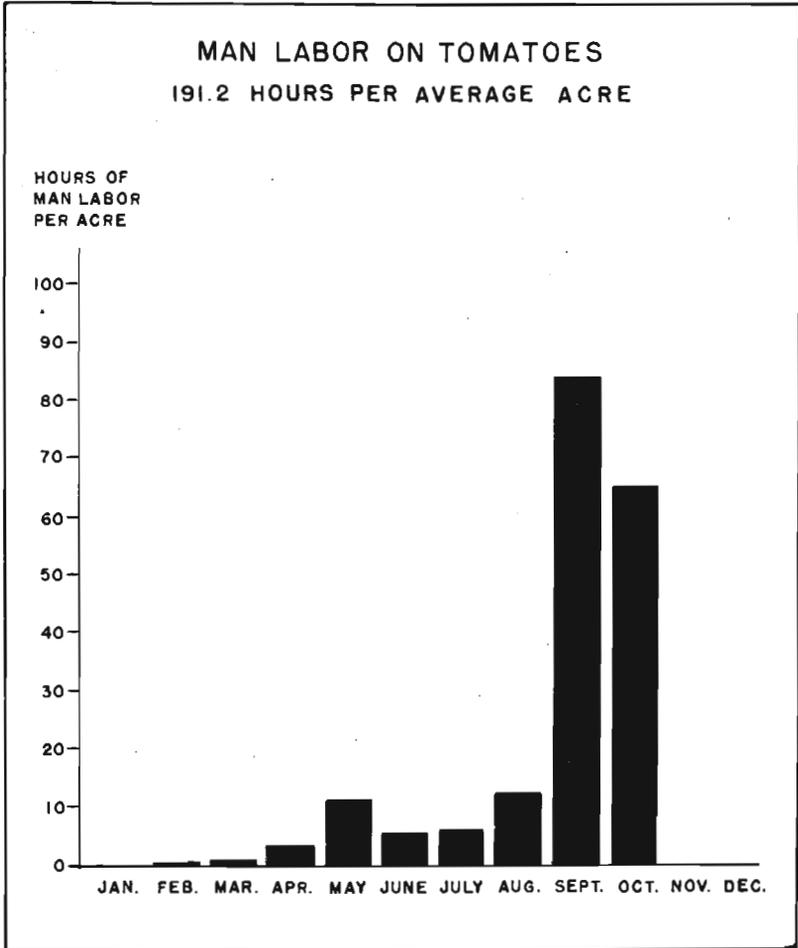


Figure 8. Distribution of Average Man Labor Requirements by Months for Tomatoes in the Willamette Valley, Oregon, 1942. Based on data obtained from twelve growers in Linn and Marion counties. Three-year average yield (1940-42) was 13 tons per acre. (Data from Table 11.)

* Picking data were based on the grower's opinion of a normal crew, and therefore the figure includes some labor done by children.

Table 11. AVERAGE MAN LABOR REQUIREMENTS PER ACRE FOR TOMATOES IN WILLAMETTE VALLEY, OREGON, 1942*

Operation	Average number of times over field	Man-hours per acre covered†	Per cent of acreage covered	Man-hours per average acre‡	Monthly distribution of man hours per average acre											
					Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
					Plowing	1.0	1.5	100	1.53	.6	.6
Disking	2.6	1.4	92	1.2	.....	.1	.2	.9	.....	.....	.....	.....	.....	.....	.....	.....
Harrowing	3.1	1.6	75	1.2	.....	.....	.1	1.0	.1	.....	.....	.....	.....	.....	.....	.....
Other machine cultivating ..	3.2	2.3	42	1.0	.....	.....	.....	.4	.2	.2	.....	.....	.....	.....	.....	.....
TOTAL FOR SEED BED PREPARATION .....	.....	.....	.....	4.9	.....	.4	.9	2.9	.3	.2	.2	.....	.....	.....	.....	.....
Marking	1.0	.9	100	.9	.....	.....	.....	.1	.8	.....	.....	.....	.....	.....	.....	.....
Planting	1.0	8.6	100	8.6	.....	.....	.....	.....	8.4	.2	.....	.....	.....	.....	.....	.....
Replanting	1.0	1.2	92	1.1	.....	.....	.....	.....	1.0	.1	.....	.....	.....	.....	.....	.....
TOTAL FOR PLANTING .....	.....	.....	.....	10.6	.....	.....	.....	.1	10.2	.3	.....	.....	.....	.....	.....	.....
Cultivating	4.8	5.7	100	5.7	.....	.....	.....	.....	.6	2.5	2.4	.2	.....	.....	.....	.....
Hand hoeing	1.7	6.2	100	6.2	.....	.....	.....	.....	.....	2.6	3.1	.5	.....	.....	.....	.....
TOTAL FOR CULTIVATING .....	.....	.....	.....	11.9	.....	.....	.....	.....	.6	5.1	5.5	.7	.....	.....	.....	.....
Dusting and spraying	1.0	1.5	54	.8	.....	.....	.....	.....	.2	.2	.4	.....	.....	.....	.....	.....
Irrigating	1.3	5.8	50	2.9	.....	.....	.....	.....	.....	.....	.4	2.5	.....	.....	.....	.....
Making trails and roadways .....	.....	.7	67	.5	.....	.....	.....	.....	.....	.....	.....	.1	.4	.....	.....	.....
Picking .....	.....	136.3	100	136.3	.....	.....	.....	.....	.....	.....	.....	7.9	72.1	56.3	.....	.....
Hauling and box distribution .....	.....	8.2	100	8.2	.....	.....	.....	.....	.....	.....	.....	.5	4.3	3.4	.....	.....
Supervising and loading .....	.....	13.9	100	13.9	.....	.....	.....	.....	.....	.....	.....	.8	7.3	5.8	.....	.....
Hauling pickers .....	.....	3.3	25	.8	.....	.....	.....	.....	.....	.....	.....	.1	.4	.3	.....	.....
TOTAL FOR HARVESTING.....	.....	.....	.....	159.7	.....	.....	.....	.....	.....	.....	.....	9.4	84.5	65.8	.....	.....
Seeding cover crop	1.0	.8	50	.4	.....	.....	.....	.....	.....	.....	.....	.....	.2	.2	.....	.....
TOTAL FOR ALL OPERATIONS..	.....	.....	.....	191.2‡	.....	.4	.9	3.0	11.3	5.8	6.5	12.6	84.7	66.0	.....	.....

* Based on data obtained from twelve growers in Linn and Marion counties. The total acreage of tomatoes studied was 106, and the 3-year average yield (1940-1942) was 13 tons per acre.

† See page 4 for explanation of terms.

‡ In addition to the 191.2 man hours per average acre, it is estimated that the overhead labor on tomatoes amounted to approximately 10 per cent.

Preharvest operations

Plowing, disking, harrowing, and other machine cultivating were included in the operations dealing with the preparation of the seed-bed prior to planting the young tomato plants. Nearly all tillage operations were performed with a tractor.

Other machine cultivating includes such miscellaneous tasks as, rolling, floating, and Kimball weeding. These operations were performed generally as a result of poor tilth conditions or because noxious weeds such as thistles or morning glories were present.

Although the amount of time required to plant an acre averaged 8.6 man hours, individual cases varied from 3.0 to 14.2. This, at least in part, may be explained by the many different methods used in planting, such as with trowel, shovel, hoe, or with one- or two-row plant-setting machines. Other factors were the degree of care used in planting and the age and experience of the worker. Most of the growers did some replanting but in general most growers indicated that less than 5 per cent of the plants were actually replaced.

Fifty-four per cent of the tomato acreage was sprayed or dusted. Most of the dusting and spraying was done by hand. Micronized copper dust was the most common type of material used for controlling the early and late blight and also for combatting the biting and sucking insects.

The irrigated acreage, which included 50 per cent of the total, was covered by the overhead sprinkler method. The average number of applications was 1.3 with 2.9 man hours required per average acre. The period of irrigation extended from the first part of July to the latter part of August while the greatest requirement occurred during the first half of August.

No information was obtained on the time required to apply commercial fertilizer since this operation was performed by only three growers and since they applied the fertilizer during the actual planting or cultivating operation. None of the growers interviewed in this survey used any barnyard manure on tomatoes.

Six of the twelve growers seeded a cover crop during the last half of September or the first half of October, depending upon the length of the harvesting period. Broadcasting by hand was the most common method, although some growers used a small drill. A mixture consisting of oats and either vetch or Austrian winter field peas was seeded as a cover crop.

Harvest operations

Although such operations as picking, hauling, and box distribution, supervising and loading, hauling pickers, and making trails and roadways, are tabulated separately, they may be grouped under one general term as harvesting. These operations were performed during the period from August 25 to November 1. The length of the



Figure 9. The average worker picked 1,528 pounds of tomatoes in an 8-hour work day.

picking season depends upon the earliness of a killing frost. Most of the growers reported that the harvest peak came in September.

All harvesting work, which represented approximately 84 per cent of the total man labor requirement, utilized 159.7 man hours per acre. The operation of picking, alone, required 136.3 man hours per acre and represented 71 per cent of the total labor on tomatoes.

The average picker harvested 38.2 (40-pound) cannery lugs or 1,528 pounds per 8-hour work day. (See Figure 9.) According to information obtained from the growers, it would appear that one picker per acre would meet the harvesting needs. This is based on the assumption that the season will be about normal as to yield and weather conditions. Many of the smaller growers indicated that the farm family could harvest the crop with occasional outside help during the peak picking periods.