

PLIFICATE

Cost of Producing **POLE BEANS**

*In the Willamette Valley,
Oregon*

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Station Bulletin 452

April 1948

FOREWORD

Information on pole bean production in Oregon has been limited largely to production and gross income statistics. These are generally complete and up-to-date. Information concerning the other side of the picture—the cost side—has been almost entirely lacking.

This bulletin gives detailed information concerning costs, investments, labor requirements and yields. It shows relationships that existed between costs and sizes of fields, production per acre, kinds of soil, and the amounts of labor used to produce the crop. This bulletin should be useful to prospective growers "new" to the bean business, as well as "old" growers and the processors.

A handwritten signature in cursive script that reads "Wm. A. Schoenfeld". The signature is written in dark ink and is positioned above the printed name.

Director

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SUMMARY

This bulletin deals with the cost of producing pole beans in the Willamette Valley of western Oregon in the year 1946. The data upon which the study is based were obtained from detailed cost records secured from a representative group of 67 bean growers.

Oregon ranked second among all states in the total tonnage of beans produced in 1946. It ranked first in yield obtained per acre, with an average yield 3 times larger than the national average. Beans are sold under contract to processors who either freeze or can the product.

Cost of Production

Average costs

On the basis of this study the cost of producing a ton of ungraded beans was 104 hours of man labor plus \$21 for costs other than labor. Of the labor required, 92 hours were hired. The other 12 hours were the labor of the operator and his family.

The cost ranged from a low of \$87.60 per ton for the 10 low-cost producers to \$151.40 for the 10 growers having the highest costs. The average for all 67 growers was \$104.60. This cost is based upon an average yield of 7.9 tons of ungraded beans per acre and fields averaging 9.3 acres in size. Labor accounted for 79.1 per cent of the total cost, equipment 8.8 per cent, supplies 5.4 per cent, and miscellaneous items including taxes and interest the remaining 6.7 per cent.

The average cost of producing an acre of beans was \$822.90. Cash costs represented 76 per cent of the total cost of production.

Labor

The total labor used on beans amounted to 824.2 man hours per acre based upon an average yield of 7.9 tons per acre. Over 83 per cent of this labor was concentrated within the harvest season, July, August, and September.

Investment

The average investment in farm property used in producing an acre of beans amounted to \$784. Land accounted for over half this amount with irrigation equipment representing 20 per cent and yard equipment 11 per cent of the total. The bean land was valued by the growers in 1946 at \$431 per acre. Their estimates of its "normal" value averaged \$241.

Factors Affecting Costs

Three factors were largely responsible for the variations in costs among individual growers. They were: (1) tons of beans produced per acre; (2) hours of labor used per acre, excluding picking; and (3) acres per bean yard.

Yield per acre

Generally the higher the yield obtained the lower the cost per ton. Growers having yields of less than 4 tons per acre had a total cost per ton averaging \$162.10. Growers with yields of 10 tons or more had costs averaging less than \$90.00 per ton.

Labor used per acre

The fewer the hours of man labor (excluding picking labor) used per acre the lower the total cost per ton. Growers using less than 180 hours of labor per acre had costs averaging \$99.40 per ton. Those who used 360 or more hours of labor had costs averaging \$129 per ton.

Acres per bean yard

Increases in the size of the bean yard up to 15 acres were associated with lower costs. Those growers having more than 15 acres in beans, however, had higher costs than growers in the 10- to 15-acre group. This is partially explained by the lower productivity (consequently lower yields) of the land used for beans on the largest yards.

Management

Throughout the study, the data point to good management as evidenced by high yields and the economical use of labor as being exceedingly important in obtaining low costs. Some growers received high yields, but because of high labor costs (excluding picking) their total costs per ton were above average. Other growers obtained high yields with low labor costs. Their total costs per ton were extremely low.

High and low cost producers

These results are further substantiated by a comparison of the 10 high-cost and 10 low-cost producers. The low-cost producers had average sized bean fields from which they obtained yields averaging about 10 tons per acre. The high-cost producers had fields only half as large. Furthermore, their yields averaged only 5 tons per acre. The low-cost growers were also efficient in the use of labor. They used 40 per cent less labor (excluding picking) per acre than the other group, even though producing twice the tonnage of beans per acre.

Cost of Producing Pole Beans¹

In the Willamette Valley, Oregon

By

G. B. DAVIS and D. CURTIS MUMFORD²

THIS bulletin deals with the cost of producing pole beans in Oregon in 1946 and is the first of a series dealing with production costs of the major vegetable crops grown for processing in Oregon. The other vegetables are sweet corn, table beets, and carrots. Similar reports on the cost of producing these crops will be issued.

Objectives

The investigation of the production costs of pole beans had as its objectives (1) the determination of the investment required, practices followed, and the amount and distribution of man labor and machine work required to produce the crop; (2) the determination of the individual costs of production of a representative cross section of pole bean growers; (3) the analysis of these costs in order to determine the factors responsible for variations in costs among growers; and (4) the suggestion of adjustments that would tend to lower costs.

Procedure

The basic data included in this report were obtained from 67 growers of pole beans in the Willamette Valley. Each grower was visited by a trained enumerator who obtained the information by means of a detailed questionnaire.

The cooperating growers were selected to represent a cross section of the bean industry in the Valley. In selecting the sample of growers, particular attention was given to location and the acreage of beans. The cooperating growers were distributed among the

¹The term "pole beans" (*Phaseolus vulgaris*) as used in this report, refers to *green snap* beans of the pole variety.

²*Acknowledgments:* The authors gratefully acknowledge the fine cooperation received from the 67 bean growers who furnished the basic data included in this study. The Willamette Valley county agricultural agents and the personnel of the various processors of vegetables also contributed valuable advice and assistance in making this study possible. Acknowledgments are due E. L. Potter, Head, Division of Agricultural Economics, Oregon State College, for his advice in preparing this bulletin; G. W. Kuhlman, Associate Economist, Department of Farm Management, for his assistance in the field work; M. H. Becker, graduate student, for his assistance in the field work and in the analysis of the data; and R. H. Bergstrom and W. H. Coffield, both former Oregon State College students, for their help in obtaining the data in the field.

All pictures except Figure 2 were furnished by the Emergency Farm Labor section of the Oregon Extension Service. Figure 2 was supplied by the Department of Visual Instruction, Oregon State College.

counties in proportion to the total number of growers in each county. Also, they were selected so that their acreages per field represented a typical cross section of the different sized fields actually existing. The bean acreage of these 67 growers represented about 13 per cent of the total bean acreage (for processing) in Oregon.

The Oregon Bean Industry

Oregon ranked second among all states in the total tonnage and value of green beans produced for processing in 1946. New York was first. Oregon produced 12.5 per cent of the total national tonnage of beans on only 4.1 per cent of the total bean acreage in the United States. Oregon's 1946 production per acre averaged 5.2 tons and was three times the national average.¹

Oregon has not always held this high position in bean production. In 1930 there were less than 900 acres devoted to beans. Since that time, however, there has been a remarkable increase. In 1940 the acreage had doubled over 1930. In 1946, with an estimated 4,800 acres, the 1940 acreage had also been doubled.¹ Even though a good share of the latter increase occurred during the war years, the long-time acreage trend has been definitely upward.

Within Oregon, the production of pole beans for processing is almost exclusively confined to the Willamette Valley. Here the acreage is distributed among all counties with heavy concentrations in Lane County, and in the Stayton area of Marion County.

Beans are grown under contract. That is, the grower contracts or agrees to produce and sell a certain tonnage or acreage to a particular processor, and the processor in turn agrees to buy a particular tonnage or acreage from the grower. This is done before the crop is planted. The processors handling beans are usually located in the bean-producing areas. They process the beans by canning or freezing.

Practically all of the beans are of the standard Blue Lake variety, with only an occasional acreage of the "stringless" strains. The "stringless" pole beans are relatively new to commercial production, and their progress is being closely followed by the entire bean industry.

Beans are produced to a large extent on the river bottom soils and almost always under irrigation. A major exception to the river bottom soils is the Stayton area in southern Marion County. Here the soils consist of the gravelly phases of Clackamas, Salem, and related soil series. The farmland is relatively flat and in the majority

¹Statistics from Bureau of Agricultural Economics, U. S. Department of Agriculture.

of cases the bean yards are flood irrigated from the irrigation district's gravity water supply. Sprinkler irrigation is the common method of applying water to the rolling bottomlands and the remainder of the valley acreage devoted to beans.

Costs of Production

Costs defined

The costs included in this publication are the 1946 costs. They include the actual cash-out-of-pocket expenses of production, as well as all the noncash expenses. Noncash charges include the bean crop's share of the following:

- a. Depreciation on equipment, bean yard equipment, and buildings.
- b. An interest charge of 5 per cent of the value of the bean yard equipment, other equipment, and workstock.
- c. An interest charge of 4 per cent of the value of land and buildings.
- d. The grower's estimated charge for his own time and that of his family spent directly on the bean crop.
- e. An overhead expense for the indirect time spent by the grower in the production of beans.

All rented land and buildings used in the production of beans have been treated as though they were owned by the grower. They would, therefore, be subject to the same real estate charges as owned property, the actual rental paid not being included as an expense. This procedure places each grower's costs on a comparable basis.

In calculating the costs and returns per ton, and also the yield per acre, ALL BEANS, INCLUDING BOTH CULLS AND GRADED BEANS, WERE COUNTED.

Location and size of fields

Bean production is heavily concentrated in Lane and Marion counties (Table 1). In fact, over 60 per cent of the cooperating growers contributing to this study were located in these two areas. The two counties also account for about that same percentage of the total acreage of beans in the Willamette Valley.

Bean yards are relatively small in acreage when compared with many crops. It will be noted that only 9 out of the 67 growers had 15 or more acres. Of these 9, only 3 had acreages exceeding 20, and only 1 of the 3 had more than 40 acres (Figure 1). The small

acreages result from several factors. In the first place, some processors limit the tonnage or acreage contracted from the individual growers. Another and probably more important reason is that the growers themselves are reluctant to plant large acreages because of the heavy investment, high expense, extremely close supervision, and the risk involved. An acre of beans requires a cash outlay each year that exceeds the value of the land itself.

Table 1. LOCATION AND SIZE OF BEAN YARDS STUDIED
Williamette Valley, Oregon
1946

County	Number of cooperating growers				Total number of cooperating growers
	Yard under 5 acres	Yard 5 to 10 acres	Yard 10 to 15 acres	Yard 15 acres and over	
Benton	0	2	1	0	3
Clackamas	1	1	0	1	3
Lane	7	7	5	3	22
Linn	0	1	5	0	6
Marion	5	7	5	4	21
Multnomah	2	0	0	0	2
Washington	3	1	1	0	5
Yamhill	1	1	2	1	5
Total number of cooperating growers	19	20	19	9	67



Figure 1. With a yield of 8 tons per acre this 25-acre bean field would use an average of 100 or more pickers each day for the 3 to 6 week picking season.

Prices received

The average of prices actually received by all growers included in this study was not determined. In several instances, however, growers reported prices which averaged about as follows:

<i>Grade</i>	<i>Price per ton</i>
1	\$150
2	\$135
3	\$ 90
Culls	No value

If these prices are applied to the average yields and grades shown in Table 2, the average price per ton, including culls, would be approximately \$112.

Table 2. AVERAGE PRODUCTION OF BEANS PER ACRE ACCORDING TO GRADE¹
Willamette Valley, Oregon
1946

Grade	Average yield per acre	Grade
	<i>Tons</i>	<i>Per cent</i>
1	2.6	33
2	2.3	30
3	2.0	25
Culls	1.0	12
TOTAL	7.9	100

¹About one-half of one per cent of the beans harvested were graded as number 4. They have been included with the culls.

Bean grades

Bean grades are based largely on size of bean. Number 1's are smaller and lighter in weight than number 2's, etc. Culls are ordinarily oversize beans (Figure 2).

Processors encourage the production of No. 2 beans by making the price differential between No. 1 and No. 2 grades less than the weight differential between the two grades for the same number of beans. In other words, with the above prices, 100 No. 2 beans would bring a greater return than 100 No. 1 beans. With such a pricing system the growers naturally try to produce as high a percentage of No. 2 beans with as few culls as possible. Culls are ordinarily of no value, but require the same picking expense per pound as No. 1's. Consequently, the amount of culls can easily determine whether or not a profit or loss will be realized from the crop.

Cost per acre and per ton—entire Valley

The 1946 cost of production varied from \$80 per ton for the grower having the lowest costs to over \$200 for the high-cost producer. The average cost for all 67 growers was \$104.60 per ton

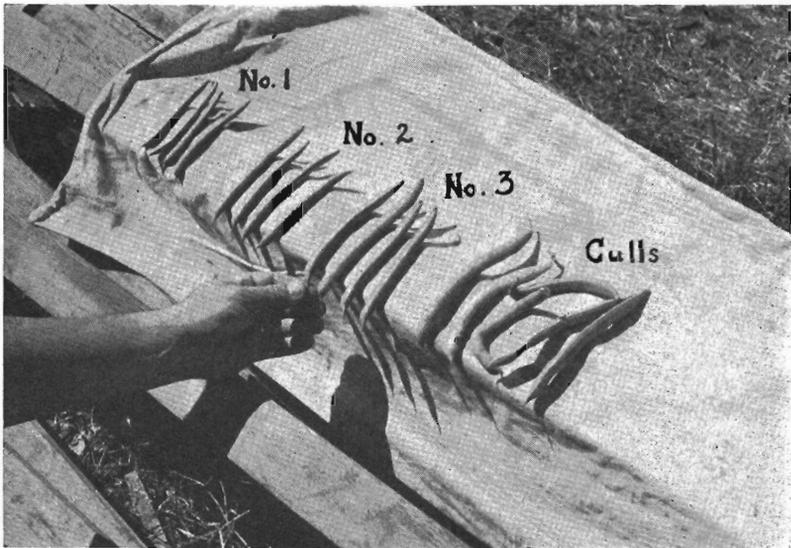


Figure 2. Growers receive the highest price per ton for number 1 beans. Culls are ordinarily of no value. Under favorable growing conditions a number 1 bean will become a cull within 4 or 5 days. Carefully supervised picking at the proper time, therefore, is very important.

(Table 3). With an average yield of 7.9 tons per acre, the cost was \$822.90 per acre. It will be noted that labor, including picking, accounts for 79.1 per cent of all costs, and picking labor by itself amounts to over one-half the total cost. Equipment and supply costs are certainly important, but together account for less than 15 per cent of the total.

Bean land was valued in 1946 by the growers at an average of \$431 per acre. An interest charge of 4 per cent on this valuation amounted to \$17.30 per acre. For many crops this land charge would be prohibitive, but for beans it is relatively unimportant, representing only slightly more than 2 per cent of total production costs. Using a "normal" valuation which averaged \$241 per acre for this same land would decrease the total cost about \$8 per acre or \$1.00 per ton.

Cost per acre and per ton—Stayton area

The cost of producing beans in the Stayton area was only \$1.80 per ton higher than the average for the study, even though yields were substantially lower (Table 4).

When compared to the other yards, those in the Stayton area were larger, were flood irrigated, had leveler land, and required no spring clean-up after winter floods. This made it possible to operate these fields cheaper and to offset the relatively low yields received.

Table 3. ITEMIZED COSTS OF PRODUCING POLE BEANS
Willamette Valley, Oregon
1946

Number of growers			67
Acres per yard			9.3
Yield per acre (tons of ungraded beans)			7.9
Item	Cost per acre	Cost per ton	Per cent of total
Operator and family labor ¹	\$102.10	\$ 13.00	12.4
Hired labor (excluding picking)	115.20	14.60	14.0
Picking labor (all hired)	434.00	55.20	52.7
TOTAL LABOR COST	\$651.30	\$ 82.80	79.1
Irrigation (excluding labor)	32.20	4.00	3.9
Tractor	7.00	.90	0.9
Truck and automobile	22.80	2.90	2.8
Other equipment	7.70	1.00	0.9
Horse work	2.30	.30	0.3
TOTAL EQUIPMENT AND HORSE COST	\$ 72.00	\$ 9.10	8.8
Bean seed	4.90	.60	0.6
String and nails	10.70	1.40	1.3
Fertilizer and manure	21.60	2.70	2.5
Dust	3.20	.40	0.4
Cover crop seed	2.30	.30	0.3
Bean tickets, etc.	2.10	.30	0.3
TOTAL SUPPLY COST	\$ 44.80	\$ 5.70	5.4
Yard equipment (depreciation and interest)	\$ 20.90	\$ 2.70	2.5
Buildings (repairs, depreciation and interest)	4.70	.60	0.6
Liability insurance and office expense	8.70	1.10	1.1
Taxes	3.20	.40	0.4
Interest on land at 4 per cent	17.30	2.20	2.1
TOTAL COSTS	\$822.90	\$104.60	100.0

¹Includes overhead labor of operator.

Cost of production by operations

Table 5 shows the average cost of the major operations involved in bean production. The cost of each operation includes the cost of all labor, all supplies, gas, oil, repairs, and the interest and depreciation charges for the equipment used in performing the operation.

Cash and noncash costs

Harvest expenses account for almost two-thirds of the total expense. Naturally a high proportion of this is cash. Preharvest costs consist of about one-half cash and the other half noncash expenses. Therefore, at least \$100 per acre in cash is spent before any beans are harvested.

Table 4. ITEMIZED COSTS OF PRODUCING POLE BEANS IN THE STAYTON AREA
Willamette Valley, Oregon
1946

Number of growers	15	
Acres per yard	10.3	
Yield per acre (tons of ungraded beans)	6.2	
Item	Cost per acre	Cost per ton
Operator and family labor (including operator's overhead)	\$111.00	\$ 17.80
Hired labor (excluding picking)	65.10	10.40
Picking labor (all hired)	343.70	55.00
TOTAL LABOR COST (589.1 hours per acre)	\$519.80	\$ 83.20
Irrigation (excluding labor)	\$ 20.20	\$ 3.20
Tractor	4.60	.70
Truck and automobile	18.80	3.00
Other equipment	5.60	.90
Horse work	4.10	.70
TOTAL EQUIPMENT AND HORSE COST	\$ 53.30	\$ 8.50
Bean seed	\$ 5.10	\$.80
Strings and nails	10.80	1.70
Fertilizer and manure	19.60	3.10
Dust .....	.50	.10
Cover crop seed	1.60	.30
Bean tickets, etc.	2.40	.40
TOTAL SUPPLY COST	\$ 40.00	\$ 6.40
Yard equipment (depreciation and interest)	\$ 29.00	\$ 4.60
Buildings (repairs, depreciation and interest)	4.00	.70
Liability insurance and office expense	5.10	.80
Taxes	2.10	.40
Interest on land at 4 per cent	10.20	1.60
TOTAL COSTS	\$663.50	\$106.20

Table 5. COST OF PRODUCING POLE BEANS BY OPERATIONS
Willamette Valley, Oregon
1946

Item	Cost per acre	Cost per ton	Per cent of total
Spring clean-up (after winter flood)	\$ 2.50	\$.30	0.3
Seedbed preparation	11.00	1.40	1.3
Planting	8.80	1.10	1.1
Hand cultivation	24.70	3.10	3.0
Machine cultivation	10.60	1.40	1.3
Yard preparation	70.10	8.90	8.5
Fertilizing and manuring	24.60	3.10	3.0
Irrigation	55.10	7.00	6.7
Dusting	5.30	.70	0.6
Fall clean-up	13.90	1.80	1.7
Cover crop	4.80	.60	0.6
TOTAL PREHARVEST COSTS	\$231.40	\$ 29.40	28.1
Picking (labor only)	\$434.00	\$ 55.20	52.7
Other harvest	68.70	8.70	8.4
Hauling crop	16.70	2.10	2.0
Hauling workers	11.20	1.40	1.4
TOTAL HARVEST COSTS	\$530.60	\$ 67.40	64.5
Overhead	\$ 40.40	\$ 5.20	4.9
Taxes	3.20	.40	0.4
Interest on land investment at 4 per cent	17.30	2.20	2.1
TOTAL COSTS	\$822.90	\$104.60	100.0

Because of the heavy harvest expense, bean production is subject to high cash costs, which in 1946 amounted to almost 80 per cent of the total cost (Table 6). Of the total cash expenses, 80 per cent is made up of labor, including picking. When excluding the labor used in picking, other labor accounts for over half the remaining cash and noncash costs.

Table 6. CASH AND NONCASH COSTS OF PRODUCING POLE BEANS
Willamette Valley, Oregon
1946

Item	Cost per acre	
	Cash	Noncash ¹
Picking	\$434.00	.....
Other labor	115.20	102.10
Equipment and horse work	33.60	38.40
Supplies	44.80	.....
Yard equipment .....	.....	20.90
Land and buildings	3.90	21.30
Liability insurance and office expense	8.70	.....
TOTAL	\$640.20	\$182.70

¹Includes the unpaid labor of the operator and family, depreciation and interest on investment.

Table 7. TIMES OVER AND LABOR REQUIREMENTS OF DIFFERENT OPERATIONS USED IN PRODUCING POLE BEANS
Willamette Valley, Oregon
1946

Operation	Average number of times over field for acreage covered	Time required to cover one acre one time over	Total time required per acre	Percentage of total acres actually covered
Spring clean-up (after winter flood)	1.0	<i>Hours</i> 15.2	<i>Hours</i> 15.2	<i>Per cent</i> 16
Seedbed preparation	1.0	5.5	5.5	100
Planting	1.1	3.0	3.3	100
Hand cultivation	2.2	13.4	29.5	100
Machine cultivation	4.0	2.0	8.2	100
Yard preparation ¹	1.0	29.1	29.1	100
Stringing	1.0	15.6	15.6	89
Fertilizing and manuring ²	2.0	1.1	2.2	99
Irrigation	8.5	3.0	25.5	98
Dusting	2.0	.8	1.6	63
Picking	5.0	118.6	592.8	100
Other harvest	5.0	13.2	66.0	100
Hauling crop	5.0	1.8	8.8	100
Hauling workers	5.0	1.1	5.5	82
Fall clean-up	1.0	13.8	13.8	100
Cover cropping	1.0	2.8	2.8	52

¹Includes the labor used in connecting stakes with twine in "stake" type yards, but does not include the "stringing" in other kinds of yards.

²Labor used in fertilizing while planting and cultivating included with those operations. Includes the labor, however, of applying fertilizer through irrigation system.

Man labor requirements by operations

The material in Table 7 applies only to the growers who actually performed the different operations. For example, 63 per cent of the total acreage of beans was dusted. The growers actually dusting

went over their fields an average of 2 times. Each time over required on the average .8 man hours per acre, or 1.6 hours for the 2 times over. The information included in the first two columns of this table may prove very useful to those who contemplate setting up a labor budget for a field of beans.

Monthly distribution of man labor

Table 8 shows the average distribution of labor and the relative importance of each operation from the standpoint of the labor used. It *does not show* in all cases the average time required to perform each operation because all growers did not perform each operation. For example, spring clean-up is listed as amounting to 2.4 hours per acre. This was calculated by dividing the total hours spent on spring clean-up by the *total bean acreage* of all 67 growers even though some growers actually *did not* have spring clean-up. According to Table 7, which should be used in conjunction with this table, only 16 per cent of the bean acreage was subject to this operation. For that acreage where spring clean-up actually occurred the labor amounted to an average of 15.2 hours per acre.

The total labor used on beans amounted to 824.2 man hours per acre when based upon an average yield of 7.9 tons per acre. This is probably more labor than is required for any other commercially-grown crop in Oregon. Unfortunately this labor is not well distributed in time.

Over 83 per cent of the total labor was concentrated within the 30-to-40-day harvest season (Figure 3). The remaining 17 per cent (about 130 man hours) was distributed unevenly over the other 6 or 7 months. The peak for this nonharvest labor was in June. At that time a large share of the yard preparation, stringing, and cultivation occurs. During the remainder of the year, November through March, very little if any labor is required.

Because of this uneven distribution of labor and the heavy harvest requirement, beans might be an unsatisfactory choice as the *only* enterprise for a family farm. On the other hand pole beans apparently fit in well with other crops, especially other vegetable crops whose harvest seasons occur at different times. Several growers included in this study used such a combination of enterprises in their farm organization.

The direct and overhead labor of the operator and family amounted to 97.4 hours per acre. The portion of the labor actually accomplished by the operator and his family varied with the size of the bean yard. On yards of under 10 acres they took care of over half the preharvest labor and almost three-fourths of the harvest labor, excluding picking. On yards larger than 10 acres, less than

Table 8. AVERAGE LABOR DISTRIBUTION FOR POLE BEANS BY OPERATIONS AND MONTHS
Willamette Valley, Oregon
1946

Operation	Man hours per acre	Average distribution of man hours per acre							
		March	April	May	June	July	August	September	October
Spring clean-up (after winter flood)	2.4	....	2.4	....	....	....	....	....	....
Seedbed preparation	5.5	.2	2.6	2.7	....	....	....	....	....
Planting	3.3	....	.2	2.9	.2	....	....	....	....
Hand cultivation	29.5	....	....	5.0	15.0	8.9	.6	....	....
Machine cultivation	8.2	....	....	1.5	3.4	2.9	.4	....	....
Yard preparation ¹	29.1	....	....	5.5	18.9	4.7	....	....	....
Stringing	13.8	....	....	2.6	9.0	2.2	....	....	....
Fertilizing and manuring ²	2.3	....	.3	.8	.2	.8	.2	....	....
Irrigation	24.7	....	....	1.0	3.0	9.4	10.6	.7	....
Dusting	1.0	....	....	....	.3	.4	.3	....	....
Picking	592.8	....	....	....	....	59.3	426.8	106.7	....
Other harvest	66.0	....	....	....	....	6.6	47.5	11.9	....
Hauling crop	8.8	....	....	....	....	.9	6.3	1.6	....
Hauling workers	4.3	....	....	....	....	.4	3.1	.8	....
Fall clean-up	13.8	1.4 ³	....	....	....	....	.3	9.3	2.8
Cover crop	1.5	....	....	....	....	....	....	.9	.6
TOTAL DIRECT LABOR	807.0	1.6	5.5	22.0	50.0	96.5	496.1	131.9	3.4
Operator's overhead	17.2	....	....	....	....	....	....	....	....
TOTAL HOURS PER ACRE	824.2	....	....	....	....	....	....	....	....

¹Includes the labor used in connecting stakes with twine in "stake" type yards, but does not include the "stringing" in other kinds of yards.

²Labor used in fertilizing while planting and cultivating included with those operations. Includes the labor, however, of applying fertilizer through irrigation system.

³This labor actually is spread over the period October to March inclusive.

25 per cent of the preharvest and 35 per cent of the harvest labor (excluding picking) was actually done by the grower and his family.

Average wage rates per hour

The average wage rate per hour for the grower and his family was estimated by the growers themselves (Table 9). The rate per hour earned by pickers is based on the estimated amount of beans picked per hour and the prevailing picking rate of \$55 per ton. Growers estimated that adult pickers on the average picked 26.7 pounds of beans per hour or 214 pounds per 8-hour day, over an average of 25 days of actual picking (Figure 4). They also reported that 4.4 pickers were used per acre during this period.

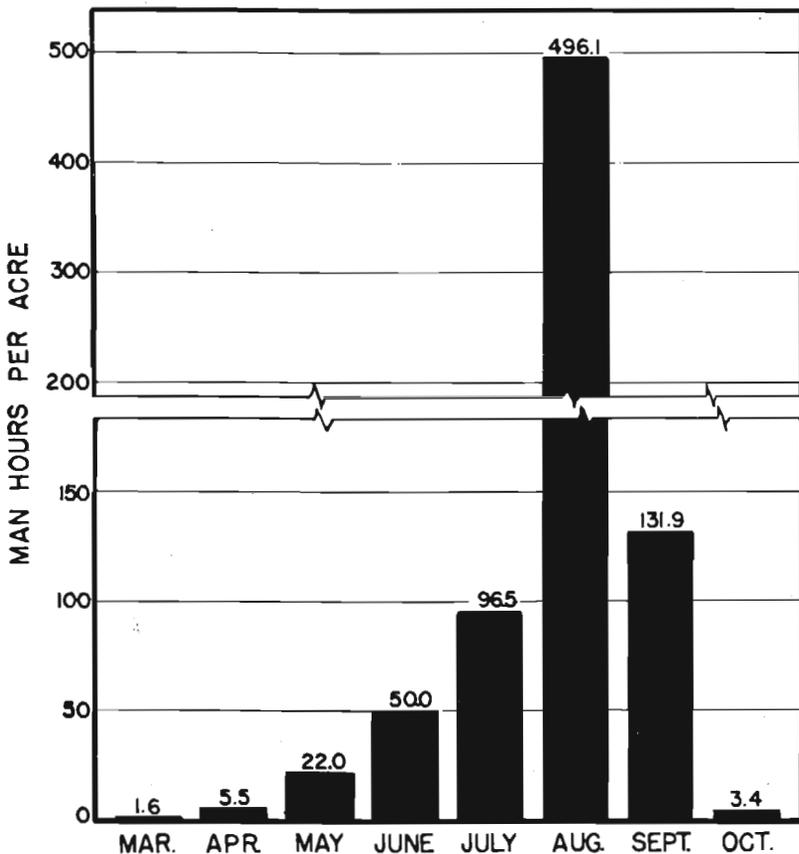


Figure 3. Average monthly distribution of labor for an acre of pole beans having a yield of 7.9 tons per acre.

Table 9. HOURS OF MAN LABOR USED PER ACRE OF POLE BEANS AND WAGE RATE PER HOUR
Willamette Valley, Oregon
1946

Item	Hours, per acre	Wage per hour
Operator (direct labor)	46.4	\$1.15
Family (direct labor)	33.8	.86
Operator (overhead labor)	17.2	1.15
Hired labor (excluding picking)	134.0	.86
Picking labor (adult basis)	592.8	.73
AVERAGE	824.2	\$0.79

Temporary and permanent yards compared

The equipment in temporary yards is removed from the bean field each year (Table 10). All or part of the equipment in permanent yards, however, remains in the field the year around. In stake yards, stakes are used for the actual support of the bean plants. In the other kind of temporary yard, posts are placed at intervals down the bean row. These posts are connected by two wires, one at the top and one at the bottom of the posts. The bean plant then climbs the string placed between the two wires. Some growers substitute string for the two wires, while others use only a top wire or string. In the latter cases, the support string is tied to the upper wire and at the bottom to the bean plant itself.

Table 10. COST OF OPERATING DIFFERENT TYPES OF BEAN YARDS
Willamette Valley, Oregon
1946

Item	Temporary yards		Permanent yards		Average for all yards
	Stake	Posts and wire and/or string	Trellis	Semi- permanent	
Number of yards	8	14	27	18	67
Acres per yard	8.8	13.1	9.3	6.7	9.3
Yield per acre (tons)	8.2	7.8	8.0	7.7	7.9
Man hours per acre on yard preparation and fall clean-up	65.0	60.3	49.7	60.7	56.7
Yard investment per acre of beans	\$51.00	\$60.00	\$120.00	\$86.00	\$88.00
<i>Cost per acre</i>					
Labor in preparing yard..	\$45.70	\$41.40	\$ 29.40	\$41.10	\$37.00
Labor in fall clean-up.....	18.80	10.10	15.00	11.40	13.30
Machinery and horse	1.90	2.90	1.50	1.80	2.10
Supplies (string, nails, staples, etc.)	2.40	13.10	11.40	10.70	10.70
Yard equipment deprecia- tion	8.60	10.60	23.80	14.80	16.50
Interest at 5 per cent on investment in yard equipment	2.50	3.00	6.00	4.30	4.40
TOTAL COST PER ACRE	\$79.90	\$81.10	\$ 87.10	\$84.10	\$84.00



Figure 4. A study of the amount of beans picked per day by pickers of different ages shows that those of grade school age picked an average of 100 pounds each day; those of high school age, about 150 pounds; and adults, 194 pounds per day.¹

¹"Man Labor Requirements for Harvesting Pole Snap Beans in Oregon," Oregon Agricultural Experiment Station Circular 166.

The trellis yards are similar to hop yards ; the wires are raised to an overhead position in order to permit machine work in the field. Ordinarily fewer but heavier posts and heavier wire are used than for the other bean yards. The posts in semipermanent yards remain in the ground all year, but the wire is removed after the bean crop is harvested. In both types of permanent yards, string looped between the upper and lower wires supports the bean plant.

The difference in the cost per acre between these different yards is small. Those of the trellis type were the most expensive, having a relatively high investment and depreciation cost per acre, but they also had the lowest labor costs of any type yard. The stake yards had a low investment per acre, but obviously required more labor since they were entirely removed each fall and then returned each spring. It appears that yields are little affected by the type of yard used.

Generally speaking the temporary yards were used in the overflow, river-bottom areas. Removing the entire yard prevents the loss of posts and stakes, facilitates cover cropping, and makes possible the use of a different field each year.

Kinds of soil and costs

Insofar as native productivity is concerned, soils in the river-bottom group are usually rated first. This conclusion is substantiated in Table 11—both yield and land values were highest for this group. In the case of the six growers listed as "other," five had soil of the Wapato series and one had Amity. Apparently some types of Wapato are well adapted to bean production, for two of these five growers had yields of over 12 tons per acre. Their bean land was also valued at a relatively high figure.

The low cost per ton for bean yards on the Willamette soils can, for the most part, be attributed to larger yards, flat land, and the absence of need for spring clean-up.

Table 11. COMPARISON OF POLE BEAN PRODUCTION ACCORDING TO THE KIND OF SOIL USED
Willamette Valley, Oregon, 1946

Kind of soil	Number of growers	Cost per ton	Average size of bean yard	Yield per acre	Value of bean land per acre
Riverbottom soils ¹	41	\$104.40	<i>Acres</i> 8.0	<i>Tons</i> 8.8	\$573
Willamette soil series	5	102.60	24.2	7.3	281
Stayton area soils ²	15	106.20	10.3	6.2	256
Other ³	6	107.50	4.0	7.8	394

¹Typical soils series would be Chehalis and Newberg.

²Gravelly phases of the Salem, Clackamas and Sifton soil series.

³Wapato and Amity soil series.

Items of investment in the bean enterprise

The 1946 value of the "bare" bean land, as estimated by the growers, made up over half the average investment used in 1946 to produce beans (Table 12). The investment as shown includes rented land, but does not include an investment value for hired machinery and workstock. Growers spent an average of about \$10 per acre for this expense, of which truck work accounted for over half.

Growers placed a "normal" valuation per acre of \$241 on their bean land. Using this value instead of the 1946 value would reduce the total investment per acre to \$694. Land would then represent only 35 per cent of the total investment.

Table 12. INVESTMENT USED PER ACRE OF POLE BEANS
Willamette Valley, Oregon
1946

Item	Investment per acre	Per cent of total
Land	\$431	55
Buildings	36	5
Yard	88	11
Irrigation equipment	160	20
Tractor	14	2
Workstock	4	.....
Truck and automobile	27	4
Other machinery	24	3
TOTAL INVESTMENT PER ACRE	\$784	100

Flood and sprinkler irrigation compared

As previously stated, the bean yards that were flood irrigated were found mainly in the Stayton area of Marion County. Here the relatively flat terrain permits this type of irrigation. On the river-bottom soils, however, the undulating character of the land in most cases prohibits irrigation other than by sprinkling. Sprinkler irrigation is definitely expensive from the standpoint of both investment in equipment and annual operating expenses (Table 13). It will be noted that the average investment per acre in irrigation equipment is \$188. In some cases this is as high or higher than these same growers felt their bare bean land was worth prior to the war.

The size of the investment in irrigation equipment might lead one to believe that the useful capacity of the equipment was not being fully utilized. The growers, however, reported a use averaging 80 per cent of capacity. This is probably as high as the use capacity of most other farm equipment. The main reason that the investment per acre is relatively high is that the beans were irrigated about 9 times during the year. With such frequent irrigation the equipment's use for other crops is limited. In terms of investment for each acre

irrigated once, the investment would probably be as low or lower than for other irrigated crops.

Noncash costs are the major equipment costs. They account for about three-fourths of the total and are made up of about two-thirds depreciation and one-third interest.

Table 13. COST OF FLOOD AND SPRINKLER IRRIGATION OF POLE BEANS
Willamette Valley, Oregon
1946

Item	Method of applying water	
	Flood ¹	Sprinkler ²
Number of bean yards	9	55
Acres per yard	9.2	9.7
Investment per acre in irrigation equipment	\$5.00	\$188.00
Times irrigated	6.4	9.1
Total hours irrigation per acre	14.5	40.7
Hours irrigation per time over	2.3	4.5
	Cost per acre	Cost per acre
<i>Irrigation equipment costs and water charges</i>		
Cash (power, repairs, and water charges)	\$ 4.30	\$ 8.70
Non-cash (interest, depreciation and upkeep) .....	.90	28.40
TOTAL	\$ 5.20	\$37.10
<i>Water application costs</i>		
Labor	\$17.70	\$23.80
Tractor, truck, horse and other equipment .....	.10	.40
TOTAL	\$17.80	\$24.20
TOTAL IRRIGATION COST PER ACRE OF BEANS	\$23.00	\$61.30

¹Includes one grower pumping water for flood irrigation, and one grower having his own water storage facilities for gravity irrigation.

²Includes 5 growers pumping from irrigation district ditch.

Variation in Costs Between Growers

The cost of producing a ton of beans varied considerably between growers. The lowest cost was slightly less than \$80 per ton, and the highest was well over \$200. It appears that three factors were largely responsible for this variation. These factors were: (1) tons of beans produced per acre, (2) the hours of labor used per acre, excluding picking, and (3) acres per bean yard.

Each of these factors is important in its influence on costs, but the importance of one factor cannot be adequately measured without considering the others. In other words, a grower having a large acreage of beans is not necessarily a low-cost producer. That depends a good deal upon the yield he receives, and upon the amount of labor he uses per acre. Likewise, there is a tendency for growers

having high yields to have low costs, but this again is not true for all growers with high yields. Some have labor costs that are too high and perhaps their acreage is so small that efficient use of equipment is impossible.

In the following tables some of these associations will be pointed out. The first tables will show the gross effect of each of the three factors upon costs, disregarding the other two. The last tables will show how these factors in different combinations affect costs.

Size of field as related to cost

There was a definite tendency for bean production costs per ton to become less with increases in the size of bean fields up to 15 acres (Table 14). Growers having 15 or more acres, however, had costs higher than the 10 to 15 acre group. This situation was caused to a large extent by the low yield received and a cost for yard investment and supplies that was higher than for any other group. Their labor and equipment costs per acre were the lowest, but when the low yield received is taken into account these same costs on a per ton basis were higher than average.

Table 14. COSTS OF PRODUCING POLE BEANS AS AFFECTED BY ACRES OF BEANS PER GROWER
Willamette Valley, Oregon
1946

Size of bean yard	Average size	Number of growers	Total cost per ton	Yield per acre	Labor costs (excluding picking)	
					Per acre	Per ton
	<i>Acres</i>			<i>Tons</i>		
Under 5 acres	3.0	19	\$117.80	7.4	\$284.80	\$38.60
5 to 10 acres	6.5	20	107.50	8.1	251.70	30.90
10 to 15 acres	11.1	19	99.30	8.8	214.20	24.20
15 acres and over	25.4	9	105.40	6.9	184.00	26.50
ALL GROWERS	9.3	67	\$104.60	7.9	\$217.30	\$27.60

The relatively low yields and higher-than-average costs per ton on the largest yards are not necessarily the results of having a large acreage. They are explained in part by the productiveness of the land on which a majority of these bean yards were located. Five of the nine growers had their bean yards on soil classified as other than riverbottom. As pointed out previously, bean yields were considerably lower on these land classes than on the riverbottom soils. Had all nine of these yards been located on riverbottom soils it would seem likely that their average yields would have been considerably higher and their costs lower than those shown in the above table.

Yield per acre as related to cost

The yield of beans per acre was one of the most important factors affecting costs (Figure 5). Higher yields were associated with low costs per ton, and low yields with high costs (Table 15). The labor costs, excluding picking, also varied with yields. Growers having high yields also had high labor costs per acre. The labor costs, however, did not increase in the same proportion as yields. In other words, even though the labor cost per acre increased, these same costs on a per ton basis actually decreased with higher yields.

Table 15. COSTS OF PRODUCING POLE BEANS AS AFFECTED BY YIELD OF BEANS PER ACRE
Willamette Valley, Oregon
1946

Bean yield per acre	Average yield	Number of growers	Total cost per ton	Average size of bean yard	Labor costs (excluding picking)	
					Per acre	Per ton
	<i>Tons</i>			<i>Acres</i>		
Under 4 tons	3.4	4	\$162.10	4.8	\$218.90	\$64.40
4 to 6 tons	5.3	10	113.90	11.8	167.00	31.50
6 to 8 tons	7.2	21	107.10	11.2	209.70	29.10
8 to 10 tons	8.8	13	101.20	8.2	224.70	25.50
10 to 12 tons	10.6	15	99.70	8.5	268.00	25.30
12 tons and over	12.8	4	88.70	4.9	239.40	18.70

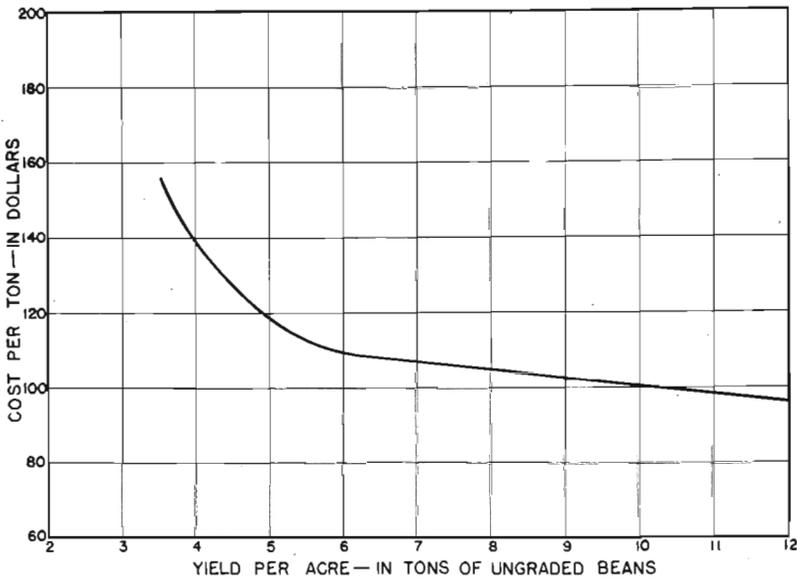


Figure 5. The cost per ton of producing beans declines as the yield per acre increases.

As previously mentioned, bean grades are based largely on size of bean—the larger the bean the lower the grade. It might have been expected that growers having high yields would have a high percentage of low-grade beans, but this was not the case. There was little, if any, relationship between yield per acre and grade of beans.

If the Stayton area data had been removed from this table, a somewhat different picture would have resulted. Then the average costs of the "4 to 6 group" would have been higher because growers in the Stayton area had about average costs with yields that were considerably below average.

Man-hours of labor as related to cost

Labor costs, excluding picking, make up about 55 per cent of the remaining cost of producing beans. Economies in its use, therefore, generally mean lower costs per ton. Table 16 shows this relationship—the fewer the hours of labor per acre the lower the total cost per ton. The growers having the fewest numbers of hours of labor per acre attained this efficiency by using less labor per acre in cultivating, in preparing their yards, and in their harvesting (excluding the cost of picking).

Table 16. COSTS OF PRODUCING POLE BEANS AS AFFECTED BY MAN HOURS OF LABOR (EXCLUDING PICKING)
Willamette Valley, Oregon
1946

Labor used per acre	Average labor	Number of growers	Total cost per ton	Average size of bean yard	Yield per acre	Labor costs (excluding picking)	
						Per acre	Per ton
	<i>Man hours</i>			<i>Acres</i>	<i>Tons</i>		
Under 180 man hours	158.4	15	\$ 99.40	11.9	6.8	\$148.00	\$21.80
180 to 240 man hours	205.5	17	101.40	13.0	7.8	193.30	24.80
240 to 300 man hours	267.5	17	105.00	7.5	8.4	242.90	28.90
300 to 360 man hours	339.8	10	109.10	5.6	10.0	330.50	33.00
360 man hours and over	421.7	8	129.00	5.3	8.4	406.40	48.60

Combination of factors as related to cost

The group of growers having the lowest costs were above average in acres of beans, but were *below average* in yield, showing that above-average yields are not always required for low costs, if certain other factors are favorable.

Not all of the growers using a small amount of labor per acre had low yields. Some had high yields and their costs were extremely low. This is illustrated in the next table.

It would be possible for growers to have high costs as a result of using either too little or too much labor per acre. In this study, however, there is no evidence that growers used insufficient labor, but it is evident that some growers used considerably more than was necessary. Of the growers using 300 or more man hours per acre, even those receiving yields of 10 tons or over per acre had costs above average (Table 17). On the other hand, of the growers using less than 180 man hours per acre, only the group having the lowest yields had costs above average.

As pointed out in table 16, growers using low amounts of labor per acre generally had below average yields. Some of these growers, however, were able to use a small amount of labor per acre, and also receive high yields. This was good management on their part, and it paid off. Their costs were extremely low, averaging \$86 per ton.

Table 17. COST PER TON OF POLE BEANS AS AFFECTED BY LABOR EFFICIENCY AND YIELD PER ACRE
Willamette Valley, Oregon
1946

Labor used per acre (excluding picking)	Cost per ton		
	For yield under 7 tons	For yield of 7 to 10 tons	For yield of 10 tons or over
Under 180 man hours	\$107	\$ 96	\$ 86
180 to 240 man hours	116	102	89
240 to 300 man hours	154	107	96
300 man hours and over	163	125	108

Comparison of high- and low-cost producers

A comparison of the costs for high- and low-cost producers emphasizes the importance of the factors associated with low costs that have just been discussed (Table 18). The low-cost yards were about average in size but were almost twice as large as the high-cost yards.

Good management is evident in the case of the low-cost producers. Their yields were twice as large as those for the high-cost group, yet they used 40 per cent less labor per acre (excluding picking) in obtaining this production. A study of the labor used shows that the low-cost producers used much less labor per acre for each of the major operations shown. This is especially significant in the case of picking supervision (harvest labor other than picking and hauling). The low-cost growers had yields of over 10 tons per acre and used an average of 55.4 hours of picking supervision per acre.

Table 18. COMPARISON OF HIGH AND LOW COST GROWERS OF POLE BEANS
Willamette Valley, Oregon
1946

Item	Averages for 10 low cost growers	Averages for 10 high cost growers	Averages for all 67 growers
Cost per ton	\$ 87.60	\$151.40	\$104.60
Acres per yard	9.1	4.8	9.3
Yield per acre	10.3	5.0	7.9
Labor cost per acre (excluding picking)	\$174.40	\$302.30	\$217.30
Labor cost per ton (excluding picking)	\$ 17.00	\$ 59.90	\$ 27.60
Man hours per acre:			
Total (excluding picking)	188.0	324.6	231.4
Seedbed preparation	3.4	7.6	5.5
Hand cultivation	24.5	53.1	29.5
Machine cultivation	5.5	14.3	8.2
Yard preparation	33.5	61.4	42.9
Irrigation	19.7	24.5	24.7
Harvest supervision	55.4	68.6	66.0
Fall clean-up	11.8	25.1	13.8
Times hand cultivated	2.0	2.6	2.2
Times machine cultivated	3.4	4.8	4.0

The high cost producers used 68.6 hours of supervision per acre but picked only half that amount of beans.

Throughout the study, the data point to good management (as evidenced by high yields and the economical use of labor) as being exceedingly important in obtaining low costs.