

OREGON EXPERIMENT STATION
J. T. Jardine, Director

Circular of Information 59

COST OF PRODUCING WALNUTS IN OREGON

(For the year 1929)

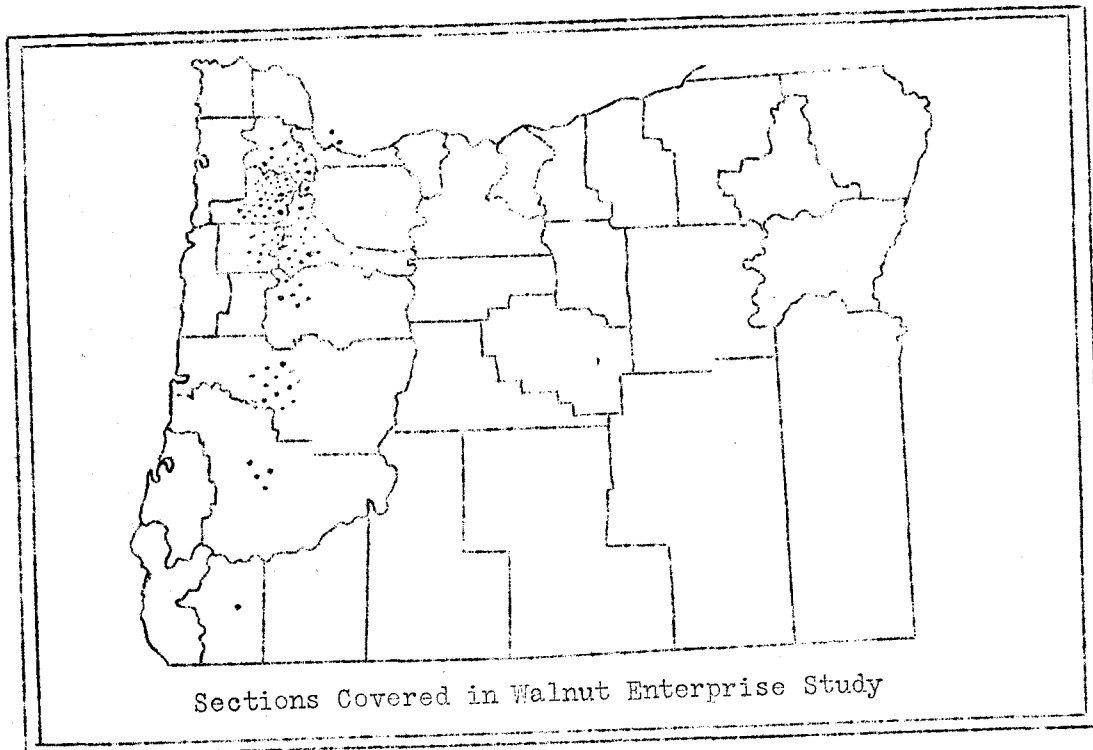
Progress Report No. 1

By

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Sections Covered in Walnut Enterprise Study

Corvallis, Oregon
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THE SITUATION

Persian or "English" walnut growing in Oregon is as yet an infant enterprise. A few of the oldest commercial plantings range from 35 to 40 years of age, but the bulk of the present bearing acreage averages about 20 years of age, just the beginning of good bearing years. The enterprise has gone far enough to establish the fact that western Oregon has favorable climatic conditions for producing high quality nuts and has excellent walnut soils, available at low prices.

For these reasons interest in the enterprise is increasing, and it is time that, through study of past mistakes, the future development of the crop be placed upon a more secure footing.

The consumption of Persian or "English" walnuts in the United States during 1929 was 64,089 tons. Of this amount, approximately 64% were produced at home and the other 36% were imported.

California and Oregon produce practically all of the Persian or "English" walnuts grown in the United States. In 1929 the total production from these states was estimated by federal statisticians at 41,100 tons. Of this total production about 1,050 tons or approximately 2.5% were grown in Oregon. However much of the walnut acreage in both California and Oregon is not yet in full bearing. California investigators estimate that approximately 35% of their acreage is non-bearing and another 24% is in only partial bearing. In Oregon it is probable that nearly half of the total acreage is too young to be classed as bearing. With steadily increasing production, it appears that walnut growers are approaching a period of keen competition.

The future of the walnut enterprise in Oregon, it is believed, depends largely on production costs. Can the average Oregon walnut grower produce at a cost low enough to allow successful development of this industry in spite of increasing competition and possible lower price levels, or are his costs so high that further development seems unwise? Furthermore, if the present production costs are too high, what are the possibilities of reducing these costs? These questions should be answered before further development occurs, for it seems likely that within a short time the door to walnut profits may be securely locked against all keys except low production costs.

PURPOSE OF THE STUDY

The Oregon Experiment Station in cooperation with the United States Department of Agriculture is now conducting an extensive economic investigation of the walnut enterprise in Oregon, in order to determine

Acknowledgments: The authors wish to express their appreciation for the excellent cooperation received from the growers participating in this study and for the assistance rendered by the North Pacific Nut Growers Association in securing individual grades for the nuts produced. They also wish to acknowledge the generous assistance of Professor H. D. Scudder, Chief in Farm Management, in the preparation of the field schedules, and the preparation of this progress report.

the economic status of this industry and its future needs. This study has four major objectives, two dealing with the orchards now in bearing and two dealing with young orchards not yet of bearing age. These objectives are:

1. To determine the cost of producing walnuts.
2. To determine what factors have a major effect on the cost of producing walnuts.
3. To determine the cost of bringing a planting of walnuts to bearing age.
4. To determine the most economical methods of bringing a walnut planting to bearing age.

EXTENT AND PROGRESS OF THE STUDY

This investigation was commenced during the winter of 1929-1930 and will probably be completed during 1932. To date it has proceeded along two general lines. The representative of the United States Department of Agriculture in charge of Northwest nut investigations has been giving special attention to such points as orchard location, soils, rate of tree growth, planting distances, and pollination - the production phases. The representative of the Oregon Experiment Station has been giving major attention to the production costs and the relationship of these costs to the production phases.

The areas covered in this study are shown by the map on the cover page. A total of 122 records of orchard operation costs have been secured in nine Oregon counties and Clark County, the chief producing section of the state of Washington. The numbers of cooperating orchards in each county are as follows: Yamhill, 57, Marion, 17; Washington, 13; Lane, 12; Polk, 9; Linn, 6; Douglas, 4; Josephine, 1; Clackamas, 1; and Clark-County Washington, 2. These cooperating orchards had a total of 3,471.25 acres of bearing orchard which produced 1,164,574 pounds of walnuts in 1929. Of this orchard, 30% was of the Franquette variety, and practically all of the remainder was seedling orchard, largely second generation Franquettes.

In addition to the cost reports obtained, about half of the 122 orchards have also been studied in detail from the production standpoint. Such important factors as soil, depth, slope, altitude, and rate of growth have been carefully considered. These studies will be continued until each cooperating orchard has received the same study.

The only phase of this study discussed in the report is the production cost for the 1929 crop. The other phases of the study will be presented when they have progressed far enough to justify statements concerning them. All figures and statements in this report are tentative and are subject to revision.

WALNUT FARM ACREAGE

The average walnut farm was found to contain approximately 112 acres of land of which 25.5% is bearing walnut orchard. (Table 1)

The averages in Table 1 picture the Oregon walnut orchard as an important enterprise in a diversified system of farming. However included in these averages are quite a few farms that are strictly specialized and do not conform to the general situation. With a few exceptions, these specialized farms are owned by absentee owners and are operated by hired labor.

Table 1. DISTRIBUTION OF ACREAGE ON WALNUT FARMS
(1929)

Classification of acreage	Average acres per farm	Percentage of total acreage
Bearing walnuts	28.5	25.5
Non-bearing walnuts	8.3	7.4
Other fruit	12.1	10.8
Other crops	23.5	21.0
Pasture, waste, etc.	39.5	35.3
TOTAL ACRES	111.9	100.0

INVESTMENT IN THE BEARING WALNUT ENTERPRISE

The average total investment in this bearing walnut enterprise amounts to \$17,109 per farm or \$601 per acre of bearing orchard. (Table 2) The investment in land and trees represents the cooperators' careful estimate of the present market price for orchards of similar age and quality in this community, while the building and equipment investment represent their present depreciated value. Most of the machinery and buildings used in operating the walnut orchard are also used to some extent by other farm enterprises, and where so used the investment charge to walnuts represents only the actual amount of use by this enterprise; therefore the investment of \$18 per acre in these items does not represent the full value of this equipment.

Table 2. INVESTMENT IN THE WALNUT
ENTERPRISE
(Bearing Orchard Only, 1929)

Investment item	Investment per farm	Investment per acre	Percentage of total investment
Bearing orchard	\$ 16588	\$ 583	97.0
Tractor	123	4	.7
Other mach & equip.	71	2	.4
Dryer	279	10	1.6
Other buildings	48	2	.3
TOTAL	\$17109	\$ 601	100.0

Of the total farm investment which amounts to \$32,803 per farm only 52.2% is in the bearing walnut enterprise. The remainder is in young walnut orchard and other farm enterprises.

The capital requirements of the walnut enterprise differ from most orchard enterprises in that the amount of operating equipment and building investment is small. Walnut growers have so far cared for their plantings and harvested their crops without heavy investments in such items as spray equipment, dryers, ladders, and lug boxes, which many other orchard crops require. Indications are that in the future this condition may change somewhat for as diseases and pests become more common machinery to fight them must be provided.

THE COST OF PRODUCTION

The average cost of producing the 1929 walnut crop on the orchards cooperating in this study was \$58.11 per acre, 17.4¢ per pound, or \$2.86 per tree. (Table 3) These cooperating orchards comprise about 70% of the estimated bearing walnut acreage in the state. The average orchard on which these costs were incurred consisted of 28.5 acres of 20 year old trees, set 20 trees to the acre and produced 335 pounds of nuts per acre. The chief items of cost were man and horse labor which made up one-third of this cost, and 5% interest on the capital investment which accounts for slightly over half of the total cost.

Labor. The total labor charge amounted to \$19.47 per acre, of which \$1.02 was horse labor and the balance (\$18.45) was for man labor. Of this man labor \$1.47 per acre was for overhead management and the balance was for direct labor. Most of the man labor was hired or contracted, these two items making up about three-fourths of the total man-labor charge. The hired labor cost 36.3¢ per hour, the operator's labor was valued at 36.2¢ per hour, and the family labor value was 34.7¢ per hour.

The charge of \$5.11 per acre for contract labor was not all for labor, but was partly for the use of buildings and equipment. For example the contract labor charge was divided 45.7% to drying, 31.6% to picking, 7.7% to cultivation, and 15.0% to miscellaneous jobs, mostly hauling. Drying, cultivation, and hauling all require the use of equipment and the charge for this use together with the labor was included in the contract rate. Since it is difficult to separate the labor charge from the total charge, and since the larger portion of this contract cost was for labor, it seems justifiable to include the whole under the labor classification.

Miscellaneous Cost. The chief items of miscellaneous cost were taxes, tractor operation, fertilizer, and cover crop seed. The sum of all the items in this group of costs made up only 11.3% or about one-tenth of the total cost.

Depreciation. Over a period of years machinery and buildings wear out and must be replaced. It is only proper, therefore, to charge a part of this wear or depreciation to each year's crop. This charge amounted to \$1.99 per acre, or 3.4% of the total cost. Although not a large annual charge, this allowance accumulated over long periods will replace the buildings and machinery used in walnut production.

Operating Cost. The sum of all the costs except interest has been designated as operating cost. This sum amounted to \$28.05 per acre, or 8.4¢ per pound of walnuts. The price received for the product less the operating cost gave the earnings which accrued to the capital investment.

Table 3. THE COST OF PRODUCING WALNUTS
(1929 Crop)

122 orchards, 3,471 acres, producing
1,161,574 pounds of Nuts.

Average acres bearing walnuts per farm 28.5; average yield per acre 335 pounds;
average number of trees per acre 20; average age of trees, 20 years.

Cost item	Cost per acre	Cost per pound nuts cents	Cost per tree	Percentage of Total cost
Hired man-labor (23.7 hrs. per A.)	\$ 8.60	2.6	\$0.42	14.8
Operator's labor (7.6 hrs. per A.)	2.75	.8	.14	4.7
Overhead management (1.5 hrs. per A.)	1.47	.4	.07	2.5
Unpaid family labor (1.5 hrs. per A.)	.52	.2	.03	.9
Contract labor	5.11	1.5	.25	8.8
TOTAL MAN LABOR	18.45	5.5	.91	31.7
Horse labor (7.8 hrs. per A.)	1.02	.3	.05	1.8
TOTAL LABOR	19.47	5.8	.96	33.5
Fertilizer	.68	.2	.03	1.2
Cover crop seed	.77	.2	.04	1.3
Taxes	2.22	.7	.11	3.8
Power	.15	*	.01	.3
Tractor operation	1.13	.4	.05	2.0
Spray materials	.37	.1	.02	.6
Rent of machinery	.36	.1	.02	.6
Use of auto or truck	.30	.1	.01	.5
Fuel bought	.13	*	.01	.2
Miscellaneous	.48	.2	.02	.8
TOTAL GENERAL EXPENSE	6.59	2.0	.32	11.3
Depreciation on tractor	.82	.3	.04	1.4
Depreciation on other mach. and equip.	.43	.1	.02	.7
Depreciation on dryer	.60	.2	.03	1.1
Depreciation on other buildings	.14	*	.01	.2
TOTAL DEPRECIATION	1.99	.6	.10	3.4
TOTAL OPERATION COST	\$28.05	8.4¢	\$1.38	48.2%
Interest on land	\$29.15	8.7¢	\$1.43	50.3%
Interest on tractor	.22	.1	.01	.4
Interest on other mach. and equip.	.12	*	.01	.2
Interest on dryer	.49	.2	.02	.8
Interest on other buildings	.08	*	.01	.1
TOTAL INTEREST (@ 5%)	30.06	9.0	1.48	51.8
TOTAL COST	\$58.11	17.4¢	\$2.86	100.0%

* Less than one-tenth cent per pound

Interest. Interest at 5% on the bearing walnut enterprise investment amounted to \$30.06 per acre, or 9.0¢ per pound of nuts. The bulk of this charge was interest on investment in land and trees.

CASH COSTS

Not all of the cost of producing an acre of walnuts is cash or out-of-pocket cost. Of the total cost only \$21.39, or slightly over one-third, was actual cash expenditure. The remainder of the total cost was for such items as operator or unpaid family labor, and depreciation for which no actual cash was paid. (Table 4) Interest was also considered as a non-cash cost. Some of the orchards were mortgaged and paid part of their interest in cash, but many of these mortgages were placed to secure funds for investment purposes which were not related to the farm operation.

Table 4. CASH AND NON-CASH COSTS PER ACRE
(1929 Crop)

Cost Item	Cash Cost	Percentage of total cost %	Non-Cash cost	Percentage of total cost %
Hired and contract labor	\$13.71	23.6	\$ --	--
Operators and family labor			3.27	5.6
Overhead, labor	.87	1.5	.60	1.0
TOTAL MAN LABOR	14.58	25.1	3.87	6.6
Horse Labor	.22	.4	.80	1.4
TOTAL LABOR	14.80	25.5	4.67	8.0
Taxes	2.22	3.8	--	--
Tractor operation	1.13	2.0	--	--
Fertilizer	.68	1.2	--	--
Cover crop seed	.77	1.3	--	--
Other miscellaneous cost	1.79	3.0	--	--
TOTAL GENERAL EXPENSE	6.59	11.3	--	--
DEPRECIATION			1.99	3.4
INTEREST (at 5%)			30.06	51.8
TOTAL COST PER ACRE	\$21.39	36.8	\$36.72	63.2
COST PER POUND	6.4¢	36.8	11.0¢	63.2

Any segregation of cash and non-cash cost is more or less arbitrary. Unpaid labor, horse labor, depreciation, and interest may not call directly for a cash outlay, but indirectly they require partial payment in cash, for the family labor and horses must be fed, eventually worn-out machinery must be replaced, and mortgage interest, if a mortgage exists, must be paid. Therefore, growers that produce only enough to meet their cash costs will probably find themselves in financial difficulty, and unable to continue operation of their business, but it is also true that growers can exist fairly comfortably for quite a period without ever meeting their total cost. The amount of margin between the cash cost and the selling price which is necessary to permit production to continue will, of course, depend on business volume and the money requirements of the individual grower concerned.

VARIATIONS IN PRODUCTION COSTS

Quite a wide variation in production cost was found among the different orchards. The lowest cost orchard produced nuts for 7.8¢ per pound and the highest cost orchard produced for \$1.05 per pound. Between these two extremes were the production costs of the other 120 cooperating orchards.

About half of the orchards were producing nuts at less than average cost. Among these low cost farms were 10 that produced for less than 10¢ a pound and 31, approximately one-fourth of all the orchards in the study, that produced for less than 14¢ a pound. (Table 5) These extremely low cost growers can successfully face a great deal of competition.

Table 5. VARIATIONS IN COST OF PRODUCING WALNUTS
(1929 Crop)

Variation in cost per pound cents	Average cost per pound cents	Number of farms	Percentage of total farms %	Cumulative percentage of total farms %	Acres Bearing	Cash Cost per pound cents
Below 10	9.4	10	8.2	8.2	168	4.3
10 - 14	11.6	21	17.2	25.4	309	4.0
14 - 18	15.8	31	25.4	50.8	301	6.4
18 - 22	19.7	27	22.1	72.9	502	5.3
22 - 26	23.7	15	12.3	85.2	384	8.9
26 - 40	30.5	10	8.2	93.4	591	11.9
40 and over	78.5	8	6.6	100.0	216	27.4
TOTAL AND AVERAGE	17.4	122	100.0	-	3471	6.4

A few orchards had very high costs. One group of 8 had costs of 40¢ per pound or more, averaging 78.5¢ per pound. Such a cost is far above any possible market price. Aside from these few orchards the high costs found were not so extreme. Only 27% of the orchards had costs of 22¢ per pound or over, and but 15% had costs of over 26¢ per pound.

Excepting for the 8 very high cost orchards all cooperating orchards were producing nuts at a cash cost well under the average net field run price of the 1929 crop which was 15.3¢ per pound. Should prices decline to any extent it would appear that approximately one-fourth of the orchards, those with costs of 22¢ per pound or more, will not only fail to meet their total cost by quite a large margin, but also will have a very small margin, if any, between their cash cost and the selling price, unless, of course, their production operations are improved in some way.

The low cost farms are ready to meet increasing competition. How can the high cost farms also prepare for this competition? To supply the answer or answers to this question is a major purpose of this study, but at the present time the incomplete stage of the study does not justify the mention of but one factor. This factor -- yield per acre -- has such an outstanding effect on production cost that it is worthy of the immediate and serious attention of every walnut producer.

PRODUCTION COSTS ON ORCHARDS WITH AND WITHOUT INTERPLANTINGS

About 45% of the bearing orchards included in this study are still interplanted with filler trees of some fruit other than walnuts. Prunes and cherries are the most common fillers found. In computing the production cost for orchards of this type, joint costs, such as taxes, cultivation, and cover crop seed, were charged to the walnuts according to the proportion of walnut trees to filler trees.

On this basis the cost of producing walnuts in those orchards which were not interplanted was less than it was in those interplanted. (Table 6) In the orchards without interplanting the average yield of walnuts (472 pounds per acre) was more than double the average yield (230 pounds per acre) of the interplanted orchards. The higher cost per acre on the straight walnut plantings was more than offset by the higher yields and hence the resultant lower cost per pound of walnuts.

Table 6. PRODUCTION COSTS ON INTERPLANTED WALNUT ORCHARDS AND WALNUT ORCHARDS NOT INTERPLANTED (1929 Crop)

Item	Interplanted	Not Interplanted
No. of farms	57	65
Acres of bearing nuts per farm	34.7	23.0
Av. yield per acre	230	472
Av. no. trees per acre	19	22
Av. age trees	19.5	20
	Costs against walnuts only	
Man and horse labor per acre	\$14.75	\$25.72
Miscellaneous costs per acre	4.55	9.28
Depreciation per acre	1.52	2.61
Interest per acre @ 5%	24.92	36.87
TOTAL COST PER ACRE	45.74	74.48
TOTAL COST PER POUND	19.8¢	16.0¢

Up to a certain age the net returns obtained from good interplanting in many cases undoubtedly help to reduce the cost per acre of bringing a walnut orchard into bearing. How long such interplantings may be left without reduction of walnut yields to an unprofitable degree is a question that must be answered according to the varying conditions existing in each orchard. The effect of interplantings on the growth and yield of the walnuts and the extent to which profits from interplantings offset this effect must be carefully considered. It is hoped that further light may be obtained on this question before this investigation is completed.

DISTRIBUTION OF DIRECT MAN LABOR

Direct man labor accounts for such a large portion of the total cost that it is of interest and importance to know how this labor is utilized.

It was found that the operations performed prior to harvest account for 29.7% of the total direct man labor used. Of these pre-harvest operations, cultivation and pruning use about two-thirds of all the pre-harvest labor.

Harvest operations use about two and one-half times as much labor as the pre-harvest labor operations. Chief in importance of these operations is gathering the nuts and the delivery of them to the dryer, which constitutes about two-thirds of all the harvest labor.

YIELD PER ACRE

Regardless of the amount of nuts harvested, costs such as taxes, interest, depreciation, and cultivation go on just the same; therefore, larger yields should decrease the cost per pound as there are more pounds to carry these fixed costs.

Table 7. THE EFFECT OF YIELD ON COST
(1929 Crop)

Yield per acre	Number of farms	Average Yield per acre	Average cost per acre	Average cost per pound	Operating cost per pound
Pounds		pounds		cents	cents
Below 150	12	69	\$32.45	47.2	19.5
150 to 350	47	239	47.24	19.7	9.3
350 to 550	32	429	76.28	17.8	8.6
550 to 750	14	620	97.64	15.8	8.1
750 and over	17	952	103.60	10.9	5.8
TOTALS & AVE.	122	335	58.11	17.4	8.4

The effect of yield on cost is shown in Table 7. As the yield increased from an average of 69 pounds per acre for the 12 low yielding orchards to 952 pounds per acre for the 17 high yielding orchards the production cost per pound decreased from 47.2¢ per pound to 10.9¢ per pound. The operating cost (total cost less interest) decreased in about the same proportion as the total cost. The cost per acre was higher for the larger yields of course, because of the increased cost per acre of harvesting the larger yield.

High yielding orchards were not plentiful. Only 17 orchards, 14% of all cooperating orchards, had yields of over 750 pounds per acre, and but 31 orchards, about one-fourth of the cooperating orchards, had yields of 550 pounds or more per acre. These figures do not agree with yields ranging from 1000 to 2000 pounds per acre such as one hears frequently mentioned. Analysis reveals that most of these reports of high yields come from a few exceptional orchards, and are not indicative of the present general situation. The yields for 1929 appear to be about normal and the many low yields shown are not due to a poor season.

The care required by walnut orchards is so simple and the equipment investment so low that even such low yields as 150 to 350 pounds per acre permit operation costs to be several cents per pound under the selling price. It would appear that all except the poorest of the low yielding orchards could be operated at a profit unless burdened by too heavy an investment in land and trees. It is very probable that the cost of growing such an orchard is quite a bit above the present market value of these

orchards, which precludes the possibility of growing such orchards with the expectancy of profits, but still permits their operation for profit if they can be purchased cheaply. Also, it requires a large area of low yielding orchards to produce enough income to return the grower an adequate living. This objection is largely overcome if the low yielding orchard is operated as a unit in a diversified system of farming.

There are definite reasons why some orchards are high yielding and others low yielding. As this study progresses, facts bearing on this problem will be presented from time to time. Preliminary investigation indicates that certain major causes of low yields can be eliminated before the planting is made. Many of the present low yielding orchards probably will always be of mediocre quality because of conditions such as poor soils, or inferior trees, conditions that are difficult to alter. But, even so, it is probable that in many cases yields can be improved somewhat through better management, so that production costs will bear a much more favorable relationship to selling prices than at the present time.

INDIVIDUAL COSTS

On the following page is presented a table which compares production costs on the lowest cost, the highest cost, and the average walnut orchard. There also appears a column entitled YOUR FARM. On the copy of this progress report returned to the cooperating grower this column has been filled out with the costs for this grower's orchard. This is the only instance in the entire study where the growers' name is ever used in connection with any of the figures or facts presented and this individual report is provided only to the grower cooperating.

Comparison of "Your Farm" costs with the costs on the average orchards, the lowest cost orchards, and the highest cost orchards should suggest possibilities for cost reductions. Later reports on this study will show more specifically how cost reductions can best be accomplished.

OREGON EXPERIMENT STATION AND
U. S. DEPARTMENT OF AGRICULTURE COOPERATING

Walnut Production Cost Study

INDIVIDUAL COST REPORT FOR 1929 CROP
(Confidential)*

Orchard of _____

Address _____

Cost Item	Average Cost Per Acre			YOUR FARM
	10% High Cost Farms	10% Low Cost Farms	Average of All Farms	
Pre-Harvest Man Labor	\$ 3.76	\$ 7.04	\$ 5.05	
Harvest Man Labor	3.85	22.00	11.93	
Overhead Management Labor	.47	4.02	1.47	
Horse Labor	.42	1.31	1.02	
TOTAL LABOR	8.50	34.37	19.47	
Taxes	1.34	3.87	2.22	
Fertilizer	1.90	.02	.68	
Cover Crop Seed	.67	1.29	.77	
Other Miscellaneous Cost	1.45	5.74	2.92	
TOTAL MISCELLANEOUS	5.36	10.92	6.59	
TOTAL DEPRECIATION	.63	4.34	1.99	
TOTAL INTEREST	22.86	40.49	30.06	
TOTAL COST	\$37.35	\$90.12	\$58.11	
Average Yield Per Acre	67 lbs.	932 lbs.	335 lbs.	
TOTAL COST PER POUND	55.9¢	9.7¢	17.4¢	
CASH COST PER POUND	18.2¢	4.0¢	4.4¢	

*This is the only copy of any analysis sheet that bears your name.