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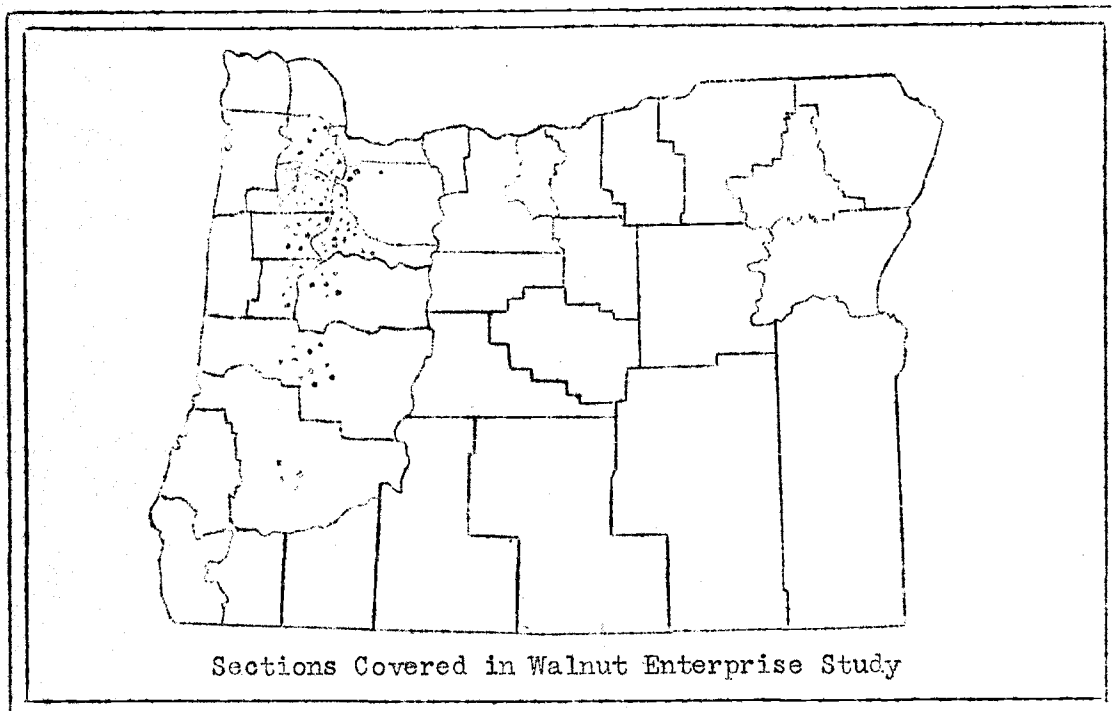
COST OF ESTABLISHING WALNUT ORCHARDS IN OREGON

Progress Report No. 1

by

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## THE SITUATION

The Persian or "English" walnut enterprise in Oregon has been developed entirely within the past forty years, and the bulk of this development has been during the past twenty years.

Early plantings were successful and many of these plantings now rank among the best of the present day bearing groves. As success with this new enterprise became more apparent there developed a rather general planting of walnuts, most of which occurred from eighteen to twenty-five years ago. Due to unrecognized factors such as shallow soil, poor air drainage or water drainage, poor strains and varieties, improper care, and possibly other causes, much of this large planting was not successful, and a great deal of it has already been destroyed. Probably as a result of some of the difficulties encountered following this "boom" period, interest in the industry temporarily receded for a few years.

During the past ten years there has been a distinct revival of interest in walnut planting. Indications are that present-day growers are planting with some of the mistakes of the past well in mind, for such factors as air drainage and water drainage, soils, improved varieties, and other production factors are receiving considerable attention.

No information whatever has been available as to the cost of growing a young orchard to bearing age and the cost of producing walnuts after the orchard has reached bearing age. There has been in the past, and is at present, a general misconception of the time and money required to establish a walnut orchard. Under-estimation of the capital required to develop groves has often proved embarrassing, particularly to owners with limited capital who were hiring all of the work. A greater hardship still has been the failure of some groves to return satisfactory profits after reaching bearing age. Both present and prospective growers have become greatly interested in learning the facts as to the costs involved in this enterprise, not only as a means of making present operations more profitable but as a fundamental necessity if prospective future competition is to be met successfully.

## PURPOSE OF THE STUDY

The Oregon Experiment Station and the United States Department of Agriculture at the request and with the cooperation of the growers are now conducting an extensive economic study of the walnut enterprise in Oregon, in order to determine the 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; and (4) to determine the most economical and practical methods of bringing walnuts to bearing age.

## EXTENT AND PROGRESS OF THE STUDY

Progress Report No. 1, covering the cost of producing walnuts

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was issued January, 1931. This report may be obtained from the Oregon Experiment Station.

Preliminary findings on the cost of bringing a walnut orchard to bearing age are reported herein.

The areas covered in this study are shown by the map on the cover page. Cost records were obtained from 41 growers reporting on 54 different blocks of trees, ranging in age from one to eleven years, and totaling 1182 acres in area. In addition to the cost records, data on planting distances, planting plans, interplantings and intercrops, yields and other factors were secured from 40 additional growers representing 722 acres of young orchard. This total of 1904 acres covered so far in this investigation represents approximately 15% of the total young walnut acreage in the state, and probably 40 - 50% of the commercially planted young walnuts.

All statements and tabular material presented in this report are preliminary in character and are subject to change and revision in the final publication of the report on this investigation.

#### THE WALNUT FARM ACREAGE

Analysis of the farm acreage found on 194 walnut farms, some with bearing groves only, some with young groves only, and some with both bearing and non-bearing walnut groves, shows that in Oregon the walnut grove is, as a rule, only a unit or enterprise in a diversified system of farming. This point is illustrated by the averages shown in Table 1.

Table 1. - DISTRIBUTION OF ACREAGE ON WALNUT FARMS

(Averages for 194 farms having bearing and non-bearing walnuts)

Item	Acres	Percent of Total
Bearing walnuts	18.2	16.8
Non-bearing walnuts	13.8	12.8
Other fruits and nuts	11.4	10.5
Other crops	26.2	24.2
TOTAL TILLED LAND	69.6	64.3
Pasture and waste	38.6	35.7
TOTAL ACRES	108.2	100.0

The average Oregon walnut farm contains 108 acres of which about two-thirds is tillable. Of the tillable land 46% is in walnut trees, slightly over half of which are in bearing, 16% is in other orchard, and 38% is in field crops. Farms having bearing groves only were found to

average a greater percent of the tillable land in walnut trees than farms with only non-bearing groves or farms with walnut groves of both bearing and non-bearing trees.

A medium to large sized diversified farm, such as is pictured in Table 1, offers perhaps the best opportunity to develop a walnut grove with a high degree of economy. Such a farm (1) can afford adequate tools with which to give efficient care, and yet the machinery cost against walnuts will be low for this machinery can also be used on the rest of the tillable acreage, (2) has sufficient land to produce for the farmer a living income without extreme intensity of production, which is so often associated with intensive and injurious orchard intercropping, (3) the owner can care for or supervise care of the young orchard, so that attention will be given at the time and in the manner needed, a factor often causing difficulty where isolated five, ten, and fifteen acre tract plantings must await their turn or the convenience of a hired caretaker, (4) units of any size may be planted, for the walnut income will be a supplement to the general farm income, which is not the case with specialized plantings where large acreages must be planted if a living income is to be expected when the grove matures.

The average walnut farm as now found in Oregon certainly possesses many elements of organization which should lead to successful and profitable walnut production, particularly if these elements are welded together into a sound and efficient working plan.

#### PRE-PLANTING CAPITAL REQUIREMENTS

No special equipment is needed to start a walnut enterprise. Since most of the new plantings are established on farms where cultural tools are already owned the only new capital required is for the trees and whatever labor must be hired. If a planting is contemplated by a non-land owner both land and tools, unless care of the orchard is hired, must be provided before planting.

The average value of unplanted land suitable for walnuts, as estimated by the cooperators in this study, was \$151 per acre. However, in buying such land, unless purchased in small tracts, it is usually necessary to acquire some land not suitable for walnut planting or perhaps for anything except pasture, since land owners seldom will agree to divide a farm to the extent of selling off the good land and leaving the poor. While indicative of the present value of good walnut land, \$151 per acre should probably be considered as close to a minimum rather than an average requirement for land investment.

Present non-bearing plantings show an average investment of \$4.36 per acre for tools and tractor, where the walnut grove is charged only with its correct proportion of the total use of the farm machinery. It does not appear that the average capital requirement for tool investment is of any great consequence. On small farms or on groves where interplanting or intercropping is not practiced this tool charge will probably be considerably higher for in these instances the walnuts will bear a greater proportion of the total tool cost than on the average farm.

THE COST OF GROWING PERSIAN (ENGLISH) WALNUTS TO BEARING AGE (12 years)

From observations as to yield it is believed that the average walnut orchard today comes into profitable bearing at 12 years of age, usually giving sufficient returns at that age to pay all costs of production and a small profit in addition. Sometimes under favorable conditions and management this may occur at 9 or 10 years of age.

Table 2. - ITEMIZED COST PER ACRE OF BRINGING A YOUNG WALNUT ORCHARD TO BEARING AGE

Cost Item	COST PER ACRE			Percentage of Total Growing Cost
	For First Year	Per Year for 2nd to 11th year (incl.)	Total for Entire 11-yr. Period	
Operator & family labor	\$ 3.20	\$ 1.34	\$ 16.63	8.7%
Hired labor	4.54	.78	12.29	6.5
Contract labor	3.06	.23	5.33	2.8
TOTAL MAN LAOR	\$10.80	\$ 2.35	\$ 34.25	18.0%
Horse labor	1.14	.68	7.99	4.2
TOTAL LABOR	\$11.94	\$ 3.03	\$ 42.24	22.2%
Taxes	1.30	1.14	12.58	6.6
Cover crop seed and fert.	1.32	.66	7.95	4.2
Stakes and ties	.40	-	.40	.2
Tractor operation	.72	.69	7.65	4.1
Replace trees	-	.09	.96	.5
Powder	.99	-	.99	.5
Other misc. expense	.02	.04	.40	.2
TOTAL MISCELLANEOUS	\$ 4.75	\$ 2.62	\$ 30.93	16.3%
DEPREC. ON MACH. & EQUIP.	\$ .69	\$ .66	\$ 7.27	3.8%
TOTAL OPERATION COSTS	\$17.38	\$ 6.31	\$ 80.44	42.3%
WALNUT TREES - Ave. 22 per A.	\$26.76	-	\$ 26.76	14.1%
Int. on land	3.67	3.09	34.63	18.2
Int. on devlp't costs	-	4.58	45.82	24.2
Int. on equip. & mach.	.22	.21	2.29	1.2
TOTAL INTEREST	\$ 3.89	\$ 7.88	\$ 82.74	43.6%
TOTAL GROWING COSTS	\$48.03	\$14.19	\$189.94	100.0%
HARVEST COSTS (First 11 yrs.)	--	\$ 2.59	\$ 25.91	-
TOTAL GROSS COST	\$48.03	\$16.78	\$215.85	-
CREDIT FOR NUTS	-	\$10.27	\$102.73	-
TOTAL NET COST	\$48.03	\$ 6.51	\$113.12	-
AVERAGE VALUE PER ACRE OF UNPLANTED WALNUT LAND	-	-	\$151.55	-
TOTAL GROWING COST PLUS VALUE OF UNPLANTED LAND	-	-	\$341.49	-
NET COST PLUS VALUE OF UNPLANTED LAND	-	-	\$264.67	-
LAND AND TOTAL GROWING COST EXCEPT INTEREST	-	-	\$258.75	-
LAND AND NET GROWING COST EXCEPT INTEREST	-	-	\$181.93	-

The first year cost of establishing a young walnut grove, including the cost of trees, averaged \$48.03 per acre (Table 2). Of this cost 56% or slightly over half, was for trees; 25% was for man and horse labor;

and the remaining 19% was for such items as interest on capital investment in land, interest and depreciation on equipment, and miscellaneous items, such as taxes, cover crop seed, fertilizer, stakes, ties, etc. On intercropped or interplanted orchards, joint costs such as labor, cover crop seed, taxes, interest, depreciation, and fertilizer were allocated to the walnuts and interplants or intercrop according to the land area occupied by each.

The 54 orchards for which the first year costs were summarized averaged 22 acres in size, and were set 22 trees to the acre. Except for the cost of the trees themselves, which was \$1.21 each, and the cost of planting and staking the trees, which was \$9.17 per acre, practically no difference existed between the first year costs and the costs for the years following.

From the second to eleventh year the average annual cost of growing the orchard was \$14.19 per acre. Approximately 44% of this cost was for orchard operation expense; that is, labor, materials, and depreciation on equipment, while the remaining portion, or \$7.88 per acre was for interest at 5% on land investment, equipment investment, and on the investment in development costs, which were capitalized at the end of each growing year.

At the end of the eleven-year growing period the total cost of growing the orchard was \$189.94 per acre. Direct operation costs and interest costs were about equal, each amounting to a little over 40% of the total cost, while the remaining 14% of the total cost was for the trees.

After the orchard is set the chief expense, aside from the interest charge, is the annual care, such as pruning, tillage, cover cropping, and fertilizing. The largest single item of this expense is for the man labor used in performing these operations; and if the associated items of horse labor cost, tractor operation cost, and machinery depreciation are added to the man labor, almost three-fourths of the total eleven-year operation costs (exclusive of interest) are accounted for.

It is impossible to determine accurately at just what age a walnut grove will come into profitable bearing since this depends directly upon the individual conditions and care. However, beginning with the fifth year, slight yields were found from the orchards cooperating in this study. At the end of the eleven-year period, a total of 513 pounds of nuts per acre had been produced.

The cost of harvesting and drying the nuts produced was charged at a uniform rate of approximately five cents per pound, which was the average harvesting cost for the 1929 crop as shown by cost records on 122 orchards. This is believed a minimum harvesting charge in view of the greater expense of gathering the nuts from young orchards. When the harvesting cost is added to the total growing cost, and the nuts are credited at a rate of 20¢ per pound, the total net cost of growing the walnut orchard is only \$113.12 per acre. However, since yield is an uncertain factor in the young orchard, it is much safer to consider the total cost of developing the orchard to bearing age (\$189.94 per acre)

rather than the net cost alone. If the seasons are favorable this development cost will be reduced by substantial credits for nuts, but if they are unfavorable, it will be close to the actual cost.

To determine the average total investment in a young orchard at the beginning of the 12th year it is necessary to add to the growing cost the original value of the unplanted land. The average value of unplanted land suitable for walnuts, as estimated by the cooperators in this study, was \$151 per acre. Addition of this sum to the growing cost gives a total capitalized value of \$341 per acre of orchard.

### CASH AND NON-CASH COSTS

The cost of growing a young orchard is seldom all cash outlay. Some young orchards, it is true, are owned by city dwellers or absentee owners and all of the operation costs must be paid in cash, but even for these orchards the interest charge is not usually a cash or out-of-pocket expense.

Table 3. - CASH AND NON-CASH COST OF GROWING A YOUNG WALNUT ORCHARD TO BEARING AGE (12 years)

Cost Item	Total Growing Cost Per A. for Entire 11-year Period	Cash Cost		Non-Cash Cost	
		Per Acre	% of Total Cost	Per Acre	% of Total Cost
Operator & family labor	\$ 16.63	\$	%	\$ 16.63	8.7%
Hired labor	12.29	12.29	6.5		
Contract labor	5.33	5.33	2.8		
TOTAL MAN LABOR	\$ 34.25	\$ 17.62	9.3%	\$ 16.63	8.7%
Horse labor	7.99			7.99	4.2
TOTAL LABOR	\$ 42.24	\$ 17.62	9.3%	\$ 24.62	12.9%
WALNUT TREES	\$ 26.76	\$ 26.76	14.1%		
Taxes	12.58	12.58	6.6		
Cover Crop seed & fert.	7.95	7.95	4.2		
Stakes and ties	.40	.40	.2		
Tractor operation	7.65	7.65	4.1		
Replace trees	.96	.96	.5		
Powder	.99	.99	.5		
Other misc. expense	.40	.40	.2		
TOTAL MISCELLANEOUS	\$ 30.93	\$ 30.93	16.3%		
DEPREC. ON MACH. & EQUIP.	\$ 7.27			\$ 7.27	3.8%
TOTAL INTEREST	\$ 82.74			\$ 82.74	43.6%
TOTAL GROWING COST	\$189.94	\$ 75.31	39.7%	\$114.63	60.3%

The average young walnut grove in Oregon is developed at a cash cost of only \$75.31 per acre (Table 3) which is 39.7% of the total growing cost. Three items, trees, hired and contract labor, and taxes, account for about three-fourths of the cash cost. Of these items, tree cost is of major importance (Table 3).

The items which are not paid for directly in cash are (1) the labor of the farmer and his family; (2) farm horse labor; (3) depreciation on machinery; and (4) interest. However, though the farmer does not charge wages he must have money to buy the necessities of life and when machinery wears out it must be replaced. Therefore, it is not necessarily correct to assume that because cash payment of some items can be deferred or omitted that such items are entirely non-cash in character. While, then, such a division of cost may be admitted more or less arbitrary, nevertheless it provides a clearer picture of the nature of the expenditures involved.

VARIATION IN GROWING COST

Table 4. - VARIATION IN THE TOTAL COST OF GROWING A YOUNG WALNUT ORCHARD TO BEARING AGE (12 years)

FIRST YEAR COSTS	
Variation in Costs	Percent of Orchards
Below \$20 per A.	7%
\$20 - \$35 per A.	26%
\$35 - \$50 per A.	26%
Average	
\$50 - \$65 per A.	30%
\$65 - \$80 per A.	7%
\$80 & over per A.	4%
TOTAL ANNUAL GROWING COSTS - 2nd. to 11th year	
Below \$ 5 per A.	9%
\$ 5 - \$10 per A.	28%
\$10 - \$15 per A.	25%
Average	
\$15 - \$20 per A.	24%
\$20 - \$25 per A.	5%
\$25 & over per A.	9%



Table 4 shows the variation found in costs on different orchards. Both in the first year costs and in the annual costs for the succeeding ten years the bulk of the orchards were found fairly close to the average. However, in first year costs, 7% of the orchards were established at a cost of over \$30 per acre below the average, and 11% cost over \$30 per acre above the average. Likewise in the annual growing cost for the next ten years, 9% of the orchards were operated for \$10 per acre less than average cost while another 9% cost \$10 per acre more than the average.

With such a wide variation in cost existing it is of importance to analyze these costs and find out why some are so low and some so high. Since so many cluster about the average it would appear that the bulk of the growers are using similar methods, but the very low costs found indicate that cheaper and perhaps better methods may be possible and the very high costs indicate that a few growers either wish to use expensive methods or do not realize their extravagance.

#### PLANTING DISTANCES AND SYSTEMS

Much of the variation in cost shown in Table 4 is due directly to the method of planting. With any of the common systems of planting there is only a small portion of the total land area which is actually used by the trees during the first few years of growth. About 80% of the grove owners utilize this space by growing some other crop thereon. (Table 5) From the standpoint of growing cost the method of utilizing the space between trees is important. For example, if a ten acre tract is planted to walnuts and nothing else the total taxes, interest, cultivation costs, <sup>crop</sup> cover/seed, etc., must be considered as walnut growing costs. However, if properly selected filler trees or intercrops are also planted on this tract the costs incurred on whatever portion of the ground they occupy are not walnut growing costs, but are now interplant or intercrop costs, and can and should be met from the income of the intercrop or interplant. Of course, if the walnut grower makes an error in judgment in selecting the intercrop or interplant it may not yield enough returns to pay the costs allocated to it. In this study it was assumed and believed to be the fact that on the average the interplants or intercrops pay their way and hence neither losses or profits from them enter into the walnut costs shown.

Table 5. - METHODS OF UTILIZING VACANT SPACE  
IN YOUNG WALNUT ORCHARDS

System of Planting	Total Acres	Percent of Total Acreage
Walnut trees only	393	20.7
Intercrop only*	912	47.9
Filler trees only	368	19.3
Both filler trees & intercrop	231	12.1
<b>TOTAL</b>	<b>1904</b>	<b>100.0</b>

\*Includes all annual crops, cane and vine fruits and hops.

The actual effect of interplanting and intercropping on growing cost is shown in Table 6. Both in the first year and in subsequent years the clean cultivation method of establishing a grove proved the most costly while the least costly was the method whereby both filler trees and intercrop were used between the walnuts. This study has not yet been developed to a point where discussion of the relative merit of the various planting systems is justified. However, when the use of clean cultivation raises the annual growing costs to a figure almost five times greater than they would be if filler trees and intercrop were used, and to almost twice the cost where either interplants or intercrops are used alone, it would appear that prospective growers should give this matter their most serious consideration before setting out trees.\*

The predominating planting system used for young walnut groves is the square. Of the orchards included in this study 81% were so planted, while 13% were planted on a diagonal and 6% were set in a rectangular system. The most popular distance for setting young groves at present is the 40-foot square. About half the square plantings were using this distance. The 50-foot distance was used for about 25% and the 60-foot distance for 12% of the square plantings. A summary of the growers' opinions as to the most desirable planting distance for future plantings indicated considerable shift from the 40-foot square to the 50-foot and 60-foot square.

A summary of the intercrops used, both where used alone and where used along with filler trees, shows that 46% of these were non-cultivated intercrops such as grain and hay, 34% were cultivated field crops and 20% were strawberries and cane fruits.

In past years filler trees of other fruits or nuts were a mere popular means of utilizing the vacant space between the walnuts than at present. Of the 122 present day bearing orchards cooperating in this study 85% were set with filler trees when young, and the other 15% were either intercropped or clean cultivated.

Owners of present day young groves appear to prefer intercrops to utilize the vacant space between trees. As shown in Table 5, 48% used intercrops (including cane and vine fruits and hops), 19% used filler trees, and 12% used both filler trees and intercrop.

Individual farm conditions often determine the planting distance and method of planting used. Any one of the methods shown in Table 6 may be justified, but in selecting the method to use it is important for the grower to fully understand just what the probable affects will be on his pocketbook. This fact becomes of increasing importance if the grove is being planted by an absentee owner who must pay all operation costs in cash. For example, it may be cheaper for an absentee owner to use the clean cultivation method of growing an orchard even though apparently more costly, for if he attempts to intercrop or interplant he may lose so heavily on the intercrop or filler as to more than overbalance any savings made in walnut growing costs.

Table 6. - THE EFFECT OF INTERPLANTS AND INTERCROPS ON THE TOTAL COST OF GROWING WALNUTS

(All costs and returns of interplantings excluded)

Cost Item	Utilization of Space Between Walnut Trees									
	First Year Walnut Growing Costs					Annual Costs 2nd. to 11th. years				
	With Filler Trees and Inter-crop	With Cult. Inter-Crop Only	With Non-Cult. Inter-crop Only	With Filler Trees Only	With Clean Cult.	With Filler Trees and Inter-crop	With Cult. Inter-crop Only	With Non-Cult. Inter-crop Only	With Filler Trees Only	With Clean Cult.
Man labor	\$ 4.82	\$10.37	\$12.43	\$ 9.04	\$12.91	\$ 1.12	\$ 2.76	\$ 2.23	\$ 2.77	\$ 3.05
Horse labor	.39	.79	1.17	.31	1.79	.21	1.08	1.16	.30	.88
TOTAL LABOR	\$ 5.21	\$11.16	\$13.60	\$ 9.35	\$14.70	\$ 1.33	\$ 3.84	\$ 3.39	\$ 3.07	\$ 3.93
Taxes	.28	.64	1.11	.59	2.38	.29	1.01	1.08	.61	2.28
Cover Crop seed & Fert.	.02	.15	.99	.13	2.99	.13	.35	.61	.54	1.64
Other misc. expense	.94	.82	1.06	1.39	4.21	.31	.73	.48	.89	1.87
TOTAL MISCELLANEOUS	\$ 1.24	\$ 1.61	\$ 3.16	\$ 2.11	\$ 9.58	\$ .73	\$ 2.09	\$ 2.17	\$ 2.04	\$ 5.79
DEPR. ON MACH. & EQUIP.	\$ .07	\$ .19	\$ .53	\$ .87	\$ 1.28	\$ .09	\$ .19	\$ .40	\$ .71	\$ 1.53
TOTAL OPERATION EXPENSE	\$ 6.52	\$12.96	\$17.32	\$12.33	\$25.56	\$ 2.15	\$ 6.12	\$ 5.96	\$ 5.82	\$11.30
WALNUT TREES	\$21.68	\$28.34	\$28.33	\$37.99	\$24.78	-	-	-	-	-
Int. on land	.75	1.77	3.91	2.02	6.16	.74	2.59	3.16	2.12	6.24
Int. on Devlp't costs	-	-	-	-	-	1.77	3.62	4.70	4.65	4.94
Int. on mach. & equip.	.03	.07	.22	.28	.36	.02	.07	.17	.18	.44
TOTAL INTEREST	\$ .78	\$ 1.84	\$ 4.13	\$ 2.30	\$ 6.52	\$ 2.53	\$ 6.28	\$ 8.03	\$ 6.95	\$11.62
TOTAL GROWING COST	\$28.98	\$43.14	\$49.78	\$52.62	\$56.86	\$ 4.68	\$12.40	\$13.99	\$12.77	\$22.92

Cost variations also occur to some extent among growers using the same method of developing a walnut grove. Differences in such factors as cost of trees, type and amount of tillage, amount and kind of cover-cropping, amount and cost of fertilizer used, shape of fields, steepness of slope, and efficiency of planting crew, will cause some orchards to cost more than others. However, as a rule these differences will be of minor importance as compared to such important matters as the correct selection of the intercrop or interplant and the amount of intercropping or interplanting to carry on. In the final publication of the results of this investigation, both major and minor factors affecting cost will be discussed to whatever extent their importance justifies, but at the present time analysis of the data is not complete enough to justify their discussion.

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