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Economics of Apple Orcharding

BY

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Economics of Apple Orcharding

SUMMARY

For the past four years the Division of Horticulture has been conducting investigations dealing with the cost of fruit production in the Pacific Northwest. The investigations have been conducted on a broad scale, including the states of Oregon, Washington, Idaho, and the Province of British Columbia, and have entailed the study of a thousand orchards.

All figures are taken from farms which have at least two-thirds of their entire acreage devoted to orchard and at least two-thirds of this orchard devoted to apples.

The aim of the bulletin is to give average costs of production which will serve as an aid to those orchardists attempting to lower their production costs and which will indicate what expenses may be included under the various heads of Growing, Handling, Overhead and Selling.

The average cost of clearing land and planting to apples in the Northwest amounts to about $112.82 an acre.

The average cost of maintenance and development of the young orchard is as follows:

Orchards two to three years of age $62.72 an acre.

Orchards four to five years of age $60.36 an acre.

Orchards six to seven years of age — less receipts — $52.87 an acre.

A study of costs of production according to horse units, as shown in Table III, reveals the fact that the average fruit ranch maintains too many horses for economical management.

The figures, as given in Table IV on Costs of Production of Apples, show conclusively that it is much cheaper to produce apples on the larger units than on the smaller units, and that those growers who are depending upon five or ten acres of apples should either enlarge their orchards or combine with apple production some other agricultural activities.

Our figures seem to indicate that, given a large number of orchards, it would be possible to plot a curve which would show strong regular fluctuations of higher and lower costs according to the approximation to the local economical unit, and a progressive lower cost according to increase in acreage. There would be, then, certain combinations of acreage which would mean low production costs, and certain combinations which would mean high production costs.

The average costs of production of apples in orchards six to nine years old with an average yield of 120 bushels, on an acreage basis, were:

Maintenance, $30.71; Overhead, $57.03; Handling, $53.18; a total of $140.92.

The average costs of each box under the same conditions were: Maintenance, $0.2564; Overhead, $0.4776; Handling, $0.4463; a total of $1.1803.

The average costs of production of apples in orchards ten to eighteen years old with an average yield of 233 boxes to the acre, on an acreage basis, were: Maintenance, $40.75; Overhead, $110.76; Handling, $68.99; a total of $220.50.

The average cost for each box under these conditions were: Maintenance, $0.1782; Overhead, $0.4737; Handling, $0.3030; a total of $0.9549.

To make a success of apples, the orchardist must choose varieties with which he can excel.

It is doubtful if the Northwest as a whole should be producing more than a dozen varieties of apples, and each locality should only be producing the particular few varieties that are best suited to the local conditions, probably not more than three or four at the most.

The average orchardist studies his problems from the point of view of the whole orchard or large blocks of trees in the orchard, whereas he should study the problems more as they are related to each individual tree and small blocks of trees.

The problem is to find out what trees are unprofitable and to determine why this condition is true.

We believe that the best opportunities to diversify the apple farm—especially where lands are high priced and where there is an overhead cost, taxes and interest on investment, of from $30 to $50 an acre—is by the growing of more than one kind of fruit. We doubt if there are many types of farming other than fruit growing that will pay as good a dividend on an investment of over $500 an acre.

Regardless of location, soil or climatic conditions, where fruit is raised there is no doubt that the fruit grower should under all circumstances have a good garden; should raise enough pork for his own use; should keep a family flock of chickens and a good cow. He should also endeavor to raise all feed necessary to maintain all stock on the ranch.

Under proper conditions a number of growers are handling forage crops to advantage, where the crop is fed to live stock on the place. When grown strictly as a hay crop in the orchard, it is very difficult to make much profit from the crop, as the increased cost of producing hay under such conditions leaves the margin of profit extremely narrow.

If it becomes necessary to hire labor for all the work in raising truck and garden crops in the orchard, it will be only in exceptional cases that profits can be realized.

Where irrigation is practiced, probably one of the most successful crops grown among trees in the Northwest is the strawberry.

Potatoes as an intercrop have been tried by a number of orchardists with varying success.

Where climatic and soil conditions favor cheap and abundant pasturage and where most of the concentrates necessary may be raised on the farm or obtained at a reasonable price, hogs have proved a profitable investment with orcharding.

The only opportunity for the orchardist in the Northwest to make a profit from dairying in conjunction with his orchard, is by having a superior herd—better than the average—and by producing on the ranch the major portion of all feed consumed.

There is perhaps no one orchard operation which will probably allow more economy than that of tillage.

The greatest loss from the use of fertilizers and manures comes from the tendency of many growers to buy mixed fertilizers.

Perhaps the greatest loss in pruning comes from a lack of knowledge of fundamental principles of pruning, and of the application of these principles to the orchard and to individual trees.

Large sums of money are lost in improper spraying.

Lack of facilities for scientific handling of the crop often causes a loss.

Unskillful organization and handling of labor is responsible for the loss of much money.

One of the greatest drawbacks in the past has been the absolute independence of the selling agencies.

Not enough attention has been given to the relation of the size of crop, the general market conditions of any one period, and the proportion and amount of fruit that is held in storage.

We strongly urge the establishment of a Bureau of Statistics and a Protective Fruit League.

The causes of a large percentage of low-grade and cull apples are choice of wrong varieties, too many unprofitable trees, poor management, and unfavorable climatic conditions.

We have three possibilities in handling low-grade apples: (1) reduce the amount of this fruit to the minimum; (2) handle this class of fruit in a cheaper package; (3) manufacture these apples into fruit by-products.

The general apple situation would indicate that to make a profit from the industry at present prices an economical unit must be chosen and the investment kept down to a reasonable figure so that the overhead charges are not excessive; soil and climatic conditions must be favorable; proper varieties must be grown; and skillful management given.

INTRODUCTION

The Division of Horticulture has been conducting investigations for four years concerning the cost of fruit production in the Pacific Northwest. We were first attracted to this problem as a result of our various horticultural surveys, it being found extremely difficult to obtain data which were reliable, owing to the fact that most growers could give nothing but estimates.

The problem the past year has been prosecuted with more vigor than formerly. During the fall of 1914 three thousand general outlines were sent to growers requesting information on orchard costs. This general outline was followed up with other blanks asking for more specific data; and a personal correspondence carried on with a great many of the growers furnished us with additional information. Besides collecting reports through correspondence, we have made some trips to different fruit districts in the Northwest in order that we might investigate certain ranches personally and have an opportunity of studying some individual problems and obtaining certain data on costs of maintenance and development that otherwise would be unavailable.

As a result of our investigations, some data were obtained from about one thousand orchards, some five hundred orchardists furnishing considerable information which was more or less complete. The investigation, which was conducted on a broad scale, included the states of Oregon, Washington, Idaho, and the Province of British Columbia, giving us a fair average for Pacific Northwest conditions.

In this bulletin all figures are taken from fruit ranches which have at least two-thirds of their entire acreage in orchard, two-thirds of which orchard must be devoted to apples. There may be some diversity in the growing of their crops among the trees or the handling of some live stock on the ranches, but undoubtedly such a ranch is strictly an apple ranch, highly specialized.

The greatest disappointment in this work, as in all work of this kind, has been the relatively small proportion of growers who have complete accurate data. We have already had the pleasure of noting, however, that, as a result of our work the past three years, a much keener interest has developed on the part of the growers. For example, men who could give us nothing two or three years ago, are now keeping accurate accounts of their costs and realize the benefit of this work.

Following this study of cost of production, we began a study of side lines, which are developing with apple growing, and have collected a great deal of miscellaneous information on this question, only a small part of which is conclusive enough to be included in this report.

We have also endeavored to obtain results from a large number of orchardists regarding the reduction of their costs of producing apples by the use of some special tools or implements, or by some special method of handling their work.

The fruit grower often has too great a tendency to look to external factors, such as marketing, by-products, side lines of various kinds, etc., to make fruit growing a good profit-paying business, rather than to face the problem of production where the real solution of the difficulty lies.

Too many fruit growers of the Northwest seem to feel that their only problem is that of marketing and distribution, and they are looking at the problem of marketing entirely from the angle of selling prices, hoping that the future will bring a return of the former high prices. It

is very doubtful if this will ever come about except in years of unusual conditions. The real problem is to adjust our orchard methods and our cost of production to present market prices.

The apple consumer and apple distributor have been led to believe that apple production is a bonanza business, and that the profits are phenomenal. The grower, on the other hand, does not really know whether he has been making money or not, and has no concrete conception concerning the actual costs and the opportunities of reducing these. Almost any grower will give you an estimate of the cost of producing a box of apples; but it is almost impossible for him to tell definitely what varieties of apples he is producing that are giving him the most profit, taking into account the number of trees he may have of this variety, the relative expense of growing and marketing this crop, the number of bushels of fruit produced by each tree, etc. He will tell you, of course, that a certain variety is giving the greatest profit, since that variety has brought the highest price for each box of fruit. He may not have remembered that he has had to spray this variety once or twice more than some other variety; that the frost will injure it somewhat more than other varieties; that it is a shy or medium bearer more often than some of his other varieties, owing to peculiar climatic or soil conditions; that his thinning costs on this variety have been exorbitant, on account of the way fruit sets; that his picking costs have been very high, owing to the fact that he has had to go over his trees two or three times in order to obtain sufficient color to class as Fancy or Extra fancy; that the variety is a very peculiar grower and that his pruning costs are consequently higher than average. A thorough investigation will show that the selling prices of varieties vary tremendously, that the yield of fruit to each tree is probably never the same for two varieties, that the cost of production for each unit of one variety as compared with another variety is often materially different, and that under certain conditions the lower-priced variety gives the greater net profit to the grower.

Probably the most important phase of our production problem is how to reduce this cost. This is just as important and perhaps more important than a study of how to get more money for the product. In all manufacturing business, this problem of reducing costs—the efficient handling of labor, machinery, etc.—is one of the most important branches of the business, and some of the highest-paid experts are working continually along this line. Their aim is to produce the maximum amount of their product at the minimum cost for each unit, whatever this unit may be. The fruit grower has exactly the same problem—to produce the maximum number of boxes of fruit to the acre at the minimum cost.

Up to the present time the majority of growers have looked to the sales end to produce a return great enough to give them a good profit over and above all expenses, regardless of what these expenses may have been. Very often, too, the grower considers as "expenses" all the money he has checked out of the bank during the year, whether this money went to buy a new dress for his wife, an automobile for pleasure purposes, or to pay for actual production. Most fruit growers, in fact, are unable to tell just what portion of the money spent each year has been for the actual production of fruit, what has been spent for development and improvements, and what has been spent for personal expenses. They expect their selling association to give them a return, however, great enough to cover all of this.

One of the main purposes of this bulletin is to wake up the fruit grower to the actual cost of producing fruit; to get him to determine what it is costing him to produce his fruit, and, knowing these costs, to be able to find where any leaks may be and how to stop these—in this way reducing the cost of production to the minimum. It is impossible

to do this without first knowing what the actual costs of different orchard operations are in the particular orchards studied.

Our aim has not been so much to present minimum figures or maximum figures, but to give an average cost of production. This will not serve as a criterion on which a grower can base his own costs, but should serve as a guide to study methods of lower costs, showing what to include in these costs. The figures, however, since they have been collected from such a large number of orchards, probably give a fair average of the costs at the present time. It must be borne in mind that these costs are from the better class of fruit growers, who are taking the best of care of their orchards, and who are putting up the highest class fruit; since it is only this better class of growers who have been able to give us accurate data.

In obtaining our average figures on the cost of producing a box of apples, or determining the cost of production for each unit of orchard, we have divided this cost into four divisions, which divisions are naturally sub-divided in the following way:

Growing Costs.

General Maintenance	Pruning
Spraying	Irrigation
Cultivation	Cover Crops
Fertilizer	Thinning
Propping	

Handling Costs.

Picking	Hauling fruit to packing shed
Grading	Packing
Box, paper, nails, making	Miscellaneous
Warehouse costs	Hauling fruit to warehouse

Overhead Costs.

Taxes	Interest on investment
Depreciation on equipment	Depreciation and repairs on bldg.

Selling Costs.

Association Charges	Storage Charges

There are a number of other ways that costs may be segregated and this segregation should be studied by the individual and fitted to his own conditions. In some cases he may desire to put all of the team costs for all classes of work under Barn Maintenance, and proportion this cost to Improvement, Growing, and Handling according to varieties, system of handling, etc.

In our report we found it impossible to segregate certain ove head charges properly. For example, it has been impossible to segregate taxes and insurance for the home from that of the ranch proper. We feel that the entire interest, taxes, etc., on the home should not be charged up to the orchard any more than the woolen manufacturer would charge up the cost of his home to the woolen business. In other words, the dwelling has some value as a home and all costs on this should be considered personal. This will account for considerable fluctuation in some of the tables concerning overhead charges.

It must be borne in mind also that in our average costs, we are not trying to show how much money can be made in fruit growing, but simply what the cost is; and for this reason, we have allowed interest at six per cent on the entire investment, have allowed the average prices paid for wages for the different classes of work, allowing the owner these wages if he is working all the time, or allowing him a charge for superintending if he is merely the manager.

The following table gives the average prices paid by fruit growers of the Northwest for labor for various orchard operations:

Pruning	$2.50	a day
Spraying	2.25	a day
Cultivation	2.00	a day
Thinning fruit	2.00	a day
Picking	2.00	a day
Packing	.0475	a box
Grading	2.00	a day
Miscellaneous	2.00	a day
Teams without teamster	2.50	a day
Teams with teamster	4.75	a day

ACKNOWLEDGMENT.

We wish at this time to thank the orchardists of the Pacific Northwest who have so kindly and so heartily cooperated with us in gathering information included in this bulletin. Without their hearty cooperation, it would have been impossible to conduct the work successfully.

We also wish to thank the fruit growers associations that have contributed information to us and have also greatly assisted by placing within our reach the names of growers who could assist us.

Fig. 1. Efficiency in breaking oakgrub land.

THE YOUNG ORCHARD.

The following table takes up the average cost an acre of clearing orchard land and planting this land to apples. This table is made up

from a large number of reports on this work, but it was found impracticable to divide the costs up for different-sized units. The costs given are for various-sized units and for all kinds of conditions found in the Pacific Northwest fruit growing sections.

Table I. Cost of Clearing and Planting Per Acre.

Clearing	$89.20
Plowing and other preparation	8.18
Staking	1.18
Nursery stock	10.40
Planting	3.86
Total	$112.82

Clearing. Concerning the item of clearing it must be remembered that this cost has been based on all types of clearing such as sage brush land, pasture land, and heavily fir-timbered land. Much of the open pasture land can be cleared for $50 to $100 an acre. On the other hand, some of the heavily fir-timbered land will cost over $200 for clearing.

Plowing. The plowing and general preparation will vary according to the depth of soil, type of soil, whether heavy or light, whether the soil is rocky, whether the land is hilly or level, labor conditions, etc.

Nursery Stock. The item of nursery stock was based on the average selling prices of various nurseries here in the Northwest where lots of one thousand trees were purchased. This figure will vary different seasons according to general supply and demand of nursery stock.

Planting. The item of planting will fluctuate according to labor conditions, type of soil, etc.

MAINTENANCE AND DEVELOPMENT OF THE YOUNG ORCHARD.

The following figures on Maintenance and Development of the Young Orchard are averages from a large number of orchards:

Table II. Maintenance and Development of the Young Orchard.

Age of trees	1-3	4-5	6-7
Acreage Basis			
Estimated Valuation			
Ranch	$449.22	$547.72	614.61
Equipment, incl. horses	22.50	37.24	40.10
Maintenance			
Pruning	1.91	2.05	5.77
Spraying	2.21	3.02	10.56
Cultivation	9.35	5.36	3.55
Cover and Shade Crops when planted	3.09	3.64	5.69
Irrigation, when used	5.32	5.37	1.58
Fertilizers, where used	1.24	2.45	.32
Thinning			2.70
Propping and tying			2.35
Miscl. expenses not segregated	6.39		5.00
Total	$ 29.51	$ 21.89	37.52
Overhead charges			
Taxes and insurance	4.01	1.89	3.96
Interest	26.95	32.86	36.88
Depreciation on working equipment	2.25	3.72	4.01
Total	$ 33.21	38.47	44.85

Handling Costs			
Av. No. bushels fruit harvested			37.5
Cost from tree to warehouse			12.12
Selling cost			3.75
Storage and warehouse			1.50
Total			17.37
Crop Receipts			
37.5 boxes apples est. @ $1.25			46.87
Summary			
Maintenance	29.51	21.89	37.52
Overhead charges	33.21	38.47	44.85
Handling			17.37
	62.72	60.36	99.74
Credit.			
Receipts—Sale of Apples			46.87
Balance of total expense	62.72	60.36	52.87

REPORTS OF INDIVIDUAL ORCHARDS.

The following individual reports of costs of development of the young orchard are typical of those we have received. The price of land, of course, has not been included in these reports.

1000 acres of orchard. First year.

Disking 200 acres @ $1.00 an acre 3 times over	$ 600
Spring tooth, 1000 acres @ 65c	650
Peg tooth, 1000 acres @ 40c. twice over	800
Kimball cultivator, 1000 acres @ 30c, 7 times	2100
Corn cultivator, 1000 acres @ 15c, 10 times	1500
Hand cultivation, 1000 acres @ 20c	200
Total	$5850

or $5.85 an acre.

This was based on labor at $2.25 and teams at $2.50 a day. It also included the salary of two foremen at $75 a month, but did not include supervision.

PLANTING AND CARE OF A NORTHWESTERN ORCHARD.

Cost per acre.

	Per acre
Plowing	$ 4.00
Staking	.83
Planting	2.44
48 apple trees	4.80
20 peach trees	2.40
10 plum trees	1.20
10 pear trees	2.00
Pest control	.10
Heading trees	.10
Hort. supervision	4.00
Office expenses	2.77
Total	$30.49

COST OF PREPARATION FOR PLANTING AND OF PLANTING TO APPLE TREES OF 96 ACRES OF SAGE-BRUSH AND SOD LAND.

Breaking	$ 283.03	
Grading	688.47	
Harrowing, etc.	302.24	
Total	$1273.74	
Cost per acre		$13.27
Planting the trees		
Staking	$ 83.89	
Hauling and heeling in trees	21.95	
Planting (9993)	176.39	
Planting poplars (406)	4.49	
Total	286.72	
Cost per acre		$2.98
Total cost per acre		$16.25

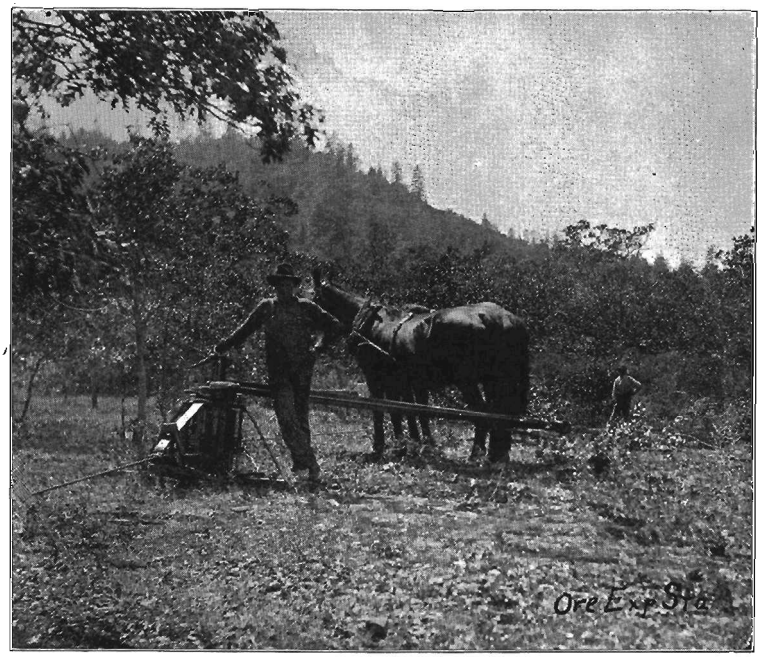

Fig. 2. A method of clearing; efficient under certain conditions but having limitations.

Included in this was a foreman who did not work, who received $4.00 a day. The men were paid $2.65, and horses all charged at $1.60 each a day; Chinamen $55 a month. The planting crews were, one horse with sled, three Chinamen digging holes, one man planting, one filling in. Man planting, pruned roots and part of the time the tops. Having roots pruned separately cost, 15 acres at $2.75.

COST OF CLEARING, PREPARING, PLANTING, AND CARING FOR A 3-ACRE APPLE ORCHARD.

This is a good example of what hard work combined with initiative will do.

Cost given for three acres.		
Cost of clearing—fir land—$110 an acre	$330.00	
Preparing ground, $20 an acre	60.00	
	$390.00	
Received for cord-wood $40 net	$120.00	
		$270.00
Cost of nursery stock		25.00
Staking		4.00
Planting		12.00
Spraying		2.00
Cultivating—4 plowings		15.00
Hoeing		25.00
Staking and tying trees in the fall		5.00
		$358.00
Cost setting strawberries between trees—2 acres		30.00
Cost of plants		24.00
Total cost		$412.00
2nd year (1913)		
Setting one acre to strawberries		10.00
Pulling stakes and untying trees		1.25
Pruning		3.00
Spraying		3.00
Cultivation—4 plowings		15.00
Hoeing		35.00
Tying up trees		5.00
Total cost 2d year		$72.25
Receipts from 2 acres strawberries between rows		
162 crates shipped	$366.02	
15 crates over-ripe	15.30	
	$381.32	
Less expense of picking, packing, hauling, Union charge, crates, etc.	$166.00	
Cost of packing shed	10.00	
	$176.00	
Net returns from strawberries		$205.32

Summary

Total cost of establishing and caring for orchard		
First year	$412.00	
Second year	72.25	$484.25
Net returns from strawberries 2d year		205.32
Total cost—net—end of second year		$278.93

THE COST OF PRODUCTION ACCORDING TO HORSE UNITS.

The following set of tables was worked out on the basis of "horse units." In this we were trying to determine the economical horse unit for apple orchards in the Northwest. While we have been unable to show this, we have shown quite clearly in this study that there are entirely too many horses used in all average orchards. The fruit grower should be able to take the best of care of his orchard with fewer horses, cutting down the cost of maintenance very materially.

This set of tables is divided into three classes; viz., Class I, the two-horse unit; Class II, the three-horse unit; and, Class III, the four-horse unit.

The tables appear to show at first glance that Class II is the most expensive sized orchard. It must be remembered, however, that this class is an average of 1 to 2 years older than the other two classes and that this difference of cost is not great enough to draw definite conclusions.

These tables bear out our finding in Table IV; viz., that the larger orchards are the more economical.

Table III. The Cost of Production According to Horse Units.

A. Investment.

	Class I	Class II	Class III
Size of Unit	2 horse	3 horse	4 horse
Average size farm—No. acres	23	29	40
Average size orchard—No. acres	20.5	25	30
Average age of orchard—years	9-10	10-11	9-10
Average total investment each farm	$10,731.00	$20,000.00	$18,123.60
Average investment each acre	462.22	689.65	453.09
Average investment each acre orchard	523.46	800.00	604.12
Average investment in working equipment, not including buildings.			
Value horses	306.00	459.00	612.00
Value plows	16.90	26.00	26.00
Value cultivating tools	45.54	66.66	75.30
Value spray rigs	241.43	339.16	321.25
Value wagons	103.60	132.00	132.00
Value pruning tools	6.80	15.45	20.00
Value packing equipment	14.12	29.83	26.66
Value miscellaneous tools and equipment not listed above	263.52	346.23	84.79
Total	$ 992.91	$ 1,414.33	$ 1,298.00
Total average value working equipment each acre	43.17	48.77	32.45

B. Growing Costs.

	Class I	Class II	Class III
1. Average Cost of Pruning.			
Cost of pruning each acre	$ 5.34	7.88	11.66
Cost of hauling brush each acre	1.10	2.44	1.83
Total cost each acre	6.44	10.32	13.49
2. Average Cost of Spraying.			
No. times sprayed	4.5	4.7	5.
Cost of spraying each acre	2.55	2.91	3.36
Cost of all sprayings each acre	11.51	13.48	16.89

3. Average Cost of Cultivation			
Cost each acre	6.51	6.79	3.03
No. acres orchard cultivated	11.5	21.6	22.6
4. Average Cost of Cover Crops and Shade Crops.			
Number acres in cover crops	11	4	13
Cost each acre	3.40	4.83	6.03
5. Average Cost of Irrigation			
Cost of irrigation each acre when practiced	5.00	3.02	1.84
Per cent of all orchards studied using irrigation water	45	43	50
6. Average Cost for Fertilizer			
Cost of fertilizers and applying for each acre, when used	1.42	1.05	none used
Per cent of orchards in classes studied that used fertilizer	16	14	
7. Average Cost of Thinning			
No. acres thinned	15	16	9
Cost each acre	3.91	5.56	4.55
8. Average Cost of Propping and Tying.			
Cost each acre	3.50	4.18	5.10
9. Average Cost of Miscellaneous work of all Classes not Segregated.			
Cost each acre	7.00	2.00	1.75

C. Handling Costs.

	Class I	Class II	Class III
10. Average Cost of Handling the Crop.			
Acre Unit.			
No. of bushels each acre	166	183	244
From tree to warehouse	$ 49.05	$ 55.61	$ 76.14
Selling	20.75	22.88	31.00
Storage and warehouse	6.64	7.32	9.92
Total	76.44	85.81	117.06
Box Unit.			
From tree to warehouse	.2955	.3039	.3070
Selling	.125	.125	.125
Storage and warehouse	.04	.04	.04
Total	.4605	.4689	.4720

D. Overhead Costs.

	Class I	Class II	Class III
11. Overhead Charges, Average Costs.			
Taxes and insurance each acre	5.78	5.99	6.80
Interest on investment each acre	27.73	41.38	27.18
Depreciation on working equipment each acre	4.31	4.87	3.24
Average each acre	37.82	52.54	37.22

Note.—It has been impossible to give accurate figures on investment in buildings owing to the farmer's home being included in this, and the big variation in the value of these homes makes it impracticable to include depreciation, etc., in these costs. Taxes and interest, however, are included in the above table.

E. Summary.

	Class I.		Class II.		Class III.	
	Acre	Box	Acre	Box	Acre	Box
*Average cost of production	38.23	.2303	40.15	.2194	42.62	.1719
Average cost of overhead charges	37.82	.2278	52.24	.2855	37.22	.1501
Average cost of handling crop from tree to warehouse	49.05	.2955	55.61	.3039	76.14	.3070
Average selling costs, warehouse and storage	27.39	.165	30.20	.165	40.92	.165
Total	$152.49	.9186	178.20	.9738	196.90	.7940

*Note.—In determining average cost of production, the total cost for the entire orchard was first determined, taking into consideration the per cent of average number of acres cultivated, number of acres sprayed, per cent of orchards irrigated, number of acres thinned, etc. From this cost we found the average cost for each acre.

Fig. 3. For handling strips close to trees, a one-horse plow is cheaper, less apt to injure trees, and more efficient.

COST OF PRODUCTION OF APPLES.

In this study we have endeavored to determine, first, the economical unit of production of apples, and, second, the cost of producing apples on different-sized blocks of orchards of various ages in the Pacific Northwest. We have divided our orchards into three divisions; viz., orchards from 2 to 5 years old, having a weighted average age of 4 years; orchards from 6 to 9 years, having a weighted average age of 8 years; and orchards from 10 to 18 years, having a weighted average age of 13 years. Each of these three groups were divided into four classes according to acreage; viz., Class I, under 11 acres; Class II, 11 to 25 acres; Class III, 26 to 50 acres; Class IV, over 50 acres.

We had greatly desired to make a tabulation based on a series of units, each unit showing a progressive increase of five acres; but we were not able to secure data on a sufficient number of orchards to give a fair average on such a basis. It became necessary, then, to consolidate the units into the four classes as already stated.

The tables show conclusive that it is much cheaper to produce apples on the larger units than on the smaller units, and that those growers who are depending upon five or ten acres of apples should either enlarge their orchards, or combine with apple production some other agricultural activities.

The tables may be slightly misleading, as the figures which we have in our possession seem to indicate that, given a large number of orchards, it would be possible to plot a curve which would show strong regular fluctuations of higher and lower costs according to approximation to the local economical unit, and a progressive lower cost according to increase in acreage. For example, suppose that 25 acres represents the one-team economical unit for a given set of conditions; 40 to 60 acres would then probably represent the second economical unit for these same conditions; the grower under these conditions could undoubtedly produce apples cheaper either on the 25-acre unit or on the 40 to 60 acre unit than on any other acreage, smaller or greater, until the third-sized unit would be reached. There would be, then, certain combinations of acreage which would mean low production costs, and certain combinations which would mean high production costs. We believe that it is "up to" the individual, with the help of his fruit-growers' association and the cooperation of his neighbors, all working together in a community, to determine just what the economical-sized unit is under local conditions and to endeavor to reach this sized unit as soon as it is possible to do so.

Our recapitulation table shows that the average cost of producing a box of apples on orchards from 6 to 9 years old, with an average yield of 120 boxes an acre, ranges from $1.08 to $1.24—an average cost of $1.18; while on orchards from 10 to 18 years old, with an average yield of 233 boxes an acre, the cost ranges from $0.82 to $1.14—an average of $0.95.

It must be remembered that we are showing average costs and that the yield of fruit is an average also. The yield of apples to the acre as used throughout this bulletin is in the terms of packed boxes of fruit, which, according to conditions, is about two-thirds of the total yield of picked boxes; e. g., to obtain an average of 120 boxes of apples to the acre in orchards from 6 to 9 years old, from 150 to 200 bushels of fruit were produced.

It is true also that average yields of fruit or crops of any kind always appear extremely low, while average costs of production of all crops appear high. Such figures, however, do show very clearly the actual conditions existing.

We also wish especially to call attention to the fact that the only true method of studying relative comparative costs of production is in the study of Overhead Charges and Maintenance Costs on an ACREAGE BASIS and NOT on the BOX BASIS.

Under any given set of conditions the Handling Costs, of course, increase directly with the increased yield, and cost of production for each box varies in all classes according to the yield of fruit for each acre. It is true also that the Maintenance Costs for each acre will vary somewhat with the yield of fruit, but there is really very little fluctuation in this on account of a slightly greater or slightly less yield. For example, the average yield of apples in orchards 6 to 9 years of age on an acreage under ten acres was 150 bushels, giving an average total cost of production for each box of $1.24, while the Maintenance Costs and Overhead Charges were $115.03 for each acre; in orchards of the same age but having an acreage of over 50 acres with a yield of only 77 bushels to the acre, the cost of production for each box was practically the same, $1.24, while the Maintenance Costs and Overhead Charges for each acre were $58.17, showing very clearly that the large orchard is much the more economical. The yield of fruit on large orchards and on small tracts where the same care may be given, will not vary a great deal, other conditions being equal, and while our tables in a general way seem to show a decrease in yield with an increased acreage, we are satisfied that this is not conclusive and that the results will not be constant under varying conditions.

It must be remembered that these averages have been obtained from three states and one province and that some ranches had heavy crops while others had an "off year." While there will always be some fluctuations in yield in any given district, some orchards having maximum yields and others having minimum yields, the average yield for each acre does not vary materially according to the size of the acreage in any given district.

In the study of costs in a single fruit growing district, the box unit will be a fair basis for comparison, but for the study of a great many districts under various conditions, the acreage basis is the only one from which fair comparisons may be drawn.

Throughout this bulletin we have used the weighted average age of orchards, it being considered that by use of a weighted average an orchard is given a much more nearly true value in the consideration of data than if merely a simple average age is used; e. g., in the case of the following orchard having:

100	acres of 5-year-old trees which gives a weight of	500
10	acres of 6-year-old trees which gives a weight of	60
20	acres of 8-year-old trees which gives a weight of	160
130	acres divided into the total weight	720

gives us a weighted average of 5.5 years. As ordinarily considered the average of 5, 6, and 8 would be 6.3 years, which is not a true average according to the acreage represented.

Table IV. The Cost of Production of Apples.

A. Investment.

	I	II	III	IV
Size of Orchard Units	Under 11 A.	11 to 25 A.	26 to 50 A.	over 50 A.
Orchard 2 to 5 years Weighted average, age 4 years.				
Average No. of acres in farm	7	20.2	32	566.6
Average No. of acres in orchard	5.5	18.5	27	500
No. acres orchard apples	5.1	17	26.1	495

Acre Unit				
Total investment	446.66	681.81	504.25	234.52
Equipment investment, including horses	45.85	33.78	25.91	14.50
Orchard Unit				
Total investment apple orchard..	2277.97	11,590.77	13,160.93	116,087.40
Total investment equipment.....	233.84	574.26	676.25	7,177.50
Orchard 6 to 9 years				
Weighted average age, 8 years				
Average No. acres in farm.....	8	18.3	34.8	85
Average No. acres in orchard....	7.7	16.2	27	71
Per cent of orchard and acres in apples	95%-7.3	93%-15.6	94%-25.3	89%-63.1
Acre Unit				
Total investment	976.66	885.68	524.66	548.61
Equipment, incl. horses.....	68.25	38.00	24.91	14.63
Orchard Unit				
Total investment in apple orchard	7,129.62	13,816.61	13,273.89	34,617.29
Total investment in equipment....	498.23	592.80	630.22	923.15
Orchard 10 to 18 years				
Weighted average age, 13 years				
Average No. acres farm	8.4	20.1	34	no data
Average No. acres orchard.....	8.4	18.8	29.3	
Per cent of orchard and No. acres in apples	95%-7.9	90%-16.9	89%-26	
Acre Unit				
Total investment	1,304.16	795.62	728.77	
Equipment, including horses.....	98.30	48.13	34.01	
Orchard Unit				
Total investment in orchard.....	10.302.86	12.445.98	18,948.02	
Total investment in equipment....	774.57	813.40	984.26	

B. Growing Costs.

Pruning.	I	II	III	IV
Orchards—2 to 5 years.				
Acre Unit				
Pruning	2.18	.96	1.88	.65
Hauling brush	.41	.10	.44	.05
Total	2.59	1.06	2.32	.70
Orchard Unit				
Average No. acres pruned.....	6.1	16.66	23.8	172.0
Total cost	15.78	17.66	55.31	121.28
Orchards—6 to 9 years				
Acre Unit				
Pruning	6.02	4.62	3.16	1.00
Hauling brush	.82	.93	.35	.20
Total	6.84	5.55	3.51	1.20
Orchard Unit				
Average No. acres pruned.....	7.4	14.5	30.63	75.0
Total	50.38	80.55	107.54	90.00

Orchards—10 to 18 years	I	II	III	IV
Acre Unit				
Pruning	6.23	5.97	5.74	
Hauling brush	1.30	1.09	.98	
Total	7.53	7.06	6.72	
Orchard Unit				
Average No. acres pruned	5.9	15.0	20.3	
Total	44.62	105.98	136.66	

Cultivation

Orchards—2 to 5 years				
Acre Unit				
Cultivating	5.98	8.27	5.50	2.93
Orchard Unit				
Average No. acres cultivated	5.5	14.7	13.6	495.0
Total cost	32.89	121.57	74.80	1450.35
Orchards 6 to 9 years				
Acre Unit				
Cultivating	6.00	5.76	7.13	5.73
Orchard Unit				
Average No. acres cultivated	6.4	12.0	23.5	59.3
Total cost	38.40	69.12	167.56	339.79
Orchards—10 to 18 years				
Acre Unit				
Cultivating	5.53	5.93	6.54	
Orchard Unit				
Average No. acres cultivated	7.9	14.0	20.3	
Total cost	43.69	83.02	132.76	
Per cent orchard cultivated	100%	83%	78%	

Spraying

Orchards 2 to 5 years	I	II	III	IV
Acre Unit				
No. times sprayed	2	2	2	1.3
Cost of each spraying	2.87	1.32	1.62	.84
Total cost	5.74	2.64	3.24	1.09
Orchard Unit				
No. times sprayed	2	2	2	1.3
No. of acres sprayed	5	18.5	18.4	171.7
Total cost	28.90	48.84	59.69	187.54
Orchards 6 to 9 years.				
Acre Unit				
No. of times sprayed	4	4.2	4.1	5.5
Cost of each spraying	2.83	2.93	1.47	.92
Total	11.35	12.31	6.06	5.03
Orchard Unit				
No. times sprayed	4	4.2	4.1	5.5
No. acres sprayed	6.4	14.1	20.2	45.0
Total	72.84	174.10	122.35	226.45
Orchards 10 to 18 years.				
Acre Unit				
No. times sprayed	3.9	4.3	2.8	no data
Cost of each spraying	4.37	2.45	1.87	
Total	17.02	10.52	5.24	
Orchard Unit				
No. of times sprayed	3.9	4.3	2.8	
No. of acres sprayed	6.2	16.2	29.2	
Total	105.50	171.40	153.09	

Irrigation.

Orchards 2 to 5 years. Acre Unit	I	II	III	IV
Average cost where irrigation is practiced	1.58	4.79	no data	5.21
*Average cost	.27	4.79		2.60
Orchard Unit				
Average No. of acres irrigated	9.5	18.7		560
Total cost where irrigation is practiced	15.00	89.37		2918.10
*Average cost	2.55	89.37		1459.05
Orchards 6 to 9 years. Acre Unit				
Average cost where irrigation is practiced	5.55	2.65	2.79	3.28
*Average cost	2.11	1.80	2.24	1.64
Orchard Unit				
Average No. of acres irrigated	7.8	17.4	29.0	80.0
Total cost where irrigation is practiced	43.48	46.11	81.00	262.50
*Average cost	16.52	31.35	64.80	131.25
Orchards 10 to 18 years. Average cost where irrigation is practiced	3.38	4.63	1.62	no data
*Average cost	2.94	1.25	1.22	
Orchard Unit				
Average No. of acres irrigated	6.8	13.0	33.3	
Total cost where irrigation is practiced	23.12	60.18	53.93	
*Average cost	20.11	16.25	40.44	

*Average cost considering both irrigated and non-irrigated orchards.

Cover and Shade Crops.

Orchards 2 to 5 years. Acre Unit				
Cost where planted	2.54	2.38	5.15	1.60
*Average cost	.43	1.59	1.03	.80
Orchard Unit				
Average No. acres in each orchard	5.1	12.4	4.9	99.0
Total cost	12.95	29.51	25.24	154.40
*Average cost	2.20	19.77	5.05	79.20
Orchards 6 to 9 years. Acre Unit				
Cost where planted	3.85	1.97	3.66	5.50
*Average cost	1.46	.49	2.19	1.38
Orchard Unit				
Average No. acres in each orchard	4.4	13.3	9.6	10.7
Total cost	16.94	25.20	35.14	58.85
*Average cost	6.44	6.30	21.09	14.71
Orchards 10 to 18 years. Acre Unit				
Cost where planted	5.18	4.98	4.25	no data
*Average cost	1.50	1.34	2.13	
Average No. acres in each orchard	9.5	6.4	10.7	
Total cost	49.21	31.87	45.48	
*Average cost	14.27	8.60	22.74	

*Average cost all orchards whether or not cover and shade crops planted.

	I	II	III	IV
Fertilizers.				
Orchards 1 to 5 years.				
Acre Unit				
Cost of fertilizers and applying, where used	no data	no data	2.45	.04
*Avcrage cost			.49	.02
Orchard Unit				
Average cost for each orchard			66.25	24.00
Per cent of orchards using fertilizers			20%	50%
*Average cost			13.25	12.00
Orchards 6 to 9 years.				
Acre Unit				
Cost of fertilizers and applying, where used	5.54	1.39	1.04	no data
*Average cost	1.39	.46	.42	
Orchard Unit				
Average cost for each orchard where used	30.50	27.38	35.50	
Per cent of orchards using fertilizers	25%	33%	40%	
*Average cost	7.63	9.13	14.20	
Orchards 10 to 18 years.				
Acre Unit				
Cost of fertilizers and applying, where used	16.00	4.21	1.18	no data
*Average cost	2.24	.55	.29	
Orchard Unit				
Average cost for each orchard where used	126.40	40.00	41.50	
Per cent of orchards using fertilizer	14%	13%	25%	
*Average cost	17.70	5.20	10.38	

*Average cost considering all orchards, whether or not fertilizers were used.

Thinning.	I	II	III	IV
Orchards 6 to 9 years.				
Acre Unit				
Cost where thinning is practiced	2.67	4.75	1.43	1.27
Orchard Unit				
Average No. acres thinned	4.8	9.5	23.2	24.5
Total cost	12.82	45.13	33.18	31.12
Orchards 10 to 18 years.				
Acre Unit				
Cost where thinning is practiced	9.05	5.57	4.35	no data
Orchard Unit				
Average No. acres thinned	6.1	12.0	18.0	
Total cost	55.20	66.84	78.30	

Propping and Tying.	I	II	III	IV
Orchards 6 to 9 years. Acre Unit				
Cost where practiced	2.78	3.25	2.60	1.79
Orchard Unit				
Average No. acres propped	5.23	12.64	18.72	48.59
Total cost	14.54	41.08	48.67	86.98
Orchards 10 to 18 years. Acre Unit				
Cost where practiced	3.85	4.37	3.43	no data
Orchard Unit				
Average No. acres propped	7.03	14.53	20.8	
Total cost	27.07	63.50	71.34	
Miscellaneous work not segregated.				
Orchards 2 to 5 years. Acre Unit				
Cost for each acre	4.78	2.25	1.78	.65
Orchard Unit				
Total cost	24.38	60.75	46.46	321.75
Orchards 6 to 9 years. Acre Unit				
Cost for each acre	6.25	1.56	1.32	1.12
Orchard Unit				
Total cost	45.63	24.34	33.40	70.67
Orchards 10 to 18 years. Acre Unit				
Cost for each acre	2.35	1.87	1.85	no data
Orchard Unit				
Total cost	18.57	31.60	48.10	

SUMMARY GROWING COSTS.

Orchards 2 to 5 years.

	I		II		III		IV	
	Acre	Orch.	Acre	Orch.	Acre	Orch.	Acre	Orch.
Pruning	2.59	15.78	1.06	17.66	2.32	55.31	.70	121.28
Cultivation	5.98	32.89	8.27	121.57	5.50	74.80	2.93	1450.35
Spraying	5.74	28.90	2.64	48.84	3.24	59.69	1.09	187.54
Irrigation	.27	2.55	4.79	89.37	.....	.....	2.60	1459.05
Cover crops	.43	2.20	1.59	19.77	1.03	5.03	.80	79.20
Fertilizers	.....	.....	.....	.....	.49	13.25	.02	12.60
Total	19.79	106.70	20.60	357.96	14.36	254.56	8.79	3631.17

Orchards 6 to 9 years.

	I		II		III		IV	
	Acre	Orch.	Acre	Orch.	Acre	Orch.	Acre	Orch.
Pruning	6.84	50.38	5.55	80.55	3.51	107.54	1.20	90.00
Cultivation	6.00	38.40	5.76	69.12	7.13	167.56	5.73	339.79
Spraying	11.35	72.84	12.31	174.10	6.06	122.35	5.03	226.45
Irrigation	2.11	16.52	1.80	31.35	2.24	64.80	1.64	131.25
Cover crops	1.46	6.44	.49	6.30	2.19	21.09	1.38	14.71
Fertilizers	1.39	7.63	.46	9.13	.42	14.20	.....	.....
Thinning	2.67	12.82	4.75	45.13	1.43	33.18	1.27	31.12
Propping	2.78	14.54	3.25	41.08	2.60	48.67	1.79	86.98
Miscellaneous	6.25	45.63	1.56	24.34	1.32	33.40	1.12	70.67
Total	40.85	265.20	35.93	481.10	26.90	612.79	19.16	990.97

Orchards 10 to 18 years.

	I		II		III		IV	
	Acre	Orch.	Acre	Orch.	Acre	Orch.	Acre	Orch.
Pruning	7.53	44.62	7.06	105.98	6.72	136.66	insufficient data	
Cultivation	5.53	13.69	5.93	83.02	6.54	132.76		
Spraying	17.02	105.50	10.52	171.40	5.24	153.09		
Irrigation	2.94	20.11	1.25	16.25	1.22	40.44		
Cover crops	1.50	14.27	1.34	8.60	2.13	22.74		
Fertilizers	2.24	17.70	.55	5.20	.29	10.38		
Propping	3.85	27.07	4.37	63.50	3.43	71.34		
Miscellaneous	2.37	18.57	1.87	31.60	1.85	48.10		
Total	52.03	346.73	38.46	552.39	31.77	693.81		

C. Handling Costs.

Orchards 6 to 9 ycars.

Average No. of packed boxes considered in costs.

	I	II	III	IV
Box Unit				
From tree to warehouse.				
Picking	.0349	.0370	.0410	.0565
Hauling	.0084	.0096	.0143	.0310
Packing	.0273	.0444	.0540	.0500
Grading	.0520	.0430	.0328	.0450
Box—made up	.1264	.1034	.1008	.1000
Paper	.0438	.0374	.0286	.0300
Incidental costs (including hauling to warehouse)	.0377	.0215	.0406	.0490
Total	.3305	.2963	.3121	.3615
From warehouse.				
Warehouse and storage	.04	.04	.04	.04
Selling	.124	.1162	.105	.105
Total	.164	.1562	.145	.145
Total cost for each box	.4945	.4525	.4571	.5065
Acre Unit				
Acreage No. bushels	150	158	95	77
Handling from tree to warehouse	49.58	46.82	29.65	27.84
From warehouse	24.60	24.68	13.78	11.17
Total	74.18	71.50	43.43	39.01
Orchard Unit				
Average No. acres apple orchard with crop	5.23	12.64	18.72	48.59
No. of bushels	785	1997	1778	3741
Tree to warehouse	259.44	591.71	554.91	1352.37
From warehouse	128.74	311.83	257.81	542.44
Total	388.18	903.54	812.72	1894.81

Orchards 10 to 18 years.

Average No. packed boxes con sidered in the costs.

Box Unit				
From tree to warehouse				
Picking	.0419	.0479	.0400	no data
Hauling	.0137	.0182	.0200	
Packing	.0450	.0499	.0400	
Grading	.0375	.0386	.0250	
Box—made up	.1021	.1167	.1100	
Paper	.0378	.0329	.0375	
Incidental costs	.0495	.0249	.0310	
Total	.3275	.3291	.3035	
From warehouse.				
Storage and warehouse	.04	.04	.04	
Selling costs	.12	.1111	.11	
Total	.16	.1511	.15	
Total cost for each box	.4875	.4802	.4535	

Acre Unit	I	II	III	IV
Average No. bushels	225	286	188	no data
Tree to warehouse	73.69	94.12	57.06	
From warehouse	36.00	43.21	28.20	
Total	109.69	137.33	85.26	
Orchard Unit				
Average No. acres apple orchard with crop	7.03	14.53	20.8	
No. bushels	1582	4156	3910	
Handling from tree to warehouse	518.11	1367.74	1186.69	
From warehouse	253.12	627.97	586.50	
Total	771.23	1995.71	1773.19	

D. Overhead Costs.

Orchards 2 to 5 years.

Acre Unit	I	II	III	IV
Taxes and insurance	1.54	2.21	1.50	.63
Interest on investment	26.80	40.91	30.25	14.07
Depreciation on equipment	4.59	3.38	2.59	1.45
Total	32.93	46.50	34.34	16.15
Orchard Unit				
Taxes and insurance	7.85	37.57	42.15	311.85
Interest on investment	136.67	695.45	789.66	6965.24
Depreciation on equipment	23.38	57.43	67.63	717.75
Total	167.90	790.45	899.44	7994.84

Orchards 6 to 9 years.

Acre Unit				
Taxes and insurance	5.66	8.03	4.88	3.44
Interest on investment	58.60	53.14	31.48	32.92
Depreciation on equipment	6.83	3.80	2.49	1.46
Total	71.09	64.97	38.85	37.82
Orchard Unit				
Taxes and insurance	41.32	125.27	123.46	267.06
Interest on investment	427.78	829.00	796.43	2077.04
Depreciation on equipment	49.82	59.28	63.02	92.32
Total	518.92	1013.55	982.91	2436.42

Orchards 10 to 18 years.

Acre Unit				
Taxes and insurance	7.26	6.77	5.18	no data
Interest on investment	78.25	47.74	43.73	
Depreciation on equipment	9.83	4.81	3.40	
Total	95.34	59.32	52.31	
Orchard Unit				
Taxes and insurance	56.35	114.41	134.68	
Interest on investment	618.17	746.76	1136.88	
Depreciation on equipment	77.46	81.34	98.43	
Total	751.98	942.51	1369.99	

E. Summary.

Orchards 2 to 5 years.

Acre Unit	I	II	III	IV
Maintenance	19.79	20.60	14.36	8.79
Overhead	32.93	46.50	34.34	16.15
Total	52.72	67.10	48.70	24.94
Orchard Unit				
Maintenance	106.70	357.96	254.56	3631.17
Overhead	167.90	790.45	899.44	7994.84
Total	274.60	1148.41	1154.00	11,626.01

Orchards 6 to 9 years.

Box Unit				
Maintenance	.2723	.2211	.2832	.2488
Handling	.4941	.4525	.4572	.5066
Overhead	.4739	.4112	.4089	.4912
Total	1.2403	1.0848	1.1493	1.2466
Acre Unit				
Maintenance	40.85	35.93	26.90	19.16
Handling	74.18	71.50	43.43	39.01
Overhead	71.09	64.97	38.85	37.82
Total	186.12	172.40	109.18	95.99
Orchard Unit				
Maintenance	235.20	481.10	612.79	990.97
Handling	388.18	903.54	812.72	1894.81
Overhead	518.92	1013.55	982.91	2436.42
Total	1172.30	2398.19	2408.42	5322.20

Orchards 10 to 18 years.

Box Unit				
Maintenance	.2312	.1344	.1689	no data
Handling	.4875	.4802	.4535	
Overhead	.4235	.2074	.2782	
Total	1.1422	.8220	.9006	
Acre Unit				
Maintenance	52.03	38.46	31.73	
Handling	109.69	137.33	85.26	
Overhead	95.34	59.32	52.31	
Total	257.06	235.11	169.34	
Orchard Unit				
Maintenance	346.73	552.39	693.85	
Handling	771.23	1995.71	1773.19	
Overhead	751.98	942.51	1369.99	
Total	1869.94	3490.61	3836.99	

RECAPITULATION. (The Cost of Production of Apples.)

RECAPITULATION	Av. yield acre bu.	Acreage Maintenance	Acreage Overhead	Acreage Handling	Acreage Total average	Box Maintenance	Box Overhead	Box Handling	Box Total average
Orchards 6 to 9 years.....									
Class I	150	40.85	74.18	71.09	186.12	.2723	.4941	.4739	1.2403
Class II	158	35.93	71.50	64.97	172.40	.2211	.4525	.4112	1.0848
Class III	95	26.90	43.43	38.85	109.18	.2832	.4572	.4089	1.1493
Class IV	77	19.16	39.01	37.82	95.99	.2488	.5056	.4912	1.2466
*Total, Orchard 6 to 9 years—average	120	30.71	57.03	53.18	140.92	.2564	.4776	.4463	1.1803
Orchards 10 to 18 years									
Class I	225	52.03	109.69	95.34	257.06	.2312	.4875	.4235	1.1422
Class II	286	38.46	137.33	59.32	235.11	.1344	.4802	.2074	.8220
Class III	188	31.77	85.26	52.31	169.34	.1689	.4535	.2782	.9006
*Total Orchards 10 to 18	233	40.75	110.76	68.99	220.50	.1782	.4737	.3030	.9549
*Total Orchards, 6 to 18 years—average.....	176.5	35.73	83.90	61.09	180.72	.2173	.4757	.3747	1.0677

*It will be noted that there is a slight difference between the actual cost for each bushel as shown under the acreage segregation and the cost for each box as shown under the box segregation as a result of not taking into account the fraction of bushels of apples for each acre.

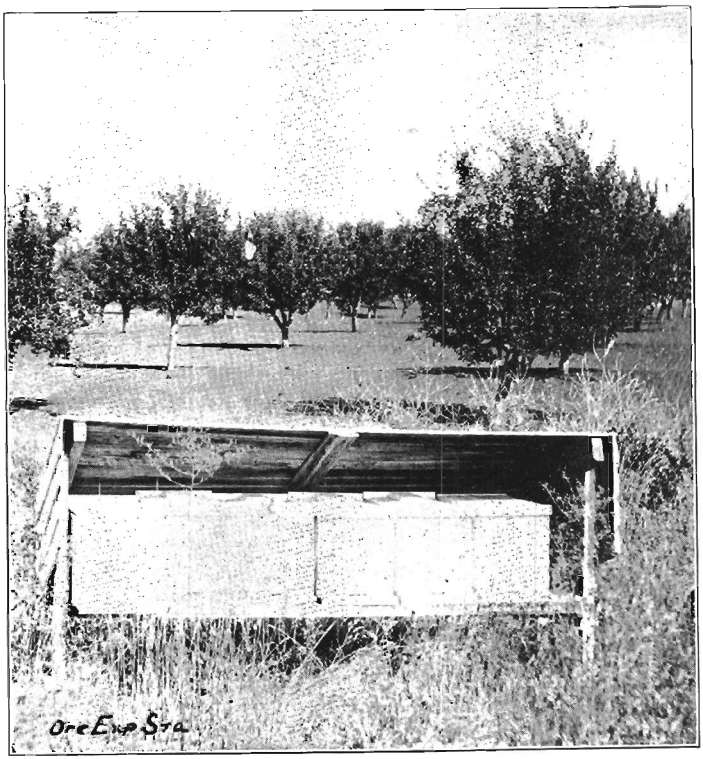

Fig 4. A necessity for all orchards. Bees are essential agents in pollination, thus helping insure a crop.

CHOICE OF VARIETY.

Ten or fifteen years ago, when the large orchard acreage here in the Northwest was being planted, it was not uncommon to find a single grower planting from ten to fifty varieties in his orchard. He soon learned that this was poor economy, and that to grow fruit successfully he must limit himself to a few varieties. Consequently, he grafted the entire orchard over to one or two varieties, generally selecting these varieties according to the general, and often eastern, market quotations at the time. Consequently, with such varieties as Esopus (Spitzenberg), Yellow Newton, Baldwin, or Winesap, which were bringing bonanza prices, he immediately felt that these were the only varieties for him to grow, regardless of his own local conditions, adaptability of these varieties to his conditions, or whether his neighbors had these varieties, thus enabling him to market his crop cooperatively. The result today is that when these trees come into heavy bearing many of them are unprofitable,

Fig. 5. The ultimate fate of many orchards—shallow soil, poor drainage, wrong varieties, and improper management rendering the business unprofitable under such conditions.

because the soil and climatic conditions, or the general environment of the orchard, are not conducive to the production of high-class fruit of the varieties he has chosen, or because the acreage of these varieties is not great enough for economical shipment. It is going to be necessary for many an orchardist to graft over many of his fruit trees to more desirable varieties, or else to rip out the trees entirely; for otherwise the keen competition of the future will drive him from the apple business.

To make a success of apples, you must choose a variety or varieties with which you can excel. Your apples should be highly colored, of commercial size, of good quality, and should have keeping qualities which are demanded of the variety. They should be regular in their bearing habits, should be heavy yielders, and reasonably free from diseases.

When we urge an increased yield from our apple trees, the statement will probably be challenged. Many growers would say that it is evident we are going to have too many apples, why encourage more? That is not the problem as we see it. The problem is this,—that the more apples you produce from a given tree or a given acreage, the

cheaper you can produce those apples, and the more nearly you can meet the market prices. The man who will have to go out of the apple business will be the one who has not the right variety, whose trees do not yield well, and who consequently cannot conduct his business in competition with other growers. Already we see here in the Northwest that the acreage is shrinking very rapidly. Hundreds of men are beginning to realize that they haven't the location, the varieties, the money, or the general conditions, to carry on the business successfully. These orchards will be pulled out; in fact the uprooting is now being done. A great many orchards that are now in bearing, moreover, will, in the next few years, cease to bear profitable crops. In the long run, the men who are going to stay with the apple business and make the most money from the business, are those men who can grow high class fruit, and in great abundance, on a given acreage.

It is doubtful if the Northwest, as a whole, should be producing more than a dozen varieties of apples, and each locality should only be producing the particular few of this dozen that are best suited to the local conditions, probably not more than three or four at the most. Only very rarely would it pay individual orchardists to attempt to grow more than three varieties of apples. Find out first what varieties are sold in your locality. Second, find out what varieties from among this list you can grow and still meet the competition. It may be that you may have to choose a variety different from the great majority of the growers in your community, although this will rarely be true. Stick to the better known commercial varieties. Occasionally a man can introduce new varieties and make money with them. The majority, however, cannot.

We wrote letters to a large number of fruit-growers' associations of the Pacific Northwest, and asked them to give the names of varieties which they sold and also the figures concerning the percentage of each variety. We have compiled these figures as follows:

Rome Beauty	17 per cent
Jonathan	17 per cent
Newtown	10 per cent
Esopus (Spitzenberg)	10 per cent
Winesap	10 per cent
King	5 per cent
York Imperial	4 per cent
Baldwin	4 per cent
Following miscellaneous varieties	10 per cent
Grimes Golden	
Northern Spy	
Gano	
Arkansas	
Ben Davis	
Gravenstein	
Miscellaneous varieties	13 per cent

Most of the varieties that are already quoted as making up a large percentage of the crop will undoubtedly continue to do so. The Baldwin will, undoubtedly, show some decrease, because in many sections the susceptibility of this variety to fruit pit is going to drive it out of commercial orchards. The York Imperial is also an apple which will not hold its own in the ratio. During the next few years varieties which are not mentioned extensively in the list, will probably increase in proportion; such varieties as Gravenstein, Delicious, Winter Banana, and Grimes Golden will all increase, and the acreage of young trees of these varieties not yet in bearing is quite large. One of the best ways that will reduce the cost of production and make an acreage more profitable is to choose the right varieties.

THE TREE.

It is not sufficient that we study the variety alone; we must study our orchard, not only as a variety, or as a whole, or as a general unit, but we must study it in respect to its individual trees. We have heard the dairyman preaching for years that it is one of the basic principles of making money from dairying to have the individuals that are heavy producers. Consequently, every up-to-date dairyman is testing his cows, not only for their percentage of butter fat, but for the amount of milk they produce, for the number of pounds of butter fat they will produce in a year. On the other hand, our orchardists not only cannot tell, in many cases, the relative value of three leading varieties which they may have in their orchards, as far as money making over a period of ten years is concerned. but they cannot tell anything definite concerning the individual merits of their trees. They may have observed a tree here and there which seems to run better than the average. They remember that

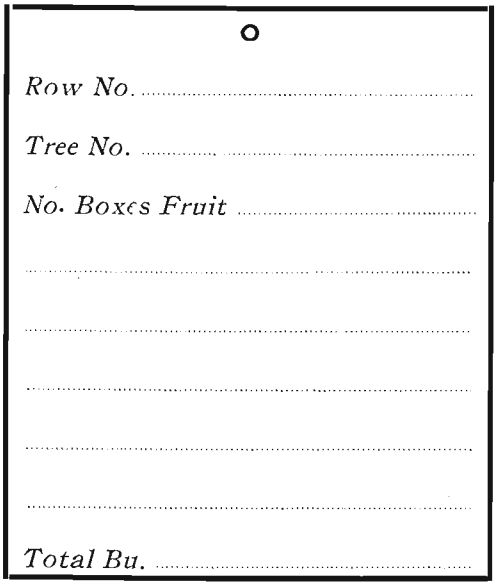

Fig. 6. Record tag.

the tree bears annually and that the fruit colors up beautifully, and that it is a nice-looking tree; but even then, they can seldom tell the number of bushels it produced. If the average orchardist would check up on his trees, he would be surprised to note the very large percentage of individuals that are unprofitable, trees that have never made a dollar for him, and never will; trees that are absorbing an enormous amount of money for tillage, irrigation, fertilization, pruning, spraying, harvesting, and overhead expense, and yet are unproductive. The problem is to find out what trees are unprofitable, and to determine why this condition is true.

We would suggest as a means of determining this that the orchardist first divide his orchard into blocks or units. It is probably impracticable to try to run fifty or one-hundred acres in one block. It is better to have the blocks of small acreage. These blocks or units may be divided

according to varieties, soils, exposures, or natural subdivisions made by streams of water, highways, etc. If it is impracticable to do this, then we would arbitrarily divide the orchard into various blocks. We would have each one of these blocks named or numbered, and each row in each block numbered, so that it would be a very easy thing to name, for example: that down in Block A, Row 15, Tree 26 needs some attention. The owner or foreman will find it will pay him handsomely, during the season, to ride through his orchard and spot these poor trees.

At a very small expense metal tags bearing the numbers may be secured and nailed to the trunks of all the trees. The foreman or owner in passing can very readily note some unusual conditions and will be able to come back to the particular tree at a convenient time and note more carefully any special characteristics, whether this be an injury caused by some careless cultivating, a particularly bad infestation of some insect, or possibly a tree bearing an unusually large crop, or perhaps no crop whatever.

A better way of studying the crop, however, is by having a small card-board tag which may be tacked on the trunk of each tree just before picking begins. The tag shown in Figure 6 is used by one grower at Mosier, and has proved very satisfactory. Either the picker, or loader, generally the latter, will place the number of boxes or buckets on the card.

If the grower finds it impracticable to keep a record of each tree, I would suggest that he first try and spot a few of the very poor trees, and compare them with a few of the very best trees. It will only be a short time, however, until the owner will become so interested in this phase of his work that he will have a very good idea of the standing of nearly every tree in the orchard. I believe he will find it a good investment to give such attention to his business that he knows what trees are profitable and what trees are not. The cause of unprofitableness of a few of the trees may be due to disease, to poor soil, to an inherent weakness, or to a wrong variety. The remedy may be topworking these trees to better varieties, giving the trees some special attention, or, lastly, pulling the tree out and planting the land to some other variety or possibly to some other crop.

DIVERSITY.

While we have been making a study of diversified fruit growing, we have not as yet collected enough definite information to state what form of diversity will prove the most profitable under our Northwestern conditions. We do believe that the best opportunities to diversify the apple ranch—especially where lands are high priced and where there is an overhead cost, taxes and interest on the investment, of from $30.00 to $50.00 an acre—is by the growing of more than one kind of fruit, and with alfalfa or clover, which should be fed to live stock on the ranch. We doubt very much if there are many types of farming other than fruit growing that will pay as good a dividend on an investment of over $500.00 an acre.

FRUITS.

The orchardist should strive, of course, to have an ideal working unit and utilize labor and horses on the ranch to the utmost advantage. We would suggest, however, that instead of planting the entire fruit unit to apples, the grower look into the feasibility of diversifying his fruit interests and that he grow two, three, or four kinds of fruit instead of apples alone. While this may not be possible in some cases owing to soil conditions, on most ranches it will be feasible. For example, the

fruit grower in the Willamette Valley could have a few acres of small fruits, such as loganberries, blackberries, and raspberries, a few acres of pears, principally for canning purposes, a few acres of Italian prunes for evaporation purposes, and several acres of apples. If he preferred, he could substitute walnuts for apples, and sweet cherries for berries. He would still have a probable economic unit and have a better distribution of labor than would be possible with the entire acreage in one kind of fruit. In Hood River, as another example, he could plant berries, such as strawberries, blackberries, and raspberries, sweet cherries, apples, and pears, either Bartlett for canning or good shipping pears such as d'Anjou. For specialized sections, such as The Dalles, the bulk of the planting should undoubtedly be stone fruits, sweet cherries, peaches, apricots, etc. Other combinations could be substituted in these various localities, but these are simply suggested and used as an illustration of the opportunities.

Regardless of location, soil, or climatic conditions, where fruit is raised, there is no doubt that the fruit grower should, under all circumstances, have a good garden, handled in an economic, systematic manner; should raise enough pork for his own use during the year; should keep a family flock of chickens; and should have a good cow to furnish his family with all the milk and butter they can use. He should also endeavor to raise all the feed necessary to maintain all stock on the ranch. This last, of course, will not be practicable under all conditions, but it will usually be possible to raise most of the forage and hay required for the stock, thus materially reducing the feeding expense.

GENERAL CROPS.

Nearly every orchardist has tried one or more inter-crops in his orchard with varying success. There are a number of factors which will determine whether or not various general crops can be successfully handled among fruit trees. One of these is that of moisture; since the orchard requires much more moisture when inter-cropping is practiced than it does to grow trees alone. The increased cost of handling the soil and caring for the trees must be taken into consideration. The cost of tillage, especially, is materially increased. Other factors are soil and climate, adaptability of the crop to market requirements, advantageous use of the crop raised, and the personal element.

Forage Crops. Under proper conditions a number of growers are handling forage crops, such as alfalfa and clover, to advantage, especially where they can be used as feed for live stock on the place. This point is brought out in our discussion of hog raising and dairying. When grown strictly as a hay crop in the orchard, it is very difficult to make much profit from the crops, as the increased cost of producing hay under such conditions is such as to leave the margin of profit extremely narrow.

The following extracts from letters are typical of data we have secured concerning general crop growing in the orchard.

CLOVER. In a block of young Howells, 3 years old, we sowed clover. Without water we found this a very poor policy, as the trees were stunted and the fourth year had a full set of bloom.

ALFALFA. We feed all our alfalfa to our cows and horses. I judge that we raise from 4 to 6 tons to the acre on land not in orchard. We don't get as much from the orchard as we do from the regular alfalfa land. There is more or less waste around the trees. It takes considerable more work to get the alfalfa out of the orchard than off regular alfalfa land.

Alfalfa in the orchard seems to make the apples smaller and of a high color. The trees do not grow nearly as fast. We set out a few

trees three years ago to replace some that had been missing and they have not grown more than a foot in that time. The reason we have had alfalfa in our orchard is because the orchard is low and liable to late frosts.

ALFALFA. We made a series of experiments with different fertilizers without much result. The next year I sowed a heavy stand of vetch in the fall and left it the following year, irrigating it. I was told it would stay green all summer. It did not. The vetch helped some. The following season I sowed alfalfa in the spring; cut about three tons. Last year I cut about twelve tons of alfalfa off that plot. The trees are different in every particular. The bark is smoothing off, the color of bark and leaves is deeper and the growth much more vigorous and healthy. Now the trees need considerably more pruning.

My alfalfa fed seven animals six months. Its only cost was having it cut and raked—$7.20—as handling it was part of the routine work of the place and did not require outside help. However, the actual time was an hour a day for each irrigation, and two men and a team for one hour a day, three times, hauling hay.

ALFALFA. My experience with alfalfa as a hay crop in the orchard was unsatisfactory because of the difficulty of mowing and raking hay among trees without greatly injuring the trees.

ALFALFA. We find that it is not practical to cut alfalfa and put it up for hay, so we have fenced the orchard into several pastures and run hogs on it.

ALFALFA. Alfalfa does not injure the trees in my orchard. I believe that where alfalfa is grown, the trees require more irrigation during hot weather.

OATS AND VETCH. In a block of d'Anjou and Bartletts, we sowed last spring and in June cut the crop of oats and vetch for hay. The trees were three years old and last year made almost no growth, while the same aged trees and same variety where clean cultivation was used made 3 to 4 ft. of growth.

We consider this experiment costly and would not repeat it. In our older orchard, however, the inter-cropping caused the trees at 6 years to have a full bloom and the growth was excellent.

OATS. So far, I have used the oats for fall and winter pasture and hogged down one crop of grain in the summer.

HAY RAISED. I raise vetch, oats, wheat, or timothy only for the consumption of the stock on the place—5 horses and 4 cows. It takes a large amount of hay. I figure on keeping enough stock to consume all the hay I can raise, and whatever profit there is in hay is in its fertilizing value.

Truck, Garden and Small Fruits. If it becomes necessary to hire labor for all the work done in raising truck and garden crops in the orchard, it will be only in exceptional cases when profits can be realized. When undertaken on a small scale and the labor handled by such help as is already on the ranch, splendid profits are often made from such crops as cream squash, egg plants, tomatoes, rhubarb, small fruit, and truck of various kinds.

In handling general garden and truck crops, we have found a great difference of opinion concerning the profits which may be realized, some growers reporting a very handsome profit, some reporting they just about break even, and others stating that they lose money. Undoubtedly soil, climate, market, and labor conditions have much to do with such returns.

Occasionally there is a special crop which some one individual in a community can handle successfully, but it is necessary to restrict such a crop very materially if the business returns a profit. I refer to such

crops as cream squash, egg plant, etc. Such crops may bring good returns one season and the following season be grown at a heavy loss owing to market or perhaps financial conditions.

Very often, too, truck crops, in addition to requiring extra help, demand that a shipment be made practically every day, thus taking a team and man off cultivation, spraying, or whatever other work then is in progress.

Strawberries. Where irrigation is practiced, probably one of the most successful crops grown among trees in the Northwest is the strawberry. The acreage planted by individuals is nearly always small and is given intensive care, usually by help employed throughout the season. There are cases, however, where strawberries are grown among trees and insufficient moisture supplied; as a result trees are dwarfed. In fact, even with irrigation, if the grower attempts to handle plants too close to the trees, and is not careful in irrigation, there is danger of dwarfing. Undoubtedly, however, many of our orchardists

Fig. 7. Intercropping with strawberries, one of the most profitable intercrops grown in the orchards of the Northwest. This is a good model for those contemplating planting this crop.

have made a mistake by not growing strawberries among their trees, the income being fairly certain and coming at a very desirable time of year. Furthermore with proper attention to this business the yields could probably be materially increased.

Potatoes. Another crop which a number of growers have tried with varying success is that of potatoes. While under many orchard conditions some very high grade potatoes and high yields may be obtained, the varying market condition has often made the crop unprofitable. The grower usually jumps into the potato business the year following very high prices for this product, at a time when nearly everyone else is planting an increased acreage. Of course, this crop will be much larger and the corresponding prices much lower, and the orchardist goes out of the business carrying a loss for one year. As a

rule, it is only those growers who raise potatoes for a series of years that report a fair profit from the business.

Probably one of the worst drawbacks to this business as a side line to orcharding is the increase in the number of gophers, entailing much time to fight as well as poison, and the loss and damage of many trees by this rodent.

HOGS.

Many fruit growers write the Experiment Station asking about combining hogs and orcharding, the idea being to raise certain crops among the trees for hogging off. The demand for pork in our packing centers and the opportunity of growing forage crops on a great deal of land that probably cannot be utilized to good advantage in any other way, has brought up this question many times in the past few years.

There are a great many points to be considered regarding the raising of hogs as a side line to fruit growing before starting into the business.

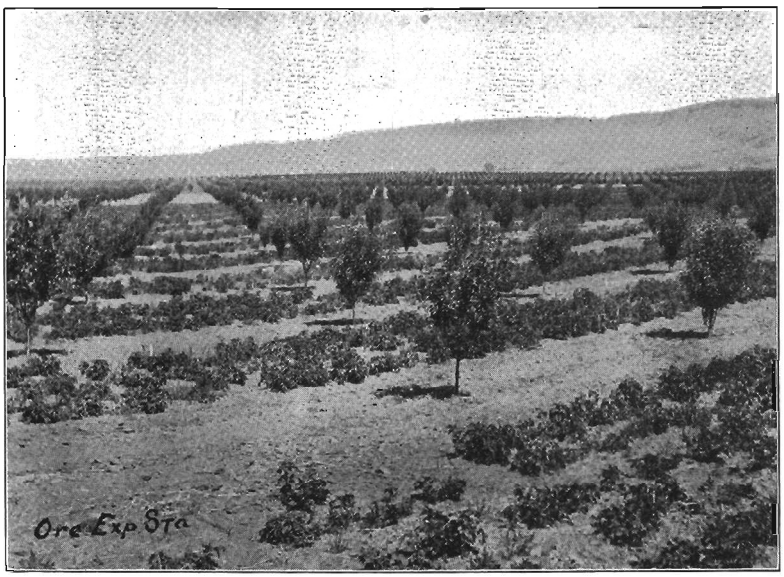

Fig. 8 Intercropping a young orchard with potatoes. Note between the crop and the trees the wide margin, which should be observed in all intercropping of orchards.

We will be able to consider these at this time only in the very briefest way.

Summer and Winter Pasturing of Hogs. There are two general systems of pasturing hogs on the fruit farm; i. e., the summer pasturage system and the winter pasturage system.

The raising of hogs in conjunction with fruit under non-irrigated conditions where the winters are not so mild that plenty of forage may be grown in the orchard, is a very doubtful practice; but in Western Oregon where the winter conditions are favorable and where in most years an abundance of forage crops may be cheaply grown, hogs may prove a very profitable side line. The usual plan under non-irrigated conditions is to turn off all excess stock in the spring.

Where irrigation is practiced, it is very easy to combine the system of cover and shade crops and hogs, for with irrigation water the fruit grower can keep a good growth on the forage crops and at the same time supply the trees with plenty of water. In fact, by a careful selection of crops for the orchard, pasturage for the hogs can be provided throughout the year. Of course, there are times during the winter when most of our orchard soils become so wet that the tramping of hogs may do considerable injury by puddling, and for this reason it is generally considered best to remove the hogs from the orchard after heavy rains. Among the crops that can be grown in the orchard for forage where irrigation is practiced, probably the greater number of fruit growers are making a success by cropping their orchards with clover (red, alsike, or crimson), alfalfa, vetch, vetch and oats, or vetch and wheat, each crop having its special climatic or soil adaptability.

For growers who are using shade crops for the first time, a word of caution may not be out of place at this time; especially is this true if the grower has had little experience with irrigation. In the spring and early summer the ground may become very dry, in fact, too dry, before the orchardist suspects it. If the ground gets dry, you are no better off than if you were allowing a rank growth of weeds to grow. Watch your subsoil carefully; get a soil auger and make frequent borings; don't allow the ground to get dry. When you irrigate, water thoroughly; give the ground a good wetting. If you are not alert to this danger, you will simply moisten the top soil and the subsoil may be as dry as powder. This shallow irrigation will make shallow-rooted trees. If you are using the rill system, you may not get water close to the trees. Either run your rill close to the trees or else make some basins or short rills at right angles to the main rills, so you can get water to the feeding roots of the trees. Only by using an auger frequently can you be sure that you are keeping the subsoil in good condition. Frequent borings under the branches of the trees will tell you whether the trees are getting enough water.

The second system of pasturing hogs in the orchard, known as the winter system, may prove successful to a certain extent even where irrigation is not practiced, and is especially adapted to Western Oregon and Western Washington. This system should be tried, however, only on our well-drained land, and will work out especially well on our hill lands.

The fruit grower who expects to carry a drove of hogs through the winter on pasture as the main feed, should plant a succession of crops; such as, turnips, both Aberdeen and Cowhorn, rape and vetch. In most of our sections there is also considerable natural feed like mustard growing in many orchards, which has considerable feed value. Seed for these crops is generally planted early, some growers planting by the first of July and others from the middle of August to the first of September. Any seed planted from the last of August to the middle of September will not be in condition to turn hogs on until late spring. The best success is usually obtained when the seed is planted early, for even in a dry season results are fairly satisfactory. It is very important under any circumstances that the orchard be plowed at the time this work should ordinarily be done in the spring, turning under all the forage the hogs have not eaten. This will furnish organic matter for the trees.

Systems of Pasturage. There are three different methods of pasturing hogs on the fruit farm: (1) by continuous grazing in the orchard, as is usually practiced where there is no irrigation and where the hogs are expected to make their gains mainly from forage crops and such feeds as are grown elsewhere and fed to them; (2) alternate pasturing

equal areas in the orchard; (3) pasturing of areas in the orchard and areas of additional land at various times.

When continuous grazing is allowed, the crop is usually kept closely grazed and is too often over-grazed, the plants being cropped so closely that the stand is soon ruined. Where the orchard is divided up into equal areas for grazing, or where continuous grazing is practiced, with no additional land that can be used at certain times, the hogs are often in the way during the picking season, and with some low headed trees, especially in the case of peach trees, the branches loaded with fruit hang so near the ground that the hogs will eat the fruit and leaves, often tearing off small branches and injuring the trees. Dividing the orchard into two or more fields of equal area, and possibly having another pasture that can be used at certain times will probably prove the most successful method for most fruit growers. This additional pasture need not be very large and should furnish some hay or other feed for such additional stock as the fruit grower may have. These last two methods are especially advantageous where irrigation is practiced as the hogs are inclined to root the surface of the ground when it is wet or damp and often puddle the soil or ruin irrigation ditches. For this reason, the orchard, if under irrigation, is irrigated just after the hogs are changed from one pasture to the next. This gives the surface of the ground time to dry before the forage is large enough to be grazed.

Feeding the Hog. The stumbling block for most fruit growers who attempt to raise hogs in their orchard is the feeding of these hogs. The question of how much grain is necessary or desirable for the hog when raised merely as a side-line to fruit growing is one that is very difficult to answer.

The orchardist has a little different problem from the hog raiser who is a specialist, or from the general farmer who has an opportunity to raise a large portion of his grain. As a rule, the orchardist does not plan to market his hogs until they are 10 or 12 months old, and by handling them in this way he is able to maintain them on pasture alone during the grazing season and the grain ration is very light, if fed at all. The result is a slow daily gain, but a greater percentage of the growth is made from cheaply grown forage in the orchard. With the orchardist the added cost of maintaining the hog until 10 or 12 months old more than balances the saving of the grain ration which he would usually have to buy.

It is, of course, necessary to feed pigs and small shotes a small amount of grain or they are apt to become stunted. This may be continued or discontinued according to conditions when the pigs have begun to feed well on the pasture. There is little doubt, however, but that the hogs will make better gains if it is possible to feed them a little grain, even a half pound a day for each hog.

We hear much about the food value of fruit for hogs. This is probably overestimated, especially in the case of apples, which do not appear to possess a high feeding value. They may be used, however, to good advantage in the maintenance of breeding stock and to give variety to a ration. Fruits having a high sugar content, as is the case with prunes, are worth something as hog feed, but these prunes are not available for hogs in most cases until rotted so badly that they have lost most of their food value.

While it is true hogs eat some pests and destroy fruit as it drops, this is a factor which as a rule doesn't need much consideration, as the successful orchardist must spray anyway, and efficient spraying will control most of our pests.

How to Get Started. After the grower has decided to go into the hog raising business, his great problem is to know how many hogs he can raise in his orchard and how many he should start with. This is a

problem that must be determined by the individual, but there is little danger of over-doing the business if the grower will start on a small scale and gradually build up his herd. This will also avoid the necessity of tying up a large amount of capital at the start. Probably one of the most successful and economical ways to start is by buying from one to three good sows, preferably bred sows, and selecting enough gilts from the pigs brought to increase the herd as found desirable.

There is no doubt that every fruit grower, even if he does not expect to raise hogs as a money crop, should have enough hogs to supply his family with pork throughout the year.

Will Hogs Injure the Trees. We hear a great deal about hogs injuring trees when pastured in the orchard. It is true that we shall always have to watch out for damaged trees when hogs are turned into the orchard. However, out of a large number of reports of orchards where hogs were pastured, very few contain any complaint of damage from the hogs. This is especially true where a variety of feed is being grown, there seeming to be more of a tendency for hogs to eat on the trees where only one kind of feed is being grown, such as clover or alfalfa.

*The Iowa Experiment Station, in a survey of fruit farms made in that State, reports that hogs were found in several orchards, but in only a few had they done a great amount of damage and then only where the pasture was limited or where feeding was done in the orchard itself. They report that one orchard in particular was entirely killed by hogs. It was small, however, affording the hogs very small pasturage, and the grain was fed them under the trees and water for wallows furnished in the same area.

By careful watching and proper care, there is little danger of any serious damage from the hogs attacking the trees and injuring them, except possibly in the young orchard. Young trees that can be easily rooted out or injured should usually be protected by driving three or four stakes around each tree and wiring the tops of the stakes together.

Alfalfa Pasturing Experiment.

Experiments conducted by Mr. R. W. Allen, Superintendent of the Umatilla Experiment Station, Hermiston, Oregon, and summarized in a recent report from that Station, show that alfalfa in a young orchard can be "hogged off" to a distinct advantage in that region.

A summary of his report may be of interest along this line.

The following account gives in detail the manner in which the experiment was conducted with results obtained.

For the purpose of determining the comparative value of alfalfa hay and pasture produced by equal areas of land planted to orchard, one-half acre of four-year-old alfalfa was taken. The soil and stand of plants were uniform as no grading was done preparatory to seeding.

The tract was equally divided into one-fourth acre fields, one-half being set aside for the production of hay and the other fenced for pasturing.

The pasture plat was divided into two parts of one-eighth acre each. A small shelter and waterbarrel were placed at one end of the dividing fence in such manner that, by changing the free end of one panel from one end to the other of the shelter they could be thrown into either of the plats.

Owing to the flume leading to this land being small, water could not be applied to the entire experiment at one time, but it was irrigated regularly at intervals averaging about 12 days in length. New furrows were made in the hay ground after each crop was removed, and in the pasture plats before each irrigation.

* Iowa Bulletin No. 153, An Apple Orchard Survey of Mills County.

Four crops of hay were cut from one-fourth acre, which yielded as follows:

First crop, May 22	848 lbs.
Second crop, July 6	838 lbs.
Third crop, August 3	534 lbs.
Fourth crop, September 28	430 lbs.
Total	2650 lbs. Or 5.3 tons to the acre.

A yield of 5.3 tons is considered large for coarse sandy soil not influenced by ground water.

The first lot of hogs purchased for use in this experiment were farrowed September 15, 1913, making them 194 days old. They were from the first litter of a young Duroc sow. The sire was of the large type Poland China and both parents were of good breeding. Hogs of the second lot were very similar in every respect to those of the first. Although not large for their age they were thrifty and in good flesh when put on the pasture.

Results for season:

No. of days	Gain Total	Gain per day	Gain daily per hog	Grain fed	Lbs. pork per acre per day
Total 190	573			1883	
Average		3.01	.75		12.4

Total number of days alfalfa was pastured—190.

Number of hog days for one acre of alfalfa—3040.

Total pounds pork produced by ¼ acre of alfalfa with addition of grain equals 573, which is equivalent to 2292 pounds to the acre. At 7c this amounts to $160.44.

After deducting $28.25, the cost of 1883 pounds of grain (rolled barley) fed at $30 a ton leaves $11.86 to the credit of ¼ acre of alfalfa. This equals a rate of $47.44 an acre for the alfalfa by pasturing under the above conditions which were no more favorable than are found on several farms on the project at the present time.

At $7.00 a ton, which is the sale price of loose hay, an acre income of $37.10 was received. The value of each ton of hay in terms of alfalfa used as pasture, in view of the above results, would amount to $8.95. At $7.00 a ton for hay, and $8.95 a ton for hay when used for pasture gives an increase in value of $1.95 a ton, or $7.80 an acre for pasture over that of hay. During one week in April small amounts of alfalfa were cut from an adjacent field and fed to the hogs on account of cool weather checking the growth of forage on the pasture plat. No record was kept of the quantity used, but as it was very small it would make only a slight difference in results of the experiment.

In the above figures no estimate or consideration is made of the comparative labor requirements in producing hay or pasturing. From the farmer's point of view the pasturing gives a better distribution of labor and, if somewhat more expensive in amount required, being more evenly distributed, would, on many farms, be cheaper than the irregularity and inconvenience of gathering haying crews for short periods of service.

The value of retaining the organic matter resulting from grain fed and forage produced upon this land and having it well distributed over the surface in the form of manure is an item of considerable importance in this district.

All that can be gained in buying grain in quantity is clear profit. In order that the greatest profit can be had from pasturing, grain (which is necessary for maximum returns) should be bought directly from the producer and in large quantities. Where a return of $47.44 an acre was got for alfalfa pastured by feeding grain at $30 a ton, a saving of $37.68 would have been made by feeding grain at $20 a ton, and an acre return of $85.10 realized. From 1.5 to 2.5 pounds of grain should be fed daily for every 100 pounds of live weight. One and one-half pounds, or 1.5% was fed in this experiment.

For the comfort, protection, and health of the animals substantial shelter should be afforded and the quarters kept clean and well disinfected. Fresh water and some form of mineral matter should be kept available at all times. A combination of soft coal, or charcoal, salt, and a small amount of sulphur, kept in a small trough in the lot, is valuable to keep the animals in good thrifty condition.

The grain should be fed twice a day and the animals frequently changed from one plat of alfalfa to the other to keep them on succulent feed and get a maximum growth of forage. If not fed down closely, the alfalfa stubble should be clipped as soon each time as hogs are removed.

We would say, then, that the successful handling of hogs in connection with the orchards from a financial point of view will depend upon such factors as the ability to grow cheaply plenty of forage, the keeping of the grain bill down to the minimum, and the using of high-grade stock.

In conclusion, we wish to submit some extracts from letters which we have received from growers over various parts of the Northwest which give their personal experience with hogs.

Letters from Growers.

WESTERN OREGON. This fall, November 1st, 1914, we put 56 hogs on 16 acres of orchard planted to oats, wheat, and vetch sown the first week in September. From November 1 till Christmas these hogs were fed, in addition to the pasture, 23 tons of squash and from 15 to 18 bushels of poor corn. Ten of the hogs were taken out at that time. Since then we have fed each day three sacks of cull potatoes, worth about 15 cents a sack. We also fed about five bushels of oats, wheat, and barley mixed during the cold weather. We will keep these hogs on the same ration until April 1 when we will put them up to fatten.

I think a fair and low estimate of net gain on these hogs would be $3.00 besides getting a fair value of the grain, potatoes, corn, and squash fed.

This same field would show a larger profit last year as the winter was warmer and the vetch made a greater growth, thus requiring less feed. I had 44 hogs on this same field last season and had them on two weeks longer.

Each season after we take the hogs off we let the crop grow about three weeks and then plow it under.

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The greatest disadvantage from growing such crops as potatoes, clover, corn, strawberries, etc., is the difficulty of disposing of the product at satisfactory prices. If one, having already embarked in the orchard business, can afford to go into hogs, the available land between the trees can certainly produce satisfactory crops for feeding purposes. Of course, I strongly believe in leaving about five feet of ground each side of the trees for no crop whatsoever, but to be cultivated occasionally so that the trees may grow satisfactorily.

SOUTHERN OREGON. I have fed hogs on my orchard for three years past. At first I kept them in movable pens and with the aid of a horse changed them every two days, keeping three pigs in a pen twelve feet square. These pens had a built-in shelter. The parts of the orchard worked over showed much better color in foliage and made more and longer new growth the first year.

I fed from ten to fifteen pigs the first winter, getting feeders at 100 to 125 pounds from our meat company and feeding to 175 to 200 pounds.

Later I fenced off a portion of the orchard and let the pigs run. The fertilizer is not so evenly distributed in this way but by moving feeding troughs and sleeping quarters occasionally this was controlled to some extent. When feeding corn, by scattering it, we could spread the manure around.

I raise very little feed: carrots and kale, which I feel are worth more fed to cows.

By keeping an account in a rough way and checking up on a lot of hogs now and then, I find that I get good pay for my time besides the fertilizer. The ideal way for me would be to keep pure-bred sows, since I am not able always to get well-bred pigs, and when I don't, I lose money on them.

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Last September I bought six head of pigs averaging about 40 lbs. apiece. They were turned into the orchard seeded to alfalfa, having no other feed except apples and alfalfa until November 13, when they were penned up to finish for market.

They were then put on a straight ration of corn with some apples, squash, and mangels. These hogs were marketed January 2, averaging then 175 pounds apiece. I had to buy the corn, paying $23.00 a ton on the cob. My net profit a head on the lot was $3.00, in which no account of labor was kept, this being very slight, however.

My conclusion from this experiment would be, that unless one can raise all or nearly all the grain necessary to finish off, there is but little money in feeding hogs for market. Where both pasturage and grain are raised, I believe the raising and feeding of hogs makes an excellent combination with fruit growing.

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My hogs have been used to consuming cull potatoes, which are cooked, and corn which is also an inter-crop. The hogs have paid up to this year ¾ cents a pound for the corn and only break even without overhead charges. The corn would have averaged 1 cent had I sold it. Cull potatoes are charged to the hogs at 30c a hundred raw.

Aside from small plantings of sweet corn and rape, the hogs have had nothing else from the place except garbage and some cull fruit. These crops were hogged off to the detriment of the trees which the pigs play with when in a joyful mood and rip off small branches.

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We have been carrying about 100 hogs on our ranch at Talent for the past season and in fact have that many at the present time (Feb. 10, 1915).

I am far from satisfied that we have reached anywhere near the best method of handling. We are going to be able this season to work out some thoughts along the line of feeds, such as kale, beets, etc., that I fully expect will be of great aid in the problem so far as this particular ranch is concerned.

Upon the question of feeding apples alone, of course, we have thoroughly tested that. While we did well a year ago on apples alone, still we believe the hogs should have some other food if possible. It does not pay to start the young hog on green apples or in fact on apples

at all. We found that the pig under 60 to 80 pounds practically stood still all season, until we put him on other feed. He remains in good condition but does not take on weight. On the contrary the hogs from 80 lbs. up did well, and we turned them off that fall without feeding any grain. This year we have fed 11 large sows nothing but apples, which are still their only feed, and although we feed them only once a day they are considerably fleshier than they should be. The 100 hogs here are still on apples except the young ones which we had to put on other feed. The larger ones are doing nicely.

EASTERN OREGON. I raise 50 to 200 head of hogs on farm.

Have always run hogs on stubble and grasses, clovers, etc., and finished them on shorts and cooked potatoes. By not trying to push them too fast by adding expensive grain feed to this, I find there is a large net profit in feeding and raising hogs in this way.

WASHINGTON. I have kept pigs, ranging from 6 to 8 in the winter to 30 to 50 in the summer. It was most profitable to sell the pigs, beginning at 6 weeks of age. In those days we got from $2.00 to $2.50 each; more as they grew older; later $4 to $4.50 at 6 weeks of age. Occasionally I fattened some, usually on corn; then I broke even; if I had to buy grain, I usually lost.

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My experience with alfalfa as a hay crop in the orchard was unsatisfactory because of the difficulty of mowing and raking hay among trees without greatly injuring them. I then fenced the orchard into three fields, using hog fence, and have since kept about 10 Duroc brood sows and their litters to good advantage.

I have my sows in farrow in March, and by so doing my pigs are large enough for fattening in September. Of course, the alfalfa pasture has to be supplemented with a little corn during the summer, and I also feed some skim milk from 8 to 12 cows. This feed with the apples and about three weeks topping off with corn makes hog raising profitable with a minimum amount of labor, and many farmers here are now adopting this plan.

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I have been keeping 3 old sows and selling 20 to 28 pigs twice a year. This year I am starting with 3 old sows and 8 young ones. I expect 75 pigs, and may not have enough pasture.

My hogs have full range of the orchard except from June 15 till the crop is picked. Some young or smaller pigs could pasture it a little later in the summer. About June 15 when the limbs are getting heavy and dropping with fruit, I turn the hogs into the young orchard which is not yet bearing.

In the past I have been short of grain so have not fed as much as I think I should. I intend this year to feed about 1 lb. of grain per pig each day. In the summer they will have plenty of pasture and in the fall and winter cull apples and alfalfa hay cut fine with an ordinary hay cutter. I also feed some potatoes after the apples are gone. These are cooked.

I want my pigs to come about April 1, and in October or not later than November 1 while the weather is warm, but not too hot. I try to sell them for feeders, if possible, when about 6 mo. old. At this age they weigh about 125 pounds and have used about 100 lbs. of grain. My money is all made at 6 months old, but if I am unable to sell at this time, I buy corn or rolled barley and fatten them.

Last year I sold my hogs for	$373.67
My feed cost	164.40
	$209.27

I have 25 brood sows which are all gilts. I feed them about 2 lbs. of rolled wheat per head a day, and one-twelfth tankage and as much alfalfa hay as they will clean up. My sows are in fine condition, weighing from 180 to 240 lbs.

I have let my hogs have free range of the orchard. The only bad result I find is in letting them in the orchard when the ground is wet.

I have always fed and finished my hogs on rolled wheat. I have sold no hogs since the high price of wheat. I market about 100 head each year and have always made a good profit on the business. I make them go around 200 lbs., and they have made me from $2.50 to $6.00 a head.

IDAHO. We find we make very good gains with hogs on the pasture with about 1 pound of grain a day per hog. In the fall at picking time the hogs were taken up and fed 4 pounds of grain with the same amount of alfalfa meal by weight.

The hogs were finished on 60 days feed of corn. We have been told that it was cheaper to feed the alfalfa whole, but experience shows us that fed in that way with the same amount of grain, the hogs did not seem satisfied and we know that we put on better gains for less money by feeding grain alone.

We are well satisfied with hogs selling at anything above 6 cents a pound.

DAIRYING.

Many apple growers have been advised to engage in dairying as a side line to apple growing. We feel that a few words of caution should be given to those growers who are contemplating purchasing cows, as our investigations have shown that it is very easy to run a herd at a loss rather than at a profit.

The first item to consider is that of feed, and unless the orchardist can plan to produce a very large percentage of necessary feed he will find it very difficult to handle cows at a profit. Many of the orchardists have no pasture, can only grow a limited amount of forage among their trees, and have no means of growing grain. The cost of maintenance of a dairy herd under these conditions is very high.

The second point to consider is that of the type of cow. The average cow within the reach of the apple grower is not always a very desirable animal. She is generally the "cast off" from some dairy herd and is sold by the dairyman because she is unprofitable. We would urge those growers who are contemplating buying cows to purchase good animals whether these be grade cows or registered stock. Where communities are engaged in this industry they could to advantage buy pure-bred stock of some particular breed and hold frequent community auctions for selling excess animals, and in this way obtain the best prices for the stock sold.

One of the most important things to consider in connection with dairying is the personal element. Many of the growers have had absolutely no experience in handling stock of any kind and are not sufficiently skilled or may not have sufficient interest in live stock to make the work of interest and success.

Fruit growers are often told that the profits from cows are large, and such is undoubtedly true in the best dairy herds of the Northwest. However, it must be remembered that these herds are above the average and that the fruit grower must strive to have a herd above the average to make a profit.

Cost of Maintaining the Dairy Herd. The following report on the cost of maintaining the dairy herd taken from the Feb., 1915, Northwest Horticulturist and Dairyman, may be of interest in this connection:

"The estimated cost of keeping cows in a milking herd in King County, Washington, according to Milk Inspector Henderson, is $97.50, while the gross receipts from the average cow at 3½c per quart is $94.00, this indicating that the 'average' dairyman is operating at a loss."

Receipts from Dairy Herds. The following table taken from The Oregon Farmer gives the average income from the dairy cow from a large number of farms studied in a farm survey made in 1912.

	Coast Div.	Willamette Valley.	Southern Oregon.	Columbia Basin.	Blue Mts.	Central.
No. farms reported.....	176	556	231	235	201	212
No. reporting cows.....	158	445	165	79	76	140
No. reporting income....	151	413	123	34	37	75
No. cows, income reported	3609	3094	774	274	353	679
Total income reported..	$240,581.00	$219,600.00	$44,946.00	$13,943.00	$18,544.00	$33,036.00
Average income per cow	$66.66	$70.98	$58.07	$50.88	$52.53	$48.65

The item, "average income per cow," takes into consideration as a rule only the direct income from the sale of milk or cream as indicated by the monthly checks received. Due allowance should be made for the value of skim milk in addition, as the figures given are based on a butter-fat price.

The Home Dairy. Practically every orchardist should keep at least a family cow. In many cases two or three cows can be handled to splendid advantage and the skim milk from the cows used in connection with pork production. This is especially true where a community has an established creamery and a good price may be obtained for the dairy products. However, we believe it will be only under exceptional circumstances that it will be found profitable for the orchardist to engage in dairying on an extensive scale.

In conclusion we wish to quote extracts from some letters from fruit growers who have had experience in dairying in conjunction with orcharding:

OREGON. I think it is safe to say that an orchardist can keep one cow to each five acres of land. This takes into consideration the turning under of a clover stand every third year, and the root crops grown on land not in orchard.

The direct profits from dairying seem to be nil at present, however, as the average returns are about $10.00 a month, while it costs $9.00 to feed a good cow.

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I have tried dairying to a limited extent, but as a side line to fruit growing the results have not been very encouraging. I have found it does not pay to keep cows except for family use. I keep three cows which produce enough butter and milk for my own use. I get enough clover out of the orchard to feed these cows. After fixing a fair value on the hay and figuring up the feed and labor, they just about balance, so my profit comes in keeping up the fertility of the soil.

WASHINGTON. At the rate at which I have sold this winter from 4 of my cows, including the cream used for family of 7 grown people, I would sell or have sold on an average of $10.00 a week, which would be $520.44 a year.

I do not buy any feed. My cow feed will amount to about $2.00 a month as I do not have to feed in the summer. This is, of course, $2.00 a month for each cow.

I am making a good profit from my cows. I do not think fruit growers as a rule can handle a dairy successfully.

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I find cows essential to the raising of good pigs, but dairying to any extent and fruit growing are conflicting propositions. Both fruit and

cows need close attention and the cutting of alfalfa hay always comes at a time when one must be fighting bugs in the orchard, or picking the early fruit. Consequently, I would not advise the keeping of more than 3 or 4 cows where there are more than 10 acres of orchard.

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The following letter from a diversified fruit and dairy farm while a special case is of interest:

The principal, and in most cases, I think, the only advantage in dairying as an adjunct to fruit farming, is in having the fertilizer for the fruit crops. To me, a nice herd of cows makes life on a farm more attractive and keeps things going all the year round, but some people don't like cows and some people don't like to keep things going all the time, so there you are.

I now have thirty-one cows. Also twenty-three head of young stock.

I estimate the cost of feed for any cow at $135.00 (average).

I produce certified milk. The labor cost of the dairy including bottling milk, etc., amounts to about $100 a cow. An estimate by me for any other conditions than what actually prevail here would be of no value, so I shall not attempt to guess what it would cost to produce market milk or cream on my farm.

Gross proceeds from each cow are approximately $350 a year.

I raise nothing but succulent feed, including pasture; vetch and clover-rye grass, soil crops; corn for ensilage; mangels, and kale.

I buy alfalfa hay, grain, and a small quantity of beet-pulp and small potatoes.

I do not think the "average" fruit grower will make a profit from dairying as a side line. I think it is possible for the right kind of a man to make the combination profitable, but there must be a man in charge of the cows who is a genuine dairyman. You have to have the right combination in the man before you can work the combination on the farm.

POULTRY.

We have not been able to secure much data regarding poultry in conjunction with apples. We know there are numerous cases, however, where fruit growers have made a success of poultry with their orchards in the past. The rapid rise in grain the past year has caused many growers to either go out of the chicken business entirely or else has caused them materially to reduce the size of their flock. The question of profit will depend entirely upon the ability to grow the feed necessary to maintain the flock and upon individual interest in such work.

A small flock of chickens should be kept on each fruit ranch for the family supply, and if well handled this flock should also give some income.

A few growers who formerly were handling chickens on an extensive scale have given up the business and replaced chickens with hogs, believing that under present conditions the latter will give better returns.

PRODUCTION PROBLEMS.

Laying Out of the Orchard. Orchards should be well laid out to facilitate work and to make an attractive appearance. Considerable attention should be paid to the shape of the tracts; e. g., the rectangular blocks, other things being equal, can be maintained cheaper than the square blocks, largely on account of the fewer turns and the decreased cost of cultivation as a result of such shape.

Roads should be laid out in the orchard according to some permanent plan.

Much money has been lost in planting trees because the growers have not paid enough attention to pollination and are now finding it necessary to inter-graft varieties for this purpose. The most efficient results from the point of view of management and pollination are obtained from planting trees in blocks of from two to six rows of a single variety. Try to avoid the planting of odd numbers of rows and the mixing of varieties in a single row. By doing this, you will be able to drive down between rows of a single variety, thus simplifying and cheapening the cost of spraying, harvesting. and similar operations.

Not enough attention has been paid to proper distance of planting and possibility of thinning out trees to good advantage in subsequent years.

In replanting, growers often fail to take pains to do the work promptly and to replant with the same variety that has died, or with one to correspond with the same variety in that row or block.

Tillage. There is no one orchard operation which will probably allow more economy than that of tillage. Poor or unsuitable tools and insufficient or, often, too much horse power, are responsible for the increased cost.

Very few growers have worked out the cost of using the various tools required. Nor have they studied closely enough the comparative efficiency and value of such tools as the disk, springtooth harrow, Kimball weeder, etc., nor worked out the most economical size of many of these harrows, which may be obtained in different lengths from ten feet up. The implement of the proper dimensions will have a great deal to do with the efficiency of the work and its cost.

Many of the orchardists are plowing each year when they could get just as efficient results from disking. Not only that, but many of the orchardists that are plowing must also disk their land. This item alone will increase the cost of the orchard tillage from $2.00 to $3.00 an acre.

Much money is lost from unskillful handling of the soil. especially the heavier clay loams. Large areas are plowed and allowed to lay a considerable time before they are harrowed. Subsequently the ground begins to pack hard, or heavy rains may come and prevent harrowing, and when the ground is suitable to work, it requires a geat deal of extra labor to put it in shape. Small areas should be plowed and harrowed well before undertaking more plowing. Many make the mistake of plowing or working the ground when it is not in proper condition. The dobie soils must be plowed when wet, but many other loams when plowed too wet are injured, and the increased cost of handling, to say nothing of the occasional permanent injury to the soil, is tremendous.

It is nothing uncommon to see from two to four animals drawing a type of harrow which is entirely unadapted to the work and which is an actual waste of time and money. This is well illustrated in Figure 9.

Undoubtedly the use of the gas tractor. with large areas of land, will warrant close investigation and study. While the tractor is still in the experimental stage, if it is as efficient as some of the manufacturers and growers using it claim, it should be able to do certain of the tillage operations much cheaper than is possible with horses.

In certain orchards we find that the use of some special tool or implement, or a slight readjustment or addition of some special feature, works out to splendid advantage. and results in quite a saving under certain conditions; e. g., the Bradley truck proved a money saver in one particular orchard; the use of the sulky corn cultivator proved to be the cheapest tool for cultivating young trees in one large orchard tract; the use of the Falkner harrow over the old springtooth has proved a money saver under some conditions; the use of the Brillion has made some saving and proved an efficient implement under certain conditions.

These things merely show that the individual should know the cost of work of various kinds under his conditions.

The following figures, giving average comparative costs of some of the tillage operations in orchards in the Northwest, show how easy it is to lose money on tillage by the use of the wrong implement.

Average relative cost per acre of different orchard operations relating to tillage:

	Per acre
Plowing	$2.50
Disking	.99
Harrowing—Spiketooth	.48
Harrowing—Springtooth	.66
Harrowing—Acme	.53
Kimballing	.33
Hoeing	.68

As far as young orchards are concerned, the one item of tillage which is materially increasing the cost is the tendency to over-till. Orchards are often tilled in September and October when all tillage should have

Fig. 9. Losing money by use of the wrong implement. The cost of this cultivating must have been close to 75c an hour. A crushing or grinding implement would have been better.

ceased by the middle of July. Many of our old bearing orchards are being injured by over-tillage to the exclusion of cover crops or shade crops which are necessary to keep up the fertility of the soil.

There is also the item of the best utilization of horses, whether the use of two, three or four horses on a single implement is the cheapest. This will depend on the implement, the size of the implement, soil conditions, etc., and must be worked out by the individual.

As shown in some of our tables, the general tendency is to keep too many horses. The number of horses kept is determined largely by the acreage to be plowed and cultivated. It would be economy to keep less horses and to depend on hiring extra teams for short seasons in spring if this can be done. While this may not be practicable in all sections, it

has been found very economical under certain conditions. In fact, where one is located so that labor and teams may be secured at a reasonable price, it will sometimes prove cheaper either to contract team work or hire this by the day, than to maintain teams throughout the year.

One economical way of handling an orchard under irrigated conditions, especially where the entire orchard or farm is too large for proper tillage with a certain team unit, using this team unit so as to obtain the maximum efficiency of the horses throughout the year, is to plant half the orchard to clover, alfalfa, or some similar crop, planning on cropping this one or two seasons, depending on the crop, and plowing it under the following season, at which time the other half of the orchard is seeded down for the same length of time. Of course this system will work out to good advantage only where the grower has the proper soil and moisture conditions.

Fertilizers and Manures. The greatest loss from the use of fertilizers and manures comes from the tendency of many growers to buy mixed fertilizers. No up-to-date, intelligent fruit grower should be guilty of buying mixed fertilizers. We pay generally all the way from $10.00 to $20.00 a ton for having such fertilizer mixed, and should we obtain

Fig. 10. An efficient method of cultivation under certain conditions. Note the extension on disk enabling close cultivation.

beneficial results from such material, we are not in a position to determine which ingredient has been of value. It is only by buying separate ingredients and giving each careful trial that the grower can use commercial fertilizer economically.

Those growers interested in testing out their lands to determine their fertilizer requirements can receive full instructions regarding the handling of the same by corresponding with the Division of Horticulture.

It will be only in exceptional cases that Northwestern orchardists can afford to buy manures. Where the cost of hauling is extremely low and a high-grade manure can be obtained very cheaply, it will probably pay to use a certain amount. Very often, however, the manure that is sold is not worth the initial cost. The orchardist is often not careful enough concerning the handling and utilization of the manures produced on the ranch.

Pruning. Perhaps the greatest loss in pruning comes from a lack of knowledge of fundamental principles of pruning, and the application of these principles to the orchard and individual trees. One tendency which many orchardists have is to over-prune trees five to eight years of age. Many varieties given vigorous pruning at such ages produce vigorous growth and will not fruit. After orchards once come into bearing, however, there seems to be less tendency to over-prune. In fact, in many orchards not sufficient pruning is done and wood produced is too feeble. Those bearing orchards which have not been pruned for a number of years can be easily upset by too much vigorous pruning, and this is often done, causing a loss both from increased cost of pruning and from reduced yield of fruit. Many wounds and injuries are allowed to go unattended, and such wounds will certainly shorten the life of valuable trees. The Division of Horticulture has recently issued a bulletin on pruning* which takes up this question quite fully; we simply wish, at this time, to call attention to the fact that there is often money lost in this operation by improper pruning.

The item of removal and burning of brush should receive more attention than in the past. There is a tremendous range in the cost of

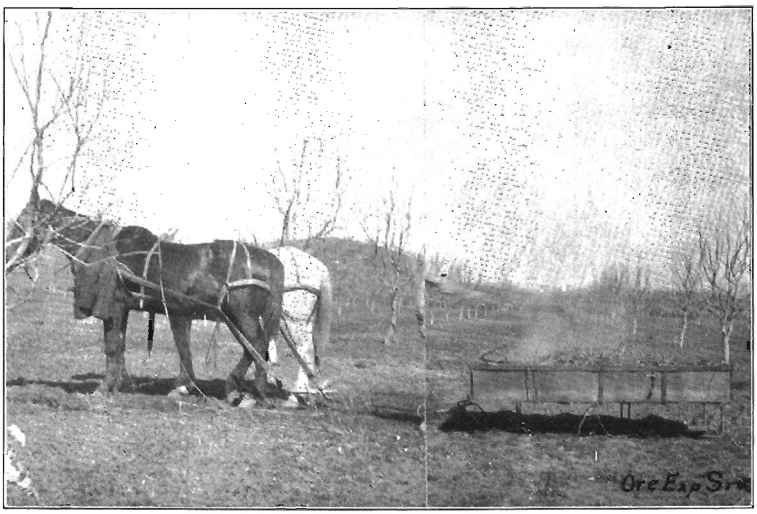

Fig. 11. A portable brush incinerator.

this operation under various systems and an opportunity for many to make some saving.

Thinning. There is no single orchard operation which will probably pay a larger dividend for the work done than thinning. Thinning tends to remove the strain and danger of breakage of the tree, materially increases the size of individual specimens of fruit and builds up the grade of fruit by reducing the percentage of culls. There is probably very little economy that can be practiced in thinning except thinning versus no thinning, and in this case as a rule the economy will be in thinning.

It is of interest to note that there seems to be very little relation between the size of crop harvested and the cost of thinning. Often a

*Station Bulletin 130, Pruning.

tree with a relatively light crop has its fruit growing in thick clusters, requiring considerable labor in thinning; so that the cost will often be fully as great as that of a tree having a heavier crop with the fruits more uniformly grouped.

Spraying. It is very easy to lose large sums of money in spraying—both from not spraying enough and from spraying too much. The principal sources of loss are:

Not knowing what the spraying is for.

By spraying the entire orchard when only a few trees need attention; e. g., I have known of young orchards being sprayed seven times one season, when perhaps all that was needed was to spray once only a small percentage of the trees.

By mixing combinations which do not work well together. Orchardists should depend upon the Experiment Station experts to determine what sprays mix properly.

By discarding well-known sprays for new, untried mixtures.

The choice of improper outfit, which is a frequent sourse of loss; e. g., a man with a small acreage of one-year-old trees may have in

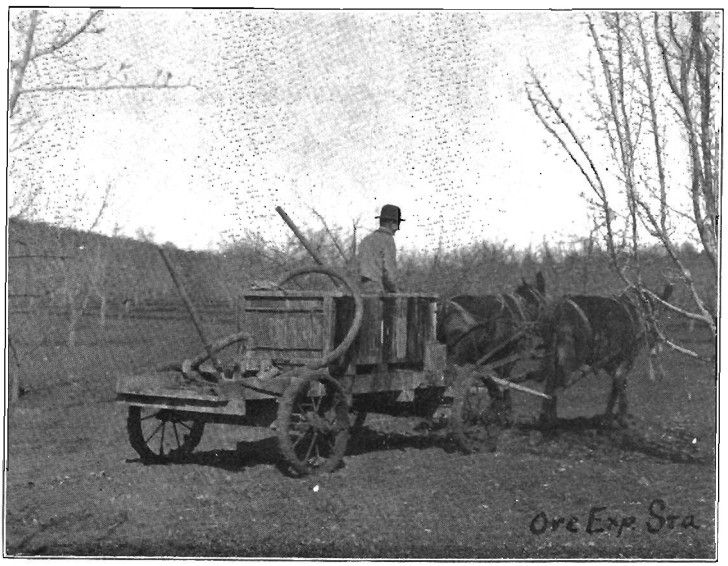

Fig. 12. A sprayer supply tank. One method of cutting the expense of spraying by keeping the spraying crews busy.

vested in an expensive heavy power sprayer when a small hand pump would serve his purpose for several seasons; again, we see orchards with large trees and considerable acreage attempting to spray with a small insufficient hand outfit.

From the tendency to use too much power without reducing the flow of the pumps. When this is coupled with use of coarse nozzles the amount of spray thrown in the course of a few minutes is so great that a man cannot be hired who is capable of running fast enough to apply such spray efficiently from the point of view of loss of spray material. While high pressure and coarse nozzles under certain conditions may be highly desirable, there are many conditions where they are

not. A mist spray which throws less liquid at lower pressure does very efficient work.

By not having a good supply wagon keeping the spray gang at work. Either a good supply wagon must be used or a system of distribution of water through the orchard must be planned for cheap, efficient spraying.

By buying too much of the prepared commercial spray material, often not considering the cost of the hauling of this as a part of the cost of the material.

While certain sprays should be bought from the manufacturer, there are some sprays that can be more cheaply made at home, especially

Fig. 13. A tower is necessary for efficient spraying of high trees.

when there is a very long haul from the loading station. In some cases the winter months can be utilized to good advantage in the manufacture of these sprays. Sometimes several neighbors can cooperate, purchase material, such outfit as is needed, and manufacture their spray material very economically.

Picking. The grower often makes the mistake of not having the facilities for scientific handling of his crop. For example, in a warm season, such as 1914, the fruit matured very rapidly and much of it

deteriorated before it could be picked and packed. It was only those growers who had superior facilities for handling that could keep the loss at a minimum. Poor location and arrangement of fruit houses is responsible for some needless loss. Houses should be so located as to allow a minimum cost for hauling to the packing house. The packing house should be the right proportion, should be so constructed that the fruit would move in one direction, and should have facilities for keeping fruit cool and well ventilated until loaded on cars.

The auto truck is being found by some growers to be feasible and in some cases has materially reduced the handling cost of fruit from the orchard to warehouse.

The introduction of the grading machine is believed by some to have resulted in a tremendous reduction in the cost of grading and packing. The results and figures quoted, however, vary extravagantly, owing to the fact that a great many machines are on the market, and some of these as yet have not thoroughly proved their merit. That the machine in some cases is an item of economy is shown by the fact that one of our largest associations pays their packers one cent less a box for packing from machine-graded apples. Some growers report that their packers can each handle one hundred boxes a day where machines are used for grading, while formerly these same packers averaged from 40 to 80 boxes.

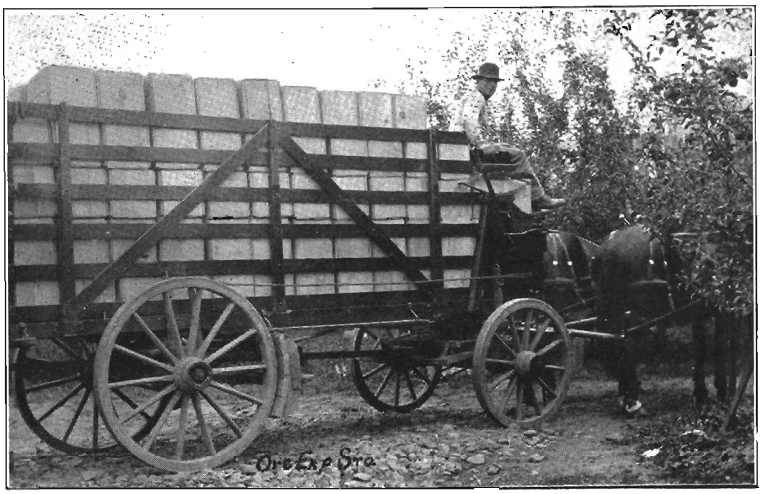

Fig. 14. One of the items of expense in handling the crop. An efficient wagon gives a maximum haul at the lowest cost per unit.

There is an opportunity to make a considerable saving by the proper picking and handling of the crop from tree to packing shed, considering such factors as time to pick; number of times to pick; methods to employ; labor to use; equipment, including picking buckets, orchard boxes, truck for hauling, etc. A careful study and proper attention to these things will mean not only a saving of money in the operation but the securing of the maximum amount of the highest grade fruit at a minimum cost for this division of the work.

Labor. There is no single item which allows for greater loss than that of labor. This is especially true where large numbers of men are employed. On many ranches the owner or hired superintendent does

little or no labor, simply serving in a directing capacity. This is a mistake unless more than eight men are employed. The owner or foreman should work with his men, grouping them and handling them in such a way as to obtain the maximum efficiency. Where large bodies of men are to be handled, the superintendent should have a field foreman to work with the men. To show the advantage of working with the men, on one orchard this spring where seven teams were plowing and where they were averaging about one acre a day to each team, when the superintendent took one of the teams himself the average then went up to over two acres a day to the team.

It is generally a mistake to divide the men into small groups and have them isolated. Better results are obtained by bunching the men and teams together where it is possible to do so. The superintendent must have the type of mind that plans work carefully beforehand, and must be the type of man who will keep a systematic list of work to be done at all times so as to be able to keep men at work under all weather conditions; must know the cost of various orchard operations and know the time required to do various kinds of work; must know what a good day's work is for men on all classes of farm work; he must have such a knowledge of human nature that he can secure high returns from labor and still keep it in good humor.

Neglected Orchards. Whenever prices have been poor for a given year, the following year sees many orchards poorly handled. Again, when the crop is very light or no crop at all is being produced, the tendency is to do as little work in the orchard as possible. Many growers go to the extreme and actually neglect the orchard. They fail to realize that the buds for the succeeding crop are being produced during the period of neglect and that, if the trees suffer, such buds will be poorly nourished, and, as a result, during the following years the crops may be exceedingly light. Excessive dropping of the fruit is often the result of former neglect. It is only trees of good vigor that produce strong buds that can be expected to give proper returns.

Cooperation. There is often an opportunity for several growers in a community to cooperate in their packing and warehouse, cutting down the cost of the labor employed for packing, making a saving in overhead costs and often buying boxes, papers, and supplies somewhat cheaper.

There is also an opportunity for such a cooperation to develop, and the growers to be able to buy many of their supplies, such as spray materials, sometimes implements, etc., much cheaper cooperatively. They would also be able to manufacture certain of their spray mixtures somewhat cheaper.

MARKETING PROBLEMS.

Considering the profits of an industry, the cost of production should also include to a certain extent the cost of marketing. In this bulletin it will be impossible to dwell in detail on the great problems of marketing. We wish, however, to call attention to some of the factors which have a relation to the cost of marketing. We feel that the present cost is not excessive, when we stop to consider the number of selling agencies and the amount of tonnage that each handles. As the tonnage of each selling agency increases, undoubtedly it can lower the cost of selling. However, one of the greatest drawbacks in the past has been the absolute independence of the selling agency, what we might term throat-cutting methods employed by such agencies. As a result of the jealousy and keenness of competition, much fruit has been sacrificed. Too much has been consigned. Too large a percentage has been sold on the auction block. These factors alone have been sufficient to demoralize the apple market. By proper cooperation between the various selling agencies

or perhaps better still by a consolidation of a number of the selling agencies, it should be possible to eliminate much of this foolish competition, and so have less and less of the fruit sold either by consignment or by auction. Some competition is undoubtedly a good thing, and is very characteristic of a large trade, but here in the Northwest we have had altogether too much competition. It is hoped that the new growers conference of one hundred, and the new board of control will do much to remove the stumbling blocks that the growers have been facing in the past three years.

Not enough attention has been given in the past to the relation of the size of crop, the general market conditions of any one period, and the proportion and amount of fruit that is still held in storage. It is almost impossible to work out this proper relation, so long as the various selling agencies are not working in close harmony. The problems confronting the marketing agencies in the Pacific Northwest are many. We must secure a wider distribution, must create a greater demand for, and consumption of, our products. These can only be brought about by the expenditure of large sums of money, by close organization, and by skillful leadership. The growers, however, are probably expecting too much from the individuals who have charge of the selling agencies. These men should have considerable aid from other sources. We would strongly urge, as we have for the past few years on numerous occasions, the establishment of a Bureau of Statistics. We believe it is absolutely essential that the selling agencies of the Pacific Northwest should have a good idea of the size of our crop, and the general condition of this crop at all times during the growing and selling season. Not only that, but it would be a distinct advantage if we had good statistics concerning crop conditions in other parts of the United States and even in foreign countries. It is impossible to expect our several selling agencies to gather such figures completely, and the bureau should be established and maintained by some small tax. This bureau should gather such statistics, as would be of service to all people who wish to sell fruit. It would tend to discourage speculation.

In addition to the bureau of statistics we need another organization here in the Northwest. An attempt has been made several times to establish such a body. We refer to a protective league. A protective fruit league, we believe, was once organized, and a transportation league also, but these bodies have never had the backing financially or even in spirit that they should have. To be convinced of the merits of the protective league and its great field for usefulness, one needs only to investigate the work of the Citrus Protective League of California. The league's duties, like those of the Protective league, should be to take up the problems which affect marketing indirectly, such, for example, as legislation, not only state, but national, and in some cases, civic legislation. It should take up transportation problems, such as must come before the Inter-State Commerce Commission; problems dealing with railroads; steamboats; tariff; icing; pre-cooling; storage in transit; and general distribution. The protective league should also take up one of the greatest needs of the day; namely, standardization, including the package and its contents. The league should be in a position to see that legislation, either state or national, or both, should be secured to help solve the problems confronting the fruit industry. They could conduct an advertising campaign; not so much that of any individual brand, but the advertising of the apple or fruit products of the Pacific Northwest as a whole. It could educate the American public up to a varietal knowledge of apples, of the eating and cooking values of the leading varieties produced here in the Northwest. It could also assist the direct marketing agencies by providing them with a great fund of information concerning our various inter-state markets, their

requirements, how they are supplied at present, the possibilities of extending our trade. Leaving the genuine direct problems of marketing to the selling agency, it seems to us that the central selling agencies, the bureau of statistics, and the protective league, all have their distinctive fields, and have distinctive problems to solve, and it is only by the segregation and centralization of these problems that we can hope for a satisfactory solution.

One field that the marketing and fruit growing associations in the Northwest have perhaps overlooked is that of assisting the grower to understand his cost of production and how to keep records of these costs. While this may seem a small thing, there is little doubt in our minds that it would soon prove to the individual grower that there are other opportunities to make money in fruit growing than merely by getting higher prices for his product. We believe there is really a greater opportunity here and a better solution of our problem than the hope of building up bonanza prices which will only come under exceptional conditions and at long intervals.

LOW-GRADE APPLES.

One of the hardest problems that our orchardists have to face is how to handle the low-grade and cull fruit. The percentage of this fruit is not only enormous but seems to be on the increase. On the whole, it costs nearly as much to grow this fruit as it does No. 1's and No. 2's, and yet very little money can be realized from its sale. It would seem that there should be some way of making a portion of this fruit, at least, cover a part of the overhead expense of the orchard.

The first problem that we need to meet in connection with the low-grade and cull apples is that of reducing the proportion of such fruit, and we believe that such proportion can be very materially reduced. The causes of a large percentage of low-grade and cull apples are choice of wrong varieties, too many unprofitable trees, poor management, unfavorable climatic conditions, which produce, for example, sunscald, or fruit of inferior grade, and the presence of diseases, especially such diseases as scab, fruit pit, etc. Now, we can undoubtedly reduce much of this loss. We certainly can reduce the loss occasioned by the wrong selection of varieties. We can eliminate the poor trees, and we can study our management a little more closely. We can't expect to overcome the climatic factors which are unusual, neither can we eliminate entirely disease-infected fruit. It might not be practical for us to try and emilinate all these low-grade apples, for the reason that we would spend more money in spraying, thinning, and other orchard operations than the value of the fruit would warrant. In other words, there would be a certain percentage of this loss which we can very easily afford to eliminate. In fact, we cannot afford not to eliminate it. On the other hand, there will always be a certain percentage of such fruit that it will not pay to attempt to eliminate.

Our second step must be to try and utilize the low-grade and cull apples better than we have in the past. We will consider first those which we will put in boxes. We are of the opinion that it will not pay to handle many of our low-grade apples as we are handling them today; that is, in high-priced boxes, with fancy packing, wrapping, lithographs, etc. We must have, first, a cheaper package. This may possibly be a box; it is more apt to be a crate or some other package. In fact, the crate has very much in its favor. It can be produced cheaply and filled and placed on the market cheaply. The fruit should be put in as a jumble pack, should generally be unwrapped, and must be put up with as little cost as possible. Such apples would go to a trade that ordinarily cannot afford to buy a better grade of fruit, but could afford

to buy fruit put up in this form of package. The cubic content of such package would probably be less than the present box. At least the package would hold less when we use the jumble pack, than it would if each apple was placed in position.

The third way of meeting the problem of low-grade or cull apples would be through by-products channels, such as evaporation, canning, and vinegar. Undoubtedly the field for evaporation is one of the most favorable here in the Northwest. We need to do some work, however, to determine what varieties can be evaporated commercially, and under what conditions we can evaporate successfully. The canneries can put up a limited amount of low-grade apples in cans, although the poorer culls cannot be used for such purposes. The field for vinegar is somewhat limited. It is doubtful if the consumption of vinegar can be very much increased, and it must be remembered that vinegar is made from many sources. An effort on our part to reduce the number of culls, introduce a new package, and use a few more through by-products channels, will reduce the unit cost of production of all the fruit quite materially, and contribute something toward meeting the cost of producing the higher class fruits.

PART II.

TYPE ORCHARDS

We have deemed it advisable to print a few complete reports furnished by orchardists. We are doing this in order to show the growers, first, the nature of the material we secured in compiling our tables, and, second, to furnish the grower an orchard which may approximate his conditions and serve as a study for his own orchard operations. The reports are, of course, for various climatic, soil, and topographic conditions and it must be remembered that the recommendations made by the individual grower hold good only for his own peculiar conditions.

As noted in the comments with the various reports, each orchard illustrates some special phases of the economics of apple production.

A REPORT ON THE DEVELOPMENT OF A SIXTEEN AND THREE-FOURTHS ACRE ORCHARD.

The soil on this tract is a silt loam with some red-shot. The land was purchased in 1909, ten acres being cleared that year. The rest of the land was cleared in 1911.

The clearing on this tract was not as expensive and heavy as in some nearby sections, owing to the fact that a portion of the tract was an old homestead and about an acre was partially cleared.

All horse and hand labor on this tract was hired, the rate for team being $3.50 a day, and the rate for hand labor being $65.00 a month.

Report for 1909-1910.

	Total	Per A.
Land:		
16 3-4 acres @ $57.50 per acre uncleared	963.12	57.500
Clearing of 10 acres:		
Land practically level and had very little rock.		
Slashing and clearing	121.55	12.155
Powder	238.34	23.834
Balance labor clearing	885.00	88.500
Total	1244.94	124.494
Preparation and Planting 10 acres:		
Plowing	50.00	5.000
Harrowing three times	15.00	1.500
Digging holes	7.50	.750
Staking—This work was done by a surveyor and two men, paying the crew at the rate of $11.00 per day	$ 11.50	1.150
Nursery stock—65 trees per acre	64.64	6.464
Planting	40.00	4.000
Total	188.64	.....

General Maintenance:	Total.	Per A.
Pruning—summer	5.00	.500
Spraying	3.00	.300
Only those trees affected by aphis were sprayed with Blackleaf 40. A knapsack sprayer was used.		
Labor $2.50		
Material .50		
Cultivation:		
Harrowing and Kimballing 4 times	20.00	2.000
Hoeing	7.50	.750
Disking in July	20.00	2.000
Weeding—2 days	5.00	.500
Wrapping trees to protect from borers	3.75	.375
Staking trees:		
Stakes	6.40	.640
Labor sharpening	2.50	.250
Setting stakes	10.00	1.000
Distributing stakes	1.00	.100
Total	84.15	

Buildings:

At the time of purchase, the only buildings on this ranch were an old barn and shack with a valuation of about $75.00. This is included in the purchase price.

Improvements:	39.115	3.915
Fencing 10 acres with a three wire fence:		
Barbed wire $15.15		
Posts—cut on land—10c ea. 16.50		
Labor fencing 7.50		

SUMMARY.

	Total.	Per A.
Valuation of ranch—purchase price	963.12	57.5000
Total cost of improvements made current year (10 acres) (This includes fencing, clearing, etc.)	1433.58	143.358
Total cost of maintenance (10 acres)	87.14	8.714
Total overhead costs (16.75 acres)	151.20	90.262
Total valuation of ranch (16.75 acres)	2635.04	157.318

REPORT FOR 1911.

Clearing and Planting of 6¾ acres:

Land rather stumpy. One acre was very rocky and rather steep.

There was no slashing on this land.

	Total.	Per A.
Labor clearing	160.31	23.749
Powder	65.85	9.755
Plowing	30.00	4.444
Harrowing 3 times	10.00	1.481
Digging holes	5.00	.740
Setting trees	27.00	4.000
432 trees at 12c	51.84	7.680
Total	350.00	51.851

Improvement:		
Fencing of 6¾ acres	35.00	5.185

General Maintenance:		Total.	Per A.
Pruning		7.50	.448
Spraying affected trees for aphis		3.00	.179
Cultivation:			
Plowing 10 acres		30.00	1.790
Harrowing		12.00	.716
Hoeing		12.40	.740
Kimballing—4 times		48.00	2.864
Wrapping trees to protect from borers		5.50	.328
Staking trees		20.30	1.211
Stakes for 6¼ acres		4.30	
Sharpening		2.00	
Setting and tying 16¾ acres		14.00	
Total		138.70	8.268
Overhead Costs.			
		237.364	14.165
Overhead Charges:			
Taxes	47.84		
Interest at 6 per cent	189.524		

SUMMARY.

Valuation of ranch at end of previous year	2635.04	157.318
Total cost of improvements made current year. This includes fencing, clearing, etc.	385.00	23.026
Total cost of maintenance	138.700	8.286
Total Overhead Costs	237.264	14.165
Total valuation of ranch	3395.968	202.815

REPORT FOR 1912.

General Maintenance:		Total.	Per A.
Pruning		8.75	.522
Winter pruning		16.00	.955
Summer pruning		5.00	.298
Spraying affected trees for aphis		42.00	2.507
Cultivation		51.00	3.044
Plowing		12.00	.715
Disking—2 ways		48.00	2.865
Harrowing		3.90	.248
Kimballing—4 times		17.50	1.044
Resetting 28 trees		5.00	.298
Staking		5.00	.298
Fencing repairs		214.15	12.785
Tree surgery			
Total			
Overhead Costs			
		214.976	12.834
Overhead Charges:			
Taxes	62.00		
Interest at 6 per cent	152.976		

SUMMARY.

Valuation of ranch at end of previous year	3395.968	202.815
Total cost of improvements made during current year. This includes fencing, clearing, etc.	214.15	12.785
Total cost of maintenance	214.976	12.834
Total Overhead Costs	4025.094	228.438
Total valuation of ranch		

REPORT FOR 1913.

		Total.	Per A.
General Maintenance:			
Pruning			
Winter pruning		14.00	.833
Summer pruning		22.00	1.309
Spraying affected trees for aphis		2.00	.119
Cultivation			
Plowing		42.00	2.499
Harrowing with Springtooth		16.50	.925
Harrowing with Spiketooth		12.00	.714
Kimballing 2 times		13.50	.805
Hoeing		10.50	.626
Resetting 50 trees		8.50	.513
Staking		12.00	.714
Total		156.75	9.358
Overhead Costs			
Overhead Charges		313.759	19.913
Taxes	62.00		
Interest at 6 per cent	271.759		

SUMMARY.

Valuation of ranch at end of previous year	4025.094	228.438
Total cost of improvements made current year. This includes fencing, clearing, etc.		
Total cost of maintenance	156.750	9.358
Total Overhead Costs	313.759	19.913
Total valuation of ranch	4495.603	257.709

A FIVE-YEAR REPORT ON AN EIGHTY-ACRE APPLE RANCH.

Keeping Accounts:

This man's system of keeping his accounts is very simple and very interesting. It must be remembered, however, that no matter how simple a system of keeping accounts may be, it is impossible to keep a record of any kind of work without devoting a few minutes—five or ten minutes on an average—each day to this work.

He states that his record of costs has enabled him to cut down his expenses in many ways and to know when he was doing this instead of merely guessing that he was making a saving. For example, in spraying, the record of this work for previous years enables him to order only such material as he actually needs each year and saves the carrying over of considerable material or the lack of material just at the time needed. In this spraying record, he has carried his system of costs a little further than will be practicable on the ordinary ranch, probably, in that he has carefully noted the amount of material used by different nozzles. He has proved by this record that a big saving can be made by selecting the nozzle best adapted to the work.

It is not necessary, of course, to complete such records to find the costs until sometime during the winter, as a rule, when there is very little outside work that can be done profitably. In this case all that was necessary at the end of the day was to give the date, number of hours of work, number of tanks, and number of men doing the work.

Cards were also kept for other classes of work where it was desirable to know the costs: e. g., a card was kept for Pruning, Irrigation, Plowing, Cultivation, Cover Crops, Picking, etc.

At this point it may be of interest to give one of the spraying records complete showing the system used. The following record is an exact copy of a spraying card taken from the 1911 file:

Size card—4x6

Bordeaux Spray—Fall 1911 6-6-50

	Hrs.	No. tanks	Men
Oct. 23	8	5	3
24	7	6	3
25	8	5	3
26	8	6	3
27	9	6	3
28	9	6	3
30	5	4	3
31	7	6	3
Total	61	44	

200 lbs B. V. at 6½c.....$13.00
650 lbs. B. V. at 6c..... 39.00
5 bbl. lime $1.90..... 9.50

Material.....$61.50

24 lbs. bluc vit. to tank
24 lbs. lime to tank
2 men at $2.00.....$4.00
man and team $5.00..... 9.00

Labor .....$13.00 day

Material $61.50
Labor 79.30

$140.80

A good form of daily time card from which such reports can very easily be made up during the winter, is shown below. We would suggest that growers use such a card, modifying it to meet their individual needs. A very convenient size card for carrying and also for filing is 4x6 inches.

Labor Report No. .....

Name.....

Week ending.....

Report in half hours.

Account	M	T	W	T	F	S	S	Total
Pruning								
Plowing								
Harrowing								
Discing								
Spraying								
Thinning								
Propping								
Picking								
Packing								
Grading								
Repairs								
Improvements								
Total								

.....

Rate per day..... Total days..... Amt. Paid..... Check No.....

With such cards all that is necessary to keep account of the costs of farm operations is to keep what may be called a Cash Book-Journal. In this book it is necessary to state very briefly whether cash is paid out for labor or for material, and, if for material, the kind of material using letters to stand for the different kinds of material used on a place: e. g., in paying for spray material, add an S after the amount paid; for cover crop seed add Sd; for equipment, add E; etc.

As soon as any equipment is purchased, a card should be made out and this added to the inventory. When a building is erected, a card should be made out showing date and cost, at the time completed.

It is not possible to go into detail at this time on a system of keeping cost accounts, but we are arriving at the stage in fruit growing in the Northwest when it is absolutely necessary to know the cost of growing an orchard, the cost of growing a box of fruit, overhead costs, and the cost of marketing this box.

Another point where he has been able to make a saving by knowing the cost of doing his work, is in propping his trees. In 1914, he purchased some tree hooks for propping purposes, and by knowing the previous costs of propping, he was very quickly able to determine whether these hooks were more economical.

The same thing was true in noting the saving of the pipe line laid in 1914. By knowing the previous cost of spraying where it was necessary to return to the central station for water each time, and determining the cost where the water was distributed in various parts of the orchard through this pipe line, he was able to state definitely that he had made a large saving and just how large this saving was for the entire year.

Very often a fruit grower goes through his orchard before the crop is harvested and notes a number of trees are not bearing as well as they should. After the crop is picked, he is sometimes able to go back to these trees and find what is wrong, that is, if he can locate the trees. This grower found it rather difficult to locate such trees after a month or two had passed, so in 1913. he had a small metal tag giving a number to each tree attached on the trunk. This was proved a distinct advantage in many ways on this farm.

A FIVE-YEAR REPORT ON AN APPLE RANCH.

Report for 1910.

This ranch at the time of purchase in 1910 consisted of eighty acres of two- to three-year old apple trees of the following varieties:

32 acres Esopus (Spitzenberg).
40 acres Newtown
8 acres Jonathan, Ortley, and Arkansas Black.

The soil consisted of a good volcanic ash.

	Total cost.	Acre cost
Valuation of ranch without improvements at time of purchase, 1910	$64,000.00	$800.00
Improvements—permanent	3,800.00	47.50
Barns $1,800.00		
House for man on place 2,000.00		
Stock	1,475.00	18.43
2 2800 lb. teams *1,400.00		
1 riding pony 75.00		

*Note: These teams should have been valued at $700.00.

		Total cost.	Acre cost
Equipment		1,018.00	12.726
1 power sprayer	$330.00		
2 wagons	194.50		
1 spring wagon	117.50		
2 plows	29.50		
1 single horse plow	9.50		
1 disk harrow	48.00		
2 acme harrows	25.00		
1 orchard truck	55.00		
2 sets double harness	52.00		
Miscellaneous small tools. repairs on equipment, small spraying equipment	130.13		
Maintenance		2,288.78	28.60
General expenses—total	$824.15		
Feed and bedding for teams	688.00		
Shoeing	22.50		
Harness repairs	10.10		
Veterinary	6.00		
Insurance on one team	21.00		
Nursery stock	3.00		
Fertilizers	33.23		
Spray material	40.32		
Labor—total	$1,464.63		
Salary of one man hired for yr	$600.00		
Manager's salary	600.00		
Transient labor	264.63		
Overhead charges			
Taxes	$ 173.15		
Insurance	36.00		
Interest on investment—6 per cent	4,354.91		
Depreciation and repairs on bldgs.—4 per cent	152.00		
Depreciation on tools and implements	101.81		

Summary—1910.

Valuation of ranch, no improvements		$71,106.65	$888.83
This includes valuation at first of year plus cost of maintenance and overhead charges for the year.			
Valuation of buildings less depreciation		3.648.00	45.60
Valuation of stock		1,475.00	18.18
Equipment less depreciation		916.32	11.40
Valuation of equipment first of year			
Equipment purchased current year	$1,018.13		
Maintenance, less receipts		2,288.78	28.60
Total investment Jan. 1, 1911		77,145.97	964.32

Report for 1911.

		Total cost.	Acre cost
Trees—three to four years old.			
Permanent improvements of roads on ranch		$ 600.00	$ 7.50
Equipment		351.04	4.388
2 Kimball cultivators	$ 40.00		
1 orchard truck	55.00		
1 manure spreader	160.00		
Miscellaneous small tools, repairs on equipment, small spraying equipment	96.04		
Maintenance		2,657.72	33.22
General expenses—total	$697.72		
Feed and bedding for teams	389.15		
Shoeing	32.13		
Harness repairs	30.65		
Veterinary	19.50		
Insurance on one team	21.00		
Nursery stock	3.00		
Fertilizer	33.23		
Spray material	169.06		
Labor—total	$1,960.00		
Salary of one man hired for yr	600.00		
Manager's salary	600.00		
Transient labor	760.00		
Overhead charges		5,517.53	68.97
Taxes	$363.60		
Insurance	36.00		
Interest on investment—5 per cent	4,845.28		
Depreciation and repairs on bldg., 4 per cent	145.92		
Depreciation on tools and implements, 10 per cent	126.73		
Receipts		606.97	7.83
To sale of 983 bushels of apples	$1,000.00		
Additional costs of handling this crop—not included elsewhere in report:			
Boxes at 11c	$ 98.13		
Paper, 5c	49.15		
Selling cost 15c	147.45		
Storage, 10c	98.30		
	393.03		

Summary—1911.

Valuation of ranch without bldgs. and equipment		$72,274.93	990.93
This includes valuation at first of year plus cost of maintenance and overhead charges for the year less receipts.			
Value of buildings less depreciation		3.502.08	43.77
Valuation of permanent improvements not bldgs. made		600.00	7.50
Valuation of stock		1,475.00	18.43
Equipment less depreciation		1,140.63	14.28
Valuation of equipment first of yr	$916.32		
Equipment purchased current year	351.04		
Maintenance less receipts		2,050.75	25.63
Total investment Jan. 1, 1912		85,392.64	1067.40

Report for 1912.

		Total cost.	Acre cost
Trees four to five years old.			
Buildings	$ 1,250.00		$ 15.62
Tool and implement house			
During this year, the owner also built a home valued at $10,000.00. However, this is considered entirely personal so far as the investment is concerned, and only taxes and insurance are allowed as a farm expense.			
Equipment		171.85	2.15
1 orchard truck	$ 23.50		
Miscellaneous tools, repairs on equipment, small spraying equipment, etc.	148.35	3,907.64	48.84
Maintenance		3,907.64	48.84
General expenses—total	$747.64		
Feed and bedding for teams	513.99		
Shoeing	31.10		
Harness repairs	8.00		
Veterinary	18.00		
Nursery stock	3.00		
Fertilizer	33.23		
Spraying material	140.32		
Labor			
Salary of one man for year	600.00		
Manager's salary	600.00		
Transient labor	1,960.00		
Overhead charges		6,073.02	75.91
Taxes	584.65		
Insurance	43.50		
Interest on investment—6%	5,123.55		
Depreciation and repairs on bldgs. 4%	190.08		
Depreciation on tools and implements, 10%	131.24		
Receipts		1,010.23	12.63
To sale of 2100 bushels of apples	$1,567.23		
Additional costs of handling this crop—not included elsewhere in report:			
Boxes at .095	$199.50		
Paper .03	63.00		
Selling costs .10	210.00		
Storage .04	84.00		
	$556.50		

Summary—1912.

Valuation of ranch without bldgs. and equipment		$88.244.86	$1103.06
This includes valuation on Jan. 1, 1912, plus cost of maintenance and overhead charges for year less receipts.			
Valuation of buildings less depreciation		4,562.00	57.02
Valuation of stock		1,475.00	18.43
Equipment less depreciation		1,181.24	14.75
Valuation of equipment first of yr.	$1,140.63		
Equipment purchased current year	171.85		
Maintenance less receipts		2,896.91	36.21
Total investment Jan. 1, 1913		95,463.10	1193.29

Report for 1913.

			Total cost.	Acre cost.
Trees five to six years old.				
Stock				
To sale of riding pony			$ 75.00	$ .937
Equipment			291.50	3.63
1 riding harrow		$ 75.00		
1 side hill sprayer truck and small spraying equipment		92.55		
1 complete apple truck		68.45		
Miscellaneous tools, repairs on equipment, plow shares, etc.		55.50		
Maintenance			6,305.19	78.81
General expenses—total	$701.38			
Feed and bedding for teams		$ 438.99		
Shoeing		57.00		
Harness repairs		2.50		
Veterinary		15.00		
Alfalfa seed for shade crop		29.16		
Nursery stock		3.00		
Fertilizer		33.23		
Spray material		122.50		
Labor—total	$5,603.81			
Salary of one man for year		600.00		
Manager's salary		600.00		
Transient labor		4,403.81		
Overhead charges			$ 6,605.53	85.07
Taxes		504.50		
Insurance		43.50		
Interest on investment—6%		5,727.78		
Depreciation and repairs on bldgs., 4%		182.48		
Depreciation on tools and implements, 10%		147.27		
Receipts—credited			5,634.38	70.43
To sale of 7,576 bushels of apples	$8,210.22			
Additional costs of handling this crop, not included elsewhere in report:				
Boxes	.095	$719.72		
Paper	.03	227.28		
Selling cost	.125	947.00		
Storage	.09	681.84		
		2,575.84		

Summary—1913.

Valuation of ranch without bldgs. and equipment	$95,521.20		1194.01
This includes valuation at Jan. 1, 1913, plus cost of maintenance and overhead charges for year less receipts.			
Valuation of buildings less depreciation		4,379.52	54.74
Valuation of stock—riding pony sold		1,400	17.50
Equipment less depreciation		1,325.47	16.56
Valuation of equipment first of yr	$1,181.24		
Equipment purchased current year	291.50		
Maintenance less receipts		670.81	8.385
Total investment Jan. 1, 1914		102,626.19	1257.827

		Total cost.	Acre cost
Trees six to seven years old.			
Improvements		$ 553.05	$ 6.91
A pipe line for irrigation purposes and for distributing water to various parts of the orchard for spraying purposes was laid during the year. The owner states that this pipe line has almost paid for itself in saving of time on spraying alone.			
Buildings		927.80	11.597
An addition was made to the barn and several labor saving devices added. This was necessary on account of the addition of a dairy herd.			
Stock		500.00	6.25
6 dairy cows	$450.00		
3 cows	50.00		
Note: During this year the owner pulled out five acres of mixed varieties of apples—mainly Arkansas Black, Ortley, and Jonathan—and sowed this land to alfalfa.			
The land planted in alfalfa is valued at $500 an acre. The land in orchard at the beginning of the year was valued at $1194.01 an acre. This makes a difference of $694.01 an acre to be written off the valuation of the ranch due to this change.			
Equipment		584.42	7.305
Cream separator	76.20		
Other dairy equipment	21.50		
Tree hooks for propping	37.50		
1 disk	47.50		
Miscellaneous tools, repairs on equipment, plow shares, etc.	84.22		
½ automobile—car used both for pleasure and business—a charge of one-half being made to each	317.50		
Maintenance		7,497.07	93.71
General expenses—total	$1,033.50		
Feed and bedding for team	244.50		
It should be noted here that this cost is much lower than previous years on account of a large part of the hay being raised in the orchard and on additional land.			
Shoeing	41.00		
Harness repairs	19.40		
Veterinary	10.00		
Alfalfa seed for shade crop, etc.	20.40		
Nursery stock	3.00		
Fertilizers	191.90		
Spraying material	190.56		
Maintenance of ½ of automobile, including repairs, tires, ½ of depreciation, etc.	121.75		
Irrigation—taxes	190.99		
Labor—total	$6,463.57		
Salary of two men for year	$1,260.00		
Manager's salary	1,200.00		
Transient labor	4,003.57		

			Total cost.	Acre cost
Overhead charges			7,049.01	88.11
Taxes			455.50	
Insurance			43.50	
Interest on investment, 6%			6,157.57	
Depreciation and repairs on bldgs., 4%			201.46	
Depreciation on tools and implements, 10%			190.98	
Receipts credited—Impossible to give as returns not in.				
To sale of 5,260 boxes of apples (no returns yet) Additional costs of handling this crop—not included elsewhere in report:				
Boxes	.095	$499.70		
Paper	.03	157.80		
Selling cost	.10	526.00		
Storage	.04	210.40		
		$1,393.90		
To sale of milk and cream from dairy		$609.53		
4 heifer calves—valuation at yr. old		100.00		
72 tons of manure at $2.50 per ton		180.00		
Skim milk at 15c per 100		54.75		

Note Regarding Dairy Receipts.

While all of the above receipts may be credited to the farm, it would not be fair to credit the total to the dairy since the orchard furnished a large part of the feed used, and the labor of man taking care of dairy was charged under total labor account.

In order to determine the actual profit or loss from the dairy the following account should be closely studied:

Labor—1 man—5 hours day taking care of dairy herd	$ 330.00
Feed purchased	300.00
Feed raised in orchard and on additional land—estimated	366.00
Service of bull	30.00
Depreciation on dairy barn—4%	37.11
Depreciation on stock—8%	36.00
Depreciation on equipment	9.77
Interest on additional investment required on account of dairy herd	88.53
Total	$1,197.41

Credit to Dairy.

To sale of milk and cream	$609.53
4 heifer calves—1 yr. old	100.00
Manure (carefully handled)	180.00
Skim milk at 15c per 100	54.75
Total	$944.28

These figures show a loss of $253.13 which must be charged to the dairy. It should be remembered, however, that while the dairy shows a minus receipt of $253.13, this does not mean that it may not have been a paying proposition when the increased efficiency of labor, a good price for shade crops raised on the orchard land, the fertility benefit, etc., are taken into consideration. This record does show that it is impossible for the fruit grower to make money from dairying unless he is able to raise the major portion of the feed necessary to maintain his herd in addition to maintaining his other stock.

A record of this dairy herd will also show a good reason for the low return during the year 1914.

Cow No. 1	6538 lbs.	2.6% fat
Cow No. 2	3697 lbs.	5.6% fat
Cow No. 3	7658 lbs.	3.8% fat
Cow No. 4	2492 lbs.	6.5% fat
Cow No. 5	2868 lbs.	5.3% fat
Cow No. 6	2500 lbs.	5.4% fat

Cows Nos. 4, 5, and 6 are heifers.

It will be of interest to note that the owner of this ranch has very recently sold cows Nos. 1, 3, and 5, and has purchased nine pure-bred Jerseys of which he expects to sell off all but four, building a herd of about twenty cows from these.

Summary—1914.

Valuation of ranch without buildings and equipment—Impossible to give as total returns not received.

This includes valuation at Jan. 1, 1914, plus cost of maintenance and overhead charges for year. Receipts for the year should be deducted from this in order to obtain the true valuation.

Valuation of buildings less depreciation	$ 4,835.06	$60.438
Valuation of stock	1,900.00	23.75
Equipment less depreciation	1,718.91	21.486
Valuation of equipment first of year	$1,325.47	
Equipment purchased current year	584.42	

Maintenance less receipts—not able to give as returns not received.

Total investment Jan. 1, 1915 .....

A THREE-YEAR REPORT ON A TRACT OF 2,100 ACRES OF WHICH 700 ACRES ARE IN ORCHARD, AND 125 ADDITIONAL ACRES TILLABLE.

The work on this tract has been under the direction of a graduate in horticulture from the Oregon Agricultural College and the report will show a careful study of costs according to local conditions.

This report is printed in the same form as made up by the manager. It should be noted that no interest charge has been recorded against the ranch, and that this item would materially increase the costs.

Trees

Price paid this year F. O. B. Station:

Pears 3 ft. to 4 ft. stock	$.15
Apples 3 ft. to 4 ft. stock	.04

Labor

9½ hours at the point of work constitutes 1 day.

Single hand, without board	$2.00
Team, without board	2.00
Man and team, without board	4.25
Man and 3 horses, without board	5.00
Man and 4 horses, without board	5.75

We do not own any teams and very few implements except Kimball cultivators. The employee furnishes his own implement and keeps it in repair at his own expense. I believe this is the cheapest and most satisfactory way on a planting of this kind.

Staking

Apples 30x30 ft. or 48.4 trees per acre on the square system.

Pears 25x30 ft. or 58.08 trees per acre.

4 men with a transit and 300 ft. wire staked 20 acres per day on large fairly level fields, or where the slope was with the rows in one

direction; costing approximately $.50 per acre. A large part of this planting is cut up with creeks, ditches, timber, etc., or is steep and rough. On tracts where the transit or plumb line was used to locate each stake, it was quite expensive.

Stakes cost $1 per thousand, cut by contract.

Cost of stakes and staking on the 700 acres was $1.50 per acre straight through.

Planting

The holes were dug 18 inches across and to a depth that would allow 8 inches of surface soil below the roots. The roots were pruned and the top cut at 24 inches.

2 men on free soil averaged approximately 275 trees per day.

2 men on heavy clay averaged approximately 100 trees per day.

Plowing

Most of the plowing is done by contract. Depth, 6 to 8 in.

Free soil, fairly level, at $2.25 per acre.

Rough, rocky, steep, or sticky land at $2.50 to $3.25 per acre.

Harrowing and Clodmashing

Contracts let at $.25 to $.35 per acre.

Teams averaged 5 to 6 acres per horse, according to ground.

4-horse implement is most economical.

Disking

Contracts let at $.75 per acre. $1 is paid if the land is steep, or where soil is rocky, on account of wear on the implement.

3 horses disk 6 acres per day.

4 horses disk 8 or 9 acres per day.

Springtooth Harrow

Contracts let at $.55 and $.60 per acre.

3-horse team averages 8 to 10 acres, according to the ground.

Kimball Cultivator

Contracts let at $.40, $.45, and $.50 per acre.

12 ft. Kimball and 4 horses average about 16 acres.

10 ft. Kimball and 3 horses average about 13 acres.

8 ft. Kimball and 2 horses average about 10 acres.

We think the larger implement does the cheaper work and the smaller one does the better work. We use the 10 ft. size mostly as it fits our 30 ft. rows, using 4 horses on steep ground and 3 on the level. We prefer the 12 ft. Kimball where the soil is loose and the 8 ft. size where the soil is firm or weedy. A man's weight on the smaller implement makes it take hold better.

Cultivation

Orchard is plowed during March, April, and May.

Cultivation ceases Aug. 1 to 15th.

4 to 12 cultivations are given according to the soils and conditions. New land of the red loam soil is easiest to keep clean and holds its mulch well. Usually 4 cultivations is sufficient on this type. The black clay is our most expensive soil to handle.

The plowing is usually followed with a drag harrow and a clod-masher. The Kimball is then used almost entirely. The disk and Springtooth are expensive and only used where the soil is too firm or soddy for the Kimballs.

We use 1-horse corn shovels, and hand hoes, around the tree in June and July.

Expenditures

Total amount paid out Sept. 1, 1911, to Sept. 1, 1912, $8,680.23.

Summary

Taxes	$ 799.07
Insurance	16.50
Clearing land	300.00
Growing and harvesting crops (hay and apples)	350.00
Improvements on buildings and fences	350.00
Implements and tools	137.00
Nursery stock	274.20
Staking and setting 35 acres of new planting at $2.50	87.50
Supervision	1,500.00
Maintenance and care of orchard	4,680.96
	$8,680.23

The maintenance and care of the orchard included,—cultivation, pruning, poisoning squirrels, spraying 11 acre bearing apple orchard 3 times and 5 acre prune orchard once, dusting 235 acres 2 yr. pears with lime for slugs, and incidentals.

ANNUAL REPORT

For the year ending December 1st, 1913.

Orchard Cultivation

Cultivation.	Acreage	Costs	Average Rate per Acre
Plowing	566.44	$1251.44	$2.21
Disking	103	78.25	.76
Spring Tooth Harrowing	80	48.00	.60
Spike Tooth Harrowing	368	95.50	.26
Kimballing	3645	1602.00	.44
Clod Sled	23	8.90	.39
Tree Row Cultivator	215	30.15	.14
Hand Hoeing	1472	176.50	.12
Cost of cultivating	665 acres	$3290.70	$4.95 per acre

Care of Young Trees

Dusting for slugs	440	$77.00	$.175
Pruning	665	112.80	.17
Poisoning squirrels		60.50	
New Planting	4.8	26.00	5.42
Replanting dead trees	665	152.00	.23
Total Cost	665	$429.30	$.64 per acre

Care and Rejuvenation of Bearing Orchards

11 acres commercial and 4 acres family orchards	Acreage	Costs
Summer pruning	14.	$119.00
3 Sprayings (worms, scab, and anthracnose)	15.	120.00
Thinning	9.5	24.00
Picking Apples (about 635 bu.)	12.	35.00
Hauling to Packing House		18.00
Grading		32.00
Packing (430 boxes $.06)		25.80
650 Boxes $65, Freight $21.82, Nailing $7, Cartage $2		98.01
Fruit Paper $33.58, Frt. $2.03, Cartage $2		36.61
Labels $9, Paste $1.50, Booklets $13.10		23.60
Hauling $27, Storage $3.50, To Brace and Load Cars $10		40.50
Total		$572.58

Credit		
Cull Apples Sold	$25.10	
Car of Apples, Net F. O. B. Drain		
252 Packing Boxes on Hand	35.28	
262 lbs. Fruit Paper on Hand	14.40	
Balance		

Care and Rejuvenation of Bearing Prunes

(Approximately 3 acres)

Pruning and Removing Brush	$ 13.00
Spraying	12.00
Picking (241 boxes at 7 cts.)	16.87
Hauling to Dryer	7.38
Total	$ 49.25
Credit	
241.4 bu. Sold to Sykes	$120.70
Net Profit	$ 80.45

Hay and Grain Crops

	Approximate 1913 crop	Acreage 1914 crop	Costs
Plowing	60.	107.75	$380.00
Disking		124.	95.00
Harrowing	200.	300.	125.00
Seed and Seeding	45.	107.75	138.25
Cutting	82.5		50.00
Raking	71.		20.00
Shocking			24.00
Hauling			90.00
Baling, 46 tons			109.41
Threshing 264 bu. oats and vetch			25.00
Hauling from baler and storing			65.00
Total Cost			$1121.66

Credit			
Sale of loose hay in field, 67,204 lbs		$246.99	
Sale of loose baled hay, 45,850 lbs		273.65	
Sale of oats, 39 buu.		15.60	
Hay on hand Dec. 1913	88,130 lbs		
Hay on hand Dec. 1912	42,770 lbs.		
At $12 per ton	45,360 lbs	272.00	
Oats for horse feed, 90 bu.		40.50	
Hay for horse feed, 3.5 tons		35.00	
Acreage planted Dec. 1913, 106.75			
Acreage planted Dec. 1912, 52.00			
At $6 average per acre	$54.75	328.50	1212.24
Net Profit			$ 90.58

Note: A large part of the grain on the bottom land drowned out and was a total loss, hence the small net profit.

	Costs
Improvements	
160 rods woven wire fence	$ 85.00
320 rods 4 strand barbed wire fence	96.00
80 rods rail and picket fence	35.00
Repair 4½ miles of line fence	95.00
Construct telephone line to house on No. 164	14.75
Establish bees for pollination	9.92
Whitewash buildings and fences on No. 153	15.00
Rebuilt dryer into packing and storage plant	70.00
Construct 5 small bridges and fix road to bearing orchard	30.00
Haul manure on garden	18.00
Clearing land	25.00
Drainage system on bottom land	40.00
Total	$ 536.67
Implements	
4 pairs pruning shears	$ 3.30
Hay rake and mower, $31; cartage, $2	33.00
5 planter hoes	3.75
3 Kimballs and freight and cartage	68.00
42 Kimball blades and freight	63.00
100 Picking Boxes, $11; Frt., hauling and nailing, $5.50	16.50
Edgmont Lid Press, $14; Frt. and cartage, $2.40	16.40
Fruit rack	18.00
Bolster springs	9.00
Ditching spade	1.75
2 clod mashers	10.00
Grass seeder	1.50
1 set balances	2.50
1 sled for spraying	4.00
Total	$ 242.70
Miscellaneous expenses	$ 118.17
Orchard Receipts	
67,204 lbs. loose hay in the field	$ 246.94
45,850 lbs. baled hay	373.65
39 bu. oats at $.40	15.60
241.4 bu. prunes at $.50	120.70
Cull apples	25.10
Cherries	2.50
Pasture for cattle	105.00
Rebate on machinery	2.00
Rolling cutter sold	7.00
For injury to trees	5.00
350 brick sold	4.37
Total	$ 807.86
Increase in Assets	
(Dec. 1, 1913, over Dec. 1, 1912.)	
Baled hay	$ 272.00
54 acres planted to grain	328.50
Paper and boxes on hand	49.68
Improvements	356.67
Implements (after deducting 15 % for wear)	206.30
Total	$1393.15

Recapitulation

Cultivation	$3290.70
Care of young trees	428.30
Care and rejuvenation of bearing orchards	572.58
Care and rejuvenation of bearing prunes	49.25
Grain crop	1121.66
Improvements	536.67
Implements	242.70
Miscellaneous	118.17
Supervision	1500.00
General expense (supplies, repairs, freight, etc.)	961.67
Total	$8821.70
Orchard receipts	807.86
Remainder	$8013.84
Increase in assets	1393.15
Balance	$6620.69

ANNUAL REPORT.

For year ending December 1, 1914.

Orchard Cultivation

Cultivation	Acreage	Costs	Average Rate per acre
Plowing	752.	$1641.86	$2.183
Spike tooth harrowing	635.	196.40	.309
Spring tooth harrowing	50.	29.75	.595
Disk harrowing	9.	7.00	.778
Kimball cultivation	4680.	1776.56	.38
Tree row cultivation	125.	17.90	.143
Hand hoeing	1095.	140.19	.128
Cost of cultivating	690	$3809.66	$5.52
Care of Young Trees			
Spraying for slugs (labor)	200.	$ 34.00	$ .17
Spray materials		4.75	.024
Nursery stock		146.88	
Planting replace trees		63.10	
Counting dead trees		6.50	
Poisoning squirrels		21.50	
Staking and training		11.00	
Winter pruning	675.	142.00	.21
1st summer pruning	665.	125.25	.188
2d summer pruning	675.	85.75	.127
Total cost	690.	$ 640.73	.93
New Planting			
Clearing ground		$ 146.47	
Staking and planting	24.45	47.50	1.94
Nursery stock		66.10	
	24.45	$ 260.13	$10.68

Bearing Apple Orchards

Pruning	15.	$ 152.00	$10.13
Hauling off prunings		13.25	.88
Spraying (labor)			
1st combined calyx and scab	15.	29.25	1.95
2d codling worm	11.	14.90	1.45
3d fungus	15.	19.50	1.30
Spray materials		49.57	
Picking and hauling to packing house	604 bu.	54.00	
Grading		21.60	
Preparing packing house		2.50	
Packing		23.76	
Nailing and labeling		12.50	
Boxes, cartage, nailing		42.60	
Paper		8.57	
Hauling culls		11.00	
Hauling to depot 432 packed boxes		36.25	
Freight to Yoncalla	432 boxes	13.82	
Total		$ 505.07	

Prune Orchard (3 acres)

Pruning	$ 28.81
Spraying, material, labor	8.85
Harvesting about 230 bu.	20.88
Hauling to cannery	14.25
Total	$ 72.79

Hay and Grain Crop

Plowing 2.6 acres	$ 6.00
Harrowing 35 acres	10.50
Seeding and seed	65.31
Harvesting about 93 acres	123.50
Hauling to baler	81.50
Baling 234,980 lbs.	234.98
Board for baling crew	35.86
Hauling and storing	148.15
Total	$ 705.80

Credit

Hay sold, 114,885 lbs.		$712.18	
Hay on hand Dec. 1914	209,100 lbs.		
Hay on hand Dec. 1913	88,130 lbs.		
Value $12 per ton	120,970 lbs.	725.82	
Loose hay for feeding horses, 4 tons		40.00	
Oats sold		1.50	
			$1479.50
Net profit			$ 773.70

Improvements	
Repairing fence	$ 69.00
New fencing	118.06
Clearing land for walnuts	154.50
Whitewash bldgs. and fences	32.12
Repaper house on No. 153	28.74
Repairing barn on No. 164	9.00
Water trough, material and labor	6.28
Road through plantings	21.75
Hauling manure around trees	29.50
Hauling rock from planting	40.00
Drainage	11.25
Total	$ 520.20
Implements	
Kimballs and Kimball extras	$ 142.52
Harrow	11.75
Files	20.50
Sprayer and cartage	302.35
Buggy	95.00
Harness	15.00
Plow	7.00
Picking pails, ladders and pruners	5.70
Extras and cartage	6.82
Total	$ 606.64
General Expenses	
Cannery stock	$ 110.00
Experimental crops for cannery—	
Beans, labor, and seed	8.50
Brocolli, labor, and seed	9.22
Office supplies	12.10
Telephone	19.00
Feed for horse	18.75
Blacksmith	24.40
Incidentals	166.30
Total	$ 368.27
Supervision	
Superintendent's salary	$1500.00
Orchard Receipts	
Pasture	$ 55.90
Hay, 114,865 lbs.	712.18
Grain	1.50
Cull apples	41.70
Cherries	2.80
Picking boxes not returned	3.45
Pickets	2.12
Trees injured	2.00
Total	$ 821.65
Credit	
Pasturage due	$ 10.00
Hay on hand, 209,100 lbs., value	1254.60
Cull apples sold not collected	17.20
432 boxes apples shipped (returns not made)	
1900 gal. canned prunes(returns not made)	

Recapitulation

Orchard cultivation	$3809.66
Care of young orchards	640.73
New plantings	260.13
Bearing apples and pears	505.07
Bearing prunes	72.79
Hay and grain crop	705.80
Improvements	520.20
Implements	606.64
General expenses	368.27
Supervision	1500.00
Total	$8989.29
Part of orchard receipts (all returns not received)	$ 821.65
	$8167.64

The following additional notes regarding our system of handling labor, method of cultivation, pruning, etc., may be of interest:

We own no teams or plows and in hiring naturally have a wide selection. Most, however, use two 1300-lb. to 1400-lb. horses on a 14-inch chilled plow for the free soils or a steel plow with less curve in the moldboard for adobe soils. The rolling colter is preferred to the jointer and a chain is used to drag under cover crops. Depth of plowing is from 6 to 8 inches.

In our experience contracting has proved most economical in plowing, and day work most economical in cultivation. This is probably due to the scarcity of farm work during orchard plowing season. It is both economical and advisable to have the first furrow around each tree row plowed by the day and to contract the middles. The portion cut and covered by the first furrow amounts to about 4½ feet, bringing this cost below $2 per acre notwithstanding that two men and a team at extra pay are required for this operation. The contract price for the balance ranged from $2 to $2.50 with an average of $2.09 per acre for this season.

Under our conditions we prefer to turn the soil toward the trees practically every year as the cost and the danger of injuring the trees is less. The lighter, well drained soils work down each summer and remain but slightly ridged after several plowings. The heavy soils become more rigid, affording better surface drainage, which is usually beneficial to this type.

We believe best results are obtained by plowing the adobe soil in December and the free soils in January, February, and March. The adobe scours well only when full of water. Spring plowing in this condition leaves it bad physically and expensive to work. The weathering action on earlier plowing seems to make soils pulverize and cultivate easier into a finer mulch, more retentive of moisture.

In cultivating, we consider the disk and spring tooth expensive; their use costing approximately 75c and 60c per acre respectively. On light or loose soils the spike tooth follows plowing. On soils that are heavy or with slight sod the kimball cultivator gives best satisfaction. Only where the soil is baked or has tough sod will the disk or spring tooth be necessary. For subsequent cultivations the kimball is used almost entirely. The cost of kimball cultivating with a 10 ft. implement is 50c to 55c for the first cultivation, with gradual reduction through the season to from 30c to 35c for last cultivation. The larger the team and implement the less cost per acre, but also less efficient work. The small implement takes hold best with a man's weight and is preferred on difficult soils. We prefer 3 horse 10 ft. kimballs for our 30 ft. rows and red loam soil.

In managing the crew all are allowed to work on the same land. The foreman with a good team sets the pace and governs the length and frequency of rests to accomplish the most without over-working the horses. Many drivers do not know the value of short frequent rests—that rests over two minutes are more harmful than good, as the horse tends to lose its second wind and stiffen.

A COMPARATIVE STUDY OF TWO ORCHARDS.

A comparative study of the following orchards is very interesting. They compare favorably as regards acreage, age of trees, climatic and soil conditions, and the orchards are within a few miles of each other. The chief difference in cost of production is due very largely to management.

The reports do not take up overhead costs in either case, and it must be remembered that these charges would add considerable to the costs given in this case.

Description of Orchards.

ORCHARD NO. 1.

4 acres apples 10 to 11 years old.
18 acres apples 6 years old.
10 acres apples 3 to 4 years old.

32 acres apples weighted average age 5.6 years.

ORCHARD NO. 2.

12 acres apples 15 years old.
10 acres apples 7 years old.
12 acres apples 3 years old.

34 acres apples weighted average age 8.4 years.

Soil in both cases is of volcanic ash—Silt loam.

Cost of Production.

	Orchard No. 1.		Orchard No. 2	
Pruning	32 A.	Av. 1 A.	34 A.	Av. 1 A.
Trees 3 to 11 yrs. old	$112.00	$ 3.50		
Trees 3 yrs. old			$5.00 (12 a)	$ .41
Spraying 1st application				
Lime and sulphur, 6-6-50	48.00	1.50		
Lime and sulphur			26.25	.77
2nd application				
Lime and sulphur, 4-4-50, with lead (8 A. sprayed)	16.00	2.00		
Arsenate of lead			17.00	.50
3rd application				
Arsenate of lead (4 A. sprayed)	6.00	1.50		
Arsenate of lead			14.50	.42
4th application				
Arsenate of lead (4 A. sprayed)	6.00	1.50		
Arsenate of lead			13.75	.41
5th application				
Fall spray, Bordeaux, 6-6-50	52.50	1.64		
Arsenate of lead			13.75	.41
6th application				
Black Leaf 40			12.50	.37
	$128.50		$97.75	
Average cost spraying per acre		$ 4.01		$2.88

	Orchard No. 1. 32 A.	Av. 1 A.	Orchard No. 2. 34 A.	Av. 1 A.
Cultivation				
Plowing, 1 time	$ 80.00	$ 2.50	$ 85.50	$2.51
Harrowing, Spiketooth, 1 time	15.00	.50		
Acme, 4 to 6 times	100.00	3.00	102.00	3.01
Disking	25.00	.75		
Total	$220.00		$187.00	
Aver. per acre		$ 6.87		$5.51
Cover Crop				
Vetch on 20 acres	$ 30.00	$ 1.50	cost not given	
Sowing and harrowing	10.00	.50	16.00	.47
Thinning fruit (4 acres	40.00	10.00		
			15.00	.44
Expenses not listed				
Feed, hay and grain	(not given)		162.00	
Blacksmith work	(not given)		43.00	
Hardware	(not given)		68.55	
Other expenses	(not given)		134.43	
Dynamite and labor handling	(not given)		12.50	
Total			$420.48	
				12.37
Taxes	$160.00	5.00	83.45	2.45

Summary.

Cost of Production				
Pruning	$112.00	$ 3.50	$ 5.00	$ .41
Spraying	128.50	4.01	97.75	2.88
Care of land	220.00	6.87	187.50	5.51
Cover crop	40.00	2.00	16.00	.47
Thinning fruit	40.00	10.00	15.00	.44
Other expenses			420.48	12.37
Taxes	160.00	5.00	83.45	2.45
Total	$700.50		$825.18	
Actual acre maintenance		31.38		24.53
Average per acre		21.89		24.27

Handling the Crop.

Number boxes apples	990 Total cost	Cost per box	1,798 Total cost	Cost per box
Picking	$ 46.00	$ .046	$141.45	$ .079
Grading	24.75	.025	107.60	.059
Box and paper	138.60	.14	204.75	.114
Hauling	49.50	.05		
	$258.85	$ .261	$453.80	$ .252
Association charges	$118.80	$ .12	$102.10	$ .057

PARTIAL REPORT ON DEVELOPMENT OF A 200-ACRE BLOCK OF ORCHARD.

This report shows that the owner of this orchard, which is divided into blocks according to age, is studying his costs very carefully. He has worked out the relative cost of clearing by various methods, knows the relative cost of tillage of hill versus level land, and heavy versus light soil. He is making a careful study of the relative efficiency and cost of using the various tools under his different conditions. These are all steps that will materially reduce the cost of production.

It must be borne in mind that no overhead costs have been included in the above reports and that these costs would materially increase the total expenditures.

Apples—Orchard No. 5a.

Notes on clearing and preparation of land for planting, etc.

200 acres of land, cleared, cost ranging from $35.00 per acre for brush land covered with willow, wild cherry, hazel and maple, to $135.00 per acre for some heavy timber land. Most of the clearing has been done from good to heavy timber land at an average cost of about $100.00 per acre where stump puller was used and about $65.00 per acre where donkey engine was used.

Plowing new land has cost, with level silt loam soil, $2.50 an acre up to, in heavy red shot with some clay, $5.00.

Preparation for planting, leveling, dragging, and raking, in level silt loam soil, $2.50, while in heavy red shot with some clay, $5.00.

Staking—using three men and a wire triangle planting trees 26 feet apart—75 to the acre, 35c.

Planting on red shot soil is double what it is on silt loam. A good man will dig 200 to 250 holes per day in the silt loam and hardly half as many in the other. Cost of planting ranges from $2.50 in the first case, to—in the second—$5.00.

Cost of Care of Orchard.

Orchard consists of 10 acres, 5 year old trees, very large—75 to the acre. Soil, silt loam, level.

Cost varies considerably, hill land costing about 15 to 20 per cent more than level land of the same kind of soil, and heavy red-shot and clay land costing twenty per cent more than silt loam.

Spraying

1st—spring—L. & S.—1-12—home made material costing $3.50 per barrel, using power sprayer with 4 nozzles, fill and empty 200 gallon tank per hour.

Material, per acre	$ 1.50
Labor	2.00
2d—codling moth—material	.40
Labor	2.00
3d—fall spray—Bordeaux, 6-6-50, blue stone 6c, lime ¾c lb.	
Material	1.70
Labor	2.00
Pruning, August	5.00
Removing brush	3.00
Cultivation—Plowing, 1 time	2.50
Disk twice (5 acres per day) per acre	2.00
Springtooth drag twice (8 acres per day)	1.25
Light draft harrow twice (20 acres per day)	.50
Kimball weeder (10 acres per day) 6 times	3.00
Hoeing twice	.50
Total cost per acre	$27.35

Cost per box of harvesting and marketing crop:	
Picking	.03
Sorting	.04
Packing	.06
Paper	.04
Box	.10
Hauling	.02
Total per box	.29

Notes.—All labor is charged at 25 cents per hour. Team and driver 50 cents per hour. Driver and team for spray machine $1.00.

The cost of pruning and removing brush in this tract was heavier this year than the average.

This 5 year old orchard paid a net return of 3% on a valuation of $1,000.00 per acre after paying all expenses of care, harvesting and marketing the crop and 3% taxes.

Cost of picking light because every apple could be reached from the ground.

Orchard No. 6a.—Same Management.

Orchard consists of 10 acres 3 year old trees, 75 trees to the acre. Land, level. Soil, silt loam.

Spraying, spring, same at No. 5a.	
Material	$ .75
Labor	1.25
Fall spray—Bordeaux.	
Material	.80
Labor	1.25
Pruning, spring and August	3.00
Removing brush	1.50
Cultivation—plowing	2.50
Kimball weeder 6 times	3.00
Level, 50c; hoe twice, 50c	1.00
Light draft harrow	.50
Total cost per acre	$15.50

Orchard No. 7a.—Same management as 5a and 6a.

Orchard consists of 10 acres 1-year-old trees, 75 trees per acre. Land level. Soil red shot.

Spraying—1 time with knapsack spray	$ .40
Cultivation	
Plowing	3.00
Spring tooth drag—5 times	5.00
Light draft harrow once	.25
Kimball weeder—5 times	5.00
Hoeing	1.00
Stake and tie up trees in fall	.25
Removing stakes and untie in spring	.60
Pruning	.50
Total cost per acre	$16.00

10 acres of hill land, same soil as above.
Add 20% to cost of cultivation.

Notes Regarding Orchards 5a, 6a, and 7a.

I shall throw away spring tooth drag next season, almost entirely discard Kimball weeder, and use disk and light draft harrow and thereby reduce cost of cultivation 25% and get as good results.

COST OF PRODUCTION BY BLOCKS OF 385.82 ACRES OF APPLES AND PEARS.

A study of this orchard should be of great interest to growers. It shows first, that the orchard has been divided into units according to conditions, and second, that a careful, well itemized account has been kept of each unit. We recommend this idea on all large orchards. The system used, of course, will vary with local conditions.

It should be noted that no overhead charges of interest on investment and taxes and depreciation are charged. These charges would increase the costs materially.

	Orchard No. 1. Total- -1 acre.		Orchard No. 2. Total—1 acre.		Orchard No. 3. Total—1 acre.	
No. acres	29.4		16.62		78.34	
No. apple trees	1750		1000		7356	
Age	4		4		3	
No. pear trees	1750		1000			
Age	3		3			
No. days	201.05	6.8	135.1	8.2	647.3	8.2
Total cost	404.40	13.75	284.15	17.09	1333.80	17.02
Miscellaneous	4.50	.15	13.35	.80	24.80	.31
Irrigation	59.45	2.02	86.95	5.23	303.05	3.86
Cultivation	83.90	2.85	52.60	3.16	256.30	3.27
Spraying	16.70	.56	14.00	.84	39.35	.50
Pruning	136.80	4.65	67.20	4.04	224.85	2.87
Thinning					13.50	.17
Cover crops	62.55	2.12	5.90	.35	27.80	.35
Spuds					190.90	2.43
Burning prunings	30.00	1.02	17.85	1.07	47.10	.60
Replanting	6.50	.22	9.00	.54	7.90	.10
Grafting					35.15	.44
Tying, staking					111.50	1.51
Tile drain			9.05	.54		
Handling and picking			4.70	.06	3.40	.33
Handling and picking			22.15	.28	10.65	1.05
Miscellaneous	4.00		8.25		16.75	
Total	$404.40	$13.75	$284.15	$17.09	$1333.80	$17.02

	Orchard. No. 4. Total—1 acre.		Orchard No. 5. Total—1 acre.		Orchard No. 6. Total—1 acre.	
No. acres	19.41		12.07		18.65	
No. apple trees					1683	
Age					8	
No. pear trees	1313		2482			
Age	5		3		8	
No. days	95.15	9.3	82.6	6.8	394.8	21.16
Miscellaneous	6.30	.61	20.60	1.70	5.25	.28
Irrigation	16.60	1.62	34.60	2.80	68.35	3.66
Cultivation	59.55	5.83	53.00	4.39	2.65	.14
Spraying	14.15	1.38	9.85	.81	125.05	6.70
Pruning	42.95	4.20	38.70	3.20	102.40	5.49
Thinning	2.00	.19			138.10	7.40
Cover crop	1.00	.09	1.25	.10	51.30	2.75
Burning prunings	13.00	1.21	5.95	.49	26.05	1.39
Replanting	2.40	.23	6.20	.51		
Tying and staking					53.51	2.86
Tile drain					2.00	.10
H. and picking	3.40	.33			171.15	9.17
H. and picking	10.65	1.05				
Hauling in					31.20	1.67
Mice damage					34.00	1.81
Miscellaneous	11.60				19.65	
Total	$192.10	$18.81	$10.15	$14.09	$847.59	$45.43
Fruit produced						
Boxes apples					4021	

	Orchard No.7. Total	-1 acre.	Orchard No. 8. Total—1 acre.		Orchard No. 9. Total—1 acre.	
No. acres	36.46		16.10		33.63	
No. apple trees	3337		650		1610	
Age	6		6		2	
No. pear trees			872		1769	
Age			7		2	
No. days	505	13.8	250	15.5	175.95	5.2
Miscellaneous	71.45	1.96	2.00	.13	6.60	.19
Irrigation	121.16	3.46	93.55	5.81	106.48	3.16
Cultivation	20.40	.55	4.60	.28	140.10	4.16
Spraying	103.15	2.82	75.70	4.70	24.75	.73
Pruning	304.00	8.33	147.83	9.18	29.90	.88
Thinning	70.65	1.93	10.80	.67		
Cover crop	89.85	2.46	37.60	2.39		
Burning prunings	45.70	1.25	24.90	1.54	6.00	.18
Replanting	4.80	.13			33.65	1.00
Tying and staking	31.25	.85	7.45	.46		
Tile drain	8.85	.24	13.45	.83	4.25	.12
H. and picking	92.90	2.54	60.25	3.74		
Hauling in	11.30	.31	8.90	.55		
Mice damage	108.70	2.98	23.30	1.44		
Miscellaneous	22.80		18.15		6.65	
Total	$1114.41	$30.56	$528.58	$32.82	$366.40	$10.89
Fruit produced -						
Boxes apples	1660		1153			

	Orchard No. 10. Total-	-1 acre.	Orchard No.11. Total—1 acre.		Orchard No. 12. Total—1 acre.	
No. acres	16.02		8.14		10.25	
No. apple trees	1400.					
Age	7					
No. pear trees			1263		1599.	
Age			5		3	
No. days	191.1	11.9	65.05	7.9	6175	6.
Miscellaneous	12.75	.85	8.40	1.03	6.40	.62
Irrigation	88.55	5.52	27.60	3.39	33.80	3.30
Cultivation	78.88	4.92	39.50	4.85	37.65	3.67
Spraying	46.10	2.88	3.35	.41	7.65	.74
Pruning	44.75	2.79	18.25	2.24	15.65	1.52
Thinning	6.40	.40	.55	.06		
Burning prunings	10.00	.62	2.65	.32	6.90	.67
Replanting	17.05	1.06	13.40	1.64	5.65	.55
Tying and staking					7.15	.70
Tile drain	22.90	1.42				
H. and picking	14.55	.90			9.40	.91
Hauling in	4.35	.27				
Miscellaneous	36.10		13.95		7.85	
Total	$413.30	$25.80	$127.65	$15.68	$138.10	$13.67
Boxes apples	243					

	Orchard No. 13. Total-	-1 acre.	Orchard No. 14. Total	-1 acre.	Orchard No. 15 Total—1 acre.	
No. acres	26.14		20.11		49.93	
No. days	121.7	4.6	305.9	15.2	412.1	
Miscellaneous			12.90	.64	210.10	
Irrigation	45.00	1.72	88.45	4.39	206.50	
Cultivation	64.80	2.47	4.20	.20	169.10	
Spraying	7.10	.27	89.85	4.46	46.00	
Pruning	63.95	2.44	157.90	7.85	68.75	
Thinning			46.00	2.28	13.20	
Cover crop			56.50	2.80	120.50	
Burning prunings	18.45	.70	24.70	1.22	37.20	
Replanting	3.00	.11	4.80	.23	12.55	
Grafting	14.20	.54				
Tying and staking	24.05	1.30	22.75	1.13		
Tile draining	4.00	.15	79.50	3.95		
H. and picking			65.40	3.25	19.18	
Hauling in			10.00	.49	3.00	
Miscellaneous			8.20		7.00	
Total	$254.55	$9.07	$676.15	$33.37	$924.45	
Fruit produced -						
Boxes apples			1425			

Summary.

Total number acres	385.82
No. of days	3644.45
Miscellaneous	$ 406.50
Irrigation	1385.06
Cultivation	1067.20
Spraying	622.75
Pruning	1463.88
Thinning	301.20
Cover crops	484.20
Spuds	190.90
Burning prunings	352.45
Replanting	126.90
Grafting	49.35
Tying and staking	312.51
Tile draining	144.00
H. and picking	475.93
Hauling in	68.75
Mice damage	166.00
Miscellaneous	189.95
Horse barn	778.08
General expenses	465.66
Total	$9,014.32
Less harvesting, tile drain, etc.	1,333.72
Cost of producing and maintaining	$7,780.60
Per acre	20.10

Total apples produced	8502 boxes
Total pears produced	105 boxes
Harvesting costs for apples per box:	
Box	.10
Nails	.004
Paper	.033
Label	.0043
Warehouse labeling	.0174
Make and nail box	.015
Pack—niece work	.05
Superintendent	.013
Grading--hand	.0286
Load cars (haul ¼ mile)	.0487
Haul to packing house	.008
Total cost per box	.335c

Haul to and load cars very heavy on account of inconvenience.

Pears sold loose –no packing.

Figures in the above orchard are for 1912.

Apple trees planted, 96 to the acre; pears 20′ x 20′.

Bearing orchards were sprayed three times and also had a winter lime- sulphur spray. For the winter spray two Bean machines—power—and one hand machine were used. For summer, the same. They were ample.

A THREE-YEAR REPORT ON A 11¾-Acre RANCH.

The following report of the ranch is very good as this ranch is on practically level land, the trees being uniform, and the ranch has had good care.

The ranch consists of eleven and three-fourths acres, eleven of which are in orchard, three-fourths of an acre being devoted to road and buildings.

The trees at the time of purchase, April, 1911, were ten years old. The orchard consists of the following varieties of apples:

1 ten acre block
- 166 Newtown
- 419 Esopus (Spitzenberg)
- 106 Ortley

1 one acre block
- 36 Arkansas Black
- 26 Arkansas
- 14 Jonathan
- 2 Gravenstein

Another reason that this report is especially good is that all horse labor has been hired, an average price of $5.50 being paid for team and teamster per day. The rate for hand labor varies from $2.00 to $2.50 per day depending on season and kind of work. A certain part of the work on this ranch has been done by the owner's family. However, this work has been included in the costs on the same basis as paid other laborers, and all labor is included except that of the owner, for which we have allowed a salary of $600.00 per year.

Report from April, 1911, to January, 1912.

Land:	Total.	Per Acre.
Valuation of ranch at time of purchase	$21,300.00	$1,812.76
No buildings or improvements included.		
Note.—Previous to the purchase, the orchard had been pruned, sprayed twice, and received the early cultivation necessary.		
Price paid for team and teamster per day	$6.00	
Hand labor for cultivating, thinning, etc.	2.00	
Hand labor during harvest, per day	2.50	

Growing Costs.

Maintenance:		
Cultivation	63.00	5.727
Hand labor, hoeing, thinning, propping, etc.	137.70	12.518
Spraying—	64.50	5.863
1 arsenate spray at $19.00.		
2 arsenate sprays at $22.75.		
Superintendent fees	32.57	2.960
Twine for propping	10.00	.909
Total	$ 307.77	27.97

Overhead Costs.

	Total.	Per A.
Interest on investment	$1,278.00	$ 108.765

Handling Costs.

Number of packed boxes of apples—1950

Handling from tree to warehouse:	Total.	Acre.	Box.
Picking	$102.50	$ 9.318	$ .0525
Grading	74.00	6.727	.0379
Packing and nailing	104.22	9.474	.0534
Boxes	297.00	27.000	.1523
Paper	81.63	7.420	.0418
Nails	9.00	.818	.0046
Miscellaneous	22.42	2.038	.0120
Hauling from orchard to packing shed and from packing shed to shipping station	60.00	5.454	.0307
Freight to warehouse	48.75	4.431	.0250
Total	$799.52	120.407	.5100
Handling costs from warehouse:			
Warehouse and selling costs	$195.00	$ 47.727	$ .1000
		120.407	.5100

Gross Receipts.

1,956 packed boxes of apples $3,359.27

Summary.

	Total.	Acre	Tree	Box
Growing costs	$ 307.77	$ 27.970	$ .4002	$ .1578
Handling costs	994.52	120.407	1.2919	.5100
Overhead costs	1,278.00	108.765	1.6618	.6092
Total	$2,580.29	$257.142	$3.3539	$1.2760
Gross receipts from sale of apples	$3,359.27	$ 70.816	$1.0129	$ .3994
Receipts	778.98	70.816	1.0129	.3994

REPORT FOR 1912.

	Total.	Per Acre.
Buildings:		
A large packing house	$1,250.00	$113.636
Equipment:		
Props for trees	30.00	
Trucks for packing house, nailing table, pruning hooks, ladders, etc.	40.00	
1 pump	25.00	
	$ 95.00	

Growing Costs.

Price paid for team and teamster per day.....$6.00
Price paid for hand labor per day..... 2.00

Maintenance:			
General expenses		9.00	.818
Spraying—			
Labor includes team, power machine, and three men		204.97	18.633
Dormant Lime-Sulphur (1-11) Spray			
Material	$75.03		
Labor	41.25		
Total	116.28		
Bordeaux (5-5-50)—Pink Spray			
Material	$37.50		
Labor	13.75		
Total	50.65		
Arsenate of Lead Sprays			
1st—Material and labor	$21.32		
2nd—Material and labor	16.72		
	$38.04		
Cultivation		$ 73.95	$ 6.722
The orchard received regular cultivation, disking, and harrowing until August, when shade crop of clover was planted.			
Shade crop—seed		16.20	1.472
Labor for handling this crop is included under **Cultivation.** The entire 11¾ acres were planted to clover, the plan being to allow this to remain on the land as a shade crop for two summers, later planning to keep half the land in clean culture and half under shade, alternating.			
Irrigation—tax		24.00	2.181
Labor for irrigation is included under Cultivation.			
Propping—twine		5.00	.454
Salary—working manager—9 mo.		540.00	49.090
Total maintenance		$ 873.12	88.006

Overhead Costs.

Overhead Charges:		
Taxes	$ 129.30	11.754
Interest	1,358.70	115.634
Insurance	5.33	.484
Total	$1,493.33	$127.872

Handling Costs.

	Total	Acre	Box
Number of packed boxes of apples,....	3,025	275	one
Handling from tree to warehouse:			
Picking	95.00	8.636	.031+
Hauling from orchard to packing shed and from packing shed to shipping station	75.60	6.872	.0249
Grading	84.00	7.636	.0277
Packing	129.75	11.795	.0428
Paper	145.71	13.246	.0481
Boxes	310.09	28.19	.1025
Freight to warehouse	75.62	6.874	.0249
Salary of working manager, 3 mo.	180.00	16.363	.0595
Total cost	$1,095.77	$74.241	$ .3618
From Warehouse:			
Storage and warehouse	121.00	11.000	.0400
Selling cost	302.50	27.500	.1000
Crop insurance in warehouse	7.50	.681	.0024
Total cost	$ 431.00	39.181	.1424

Gross Receipts.

3,025 packed boxes of apples $2,870.30

Summary.

	Total	Acre	Tree	Box
Growing costs	873.12	88.006	1.135	.2827
Handling costs	1,526.77	138.797	1.985	.5042
Overhead costs	1,493.33	127.872	1,941	.4936
Total	$3,893.22	$354.685	$5.061	$1.2805
Gross receipts from sale of apples	2,870.30	260.936	3.732	.9488
Loss	1,023.92	93.749	1.329	.3317
Total valuation of ranch without improvements	21.300.00			
Valuation of improvements	$1,250.00			
Valuation of equipment	95.00			
	$1,345.00	$1,345.00		
Total	$22,465.00	$1,927.233		

*Note: Through an oversight depreciation of buildings and equipment ($59.50) was not counted in, in 1912, but due allowance for two years' depreciation was made in 1913 account.

REPORT FOR 1913.

		Total.	Per Acre.
Buildings:			
Barn built this year		$250.00	21.276
Improvement of Property:		95.06	8.090

Growing Cost.

Maintenance:			
Cultivation		14.35	1.304
Cultivation is very low on account of the orchard being in clover. The orchard was given a light harrowing and "springtoothed" one time for reseeding.			
Spraying		123.47	11.224
Labor	$95.62		
Material	95.62		
The orchard received the following sprayings:			
Lime-sulphur—Pink spray.			
Lime-sulphur and Arsenate of Lead.			
Arsenate of Lead.			
Fall Bordeaux—5-6-50.			
General expenses		9.55	.868
Clover seed for reseeding		6.21	.564
Dynamite—experiment		3.95	.389
Fertilizer		55.02	5.001
Irrigation—water		30.00	2.727
Working manager's salary		540.00	49.090

Overhead Costs.

			Total.	Per Acre.
Overhead charges			$1,535.44	130.674
Taxes	$95.06	45.05		3.920
Interest		1,364.70		116.145
Depreciation on buildings or improvements		61.80		5.259
Depreciation on equipment		8.55		.728
Insurance		5.33		.453

Handling Costs.

	Total.	Acre.	Box.
Number of boxes of apples	1229	121	one
Handling from tree to warehouse.			
Picking	$ 30.00	2.727	.0244
Grading	25.00	2.272	.0020
Packing	65.70	5.972	.0534
Paper	58.10	5.281	.0472
Boxes	89.48	8.134	.0728
Hauling to packing shed and shipping station	31.60	2.872	.0257
Manager's salary, 3 mo.	180.00	16.364	.1464
Total	$479.88	$43.622	.3719
Handling from warehouse:			
Storage costs—warehouse	$49.16	4.64	.0400
Selling costs	122.90	12.10	.1000
Total	$173.06	16.74	.1400

1229 packed boxes of apples	$1,655.38	150.489	1.3453
Credit to clover shade crop—net	107.75	9.795	
15 tons clover @ $9.00 $135.00			
Cost of cutting and handling the two cuttings on 11 acres 27.25			

Summary.

	Total.	Acre.	Tree.	Box.
Growing costs	$ 782.55	71.140	1.016	.6367
Handling costs	652.94	59.363	.849	.5314
Overhead costs	1,535.44	139.585	1.996	1.2493
Total	$2.970.93	270.088	3.861	2.4174
Gross receipts from sale of apples $1,655.38		150.480	2.152	1.3453
Net receipts from sale of apples	1,315.55	119.595		
Net receipts from sale of clover	107.75	9.795		
Receipts	1,207.80	109.800	1.5700	.9819
Total value of ranch (without improvements)	21,300.00			
Valuation of improvements $1,381.26				
Valuation of equipment 76.00	1,457.26			
	22,757.26	1,936.702		

REPORT FOR 1914.

	Total.	Per Acre.
Improvements:		
Wiring barn, repairs, and additions	$ 65.68	5.589
Equipment:		
1 apple grader	200.00	18.181

Growing Cost.

Maintenance:			
Cultivation		102.95	9.359
One-half of the land was plowed turning under the shade crop of clover. Following the plowing the land was disked, and cultivated with a Falkner harrow until August, at which time the land was reseeded to clover.			
The other half of 11 acres was disked, the plan being to plow under this portion of the shade crop and cultivate during 1915.			
Clover seed		5.98	.108
Fertilizer		31.73	2.884
General expenses		23.34	2.121
Irrigation—water		29.26	2.650
Hauling—miscellaneous		7.15	.682
Spraying		148.85	13.531
Labor	$75.63		
Material	73.22		

The orchard received the following sprayings:
1st—Bordeaux—5-5-50—pink spray.
2nd—Arsenate of Lead and Lime-sulphur.
3rd—Arsenate of Lead and Lime-sulphur.
4th—Lime Sulphur.
5th—Fall Bordeaux (5-6-50) Spray.

Manager's salary		540.00	49.090
Total		889.26	80.841

Overhead Costs.

		Total	Acre
Overhead charges		$1,595.564	$145.142
Taxes	112.97		10.270
Interest	1,381.335		125.575
Depreciation on bldgs.	66.429		6.039
Depreciation on equipment	29.50		2.681
Insurance	5.33		..484

Handling Costs.

	Total.	Acre.	Box.
Number packed boxes of apples—3,124	3,124	283.09	one
Handling from tree to warehouse:			
Picking	$137.55	12.504	.0440
Grading	50.50	4.590	.0161
Paper	101.43	9.220	.0324
Boxes	312.40	28.400	.1000
Packing	105.76	9.614	.0338
Hauling to packing shed and to shipping station	121.56	11.050	.0389
Freight to warehouse	71.25	6.477	.0228
Working manager's salary	180.00	16.363	.0576
Total	$707.64	283.09	.3455
Handling from Warehouse:			
Storage	187.44	17.040	.0600
Selling, warehouse and advertising—est.,	374.88	34.080	.1200
Total	562.32	51.120	.1800

Returns.

3,124 packed boxes of apples—returns have not all been received.
Credit to clover shade crop, $62.50.

7½ tons of clover (from 5 acres, 1 cutting) @ $9.00		$67.50
Additional costs of cutting and raking		5.00
		$62.50

Summary.

	Total.	Per acre.	Tree.	Box.
Growing costs	$ 899.260	80.841	1.169	.2877
Handling costs	1,642.770	144.342		.5255
Overhead costs	1,595.564	145.142	2.074	.5107
Total	4,137.594	275.325	5.379	1.3239
Total value of ranch, without improvements			$21,300.00	
Valuation of improvements		$1,594.311		
Valuation of equipment	265.50	1,859.81		
		23,159.811		$2,105.437

The valuable conclusions to be drawn from this orchard are, 1st, that it is too small for the most economical production, and 2nd, that there is too high a valuation set per acre, causing an abnormal overhead cost.

A FIVE-YEAR STUDY ON A 138-ACRE APPLE RANCH.

At the present time this apple ranch consists of 94½ acres of orchard, 38 acres of waste land, and 5½ acres of land devoted to farmstead and poor meadow land. Fifteen-and-a-half acres of the land now planted to orchard were cleared and planted during 1910-11-12.

The orchard is divided into eleven blocks. The following table gives the age of trees, number of acres in each block of orchard, a summary of total acres in bearing orchard with weighted average age, and total acres of young orchard with weighted bearing age for each of the five years included in this report.

	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15
5½ a. Farmstead and poor meadow land						
38 a. waste land						
15½ a. timbered land cleared during 1910-11-12						
*Weighted average age of bearing orchard	11.9 yr.	10.3 yr.	9.6 yr.	9.2 yr.	10.2 yr.	11.2 yr.
Acres bearing orchard	29 a.	37 a.	57 a.	79 a.	79 a.	79 a.
*Weighted average age of young orchard	3.7 yr.	4.5 yr.	3.9 yr.	1.8 yr.	2.2 yr.	3.2 yr.
Acres young orchard	50 a.	42 a.	30 a.	11 a.	15½ a.	15½ a.
	Age Bearing	Age Bearing	Age Bearing	Age Bearing	Age Bearing	Age Bearing
Block 1—3 acres	25	26	27	28	29	30
Block 2—4 acres	16	17	18	19	20	21
Block 3—11 acres	8	9	10	11	12	13
Block 4—11 acres	5-9 Young	6-10	7-11	8-12	9-13	10-14
Block 5—8 acres	5	6 Young	7	8	9	10
Block 6—10 acres	4	5	6	7	8	9
Block 7—10 acres Pears	4	5	6 Young	7	8	9
Block 8—22 acres	3	4	5	6 Young	7 Young	8 Young
Block 9—8 acres		Planted	1	2	3	4
Block 10—3 acres Pears			Planted	1	2	3
Block 11—4½ acres				Planted	1	2

*Orchards 6 years and older considered bearing.

The soil on this ranch is of a volcanic ash formation, the land is well drained, and the orchard has had good care since it was purchased by the present owner in 1909.

The study of costs on this ranch has been especially interesting, since a complete set of double-entry books has been kept since 1909. Only the total costs for various operations were entered in the ledger, however, the owner not segregating the costs for individual blocks of trees. In our study of this ranch. we have endeavored accurately to estimate and divide the costs into three divisions; viz., Bearing Orchard, Young Orchard, and Other Land not planted to orchard; and, while it is true that only the total figures are the ones taken from the books, we believe that the estimates made under the different headings are close enough to the actual costs to serve as a very good guide for study.

In considering the segregation of the orchard with regard to bearing as compared with non-bearing trees, we took the segregation from the books of the owner. We wish to call attention to the fact, however, that there was considerable acreage of rather young trees in the so-called bearing blocks, trees from six to seven years of age. This has undoubtedly brought down the average yield of the bearing blocks. In future years these blocks will have reached heavy bearing and the average yields will be materially increased.

Undoubtedly the costs of developing and maintaining this orchard could be, and actually are being, materially lowered. During the first

few years too much live stock was kept throughout the year, and not enough forage or hay crops were grown for feeding this stock. The buildings, moreover, are of such a nature as to increase the overhead costs more than is necessary from a production point of view.

It will be noted in the report that the average valuation of the bearing orchard is much less an acre at the end of five years than at the time of purchase. This is due to the fact that there was a greater proportion of young orchard at the time of purchase than at the present time, and as this young orchard was valued at a much lower price an acre, this cost with that of maintenance until six years of age materially reduces the average valuation of the bearing orchard. This, of course, reduces the overhead charges of interest on valuation of bearing orchard and shows from an investment point of view in this particular case that those orchardists who have developed a portion of their land are able to place a lower valuation on their orchards than where highly developed orchards are purchased.

The following general notes on various orchard operations will be of interest and show in a general way some of the data used in determining estimates on costs. It should be remembered also that the present owner has been on this ranch for six years and should be competent to make such estimates as we have given in our reports.

Clearing. The total receipts from wood sold from clearing 15½ acres were very small. It should be noted, however, that all fire wood used on the ranch during the five years included in the report came from the clearing of this land.

Pruning. The entire orchard has been carefully pruned each year, the average price of pruning the young orchard being estimated at $1.50 an acre each year.

Spraying. None of the young orchard was sprayed except during 1909-10. The spraying the first year was done with Niagara gas sprayers, after which time gas engine power sprayers were used. Two nozzle men worked with each power sprayer and the manager usually kept watch over both machines to see that the engines were running properly and that the work was being done efficiently.

Thinning. It is interesting to note in the cost of thinning that the size of the crop harvested seemed to have no relation whatever to the total cost of thinning.

Picking. The charge under picking includes the wages of pickers and teamsters hauling to packing shed. However, no horse labor is included in this cost.

General Expenses. General expenses include such costs as fertilizers, hauling and spreading manure, repairs of various kinds not chargeable elsewhere, light, telephone, telegraph, horse shoeing, gasoline, small tools, miscellaneous harness and harness repairs, etc.

Barn Maintenance. All horse labor is charged to barn maintenance, there being no charge under any of the operations for this cost.

Cover crop seed, labor in planting and harvesting, are also charged to Barn Maintenance. This was done on account of the crop harvested being used in maintaining the barn, and no returns being credited to the orchard for the crop.

Cultivation. In the old orchard the soil is gone over two ways with a springtooth cultivator and then tilled sufficiently through the summer with an acme harrow to maintain a good mulch. To maintain this mulch, it is necessary to go over the ground about every fifteen to eighteen days during the summer until the middle of July.

In the young orchard the ground is plowed first, cultivated with a springtooth two ways, and in case of a heavy rain, disked three times.

After this, a good mulch is maintained in the same way as in the old orchard.

Manager's Salary. Since one of the purposes of this bulletin is the determination of costs of growing apples, a salary of $900.00 a year has been allowed for management of this orchard, the manager being the owner.

Interest and Taxes. While it is desirable to segregate the cost of the owner's home, taxes on this home, interest, etc. from the farm business, it was impracticable to do this in making a report of this ranch; since the costs for the owner's home and the hired man's home were totaled in the purchase, and it was impossible to segregate repairs for the two homes.

Varieties. The orchard consists of the following varieties by blocks:

Blocks 1 and 2, Ben Davis; Esopus (Spitzenberg); King; Black Twig; miscellaneous varieties; Ortley; Arkansas Black; Jonathan; Gravenstein; Geniton; Baldwin.

Block 3. Ortley; Esopus (Spitzenberg), and Newton.
Block 4. Esopus (Spitzenberg) and Newton evenly divided.
Block 5. Esopus (Spitzenberg) and Newton evenly divided.
Block 6. Esopus (Spitzenberg) and Newton evenly divided.
Block 7. Pears—Bartlett, Comice, and d'Anjou.
Block 8. Esopus (Spitzenberg) and Newton evenly divided.
Block 9. Esopus (Spitzenberg) and Newton evenly divided.
Block 10, Pears—Bartlett, Comice, and d'Anjou.
Block 11, Ortley and Newtown evenly divided.

Note: Trees of Arkansas Black and Jonathan varieties are scattered throughout the orchard for pollination purposes.

REPORT 1909-10.

Orchard. 29 A. Bearing, 50 A Young.	Total	Bearing Orchard Total	Bearing Orchard Acre	Young Orchard Total	Young Orchard Acre	Bal.
Land. Valuation of land at time of purchase, March, 1909. This does not include buildings, equipment or stock.	97,025.00	52,200	1800.00	35.000	700.00	9.825
Buildings. Valuation at time of purchase: 1 dwelling .....$2,400.00; 1 barn ..... 500.00; 1 apple house .... 500.00; Water tower .... 500.00; Wagon and tool shed ..... 400.00; Bldg. improvements made 1909-10 ..... 642.59	4,942.59	1,814.53	62.57	3,128.06	62.56	
Equipment. Valuation at time of purchase $1,325.00	1,799.00	660.40	22.77	1,138.60	22.77	

4 plows
2 disks
2 Acme harrows
1 springtooth harrow
1 spiketooth harrow
2 heavy wagons
1 light wagon
2 Niagara gas sprayers
20-200 lb. tubes for gas sprayer.
1 gas engine and air compressor
Misc'l picking and packing equipment
3 sets double harness
2 sets single harness.
Misc'l small tools and equipment

	Total	Bearing Orchard Total	Bearing Orchard Acre	Young Orchard Total	Young Orchard Acre
Equipment purchased 1909-1910 .....$474.00 1 saw horse.....20.00 1 saddle .....42.50 Pruning saws.. 2.50 1 bob sled.....53.75					
Stock. 1 saddle pony ..... 50.00 3 teams 1050.00	1,100.00	403.80	13.92	696.20	13.92
Growing Costs					
Barn Maintenance. Hay, grain and bedding—all purchased. An average of nine head of horses were carried through the entire year.	1,179.31	432.93	14.93	746.38	14.93
Maintenance.					
General expenses	704.39	258.56	8.916	445.83	8.916
Pruning	211.39	136.39	4.703	75.00	1.50
Spraying	289.87	239.27	8.25	50.00	1.00
(Entire orchard 1 time L. & S. Bearing orchard 4 arsenate sprays.)					
Cultivating	243.20	61.74	2.129	181.46	3.629
Thinning	53.95	53.95	1.86		
(Propping and tying included in general expense this year.)					
TOTAL	1,502.80	749.91	25.858	752.29	15.045

	Total	Bearing Orchard Total	Bearing Orchard Acre	Young Orchard Total	Young Orchard Acre
Overhead Costs					
Overhead Charges.					
Taxes--paid at time of purchase					
Insurance—paid at time of purchase					
Interest on investment—	6,331.99	3304.42	113.98	2397.77	47.955
Depreciation on bldgs.—	197.70	72.57	2.502	125.13	2.502
Depreciation on tools and implements.....	132.50	48.64	1.677	83.86	1.677
Manager's salary	900.00	330.38	11.392	569.62	11.392
TOTAL	7,562.19	3756.01	129.551	3176.38	63.526

Handling Costs	Total	Acre	Box
Number of packed boxes of apples	963	33.2	1
Handling, from tree to warehouse:			
Picking	80.90	2.75	.0829
Grading and wiping	49.34	1.72	.0513
Packing	47.50	1.64	.0493
Paper	48.15	1.66	.05
Boxes--made up	105.93	3.65	.11
Hauling to shipping station	3.21	.12	.003 1-3
Freight to warehouse.....	24.07	.84	.02499
TOTAL.....	359.10	12.38	.3715
From warehouse.			
Warehouse and storage charges	67.41	2.32	.07
Selling costs	96.30	3.32	.10
TOTAL.....	163.71	5.64	.17
Total Handling Costs	522.81	18.02	.5415
Gross Receipts			
963 boxes of apples.....	1,818.27	66.13	1.9919

Land Summary	Total	Bearing Orchard Total	Bearing Orchard Acre	Young Orchard Total	Young Orchard Acre	
Bearing Orchard.						
No acres in bearing at beginning of year	29					
Valuation at beginning of year	52,200.00	52,200.00	1800.00			
No. acres coming into bearing at end of year	8					
Valuation at beginning of year	5,600.00	5,600.00	700.00			
Expenditures on development and operation	239.80	239.80	29.975			
Total valuation of orchard coming into bearing	5,839.80	5,849.80	729.975			
Total number of acres bearing orchard at end of year	37					
Valuation at end of year	58,039.80	58,039.80	1568.64			
Young Orchard.						
No. acres young orchard at beginning of year	50					
Valuation at beginning of year	35,000.00			35,000.00	700.00	
Expenditures on development and operation	1,498.67			1,498.67	29,975	
Total valuation	36,498.67			36,498.67	729.975	
No. acres of young orchard coming into bearing at end of year	8					
Valuation of young orchard coming into bearing	5,839.80	5,839.80	729.975			
Total number of acres of young orchard at close of year	42					
Valuation of young orchard at close of year	30,658.95			30,658.95	729.975	

	Total	Bearing Orchard Total	Bearing Orchard Acre	Young Orchard Total	Young Orchard Acre	Bal.
Other Land not planted to Orchard	9,825					
Total No. of acres	59					
Valuation	9,825					
SUMMARY						
Working Basis for Succeeding Year.						
Capital.						
Valuation of ranch without buildings and equipment	98523.75	58039.80	1568.64	30658.95	729.975	9825
Valuation of buildings less depreciation	4744.89	1741.95	60.70	3002.94	60.06	
Valuation of stock	1100.00	403.80	13.92	696.20	13.92	
Valuation of equipment less depreciation	1666.50	604.41	20.84	1062.09	20.84	
Expenditures on development and operation.						
Barn maintenance	1179.31	432.93	14.93	746.38	14.93	
Maintenance	1502.80	749.91	25.858	742.29	15.045	
Overhead costs	7562.19	3756.01	129.551	3176.38	63.856	
Handling costs	522.81	522.81	18.02			
TOTAL	10767.11	5461.66	188.359	4665.05	93.831	
Receipts.						
Gross receipts from sale of apples		1818.27	66.13			
Total expenditures on Bearing Orchard		5461.66	188.359			
Net liability from Bearing Orchard		3643.39	122.229			

	Total	Bearing Orchard Total	Bearing Orchard Acre	Young Orchard Total	Young Orchard Acre	Other Land
Orchard.-- 37 A. Bearing, 42 A. Young						
Buildings.	1783.46	835.30	22.575	948.16	22.575	
Apple house.....$1600.00 Small buildings, painting and repairs on buildings 183.46						
Equipment.	587.81	275.30	7.4406	312.51	7.4406	
4 ladders.....$13.50 7 ladders..... 17.50 3 box hatchets..... 3.00 1 mattress for extra man ..... 5.25 Rubber stamps for apple boxes 9.35 Truck for apple house ..... 5.80 Wagon cover ..... 4.75 1 wagon .....141.90 Trucks for apple house ..... 28.50 1 orchard truck.... 20.00 2 picking ladders 6.22 Cots for packers.. 34.50 Picking buckets.... 21.75 Blankets ..... 12.00 1 manure spreader .....125.00 Hose for sprayer.. 9.35 Remodeling sprayer ..... 48.20 Ram (Pump)..... 22.00 1 Seven Day Clock thermometer ..... 40.00 1 grafting pot..... 5.00 Miscellaneous small tools, etc.. 14.20						
Stock.						
1 driving horse	145.00	67.91	1.8354	77.09	1.8354	
Improvements.	363.82					363.82
Clearing and planting 8 acres of land.						
Clearing and planting, not including team work .....$453.71 Nursery stock.... 86.40						
540.11						
Less cash received for wood 176.29						
Growing Costs						
Barn Maintenance.	1216.96	569.98	15.404	646.98	15.404	
Hay, grain, and bedding—all purchased An average of ten horses was carried through the year on this feed.						

Maintenance.					
General expense	768.06	359.73	9.722	408.33	9.722
Pruning	682.40	619.40	16.74	63.00	1.50
Spraying	650.58	422.30	11.413	228.28	11.413
Entire orchard sprayed one time with L. & S. and one time with Bordeaux. Bearing Orchard sprayed two times with arsenate—57 A. sprayed all 5 years and older.					
Cultivation	322.01	121.28	3.278	200.72	4.778
Tying and propping	227.93	227.93	6.16		
Thinning	384.04	384.04	10.38		
TOTAL	3035.02	2134.68	57.693	900.33	27.413
Overhead Costs					
Overhead charges.					
Taxes	340.10	159.29	4.305	180.81	4.305
Insurance	75.00	35.13	.9493	39.87	.9493
Interest on investment—	5772.61	3647.40	98.578	2125.21	50.60
Depreciation on bldgs.—	261.13	103.09	2.784	158.04	3.762
Depreciation on equipment	225.43	87.97	2.377	137.46	3.272
Manager's salary	900.00	421.52	11.392	478.48	11.329
TOTAL	7574.27	4454.40	120.3853	3119.87	74.2803

Handling Costs	Total	Bearing Orchard Acre	Box One
Number of packed boxes of apples	12,171	328.9	
Handling from tree to warehouse.			
Picking	612.40	16.54	.0503
Grading and wiping	866.25	23.42	.0712
Paper	608.55	16.45	.05
Boxes made up	1338.81	36.18	.11
Packing	1016.91	27.46	.0835
Hauling to shipping station	63.58	1.71	.0052
Freight to warehouse	304.28	8.22	.025
TOTAL	4810.78	129.98	.8452
Handling from warehouse.			
Warehouse and storage charges	851.97	23.02	.07
Selling cost	1217.10	32.89	.10
TOTAL	2069.07	55.91	.17
Total handling cost	6,879.85	185.89	1.0152
Gross receipts.			
12,171 boxes of apples	16410.80	444.16	1.348

Land Summary	Total	Bearing Orchard Total	Bearing Orchard Acre	Young Orchard Total	Young Orchard Acre
Bearing Orchard.					
No. acres in bearing at beginning of year	37				
Valuation at beginning of year	58039.80	58039.80	1568.64		
No. acres coming into bearing at end of year	20				
Valuation at beginning of year	14599.50	14599.50	729.975		
Expenditures on development and operation	856.34	856.34	42.817		
Total valuation of orchard coming into bearing	15455.84	15455.84	772.792		
Total number of acres bearing orchard at end of year	57				
Valuation at end of year	73495.64	73495.64	1289.40		

Young Orchard.						
No. acres young orchard at beginning of year	42					
Valuation at beginning of year	30658.95			30658.95	729|975	
Expenditures on development and operation	1798.31			1798.31	42.817	
Total valuation	32457.26			32457.26	772.792	
No. acres of New Plantings	8					
Valuation of land before planting	2800.00			2800.00	350.00	
Cost of clearing and planting	363.82			363.82	45.48	
No. acres of young orchard coming into bearing at end of year	20					
Valuation of Young Orchard coming into bearing	15455.84	15455.84	772.792			
Total number of acres of young orchard at close of year	30					
Valuation of young orchard at close of year	20165.24			20165.24	672.17	
Other Land not Planted to Orchard	7025.					
Total number of acres	51					
Valuation	7025.					

Summary Working Basis for Succeeding Year.	Total	Bearing Orchard Total	Bearing Orchard Acre	Young Orchard Total	Young Orchard Acre	Bal.
Capital.						
Valuation of ranch without buildings and equipment	100,685.88	73,495.64	1289.40	20,165.24	672.17	7025.00
Valuation of buildings less depreciation	6,267.22	4,106.11	72.04	2,161.11	72.04	
Valuation of stock	1,245.00	815.69	14.31	429.31	14.31	
Valuation of equipment less depreciation	2,028.88	1,329.26	23.32	699.62	23.32	
Expenditures on development and operation.						
Barn maintenance	1,216.96	569.98	15.404	646.98	15.404	
Maintenance	3,035.02	2,134.68	57.693	900.33	27.413	
Overhead costs	7,574.27	4,454.40	120.385	3,119.87	74.2803	
Handling costs	6,879.85	6,879.85	185.89			
TOTAL	18,706.10	14,038.91	379.374	4,667.18	117.0973	
Investment—Land.						
Clearing and planting of land	363.82			363.82	45.48	
Receipts.						
Gross receipts from sale of apples	16,410.80	16,410.80	443.54			
Total expenditures on Bearing Orchard	14,038.91	14,038.91	379.43			
Net receipts from Bearing Orchard	2,371.89	2,371.89	64.11			

REPORT FOR 1911-12.

Orchard.—57 A. bearing, 30 A. young 87 A.	Total	Bearing Orchard		Young Orchard	
Buildings.	500.92	328.19	5.757	172.73	5.757
General improvements on buildings, repairs and small buildings erected —mainly extensions on buildings.					

Equipment.	233.10	152.72	2.679	80.38	2.679
Filler pump for sprayer $27.00					
Harness 25.00					
Acme harrow improvement 38.30					
Paper trays for packers 3.00					
Grading machine..100.00					
2 spray rods, etc.. 9.80					
Misc'l small tools, etc. 30.00					
Improvements.					
Clearing and planting 3 acres of land	210.00				
Stock.					
1 saddle pony	60.00				

Growing Costs.		Bearing Orchard		Young Orchard	
	Total	Total	Acre	Total	Acre
Barn Maintenance.	1,173.87	767.78	13.47	404.10	13.47
Hay, grain and bedding. An average of 11 horses were carried through the year.					
General Maintenance.					
General Expenses	947.27	620.63	10.888	326.64	10.888
Pruning — winter and summer	431.88	386.88	6.787	45.00	1.50
Spraying	376.54	376.54	6.606		
3 arsenate and 2 L. & S. bearing orchard only					
Cultivation	286.89	158.48	2.78	128.41	4.28
Tying and Propping	328.48	328.48	5.763		
Thinning	182.66	182.66	3.204		
TOTAL....	2,553.72	2,053.67	36.027	505.05	16.668

Overhead Costs.		Bearing Orchard		Young Orchard	
Overhead Charges.	Total	Total	Acre	Total	Acre
Taxes	869.10	569.43	9.99	299.67	9.99
Insurance	75.00	49.14	.862	25.86	.862
Interest on investment....	7,576.80	4,333.06	76.0186	2,280.56	76.0186
Depreciation on buildings	250.69	163.25	2.8815	87.44	2.8815
Depreciation on equipment	202.89	132.91	2.332	69.98	2.332
Manager's salary	900.00	589.65	10.3448	310.35	10.3448
TOTAL....	9,874.48	5,837.44	102.4289	3,073.86	102.4289

Handling Costs.		Bearing Apple Orchard	
	Total	Acre	Box
Number of bushels of apples	7,706 bu.	164	One
Number of acres bearing apple orchard	47		
Handling from tree to warehouse.			
Picking	482.57	10.267	.0626
Grading and wiping....	866.25	18,431	.1124
Paper	385.30	8.198	.0500
Boxes- made up	847.66	18.034	.1100
Packing	646.11	13.744	.0838
Hauling to shipping station	25.68	.546	.0033
Freight to warehouse....	192.65	4.099	.0250
TOTAL....	3,446.22	73.319	.4471
Cost from warehouse.			
Warehouse and storage....	539.42	11.48	.0700
Selling costs	770.60	16.40	.1000
TOTAL....	1,310.02	27.88	.1700
Total handling costs....	4,756.24	101.199	.6171
Crop Returns.			
7,706 boxes of apples....	13,321.67	285.567	1.7157
1,300 boxes of pears—handling costs deducted....	893.98		
10 acres bearing pear orchard			

Land Summary.		Bearing Orchard		Young Orchard	
Bearing Orchard.	Total	Total	Acre	Total	Acre
No. acres in bearing at beginning of year	57				
Valuation at beginning of year	79,746.70	79,746.70	1,399.07		
No. acres coming into bearing at end of year	22				
Valuation at beginning of year	17,001.42	17,001.42	772.79		
Expenditures on development and operation	2,916.47	2,916.47	132.5669		
Total valuation of orchard coming into bearing	19,917.89	19,917.89	905.3569		
Total number of acres bearing orchard at end of year	79				
Valuation at end of year	99,664.59	99,664.59	1,261.578		
Young Orchard.					
No. acres young orchard at beginning of year	30				
Valuation at beginning of year	23,183.70			23,183.70	772.79
Expenditures on development and operation	3,977.01			3,977.01	132.5669
Total valuation	27,160.71			27,160.71	905.3569
No. acres of new plantings	3				
Valuation of land before planting	1,050.00			1,050.00	350.00
Cost of clearing and planting	210.00			210.00	70.00
No. of acres of young orchard coming into bearing at end of year	22				
Valuation of young orchard coming into bearing	19,917.89			19,917.89	905.3569
Total number of acres of young orchard at close of year	11				
Valuation of young orchard at close of year	9,958.93			9,958.93	905.36
Other land not planted to orchard.					
Total number of acres	48				
Valuation	6075				

Summary. Working Basis for Succeeding Year.		Bearing Orchard		Young Orchard		
Capital.	Total	Total	Acre	Total	Acre	Bal.
Valuation of ranch without buildings and equipment	116398.52	99664.59	1261.578	9958.93	905.36	7025
Valuation of buildings less depreciation	6517.45	4702.44	82.499	1815.01	82.499	
Valuation of stock	1305.00	941.53	16.518	353.47	16.518	
Valuation of equipment less depreciation	2059.09	1485.65	26.064	573.44	26.064	
Expenditures on development and operation.						
Barn Maintenance	1173.87	767.78	13.47	404.10	13.47	
Maintenance	2553.72	2053.67	36.027	505.05	16.668	
Overhead costs	9874.48	7124.60	124.993	2749.88	124.993	
Handling costs	4756.24	4756.24	81.689			
TOTAL	18358.31	14702.29	256.179	3659.03	155.131	
Improvement—Land clearing and planting of land	210.00			210.00	70.00	
Receipts.						
Gross receipts from sale of apples 47 a	13321.67	13321.67	285.567			
Gross receipts from sale of pears 10 a	893.98	893.98	89.398			
Total gross receipts from sale of fruit, 57 a	14215.65	14215.65	249.396			
Total expenditure on bearing orchard	14702.29	14702.29				
Net liability from bearing orchard	486.64	486.64	8.537			

REPORT FOR 1912-13.

Orchard.—79 A. bearing 11 A. Young	Total	Bearing Orchard Total	Bearing Orchard Acre	Young Orchard Total	Young Orchard Acre
Total, 90 A.					
Buildings.	1735.95	1523.76	19.288	212.19	19.288
Remodeling manager's home and tenant house, repairs on buildings, etc.					
Equipment.	470.91	413.31	5.232	57.60	5.232
Replacing pump and worn parts of sprayer..... 20.75					
Hose and Acme teeth 21.00					
Gas engine cylinder head 18.00					
New sprayer.....385.00					
Hose 3.35					
2 box racks 8.81					
3000 lb. springs.... 9.00					
1 Falknor harrow 50.00					
Total purchases 515.91					
Credit to sale of Grading machine.. 45.00					
Improvements.					
Clearing and planting 4½ acres land.....302.85					
Stock.					
Purchase of 1 heavy work horse 175.00					
Credit					
Sale of one team..395.00					
Loss of one saddle pony 60.00					
Growing Costs.					
Barn Maintenance.	1272.43	1116.90	14.138	155.52	14.138
Hay, grain, and bedding. 7 horses were carried through the year.					
General Maintenance.					
General expenses	585.43	513.88	6.504	71.55	6.504
Pruning	280.54	264.04	3.342	16.50	1.50
Spraying	612.82	612.82	7.757		
Bearing trees sprayed 3 times with arsenate, 2 times with L. & S. and 1 time with Bordeaux					
Cultivation	452.40	382.62	4.843	69.78	6.343
Tying and propping.....	519.03	519.03	6.57		
Thinning	165.00	165.00	2.088		
TOTAL.....	2,615.22	2457.39	31.104	157.83	14.347

Overhead Costs.	Total	Bearing Orchard. Total	Bearing Orchard. Acre	Young Orchard. Total	Young Orchard. Acre
Overhead Charges.					
Taxes	825.10	724.26	9.168	100.84	9.168
Insurance	75.00	65.85	.833	9.15	.833
Interest on investment—	8,207.72	7,204.55	91.197	1,003.17	91.197
Depreciation on bldgs.—	330.14	289.79	3.668	40.35	3.668
Depreciation on equipment.....	253.00	202.07	2.811	30.93	2.811
Manager's salary	900.00	790.00	10.00	110.00	10.00
TOTAL.....	10,590.96	9,276.52	116.677	1294.44	116.677

Handling Costs.	Total	Bearing Orchard Acre	Box
Number of boxes of apples	13,327	194.6	One
Apple orchard bearing	69	One	
The crop for this year was handled cooperatively with a number of other growers and was stored in a cooperative shed at shipping station.			
Handling from tree to warehouse.			
Picking—incl. hauling to cooperative packing shed	1,218.75	17.663	.0922
Grading, packing, and paper	1,999.05	19.190	.1500
Box—made up	1,465.97	21.406	.1100
TOTAL	4,683.77	58.259	.3522
Cost from warehouse.			
Warehouse and storage costs	922.89	13.620	.0700
Selling costs	1,332.70	19.46	.1000
Total	2,255.59	33.08	.1700
Total cost handling	6,930.36	91.339	.5222
Gross Receipts.			
13,227 boxes of apples	10,311.59	149.442	.7737
1,685 boxes pears—net from shippers' assoc.	1,406.14	140.613	.8345
10 acres pears.			

Land Summary.	Total	Bearing Orchard. Total	Acre	Young Orchard. Total	Acre
Bearing Orchard.					
No acres in bearing	79				
Valuation	99,664.59	99.664.59	1,261.578		
Young Orchard.					
No acres young orchard at beginning of year	11				
Valuation at beginning of year	11,341.44			11,341.44	1,031.04
No acres of new plantings	4.5				
Valuation of land before planting	1,575.00			1,575.00	350.00
Cost of clearing and planting	302.85			302.85	67.30
Total No. acres young orchard at close of year	15.5				
Valuation of young orchard at close of year	13,219.29			13,219.29	852.86
Other land not planted to orchard	4500				
Total No. acres	43.5				
Valuation	4500.00				

Summary.

Working basis for succeeding year. Capital.	Total	Bearing Orchard. Total	Acre	Young Orchard. Total	Acre	Bal.
Valuation of ranch without buildings and equipment	125,570.06	106,794.21	1,351.925	12,700.85	1,154.622	6075
Valuation of buildings less depreciation	7,923.26	6,954.86	88.036	968.40	88.036	
Valuation of stock	1,025.00	899.72	11.389	125.28	11.389	
Valuation of equipment less depreciation	2,277.00	1,998.70	25.30	278.30	25.30	
Expenditures on Development and operation.						
Barn maintenance	1,272.43	1,116.90	14.138	155.52	14.138	
Maintenance	2,615.22	2,457.39	31.104	157.83	14.347	
Overhead costs	10,590.96	9,276.52	116.677	1,294.44	116.677	
Handling costs	6.939.36	6,939.36	91.339			
TOTAL	21.417.97	19,790.17	236.501	1,607.79	145.162	
Improvement -Land.						
Clearing and planting of land	302.85			302.85	67.30	
Receipts.						
Gross receipts from sale of apples	10,311.59	10,311.59	149.442			
Gross receipts from sale of pears	1,406.14	1,406.14	140.613			
Total gross receipts from sale of fruit	11,717.73	11.717.73	148.325			
Total expenditures on bearing orchard	19,790.17	19,790.17				
Net liability from bearing orchard	8,072.44	8,072.44	102.182			

REPORT FOR 1913-14.

Orchard—79 A. bearing; 15½ A. young	Total	Bearing Orchard. Total	Acre	Young Orchard. Total	Acre
Buildings.	1,525.18	1,275.04	16.14	250.14	16.14
Balance of bills on remodeling manager's home, tenant house, repairs and extensions on other buildings.					
Equipment.	122.77	102.68	1.30	20.09	1.30
Pump for water....$65.00					
Miscl. equipment.. 72.77					
137.77					
Credit.					
To sale of miscl. equipment 15.00					

Growing Costs.	Total	Bearing Orchard. Total	Acre	Young Orchard. Total	Acre
Barn Maintenance. 122.05		102.45	1.29	19.60	1.29
Hay, grain and bedding.					
It should be noted that the cost of hay, grain and bedding is very much lower this year than on any previous year. This is on account of much less grain being fed and the raising of a large portion of the hay necessary. This hay was raised in the orchard.					
Seven horses were carried through the year.					
General Maintenance.					
General expenses	490.45	410.13	5.168	80.31	5.168
Pruning	488.40	465.15	5.888	23.25	1.500
Spraying	415.08	415.08	5.254		
Bearing orchard was sprayed three times with arsenate and twice with lime-sulphur.					
Cultivation	229.32	172.44	2.182	56.88	3.67
Propping	88.76	88.76	1.123		
Thinning	351.00	351.00	4.444		
Planting—resetting	48.00			48.00	3.097
TOTAL.....	2,111.01	1,902.56	24.059	208.44	13.435

Handling Costs.	Bearing apple orchard. Total	Acre	Box
Number of boxes of apples.....	16,636	241.1	One
No. acres bearing orchard	69	One	
Handling from tree to warehouse.			
The crop for this year was handled cooperatively with a number of other growers and was stored in cooperative shed at shipping station.			
Cost of picking, including hauling to cooperative packing shed	1,231.59	17.84	.074
Cost of cooperative grading, packing, and paper.....	2,495.40	36.17	.1500
Box made up	1,829.96	26.52	.1100
TOTAL.....	5,556.95	80.53	.334
Cost from warehouse.			
Warehouse and storage charges	1,164.52	16.88	.07
Selling costs	1,663.60	24.11	.10
TOTAL.....	2,828.12	40.99	.17
Total handling costs	8,385.07	121.52	.504
Receipts.			
16,636 boxes of apples	21,510.64	311.74	1.293
1,360 boxes of pears—net from selling association packing and selling costs deducted	1,257.49	125.664	.924
10 acres bearing pears.			

Overhead Costs.	Total	Bearing Orchard. Total	Bearing Orchard. Acre	Young Orchard. Total	Young Orchard. Acre
Taxes	876.21	732.49	9.272	143.72	9.272
Insurance	75.00	62.65	.793	12.35	.793
Interest on investment	8,207.72	6,861.47	86.854	1,346.25	86.854
Depreciation on bldgs.	377.94	317.00	4.00	60.94	4.00
Depreciation on equipment	239.98	200.58	2.539	39.40	2.539
Manager's salary	900.00	752.38	9.524	147.62	9.524
TOTAL	10,676.85	8,926.57	112.982	1,750.28	112.982

Land Summary.	Total	Bearing Orchard. Total	Bearing Orchard. Acre	Young Orchard. Total	Young Orchard. Acre
Bearing Orchard.					
No. acres in bearing	79				
Valuation	99,664.59	99,664.59	1,261.578		
Young Orchard.					
No. acres young orchard at beginning of year	15.5				
Valuation at beginning of year	13,219.29			13,219.29	852.86
Expenditures on development and operation	1,978.32			1,978.32	127.707
Total valuation	15,197.61			15,197.61	980.567
Total No. acres of young orchard at close of year	15.5				
Valuation of young orchard at close of year	15,197.61			15,197.61	980.567
Other land not planted to orchard	4,500				
Total No. of acres	43.5				
Valuation	4,500				

Summary. Working basis for succeeding year.	Total	Bearing Orchard Total	Bearing Orchard Acre	Young Orchard Total	Young Orchard Acre	Bal.
Capital.						
Valuation of ranch without buildings and equipment	177,383.88	99,664.59	1,261.578	13,219.29	852.86	4,500
Valuation of buildings less depreciation	9,070.50	7,582.42	95.98	1,488.08	95.98	
Valuation of stock	1,025.00	856.83	10.846	168.17	10.846	
Valuation of equipment less depreciation	2,159.79	1,805.15	22.85	354.64	22.85	
Expenditures on Development and operation.						
Barn maintenance	122.05	102.45	1.29	19.60	1.29	
Maintenance	2,111.01	1,902.56	24.059	208.44	13.435	
Overhead costs	10,676.85	8,926.57	112.982	1,750.28	112.982	
Handling costs	8,385.07	8,385.07	121.52			
TOTAL	21,294.98	19,438.67	259.851	1,978.32	127.707	
Gross receipts from sale of apples	21,510.64	21,510.64	311.74			
Gross receipts from sale of pears	1,257.49	1,257.49	125.664			
Total gross receipts from sale of fruit	22,768.13	22,768.13	288.204			
Total expenditures on bearing orchard	19,438.67	19,438.67				
Net receipts from bearing orchard	3,329.46	3,329.46	42.145			