

*Cost of Producing*

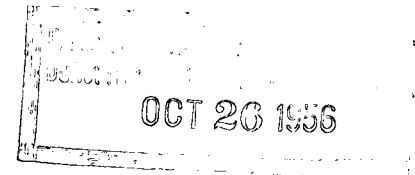
# **Apples and Pears**

*in the Hood River Valley, Oregon*

**PROGRESS REPORT IX**

**D. Curtis Mumford**

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### PROGRESS REPORT IX

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This report is a summary of detailed cost records kept on 24 fruit farms in the Hood River Valley for the year 1955 with comparable data for the 9-year period 1947-55. The cost of production includes all items of expense incurred in producing and delivering the crop to the door of the packing house or processing plant. No packing house costs are included.

### Apple Production Costs

The cost of producing apples in 1955 on 22 orchards averaged \$0.99 per loose box and \$1.60 per packed-box basis, exclusive of packing and storage costs (table 1). Assuming packing and handling charges (from \$1.25 to \$1.50\*), the total f.o.b. cost would be \$2.85 or more per packed box.

Table 1. APPLES: Cost of Production  
(Does not include cost of storage, boxes, packing, and shipping)

Item	Year 1955	Nine-year average 1947-1955	Distribution of costs
Number of orchards in study.....	22	-	-
Acreage of apples per orchard.....	12.5	-	-
Yield per acre, loose boxes.....	552	582	-
Yield per acre, packed boxes.....	343	357	-
Costs per loose box for:	<u>Dollars</u>	<u>Dollars</u>	<u>Per cent</u>
Preharvest labor.....	.31	.27	31.0
Picking.....	.14	.13	15.0
Other harvest.....	.07	.06	6.9
Total labor.....	.52	.46	52.9
Materials.....	.16	.13	14.9
General expense.....	.16	.14	16.1
Depreciation on equipment.....	.06	.05	5.8
Interest on investment (5 per cent)....	.09	.09	10.3
Total cost per loose box.....	.99	.87	100.0
Cost per packed-box basis.....	1.60	1.41	-

\* The cost of sorting and handling all apples delivered to the packing house is charged against the packed fruit, which usually comprises from 60 to 85 per cent (by weight) of fruit delivered.

Table 2. APPLE PRODUCTION COSTS  
(Does not include cost of storage, boxes, packing, and shipping)

Item	Man hours		Cost	
	1955	1947-1955	1955	1947-1955
<b>Labor per acre</b>				
Pruning .....	42.4	34.1	\$ 45.57	\$ 34.30
Brush removal .....	3.9	4.5	4.26	4.50
Hand cultivating .....	2.1	1.9	2.15	1.80
Machine cultivating .....	4.6	3.9	5.48	4.24
Fertilizing; mowing .....	2.4	2.0	2.59	2.12
Irrigating .....	9.4	11.7	10.73	12.48
Spraying .....	7.2	9.6	8.22	10.24
Thinning .....	53.9	43.0	55.52	40.12
Propping; cleanup .....	6.7	7.1	7.07	7.28
Maintenance .....	18.9	23.1	22.27	25.55
Supervision .....	6.5	8.8	8.73	11.87
<b>Total preharvest .....</b>	<b>158.0</b>	<b>149.7</b>	<b>\$172.59</b>	<b>\$154.50</b>
Picking .....	81.4	87.1	\$ 77.77	\$ 75.28
Other harvested .....	34.2	30.7	38.04	34.08
<b>Total labor .....</b>	<b>273.6</b>	<b>267.5</b>	<b>\$288.40</b>	<b>\$263.86</b>
<b>Materials per acre</b>				
Fertilizers .....			\$ 15.61	\$ 14.40
Irrigation water .....			6.77	6.09
Sprays .....			49.38	41.13
Miscellaneous supplies .....			19.30	12.51
<b>Total materials .....</b>			<b>\$ 91.06</b>	<b>\$ 74.13</b>
<b>General expense per acre</b>				
Building repair .....			\$ 4.45	\$ 4.50
Machinery repair .....			15.89	10.39
Machine hire .....			5.35	6.45
Gas and oil .....			16.45	13.24
Electricity; water; wood fuel; office .....			8.54	8.21
Liability, fire, and motor insurance .....			7.02	7.66
Property taxes .....			19.70	16.50
Cash to operate .....			10.00	10.00
<b>Total general expense .....</b>			<b>\$ 87.40</b>	<b>\$ 76.95</b>
<b>Depreciation per acre</b>				
Buildings (not including operator's dwelling) .....			\$ 9.37	\$ 9.68
Machinery .....			24.18	21.31
<b>Total depreciation .....</b>			<b>\$ 33.55</b>	<b>\$ 30.99</b>
<b>Interest per acre (5 per cent)</b>				
Buildings .....			\$ 7.54	\$ 8.04
Machinery .....			9.44	9.80
Orchard .....			30.62	30.04
<b>Total interest .....</b>			<b>\$ 47.60</b>	<b>\$ 47.88</b>
<b>Total cost per acre .....</b>			<b>\$548.01</b>	<b>\$493.81</b>
<b>Cost per loose box .....</b>			<b>\$ .99</b>	<b>\$ .87</b>
<b>Cost per packed box .....</b>			<b>\$ 1.60</b>	<b>\$ 1.41</b>
<b>Acres per orchard .....</b>			<b>12.5</b>	<b>15.1</b>
<b>Loose boxes produced per acre .....</b>			<b>552</b>	<b>582</b>
<b>Packed boxes produced per acre .....</b>			<b>343</b>	<b>357</b>

## Pear Production Costs

### ► Winter pears

The cost of producing winter pears in 1955 on 24 orchards averaged \$1.23 per lug box and \$1.36 per packed-box basis, exclusive of packing and storage costs (table 3). Assuming packing and handling charges (from \$1.25 to \$1.50), the total f. o. b. cost would be \$2.61 or more per packed box.

Table 3. WINTER PEARS: Cost of Production  
(Does not include cost of storage, boxes, packing, and shipping)

Item	Year 1955	Nine-year average 1947-1955	Distribution of costs
Number of orchards in the study.....	24	-	-
Acreage of winter pears per orchard..	7.8	-	-
Yield per acre, loose-lug boxes.....	367	450	-
Yield per acre, packed boxes.....	331	397	-
<b>Costs per loose-lug box for:</b>	<u>Dollars</u>	<u>Dollars</u>	<u>Per cent</u>
Preharvest labor.....	.29	.28	26.2
Picking.....	.15	.13	12.2
Other harvest.....	.07	.07	6.5
Total labor.....	.51	.48	44.9
Materials.....	.24	.19	17.7
General expense.....	.25	.19	17.8
Depreciation on equipment.....	.10	.08	7.5
Interest on investment (5 per cent).	.13	.13	12.1
Total cost per loose-lug box...	1.23	1.07	100.0
Cost per packed-box basis.....	1.36	1.20	-

### ► Bartlett (cannery) pears

The cost of producing cannery pears in 1955 on 24 orchards averaged \$1.60 per lug box and \$72.31 per ton (table 4). See table 6 for itemized costs.

Table 4. BARTLETT CANNERY PEARS: Cost of Production  
(Includes all costs, delivered to the cannery door)

Item	Year 1955	Nine-year average 1947-1955	Distribution of costs
Number of orchards in the study.....	24	-	-
Acreage bearing pears per orchard..	5.6	-	-
Yield per acre, loose-lug boxes.....	312	300	-
Yield per acre, tons.....	6.9	6.7	-
<b>Costs per loose-lug box for:</b>	<u>Dollars</u>	<u>Dollars</u>	<u>Per cent</u>
Preharvest labor.....	.55	.51	33.3
Picking.....	.13	.12	7.8
Other harvest.....	.07	.07	4.6
Total labor.....	.75	.70	45.7
Materials.....	.31	.26	17.0
General expense.....	.28	.28	18.3
Depreciation on equipment.....	.11	.11	7.2
Interest on investment (5 per cent)	.15	.18	11.8
Total cost per loose-lug box...	1.60	1.53	100.0
Cost per ton.....	72.31	68.15	-

Table 5. WINTER PEAR PRODUCTION COSTS  
(Does not include cost of storage, boxes, packing, and shipping)

Item	Man hours		Cost	
	1955	1947-1955	1955	1947-1955
<b>Labor per acre</b>				
Pruning.....	37.9	42.1	\$ 41.58	\$ 42.90
Brush removal.....	2.7	3.8	2.96	3.84
Hand cultivating.....	.9	1.5	.93	1.42
Machine cultivating.....	4.0	3.4	4.70	3.68
Fertilizing; mowing.....	2.6	2.2	3.07	2.37
Irrigating.....	8.7	10.2	9.97	10.82
Spraying.....	4.8	7.7	5.58	8.43
Thinning.....	-	.3	-	.31
Propping; cleanup.....	5.3	6.1	5.80	6.11
Maintenance.....	19.3	22.2	23.36	25.02
Supervision.....	6.3	8.9	8.00	11.92
<b>Total preharvest.....</b>	<b>92.5</b>	<b>108.4</b>	<b>\$105.95</b>	<b>\$116.82</b>
Picking.....	58.0	69.1	\$ 55.53	\$ 59.90
Other harvest.....	23.1	25.0	26.02	27.59
<b>Total labor.....</b>	<b>173.6</b>	<b>202.5</b>	<b>\$187.50</b>	<b>\$204.31</b>
<b>Materials per acre</b>				
Fertilizers.....			\$ 15.27	\$ 14.86
Irrigation water.....			6.72	6.04
Sprays.....			46.08	41.33
Miscellaneous supplies.....			21.54	15.90
<b>Total materials.....</b>			<b>\$ 89.61</b>	<b>\$ 78.13</b>
<b>General expense per acre</b>				
Building repair.....			\$ 4.20	\$ 4.91
Machinery repair.....			13.12	10.93
Machine hire.....			3.58	5.58
Gas and oil.....			19.51	15.59
Electricity; water; wood fuel; office.....			9.51	8.74
Liability, fire and motor insurance.....			9.07	8.32
Property taxes.....			20.82	17.06
Cash to operate.....			10.00	10.00
<b>Total general expense.....</b>			<b>\$ 89.81</b>	<b>\$ 81.13</b>
<b>Depreciation per acre</b>				
Buildings (not including operator's dwelling).....			\$ 10.64	\$ 10.59
Machinery.....			25.12	23.55
<b>Total depreciation.....</b>			<b>\$ 35.76</b>	<b>\$ 34.14</b>
<b>Interest per acre (5 per cent)</b>				
Buildings.....			\$ 7.06	\$ 8.29
Machinery.....			9.40	10.58
Orchard.....			31.72	36.86
<b>Total interest.....</b>			<b>\$ 48.18</b>	<b>\$ 55.73</b>
<b>Total cost per acre.....</b>			<b>\$450.86</b>	<b>\$453.44</b>
<b>Cost per loose box.....</b>			<b>\$ 1.23</b>	<b>\$ 1.07</b>
<b>Cost per packed box.....</b>			<b>1.36</b>	<b>1.20</b>
<b>Acres per orchard.....</b>			<b>7.8</b>	<b>10.1</b>
<b>Loose-lug boxes produced per acre.....</b>			<b>367</b>	<b>450</b>
<b>Packed boxes produced per acre.....</b>			<b>331</b>	<b>397</b>

Table 6. BARTLETT PEAR PRODUCTION COSTS  
(Includes all costs delivered to the cannery door)

Item	Man hours		Cost	
	1955	1947-1955	1955	1947-1955
<b>Labor per acre</b>				
Pruning.....	36.0	31.8	\$ 38.66	\$ 32.75
Brush removal.....	2.3	3.2	2.48	3.17
Hand cultivating.....	2.7	3.3	3.02	3.23
Machine cultivating.....	5.4	4.4	6.43	4.82
Fertilizing; mowing.....	3.2	2.3	3.65	2.50
Irrigating.....	10.8	11.8	12.53	12.66
Spraying.....	5.1	7.8	5.96	8.45
Thinning.....	54.2	41.4	56.68	39.33
Propping; cleanup.....	9.8	7.3	10.98	7.39
Maintenance.....	19.7	22.6	23.57	25.69
Supervision.....	5.2	7.9	6.98	10.47
<b>Total preharvest</b> .....	<b>154.4</b>	<b>143.8</b>	<b>\$170.94</b>	<b>\$150.46</b>
Picking.....	41.2	40.8	\$ 39.60	\$ 35.42
Other harvest.....	21.2	19.4	23.66	21.33
<b>Total labor</b> .....	<b>216.8</b>	<b>204.0</b>	<b>234.20</b>	<b>207.21</b>
<b>Materials per acre</b>				
Fertilizers.....			\$ 19.65	\$ 15.67
Irrigation water.....			6.32	5.67
Sprays.....			47.53	38.74
Miscellaneous supplies.....			21.43	16.01
<b>Total materials</b> .....			<b>\$ 94.93</b>	<b>\$ 76.09</b>
<b>General expense per acre</b>				
Building repair.....			\$ 4.77	\$ 5.25
Machinery repair.....			13.49	10.42
Machine hire.....			4.02	6.25
Gas and oil.....			18.55	15.08
Electricity; water; wood fuel; office.....			9.58	9.08
Liability, fire, and motor insurance.....			8.09	8.39
Property taxes.....			19.97	17.07
Cash to operate.....			10.00	10.00
<b>Total general expense</b> .....			<b>\$ 88.47</b>	<b>\$ 81.54</b>
<b>Depreciation per acre</b>				
Buildings (not including operator's dwelling).....			\$ 9.19	\$ 9.34
Machinery.....			24.42	22.79
<b>Total depreciation</b> .....			<b>\$ 33.61</b>	<b>\$ 32.13</b>
<b>Interest per acre (5 per cent)</b>				
Buildings.....			\$ 7.47	\$ 8.19
Machinery.....			9.55	10.81
Orchard.....			30.24	32.98
<b>Total interest</b> .....			<b>\$ 47.26</b>	<b>\$ 51.98</b>
<b>Total cost per acre</b> .....			<b>\$498.47</b>	<b>\$448.95</b>
<b>Cost per loose-lug box</b> .....			<b>\$ 1.60</b>	<b>\$ 1.53</b>
<b>Cost per ton</b> .....			<b>\$ 72.31</b>	<b>\$ 68.15</b>
<b>Acres per orchard</b> .....			<b>5.6</b>	<b>6.2</b>
<b>Tons produced per acre</b> .....			<b>6.9</b>	<b>6.7</b>
<b>Loose boxes produced per acre</b> .....			<b>312</b>	<b>300</b>

In general the higher the yield of fruit per acre -- apples, winter pears, and Bartletts -- the lower was the cost of production.

In 1955 the apple orchards yielded more boxes of fruit per acre than did the winter pears.

Table 7. YIELDS: Effect on Cost of Producing Apples and Pears  
(Does not include costs of storage, boxes, packing, and shipping)

Yield of packed boxes per acre*		Number of orchards	Acres per orchards	Cost per box*
Range	Average			
<b>Apples</b>				
Less than 200 boxes	153 .....	1	†	\$ 2.49
200 to 399 boxes	299 .....	12	13.3	1.76
400 or more boxes	494 .....	9	9.5	1.32
All orchards .....	343 .....	22	12.5	\$ 1.60
<b>Winter pears</b>				
Less than 200 boxes	126 .....	7	7.9	\$ 2.97
200 to 399 boxes	282 .....	7	6.8	1.56
400 or more boxes	492 .....	10	8.5	1.03
All orchards .....	331 .....	24	7.8	\$ 1.36
<b>Bartlett pears</b>				
Less than 200 boxes	153 .....	4	6.4	\$ 2.60
200 to 399 boxes	287 .....	13	6.2	1.61
400 or more boxes	523 .....	7	4.1	1.31
All orchards .....	312 .....	24	5.6	\$ 1.60

\* Bartlett pears are figured as standard-lug boxes. (Field-run)

† Acreage not shown because only one orchard in this group.

Age of the Trees

The orchards typically have trees of varying ages ranging from a year up to maturity (table 8). The usual practice followed by most growers is to replace any dead or undesirable trees and thus tend to perpetuate the orchards. Depreciation on orchard investment, therefore, was not included in computing the cost of producing fruit.

Table 8. AGE OF TREES: Distribution on 24 Farms

Age of trees	Apples Per cent	Winter pears Per cent	Bartlett pears	
			Actual total Per cent	Adjusted (bearing) Per cent
Less than 6 years .....	19	21	39	17*
6 to 9 years .....	13	4	18	22
10 years and over .....	68	75	43	61
Total, all trees .....	100	100	100	100

\* Not all young trees (1-5 years old) were included in the cost of production calculations because in some instances there was an abnormally high percentage of young Bartletts compared to the other age groups. The general rule was to exclude from the cost of production calculations the young trees and, therefore, the acreages in excess of the normal.

Sixty-eight per cent of the apple trees were 10 years old or over. Seventy-five per cent of the winter pear trees were 10 years or older. In the case of the Bartlett pears, however, only 43 per cent of the trees had come into full bearing. Thirty-nine per cent of the trees were less than 6 years old. In order to make the three orchard enterprises studied more nearly comparable, certain portions of the latter group of trees (less than 6 years old) were excluded in computing cost of production where they comprised an abnormally high proportion of the total Bartlett plantings. Thus 39 per cent of the adjusted acreage of Bartlett pear trees included in the cost study was less than full bearing age (under 10 years) and 61 per cent was in full bearing.

### Varieties

Newtown and Delicious (Red, Striped, and Golden) comprised the major portion of the apple acreages on farms studied (table 9). D'Anjou is the principal winter (storage) pear, and Bartlett is the canning pear.

Table 9. VARIETIES OF TREES: Distribution on 24 farms

Apples on farms studied		Winter pears on farms studied	
Variety	Percentage	Variety	Percentage
Newtown .....	36	D'Anjou .....	88
Delicious .....	57	Bosc .....	10
Ortley .....	3	Easter .....	1
Spitzenberg .....	2	Other .....	1
Other .....	2		
<b>Total .....</b>	<b>100</b>	<b>Total .....</b>	<b>100</b>

### Orchard Investment

The capital value represented by the plantings was estimated by the growers from a conservative, long-term standpoint. Consideration was given in the appraisal to the age and variety of trees and to the location and character of the land.

The present (depreciated) values of buildings (other than operator's dwelling) and all other equipment were allocated proportionately to the various enterprises according to the use made thereof (table 10).

Table 10. ORCHARD INVESTMENT: Average Value of Capital Investment

Item	Apples		Winter pears		Bartlett pears	
	Value per orchard	Value per acre	Value per orchard	Value per acre	Value per orchard	Value per acre
Orchard .....	\$ 7,683	\$ 615	\$4,964	\$ 637	\$3,383	\$ 604
Buildings .....	1,893	151	1,106	142	836	149
Equipment .....	2,368	190	1,472	189	1,069	191
Cash for operating ..	2,509	200	1,565	200	1,119	200
<b>Total investment</b>	<b>\$14,453</b>	<b>\$1,156</b>	<b>\$9,107</b>	<b>\$1,168</b>	<b>\$6,407</b>	<b>\$1,144</b>



► Apple enterprise

The estimated worth of the capital, represented by the apple enterprise on the 22 farms in the study, averaged \$14,453 per orchard. More than half of the total capital investment for apple production, or \$615 per acre, was for the plantings.

Buildings (exclusive of the operator's dwelling) averaged \$1,893 per apple orchard. The equipment inventory, averaging \$2,368 per apple orchard, includes irrigation equipment as well as the machinery, tractors, trucks, and small tools. It does not include the automobile (charge for the use of automobiles was computed on a mileage basis).

► Winter pears

Investment for winter pears averaged \$9,107 per orchard. Value of the plantings averaged \$4,964 per orchard or \$637 per acre. Investment in buildings and equipment per acre of pears was similar in amount to that shown for apple orchards in this study.

► Bartlett (canning) pears

Investment for bearing pears averaged \$6,407 per orchard. Plantings represented \$3,383 each or \$604 per acre.

### Land Use

Size of the 24 farms in the study averaged 48.5 acres per farm (table 11). Orchard plantings comprised 29.4 acres per farm. This was 86 per cent of the total tillable land including the farmstead, or 61 per cent of the total farm acreage. Most cropland not in orchard was in hay or used as pasture. Much untillable acreage is steep, rocky, and covered with trees and brush.

Table 11. FRUIT FARMS: Utilization of the Land on 24 Farms \*

Land use	Number of farms	Average per farm reporting	Average acreage per farm	Distribution of total farm area
		Acres	Acres	Per cent
Apples .....	22	13.8	12.6	26
Bartlett pears .....	24	7.6	7.6	16
Winter pears.....	24	8.7	8.7	18
Other .....	6	1.8	.5	1
Total orchard.....	24	-	29.4	61
Other cropland.....	10	6.6	2.7	6
Farmstead.....	24	2.0	2.0	4
Nontillable.....	18	19.1	14.4	29
Total, all land .....	24	-	48.5	100

\* Of the 29.4 acres in orchard, apple trees occupied 12.6 acres per farm. Total pear (winter and canning) acreage slightly exceeded the apple orchards with 16.3 acres per farm.

## Nine-Year Summary

The average annual yields per acre and the costs per box on the farms in this study have been compiled for the 9-year period 1947-1955 (table 12).

**Table 12. COST OF PRODUCING APPLES AND PEARS\***  
(Does not include costs of storage, boxes, packing and shipping)

Year	Number of farms	Apples			Winter pears			Bartlett pears		
		No. of acres	Boxes /acre	Cost /box	No. of acres	Boxes /acre	Cost /box	No. of acres	Boxes /acre	Cost /box
1947 ...	24	366	328	\$1.54	256	406	\$1.14	107	263	\$1.64
1948 ...	25	406	358	1.39	283	363	1.20	126	258	1.64
1949 ...	21	324	360	1.24	228	388	1.10	119	363	1.24
1950 ...	23	360	425	1.18	236	556	.82	141	342	1.24
1951 ...	25	364	323	1.40	261	205	1.92	159	205	1.88
1952 ...	27	418	424	1.15	306	408	1.10	187	356	1.32
1953 ...	20	284	254	1.84	182	453	1.12	124	290	1.71
1954 ...	24	306	399	1.35	191	464	1.07	150	312	1.49
1955 ...	24	276	343	1.60	188	331	1.36	134	312	1.60
<b>Average</b>	<b>24</b>	<b>345</b>	<b>357</b>	<b>\$1.41</b>	<b>237</b>	<b>397</b>	<b>\$1.20</b>	<b>139</b>	<b>300</b>	<b>\$1.53</b>

\* Apples and winter pears are packed boxes; cannery pears are standard lug boxes.

### Effect of Size of Business on Costs

Size of the orchard enterprise had only very slight influence on the cost of production during the 9-year period studied (table 13).

**Table 13. SIZE OF BUSINESS: Nine-Year Results on the Cost Farms**  
(Does not include costs of storage, boxes, packing, and shipping)

Item *	Production †			Cost †		
	Acres	Yield /acre	Total yield	Total	Per box	Range per box
<b>Small farms</b>						
Apples .....	6.9	428	2,953	\$ 4,252	\$1.44	\$ .72 to \$8.96
Winter pears....	3.4	474	1,612	2,225	1.38	.48 to 4.18
Bartlett pears...	2.6	299	777	1,414	1.82	.95 to 5.72
Total .....	12.9	414	5,342	\$ 7,891	\$1.48	\$ .48 to \$8.96
Cost per acre				\$ 612		
<b>Medium farms</b>						
Apples .....	13.2	386	5,095	\$ 7,082	\$1.39	\$ .71 to \$9.06
Winter pears....	8.6	462	3,973	4,450	1.12	.47 to 4.26
Bartlett pears...	5.7	340	1,938	2,829	1.46	.88 to 5.51
Total .....	27.5	400	11,006	\$14,361	\$1.30	\$ .47 to \$9.06
Cost per acre				\$ 522		
<b>Large farms</b>						
Apples .....	22.4	326	7,302	\$10,442	\$1.43	\$ .75 to \$3.19
Winter pears....	16.1	351	5,651	7,120	1.26	.66 to 4.44
Bartlett pears...	8.6	273	2,348	3,616	1.54	.56 to 4.59
Total .....	47.1	325	15,301	\$21,178	\$1.38	\$ .56 to \$4.59
Cost per acre				\$ 450		

\* Small farms had less than 20 acres of orchard; medium farms had from 20 to 39 acres; and large farms had 40 acres or more.

† Apples and winter pears are packed boxes; cannery pears are standard lug boxes.

The small farms (12.9 acres of apples and pears per farm) generally had the highest yields per acre. Good yields thus reduce the cost per box. Individual growers should note the wide range in costs per box and strive to reduce their own costs by increasing yields.

### Purpose and Nature of the Study

The purpose of this study was to obtain information from growers that would provide basic facts on yields and costs of production. This information, when carefully adjusted to reflect changes occurring in yields and in the price level of farm production cost, provides a basis whereby cost of production can be readily estimated for any given year if no changes have occurred in production techniques.

Cost of production reported herein is the average-acre cost of the entire plantings in the study. Thus, man-hours-per-acre (see tables 2, 5, 6) is a figure applicable to the entire acreage of a crop within an area, such as a county, and indicates the average amount of labor that may be required per acre for all the acreage in that crop in the area even though each acre may not have been covered by each operation. The same holds true of the other items of cost.

### Acknowledgments

The fine cooperation received from the growers, who kept detailed daily records to provide data for this report, is gratefully acknowledged. Special mention is made of the financial assistance contributed by the Hood River Traffic Association; also, the continuing interest and support of the Hood River Apple Growers Association. Without the active participation of these groups, the study would have been impossible.

Particular mention is made of Dr. G. W. Kuhlman, now deceased, who was instrumental in initiating this cooperative work. The present circular is essentially a revision of his earlier reports, bringing them up to date.