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Orchard Economics

The Costs of Establishing a High Density Pear Orchard in the Hood River Valley

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OREGON STATE UNIVERSITY EXTENSION SERVICE

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ORCHARD ECONOMICS: THE COSTS OF ESTABLISHING A HIGH DENSITY PEAR ORCHARD IN THE HOOD RIVER VALLEY

Clark F. Seavert and David J. Burkhart¹

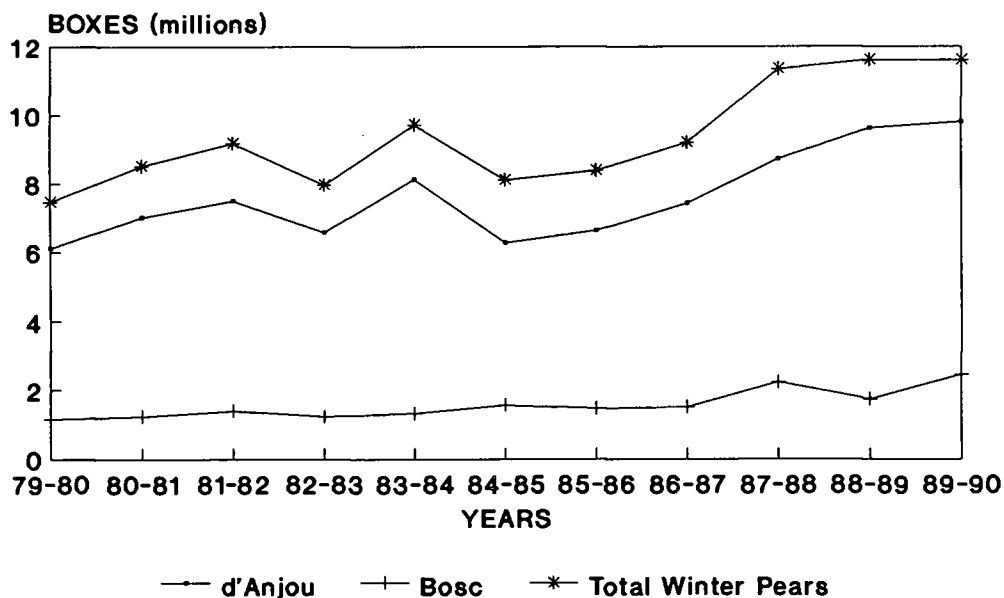
INTRODUCTION

Depressed apple prices were a result of the over production of Red Delicious apples in the United States. Consequently, many Northwest growers are currently removing apple orchards and replacing them with pears. According to the 1986 Tree Fruit Census^[1] Oregon's winter pear acreage was 12,270 acres. Accurate acreage figures for the years prior to 1986 are not available; however, increased production as shown in Figure 1. would indicate an increase in Northwest pear acreage. Also planting trends, as shown by sales of pear nursery stocks, would indicate an increase in pear acreage.^[2] Washington, the other major winter pear producing state, had 12,740 acres in 1986.

The major winter pear variety grown in the Oregon, Washington and California fruit growing districts is d'Anjou. Production in 1989 was nearly 10,000,000 boxes. The five year average production for this variety is 7,729,639 boxes.^[3] Bosc, the number two variety, accounted for nearly 2,500,000 boxes in 1988. The five year average production for this variety is 1,700,000 boxes.^[3]

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**FIGURE 1. PRODUCTION OF WINTER PEARS
IN THE PACIFIC NORTHWEST**



Other varieties such as Comice, Forelle & Seckel have also shown minor increases. Red winter pears, which include such varieties as Red d'Anjou, Red Comice, Cascade, California, Red Silk, Red Satin, Rubaiyat & Red Angelo, are now beginning to be major factors in the market place.

The total production of winter pears, all varieties included, was 11,609,000 boxes in 1989. The five year average production is 9,730,000 boxes.^[3]

Figure 1 illustrates the eleven year change in production of d'Anjou, Bosc and total winter pears. Total production of winter pears has increased significantly from 1979-80 to the 1989-90 production year from approximately eight million boxes to almost 12 million boxes, respectively. Bosc pear production has increased during this eleven year period, however, at a slower rate of increase as compared to the total production of d'Anjou pears. The increased activity in the planting of winter pears had not been as significant with the

Bosc variety as it was with the d'Anjou prior to the 1980's. However, in recent years, the sale of Bosc pear trees has represented approximately 30 percent of all pear trees sold.^[2]

The other major change within the pear industry is the move to higher density plantings. In spite of the fact that the industry does not have an acceptable dwarfing rootstock, growers are now planting pear orchards at two to three times the number of trees per acre than they did 20 or 30 years ago.

Historically, pears are productive even when 50 years of age and older, if fruiting wood is kept young and the tree structure is sound and free from winter injury or disease. Many existing orchards were planted on wide spacings with 70 to 100 trees per acre. Currently, new pear plantings are 200 to 300 trees per acre.

Another trend within the industry is the consolidation of acreages. This trend originated in southern Oregon and northern California several years ago. Individual grower holdings probably average 60 to 75 acres today. This was not the case 25 years ago.

As most pear growers know, the cost of establishing a pear orchard is much greater than that of establishing apples. This is primarily due to the fact that apples come into production much quicker than pears. We feel that by using a greater number of trees per acre and the use of more precocious rootstocks, as well as the implementation of new training techniques, the time from planting to fruiting can be reduced. Our projected costs for training, materials and labor in the early years reflect these suppositions.

In the next section of this study, assumptions were made by the authors and the six producers who assisted in the study. These assumptions are important in gathering, assessing and analyzing data that represents a clear and concise analysis for this study and future research.

Following the listing of assumptions, enterprise budgets for pear establishment and production are developed to estimate economic costs and returns. Enterprise budgets include gross returns, variable costs and fixed costs. These budgets are useful in comparing the economic profitability of pears with alternative farm and non-farm investments.^[4]

The cash flow section of this study examines only the cash requirements of establishing a pear orchard. In this section, cash expenses include operating expenditures for items such as fertilizer, labor, and fuel. A cash flow analysis is used strictly to examine the flow of funds in the orchard, and provides no information as to the profitability of the orchard. The basic use of a cash flow budget is to allow a producer to plan for financing and gain control over the cash position of the orchard.^[4]

ASSUMPTIONS

In this study, the authors made assumptions that provided a basis for the analysis. These assumptions include:

1. the typical orchard in the Hood River Valley consists of 70 total productive acres. Bearing acres include: 30 acres of winter pears (25 acres of green d'Anjou and 5 acres of Bosc pears), 15 acres of Bartlett pears, 8 acres of high density pears and 7 acres of apples and 10 acres, or approximately 15 percent, of orchard under establishment;
2. remove 110 trees per acre;
3. replant 300 trees per acre (9' x 16' spacing) consisting of 120 red d'Anjou (40%), 120 green Bartlett (40%) and 60 Bosc trees (20%);
4. trees are trained to a modified central leader system;

5. hired labor is valued at \$6.50 per hour which includes withholding taxes, recordkeeping, preparing W-2 forms, etc;
6. owner operator labor is valued at \$8.50 per hour and treated as a non-cash expense. This labor is used in planting trees, replanting damaged trees, pruning and training trees, rodent control, irrigating, frost protection and assisting in harvest operations;
7. machinery and equipment costs are based on agricultural estimates from the American Society of Agricultural Engineers. The machinery and equipment assumptions are listed in Table 1 and the assumed cost calculations are listed in Table 2. Cost of gasoline is \$1.06 per gallon and \$.80 per gallon for diesel fuel;
8. one-third of the cash expenses are borrowed for a six month period;
9. opportunity costs of capital are charged a rate of 10 percent for intermediate and long-term capital and operating capital is charged a rate of 12 percent interest. Operating capital interest is treated as a cash expense. Intermediate and long-term capital interest is treated as a non-cash expense;
10. farm machinery and land is owned by the operator and assessed a 10 percent rate of interest as an opportunity cost. Bare orchard land is valued at \$3,500 per acre;
11. price assumptions for pears are listed in Table 3. The increase in average price per bin is due to the increased production of red d'Anjou pears. Red d'Anjou pears will have a higher return than green Bartlett and Bosc pears because of its increasing yields in later years.

12. insecticide and fungicides are not applied at a full recommended rate until year 6. Table 4 lists the insecticides and fungicides applied, application rates, costs per unit and costs per acre;
13. herbicides used for strip maintenance are applied to one-third of each acre, assuming one-third of the orchard is strips between trees. The formulations shown are for 1-acre applications; multiply the herbicide rates by one-third to determine actual application rates per acre of orchard;
14. labor facilities provided by the producer cost \$30,000 for a 10 person unit. One unit per farm is needed. The life of the facility is 30 years and depreciated using the straight-line method of depreciation with a zero salvage value. Interest is calculated using the average value of the facility multiplied by a 10 percent interest rate. The repairs and maintenance for this facility is two and one-half percent of the purchase price per year;
15. tree training for the modified central leader system includes one-third tie-downs, one-third spreaders and one-third weights. The cost for materials includes; twine and W clips, as tie-downs, \$2.67 per acre, four spreaders per tree at a cost of \$.08 per spreader or \$32 per acre, and \$30 per acre for cement weights. The material costs of \$64.67 is depreciated over the eight years of establishment for a total cost of \$8.08 per acre, using the straight-line method of depreciation and a zero salvage value;
16. a solid set irrigation system is used at an estimated cost of \$1,200 per acre. Salvage value is zero and depreciated over 25 years using the straight-line method of depreciation. Interest is calculated using the average value of the system multiplied by a 12 percent interest rate. Repairs are estimated at one percent of the purchase price per year;

17. two wind machines are used for frost control along with three smudge pots per acre. The wind machines are valued at \$14,000 each and smudge pots at \$10 each. Salvage value is zero and depreciated over 25 years for the wind machines and 10 years for the smudge pots using the straight-line method of depreciation. Interest is calculated using the average value of the wind machines and smudge pots multiplied by a 12 percent interest rate. Repairs and maintenance are estimated at four percent of the purchase price of the wind machines and one percent for the smudge pots per year;
18. price inflation for the time period of this study is ignored; and
19. income tax consequences are also ignored for this analysis.

Using these general assumptions, enterprise budgets were constructed for each of the first eight years of establishment and a budget for a typical full production year.

Table 1. Machinery and Equipment Assumptions

Machine	Size	Current Market Value	Hours of Annual Use	Expected Life (yrs)
Tractor	4 Wheel Dr 60Hp	\$22,000	500.0	10.0
Tractor	2 Wheel Dr 40Hp	17,500	500.0	10.0
Tractor	2 Wheel Dr 35Hp	2,500	600.0	10.0
Truck	2 Ton, Used	10,000	100.0	10.0
Pickup	1/2 Ton, New	10,000	333.0	10.0
ATV	4 Wheeler, New	2,300	400.0	5.0
Blast (PTO) Sprayer		10,000	220.0	10.0
Fertilizer Spreader		2,000	20.0	15.0
Flail		4,000	300.0	7.0
Auger		3,500	180.0	10.0
Front-end Loader		900	90.0	10.0
Backfork		150	60.0	10.0
Bin Trailer		1,250	150.0	20.0
Gopher Machine		900	90.0	20.0
Weed Sprayer	100 Gallon Unit	2,000	80.0	15.0
Brush Windrow		2,000	90.0	10.0
Ladders	35 Units	3,165	150.0	20.0
Picking Equipment	35 Picking Bags	770	150.0	5.0
Chain Saw	3 Units	450	800.0	3.0
Pruning Saw	3 Units	144	800.0	2.0
Pole Pruners	3 Units, 1 loppers	240	50.0	5.0
Irrigation System	Solid Set Unit	1,200	72.0	25.0
Wind Machine	2 Units, Gasoline	28,000	30.0	25.0
Smudge Pot	Per Unit	10	12.0	10.0
Labor Facilities	1 - 10 Person Unit	30,000	0.0	30.0

Table 2. Machinery and Equipment Cost Calculations (per hour basis)

Machine	Size	COSTS PER HOUR					Total
		Variable		Fixed			
		Fuel & Lube	Repair & Maint.	Depreciation	Housing &/or Interest	Insurance	
Tractor	4 Wheel Dr 60Hp	\$2.76	\$1.32	\$3.10	\$3.59	\$0.28	\$11.06
Tractor	2 Wheel Dr 40Hp	1.84	1.05	2.47	2.86	0.23	8.44
Tractor	2 Wheel Dr 35Hp	2.76	0.18	0.29	0.34	0.03	3.60
Truck	2 Ton, Used	8.13	2.30	6.22	8.16	0.65	25.45
Pickup	1/2 Ton, New	3.66	3.72	1.87	2.45	0.19	11.88
ATV	4 Wheeler, New	0.12	1.60	0.95	0.47	0.04	3.18
Blast (PTO) Sprayer		0.00	5.19	3.74	3.53	0.29	12.76
Fertilizer Spreader		0.00	0.57	5.49	7.77	0.65	14.48
Flail		0.00	2.05	1.57	1.04	0.09	4.74
Auger		0.00	0.19	1.94	1.51	0.13	3.78
Front-end Loader		0.00	0.10	1.00	0.78	0.06	1.94
Backfork		0.00	0.03	0.21	0.19	0.02	0.44
Bin Trailer		0.00	0.08	0.42	0.65	0.05	1.20
Gopher Machine		0.00	0.10	0.50	0.78	0.06	1.44
Weed Sprayer	100 Gallon Unit	0.00	0.25	1.67	1.94	0.16	4.02
Brush Windrow		0.00	0.22	1.83	1.73	0.14	3.92
		COSTS PER ACRE					
Ladders	35 Units	0.00	0.45	2.26	0.66	0.00	3.37
Picking Equipment	35 Picking Bags	0.00	0.11	2.20	0.39	0.00	2.70
Chain Saw	3 Units	0.00	0.06	2.14	0.12	0.00	2.33
Pruning Saw	3 Units	0.00	0.02	1.03	0.21	0.00	1.26
Pole Pruners	3 Units, 1 Loppers	0.00	0.03	0.69	1.03	0.00	1.75
Irrigation System	Solid Set Unit	0.00	12.00	48.00	72.00	0.00	132.00
Wind Machine	2 Units, Gasoline	3.18	16.00	16.00	24.00	4.00	60.00
Smudge Pot	Per Unit	0.10	0.10	1.00	0.60	0.00	1.70
Labor Facilities	1 - 10 Person Unit	0.00	10.71	14.29	21.43	0.00	46.43

Table 3. Assumed Prices for Establishing a High Density Pear Orchard in the Hood River Valley.

Variety	PRICES PER BIN				
	4	5	Year 6	7	8
Red d'Anjou	225	225	300	300	300
Green Bartlett	125	125	125	125	125
Bosc	175	175	175	175	175
Weighted Average	\$175	\$175	\$205	\$205	\$205

Table 4. Insecticides and Fungicides used in the Hood River Valley on Pears.¹

Application Number	Chemical	Quantity per Acre	Cost per Unit	Cost per Acre
1	Oil	4 gallons	2.25	9.00
	Sulfur	16 pounds	0.71	11.36
2	Oil	4 gallons	2.25	9.00
	Baythroid	3.2 ounces	5.55	17.76
	Kocide	16 pounds	2.25	36.00
3	Morestan	4 pounds	11.50	46.00
	Rubigan	10 ounces	2.19	21.90
4	Strep	28.8 ounces	.5625	16.20
5	Terramycin	1 pound	8.50	8.50
6	Bayleton	6 ounces	2.98	17.88
	Ziram	8 pints	1.67	13.36
	Leaf Feed	2 quarts	2.13	4.26
7	Agri-mek	16 ounces	5.94	95.04
	Guthion	1.5 pounds	4.50	6.75
8	Mitac	3 pounds	20.74	62.22
	Guthion	1.5 pounds	4.50	6.75
9	Ziram	8 pints	1.69	13.52
	NAA200	12 ounces	0.29	3.48
10	Solubor	5 pounds	0.72	3.60
	Kocide	16 pounds	2.25	36.00
Total Cost per Acre per Year				\$438.58

¹ Because of constantly changing labels, laws, and regulations, Oregon State University can assume no liability for the consequences of use of chemicals suggested here. In all cases, read and follow the directions and precautionary statements on the specific pesticide product label.

Also, mention of trade-name products does not mean any endorsement of these products by Oregon State University Extension Service, and the fact that other products are not mentioned does not mean any discrimination against them. Substitute the manufacturers formulations, as appropriate, for those included in this analysis.

Enterprise Budgets

Enterprise budgets are used to show the gross returns, variable costs and fixed costs associated in producing a particular crop. This study reports the gross returns, variable and fixed costs for the establishment period and a typical full production year for high density pears in the Hood River Valley. Each enterprise budget is for a calendar year, and all budgets are prepared as of the end of their respective years.^[4]

Year 0

Before planting the new pear trees, the site must be prepared for adequate cultural practices. Year 0, Table 5, is referred to as the year the old trees are removed. The operator custom hires the digging of pits, burning the stumps and filling in the existing holes. Custom tillage, fumigation and lime application prepare the soil for the next year's trees. A solid set irrigation system is installed at a cost of \$1,200 per acre. Most of the establishment costs in Year 0 are custom hired.

Total variable cost is \$1,778 per acre. The remaining costs are fixed, including cash and non-cash items. Fixed cash items include insurance on machinery and equipment, pickups, trucks, ATV's and property and property taxes. Fixed cash cost is \$93 per acre and fixed non-cash cost is \$473 per acre. Fixed non-cash costs include land interest and depreciation and interest on pickups, trucks, ATV's irrigation system, wind machines, smudge pots and labor facilities. Total fixed cost is \$566 per acre. The total establishment cost in Year 0 is \$2,344 per acre.

Table 5. Pears, Establishment Year 0, \$/Acre Economic Costs and Returns.

<u>VARIABLE COSTS</u>	<u>Description</u>	<u>Labor</u>	<u>Machinery</u>	<u>Materials</u>	<u>Total</u>
LAND PREPARATION					
	Tree Removal, Custom	0.00	500.00	0.00	500.00
	Dig Pits, Burn Stumps & Fill in Holes				
	Rip, Disk and Plow, Custom	0.00	110.50	0.00	110.50
	Root Removal, etc, Custom	50.00	0.00	0.00	50.00
	Fumigation, Custom	0.00	100.00	555.00	655.00
	Methylbromide				
	Lime Application, Custom	0.00	0.00	110.00	110.00
	Dolomite - 2 ton x 55.00				
Total LAND PREPARATION					1,425.50
	General Labor	100.00	0.00	0.00	100.00
	Pickups, Trucks & ATV's	0.00	56.35	0.00	56.35
	Labor Facilities - Repairs & Maintenance	0.00	0.00	10.71	10.71
	Water Assessment	0.00	0.00	35.00	35.00
	Miscellaneous	0.00	0.00	50.00	50.00
	Interest: Operating Capital	0.00	0.00	100.65	100.65
Total VARIABLE COST					1,778.21
<u>FIXED COSTS</u>	<u>Description</u>				<u>Total</u>
CASH Cost					
	Machinery and Equipment Insurance		acre		8.99
	Pickups, Trucks, & ATV's Insurance		acre		3.83
	Property Insurance, etc.		acre		50.00
	Property Taxes		acre		30.00
Total CASH COST					92.82
NON-CASH Cost					
	Pickups, Trucks, & ATV's Deprec. & Interest		acre		87.44
	Labor Facilities Depreciation & Interest		acre		35.72
	Land Interest Charge		acre		350.00
Total NON-CASH Cost					473.16
Total FIXED Cost					565.98
Total of All Costs per Acre					2,344.19

Year 1

Year 1 is shown in Table 6. Young trees are planted in a 9' x 16' spacing (300 trees per acre) and require 30 hours of labor per acre. One-half of this labor is hired. Tree cost is \$5.50 per tree and planted with the use of a tractor & auger at a variable cost of \$0.53 per tree (\$159.19 per acre + 300 trees), including labor. Total variable cost to plant trees is \$6.03 per tree. Tree covers are installed at a cost of \$.03 per tree and using 10 hours of hired labor to install the covers. In this year, the orchard is strip sprayed with Kerb and Paraquat and flailed five times between the rows for a good weed control program. The orchard is irrigated, in 12 hour sets, six times throughout the first four years of establishment for a total of 72 hours and one hour of owner labor per acre. Total variable cost is \$2,184.

Fixed cash cost is \$93 per acre and fixed non-cash cost is \$1,276 per acre. Depreciation is also charged, beginning in Year 1, for training equipment and tree covers. Owner labor is \$195.50 per acre for 23 hours of work. This is a non-cash item but must be included in the study to account for all economic costs. Interest on accumulative investment is an opportunity charge from the total cost in the prior year. To calculate this cost, multiply the prior year's cumulative costs (Year 0 is \$2,344 per acre) by 10 percent interest for an opportunity cost of \$234.40 per acre. Total cost in establishment Year 1 is \$3,553 per acre. Cumulative Year 0 and 1 establishment cost is \$5,897 per acre.

Year 2

Year 2, Table 7, is the first year after the trees are planted. Tree training requirements are seven hours per acre and provided by the owner. Calcium nitrate is applied at a rate of 487 pounds per acre or one-fourth pound of actual nitrogen per tree. Strep and Mitac are applied at 20 percent the recommended rate for a mature orchard at a total variable cost of \$27.53 per acre. The variable cost is \$364 per acre, fixed cash cost is

\$86 per acre and fixed non-cash cost is \$1,433 per acre. The total cost for establishment Year 2 is \$1,883. Cumulative Year 0, 1 and 2 establishment cost is \$7,780 per acre.

Table 6. Pears, Establishment Year 1, \$/Acre Economic Costs and Returns.

<u>VARIABLE COSTS</u>	<u>Description</u>	<u>Labor</u>	<u>Machinery</u>	<u>Materials</u>	<u>Total</u>
Replanting 300 Trees/Acre		97.50	61.69	1,650.00	1,809.19
Tree Covers		65.00	0.00	0.00	65.00
Herbicide - Strip Maintenance (.33x)		13.65	6.67	25.51	45.83
Kerb	4 lbs x 14.76=59.04				
Paraquat	2.0 pts x 2.50=5.00 (2x)				
Surfactant	1.0 qt x 3.75=3.75 (2x)				
Flailing		32.50	24.69	0.00	57.19
Irrigation		0.00	12.00	35.00	47.00
Ladders, Pruning & Picking Equipment		0.00	0.68	0.00	0.68
Pickups, Trucks & ATV's		0.00	56.35	0.00	56.35
Labor Facilities - Repairs & Maintenance		0.00	0.00	10.71	10.71
Miscellaneous		0.00	0.00	50.00	50.00
Interest: Operating Capital		0.00	0.00	42.41	42.41
Total VARIABLE COSTS		208.65	162.08	1,813.63	2,184.36
<u>FIXED COSTS</u>	<u>Description</u>	<u>Units</u>			<u>Total</u>
CASH Costs					
Machinery and Equipment Insurance		acre			8.99
Pickups, Trucks & ATV's Insurance		acre			3.82
Property Insurance, etc.		acre			50.00
Property Taxes		acre			30.00
Total CASH Costs					92.81
NON-CASH Costs					
Machinery & Equipment Deprec., Interest & Housing		acre			356.02
Pickups, Trucks & ATV's Deprec., Interest & Housing		acre			87.44
Labor Facilities Depreciation & Interest		acre			35.72
Depreciation on Training Equipment		acre			8.08
Depreciation on Tree Covers		acre			9.00
Owner Labor		acre			195.50
Land Interest Charge		acre			350.00
Interest on Accumulative Investment		acre			234.40
Total NON-CASH Costs					1,276.16
Total FIXED COSTS					1,368.97
Total of All Costs Per Acre					3,553.33

Table 7. Pears, Establishment Year 2, \$/Acre Economic Costs and Returns.

<u>VARIABLE COSTS</u>	<u>Description</u>	<u>Labor</u>	<u>Machinery</u>	<u>Materials</u>	<u>Total</u>
Fertilizer		13.00	0.00	45.29	58.29
Ca Nitrate	487# x .093=45.29				
Herbicide - Strip Maintenance (.33x)		13.65	6.67	28.85	49.17
Kerb	4 lbs x 14.76=59.04				
Paraquat	2.0 pts x 5.00=10.00 (2x)				
Surfactant	1.0 qt x 3.75=3.75 (2x)				
Insecticides & Fungicides		4.88	6.96	15.69	27.53
Strep	28.8 oz x .5625=16.20				
Mitac	3.0 lbs x 20.75=62.25				
Flailing		32.50	24.69	0.00	57.19
Irrigation		0.00	12.00	35.00	47.00
Ladders, Pruning & Picking Equipment		0.00	0.68	0.00	0.68
Pickups, Trucks & ATV's		0.00	56.35	0.00	56.35
Labor Facilities - Repairs & Maintenance		0.00	0.00	10.71	10.71
Miscellaneous		0.00	0.00	50.00	50.00
Interest: Operating Capital		0.00	0.00	7.07	7.07
Total VARIABLE COSTS		64.03	107.35	192.61	363.99
<u>FIXED COSTS</u>	<u>Description</u>	<u>Units</u>			<u>Total</u>
CASH Costs					
	Machinery and Equipment Insurance	acre			2.38
	Pickups, Trucks & ATV's Insurance	acre			3.82
	Property Insurance, etc.	acre			50.00
	Property Taxes	acre			30.00
Total CASH Costs					86.20
NON-CASH Costs					
	Machinery and Equipment Deprec., Interest & Housing	acre			190.94
	Pickups, Trucks & ATV's Deprec., Interest & Housing	acre			88.21
	Labor Facilities Depreciation & Interest	acre			35.72
	Depreciation on Training Equipment	acre			8.08
	Depreciation on Tree Covers	acre			9.00
	Owner Labor	acre			161.50
	Land Interest Charge	acre			350.00
	Interest on Accumulative Investment	acre			589.70
Total NON-CASH Costs					1,433.15
Total FIXED COSTS					1,519.35
Total of All Costs Per Acre					1,883.34

Year 3

Establishment Year 3, Table 8, shows four trees are removed and replanted with the same variety of tree. This tree replacement is due to damaging climatic factors, rodents and diseases. Fertilizer rates are the same as in Year 2, however, alternating herbicide applications to a Karmex and Paraquat rotation is applied for a better control of weeds. A Strep, Agri-mek and Terramycin application is applied at 40 percent the recommended rate for a mature orchard. Rodent control begins in Year 3 with a variable cost of \$4.25 per acre. Total variable cost is \$413 per acre, total fixed cost is \$1,745 per acre; fixed cash cost is \$87 per acre and fixed non-cash cost is \$1,647 per acre. Total cost is \$2,158 per acre. Cumulative establishment cost including Year 3 is \$9,938 per acre.

Table 8. Pears, Establishment Year 3, \$/Acre Economic Costs and Returns.

<u>VARIABLE COSTS</u>	<u>Description</u>	<u>Labor</u>	<u>Machinery</u>	<u>Materials</u>	<u>Total</u>
Tree Removal(4 Trees)		3.25	0.00	0.00	3.25
Tree Replacement(4 Trees)		0.00	3.08	22.00	25.08
Fertilizer		3.90	2.08	45.29	51.27
Ca Nitrate	487# x.093=45.29				
Herbicide - Strip Maintenance (.33x)		13.65	6.67	15.17	35.49
Karmex	3 lbs x 6.00=18.00				
Paraquat	2.0 pts x 5.00=10.00 (2x)				
Surfactant	1.0 qt x 3.75=3.75 (2x)				
Insecticides & Fungicides		6.50	9.27	47.90	63.67
Strep	28.8 oz x .5625=16.20				
Agri-mek	16.0 oz x 5.94=95.04				
Terramycin	1 lb x 8.50=8.50				
Flailing		32.50	24.69	0.00	57.19
Rodent Control		0.00	0.75	3.50	4.25
Irrigation		0.00	12.00	35.00	47.00
Ladders, Pruning & Picking Equipment		0.00	0.68	0.00	0.68
Pickups, Trucks & ATV's		0.00	56.35	0.00	56.35
Labor Facilities - Repairs & Maintenance		0.00	0.00	10.71	10.71
Miscellaneous		0.00	0.00	50.00	50.00
Interest: Operating Capital		0.00	0.00	8.02	8.02
Total VARIABLE COSTS		59.80	115.57	237.59	412.96

<u>FIXED COSTS</u>	<u>Description</u>	<u>Units</u>	<u>Total</u>
CASH Costs			
	Machinery and Equipment Insurance	acre	3.47
	Pickups, Trucks & ATV's Insurance	acre	3.82
	Property Insurance, etc.	acre	50.00
	Property Taxes	acre	30.00
Total CASH Costs			87.29
NON-CASH Costs			
	Machinery and Equipment Deprec., Interest & Housing	acre	216.13
	Pickups, Trucks & ATV's Deprec., Interest & Housing	acre	88.21
	Labor Facilities Depreciation & Interest	acre	35.72
	Depreciation on Training Equipment	acre	8.08
	Depreciation on Tree Covers	acre	9.00
	Owner Labor	acre	172.13
	Land Interest Charge	acre	350.00
	Interest on Accumulative Investment	acre	778.00
Total NON-CASH Costs			1,657.27
Total FIXED COSTS			1,744.56
Total of All Costs Per Acre			2,157.52

Year 4

In establishment Year 4, Table 9, the orchard will begin producing pears. We assume 3 bins of pears are harvested at an average price of \$175 per bin. Projected gross returns are \$525 per acre. Cultural practices are much the same as in Year 3. Roundup and Princep are applied for a weed control practice. Strep, Mitac and Terramycin are applied at 60 percent the recommended rate for a mature orchard at a cost of \$52.17 per acre for materials only. A variable cost of \$.68 per acre is charged to repair broken or damaged picking and pruning equipment and ladders. Variable harvest cost is \$113 per acre. This cost includes \$11 per bin for the picking crew, 5 hours of yarding and supervising labor per acre, at \$8.50 per hour, two hours of hauling and one hour of cleanup labor, at \$6.50 per hour. The 60 Hp tractor is used for two hours with the front-end loader to load bins, two

hours for the 40 Hp tractor with the backfork to transport bins in the field and one hour for the 35 Hp tractor to assist in other field operations. Total variable cost is \$541 per acre. Fixed cash cost is \$88 per acre and fixed non-cash cost is \$1,937 per acre. Total fixed cost is \$2,025 per acre. Total cost in establishment Year 4 is \$2,566 per acre. Net projected income in Year 4 is -\$2,041 per acre. Cumulative establishment cost including Year 4 is \$11,979 per acre.

Table 9. Winter Pears, Establishment Year 4, \$/Acre Economic Costs and Returns.

<u>GROSS INCOME</u>	<u>Description</u>	<u>Quantity</u>	<u>Unit</u>	<u>\$/Unit</u>	<u>Total</u>
Pears		3.00	bins	175.00	525.00
Total GROSS Income					525.00
<u>VARIABLE COSTS</u>	<u>Description</u>	<u>Labor</u>	<u>Machinery</u>	<u>Materials</u>	<u>Total</u>
Tree Removal (4 Trees)		3.25	0.00	0.00	3.25
Tree Replacement (4 Trees)		0.00	3.08	22.00	25.08
Fertilizer		3.90	2.08	45.29	51.27
Ca Nitrate	487# x.093=45.29				
Herbicide - Strip Maintenance (.33x)		9.10	4.45	14.23	27.78
Roundup	2 qts x 16.10=32.20				
Princep	3.0 lbs x 2.25=6.75				
Surfactant	1.0 qt x 3.75=3.75				
Insecticides & Fungicides		4.88	6.96	52.17	64.01
Strep	28.8 oz x .5625=16.20				
Mitac	3.0 lbs x 20.75=62.25				
Terramycin	1 lb x 8.50=8.50				
Hive Rental	1 Hive	0.00	0.00	20.00	20.00
Flailing		32.50	24.69	0.00	57.19
Rodent Control		0.00	0.75	3.50	4.25
Irrigation		0.00	12.00	35.00	47.00
Ladders, Pruning & Picking Equipment		0.00	0.68	0.00	0.68
Harvesting Costs		95.00	17.76	0.00	112.76
Pickups, Trucks & ATV's		0.00	56.35	0.00	56.35
Labor Facilities - Repairs & Maintenance		0.00	0.00	10.71	10.71
Miscellaneous		0.00	0.00	50.00	50.00
Interest: Operating Capital		0.00	0.00	10.50	10.50
Total VARIABLE COSTS					540.83
GROSS INCOME minus VARIABLE COSTS					-15.83

<u>FIXED COSTS</u>	<u>Description</u>	<u>Units</u>	<u>Total</u>
CASH Costs			
	Machinery and Equipment Insurance	acre	4.38
	Pickups, Trucks & ATV's Insurance	acre	3.82
	Property Insurance, etc.	acre	50.00
	Property Taxes	acre	30.00
Total CASH Costs			88.20
NON-CASH Costs			
	Machinery and Equipment Deprec., Interest & Housing	acre	237.49
	Pickups, Trucks & ATV's Deprec., Interest & Housing	acre	88.21
	Labor Facilities Depreciation & Interest	acre	35.72
	Depreciation on Training Equipment	acre	8.08
	Depreciation on Tree Covers	acre	9.00
	Owner Labor	acre	214.63
	Land Interest Charge	acre	350.00
	Interest on Accumulative Investment	acre	993.80
Total NON-CASH Costs			1,936.93
Total FIXED COSTS			2,025.13
Total of All Costs Per Acre			2,565.96
NET PROJECTED RETURNS			-2,040.96

Year 5

In Year 5, Table 10, six bins of pears are harvested at an average price of \$175 per bin. Projected gross income is \$1,050 per acre.

Pruning and training the young trees is now hired at a cost of \$227.50 per acre and considered a cash item. Owner labor declines significantly because of this shift to hire the labor for pruning and training trees.

Calcium nitrate rates increase to 650 pounds per acre or one-half pound of actual nitrogen per tree at a cost of \$60.45 per acre for the material. Total variable cost for fertilizer application is \$66.43 per acre including materials, labor, machinery and equipment. Roundup and Karmex are used to rotate the applications for a good weed

control program. Herbicide material cost is \$17.98 per acre. Insecticide and fungicides are applied at 80 percent the recommended rate for a mature orchard. For increased production, one bee hive per acre is added for pollination at a cost of \$20 per acre. Variable harvest costs increase to \$172 per acre with the increase in pear production. For the remaining life of the orchard, the orchard is irrigated, in 24 hour sets, three times a year for a total of 72 hours and one hour of owner labor per acre.

Total variable cost is \$1,199 per acre, total fixed cash cost is \$90 per acre and total fixed non-cash cost is \$2,049 per acre. Total cost in establishment Year 5 is \$3,339 per acre with a net projected return of -\$2,289 per acre. Cumulative establishment cost including Year 5 is \$14,268 per acre.

Table 10. Pears, Establishment Year 5, \$/Acre Economic Costs and Returns.

<u>GROSS INCOME</u>	<u>Description</u>	<u>Quantity</u>	<u>Unit</u>	<u>\$/Unit</u>	<u>Total</u>
Pears		6.00	bins	175.00	1,050.00
Total GROSS Income					1,050.00
<u>VARIABLE COSTS</u>	<u>Description</u>	<u>Labor</u>	<u>Machinery</u>	<u>Materials</u>	<u>Total</u>
Pruning & Training		227.50	0.00	0.00	227.50
Tree Removal (4 Trees)		3.25	0.00	0.00	3.25
Tree Replacement (4 Trees)		0.00	3.08	22.00	25.08
Fertilizer		3.90	2.08	60.45	66.43
Ca Nitrate	650# x .093=60.45				
Herbicide - Strip Maintenance (.33x)		9.10	4.45	17.98	31.53
Roundup	2.0 qts x 16.10=32.20				
Karmex	3.0 lbs x 6.00=18.00				
Surfactant	1.0 qt x 3.75=3.75				
Insecticides & Fungicides		21.65	30.88	350.86	403.39
For Trade Names, Application Rates, Costs/Unit and Costs/Acre, Refer to Table 3.					
Hive Rental	1 Hive	0.00	0.00	20.00	20.00
Flailing		32.50	24.69	0.00	57.19
Rodent Control		0.00	0.75	3.50	4.25
Irrigation		0.00	12.00	35.00	47.00
Ladders, Pruning & Picking Equipment		0.00	0.68	0.00	0.68
Harvesting Costs		143.00	29.37	0.00	172.37
Pickups, Trucks & ATV's		0.00	56.35	0.00	56.35
Labor Facilities - Repairs & Maintenance		0.00	0.00	10.71	10.71
Miscellaneous		0.00	0.00	50.00	50.00
Interest: Operating Capital		0.00	0.00	23.28	23.28
Total VARIABLE COSTS					1,199.01
GROSS INCOME minus VARIABLE COSTS					-149.01

<u>FIXED COSTS</u>	<u>Description</u>	<u>Units</u>	<u>Total</u>
CASH Costs			
	Machinery and Equipment Insurance	acre	6.58
	Pickups, Trucks & ATV's Insurance	acre	3.82
	Property Insurance, etc.	acre	50.00
	Property Taxes	acre	30.00
Total CASH Costs			90.40
NON-CASH Costs			
	Machinery and Equipment Deprec., Interest & Housing	acre	290.12
	Pickups, Trucks & ATV's Deprec., Interest & Housing	acre	88.21
	Labor Facilities Depreciation & Interest	acre	35.72
	Depreciation on Training Equipment	acre	8.08
	Depreciation on Tree Covers	acre	9.00
	Owner Labor	acre	70.13
	Land Interest Charge	acre	350.00
	Interest on Accumulative Investment	acre	1,197.90
Total NON-CASH Costs			2,049.16
Total FIXED COSTS			2,139.56
Total of All Costs Per Acre			3,338.57
NET PROJECTED RETURNS			-2,288.57

Year 6

In Year 6, Table 11, twelve bins of pears are harvested at an average price of \$205 per bin. Total gross income is \$2,460 per acre.

Insecticide and fungicide application rates are now 100 percent the recommended rate for a mature orchard. Refer to Table 3 for a complete listing of insecticide and fungicides used in the Hood River Valley. Material cost is \$438.58 per acre per year and \$491.11 per acre for total variable costs which includes materials, machinery, equipment and labor.

Frost protection begins in Year 6. This practice costs \$19.38 per acre which is allocated for fuel, repairs and maintenance on the wind machines and smudge pots. The owner supplies approximately 1 hour per acre of labor for frost protection, which is a non-

cash item. Harvest costs have increased with an increase in pear production. Total variable harvesting cost is \$254 per acre.

Total variable cost is \$1,412 per acre, fixed cash cost is \$96 per acre and fixed non-cash cost is \$2,356. Total cost of establishment in Year 6 is \$3,864 per acre. The projected net return is -\$1,404 per acre. However, gross income is sufficient to cover variable costs but not the total economic cost of establishment in this year. Cumulative establishment cost including Year 6 is \$15,672 per acre.

Table 11. Pears, Establishment Year 6, \$/Acre Economic Costs and Returns.

<u>GROSS INCOME</u>	<u>Description</u>	<u>Quantity</u>	<u>Unit</u>	<u>\$/Unit</u>	<u>Total</u>
Pears		12.00	bins	205.00	2,460.00
Total GROSS Income					2,460.00
<u>VARIABLE COSTS</u>	<u>Description</u>	<u>Labor</u>	<u>Machinery</u>	<u>Materials</u>	<u>Total</u>
Pruning & Training		227.50	0.00	0.00	227.50
Tree Removal (4 Trees)		3.25	0.00	0.00	3.25
Tree Replacement (4 Trees)		0.00	3.08	22.00	25.08
Fertilizer		3.90	2.08	60.45	66.43
Ca Nitrate	650# x .093=60.45				
Herbicide - Strip Maintenance (.33x)		13.65	6.67	31.66	51.98
Roundup	2.0 qts x 16.10=32.20				
Kerb	4.0 lbs x 14.76=59.04				
Surfactant	1.0 qt x 3.75=3.75				
Insecticides & Fungicides		21.65	30.88	438.58	491.11
For Trade Names, Application Rates, Costs/Unit and Costs/Acre, Refer to Table 3.					
Hive Rental	1 Hive	0.00	0.00	20.00	20.00
Flailing		32.50	24.69	0.00	57.19
Rodent Control		0.00	0.75	3.50	4.25
Frost Protection		0.00	19.38	0.00	19.38
Irrigation		0.00	12.00	35.00	47.00
Ladders, Pruning & Picking Equipment		0.00	0.68	0.00	0.68
Harvesting Costs		209.00	44.85	0.00	253.85
Pickups, Trucks & ATV's		0.00	56.35	0.00	56.35
Labor Facilities - Repairs & Maintenance		0.00	0.00	10.71	10.71
Miscellaneous		0.00	0.00	50.00	50.00
Interest: Operating Capital		0.00	0.00	27.42	27.42
Total VARIABLE COSTS					1,412.18
GROSS INCOME minus VARIABLE COSTS					1,047.82

<u>FIXED COSTS</u>	<u>Description</u>	<u>Units</u>	<u>Total</u>
CASH Costs			
	Machinery and Equipment Insurance	acre	11.78
	Pickups, Trucks & ATV's Insurance	acre	3.82
	Property Insurance, etc.	acre	50.00
	Property Taxes	acre	30.00
Total CASH Costs			95.60
NON-CASH Costs			
	Machinery and Equipment Deprec., Interest & Housing	acre	361.13
	Pickups, Trucks & ATV's Deprec., Interest & Housing	acre	88.21
	Labor Facilities Depreciation & Interest	acre	35.72
	Depreciation on Training Equipment	acre	8.08
	Depreciation on Tree Covers	acre	9.00
	Owner Labor	acre	77.18
	Land Interest Charge	acre	350.00
	Interest on Accumulative Investment	acre	1,426.80
Total NON-CASH Costs			2,356.12
Total FIXED COSTS			2,451.72
Total of All Costs Per Acre			3,863.90
NET PROJECTED RETURNS			-1,403.90

Year 7

In Year 7, Table 12, twenty-four bins of pears are harvested at an average price of \$205 per bin. The projected gross return is \$4,920 per acre.

Total variable cost is \$1,644 per acre. Fixed cash cost is \$97 per acre and fixed non-cash cost is \$2,533 per acre. Total fixed cost is \$2,630 for a total cost in establishment Year 7 of \$4,274. Projected net returns are \$646 per acre. The gross income is sufficient to cover total costs in this year. However, this is not the break-even year for establishing an acre of orchard. This is only the year that returns are greater than total costs without any regard to previous years' costs. Cumulative establishment cost including Year 7 is \$15,026 per acre.

Year 8

We estimate Year 8, Table 13, to be the last year in establishing a high density pear orchard in the Hood River Valley. Projected gross returns are \$7,175 per acre; based on harvesting 35 bins of pears at \$205 per bin.

Pruning and training expenses have increased to \$455 per acre or \$1.50 per tree. Fertilizer rates for calcium nitrate remain at 650 pounds per acre or one-half pound of actual nitrogen per tree. Variable harvesting costs have increased to \$553 per acre.

Total variable cost is \$1,669 per acre and total fixed cost is \$2,685 per acre; fixed cash cost is \$97 per acre and fixed non-cash cost is \$2,488 per acre. Total establishment cost in Year 8 is \$4,554 per acre. Projected net returns are \$2,621 per acre. Total cumulative establishment cost including Year 8 is \$12,405 per acre. This amount is amortized over 25 years, the estimated life of the orchard after establishment.

Table 12. Pears, Establishment Year 7, \$/Acre Economic Costs and Returns.

<u>GROSS INCOME</u>	<u>Description</u>	<u>Quantity</u>	<u>Unit</u>	<u>\$/Unit</u>	<u>Total</u>
Pears		24.00	bins	205.00	4,920.00
Total GROSS Income					4,920.00
<u>VARIABLE COSTS</u>	<u>Description</u>	<u>Labor</u>	<u>Machinery</u>	<u>Materials</u>	<u>Total</u>
Pruning & Training		299.00	0.00	0.00	299.00
Tree Removal (4 Trees)		6.50	0.00	0.00	6.50
Tree Replacement (4 Trees)		0.00	3.08	22.00	25.08
Fertilizer		3.90	2.08	60.45	66.43
Ca Nitrate	650# x.093=60.45				
Herbicide - Strip Maintenance (.33x)		13.65	6.67	14.23	34.55
Roundup	2.0 qts x 16.10=32.20				
Princep	3.0 lbs x 2.25=6.75				
Surfactant	1.0 qt x 3.75=3.75				
Insecticides & Fungicides		21.45	30.60	438.58	490.63
For Trade Names, Application Rates, Costs/Unit and Costs/Acre, Refer to Table 3.					
Hive Rental	1.5 Hives	0.00	0.00	30.00	30.00
Flailing		32.50	24.69	0.00	57.19
Rodent Control		0.00	0.75	3.50	4.25
Frost Protection		0.00	19.38	0.00	19.38
Irrigation		0.00	12.00	35.00	47.00
Ladders, Pruning & Picking Equipment		0.00	0.68	0.00	0.68
Harvesting Costs		349.50	64.87	0.00	414.37
Pickups, Trucks & ATV's		0.00	56.35	0.00	56.35
Labor Facilities - Repairs & Maintenance		0.00	0.00	10.71	10.71
Miscellaneous		0.00	0.00	50.00	50.00
Interest: Operating Capital		0.00	0.00	31.92	31.92
Total VARIABLE COSTS					1,644.04
GROSS INCOME minus VARIABLE COSTS					3,275.96

<u>FIXED COSTS</u>	<u>Description</u>	<u>Units</u>	<u>Total</u>
CASH Costs			
	Machinery and Equipment Insurance	acre	12.97
	Pickups, Trucks & ATV's Insurance	acre	3.82
	Property Insurance, etc.	acre	50.00
	Property Taxes	acre	30.00
Total CASH Costs			96.79
NON-CASH Costs			
	Machinery and Equipment Deprec., Interest & Housing	acre	389.56
	Pickups, Trucks & ATV's Deprec., Interest & Housing	acre	88.21
	Labor Facilities Depreciation & Interest	acre	35.72
	Depreciation on Training Equipment	acre	8.08
	Depreciation on Tree Covers	acre	9.00
	Owner Labor	acre	85.68
	Land Interest Charge	acre	350.00
	Interest on Accumulative Investment	acre	1,567.20
Total NON-CASH Costs			2,533.45
Total FIXED COSTS			2,630.24
Total of All Costs Per Acre			4,274.28
NET PROJECTED RETURNS			645.72

Table 13. Pears, Establishment Year 8, \$/Acre Economic Costs and Returns.

<u>GROSS INCOME</u>	<u>Description</u>	<u>Quantity</u>	<u>Unit</u>	<u>\$/Unit</u>	<u>Total</u>
Pears		35.00	bins	205.00	7,175.00
Total GROSS Income					7,175.00
<u>VARIABLE COSTS</u>	<u>Description</u>	<u>Labor</u>	<u>Machinery</u>	<u>Materials</u>	<u>Total</u>
Pruning & Training		455.00	0.00	0.00	455.00
Tree Removal (4 Trees)		6.50	0.00	0.00	6.50
Tree Replacement (4 Trees)		0.00	3.08	22.00	25.08
Fertilizer		7.80	4.15	60.45	72.40
Ca Nitrate	650# x.093=60.45				
Herbicide - Strip Maintenance (.33x)		13.65	6.70	31.66	52.01
Roundup	2.0 qts x 16.10=32.20				
Kerb	4.0 lbs x 14.76=59.04				
Surfactant	1.0 qt x 3.75=3.75				
Insecticides & Fungicides		21.45	30.60	438.58	490.63
For Trade Names, Application rates, Costs/Unit and Costs/Acre, Refer to Table 3.					
Hive Rental	1.5 Hives	0.00	0.00	30.00	30.00
Flailing		32.50	24.69	0.00	57.19
Rodent Control		0.00	0.75	3.50	4.25
Frost Protection		0.00	19.38	0.00	19.38
Irrigation		0.00	12.00	35.00	47.00
Ladders, Pruning & Picking Equipment		0.00	0.68	0.00	0.68
Harvesting Costs		485.50	67.81	0.00	553.31
Pickups, Trucks & ATV's		0.00	56.35	0.00	56.35
Labor Facilities - Repairs & Maintenance		0.00	0.00	10.71	10.71
Miscellaneous		0.00	0.00	50.00	50.00
Interest: Operating Capital		0.00	0.00	38.22	38.22
Total VARIABLE COSTS					1,968.71
GROSS INCOME minus VARIABLE COSTS					5,206.29

<u>FIXED COSTS</u>	<u>Description</u>	<u>Units</u>	<u>Total</u>
CASH Costs			
	Machinery and Equipment Insurance	acre	13.54
	Pickups, Trucks & ATV's Insurance	acre	3.82
	Property Insurance, etc.	acre	50.00
	Property Taxes	acre	30.00
Total CASH Costs			97.36
NON-CASH Costs			
	Machinery and Equipment Deprec., Interest & Housing	acre	400.14
	Pickups, Trucks & ATV's Deprec., Interest & Housing	acre	88.21
	Labor Facilities Depreciation & Interest	acre	35.72
	Depreciation on Training Equipment	acre	8.08
	Depreciation on Tree Covers	acre	9.00
	Owner Labor	acre	94.18
	Land Interest Charge	acre	350.00
	Interest on Accumulative Investment	acre	1,502.60
Total NON-CASH Costs			2,487.93
Total FIXED COSTS			2,685.29
Total of All Costs Per Acre			4,554.00
NET PROJECTED RETURNS			2,621.00

Production Years

Table 14 shows an enterprise budget of an acre of high density pears in the Hood River Valley at full production. Long-term yields are estimated to be 40 bins of pears per acre at a price of \$205 per bin. Projected gross returns are \$8,200 per acre per year.

Pruning labor is significantly higher with increased pruning practices required to achieve these higher yields. At full production, raking and shredding brush is performed as a cultural practice with the intense pruning and tree growth. The variable cost is \$18 per acre for raking and shredding.

Total establishment cost is \$12,405 per acre and amortized at ten percent interest over a 25 year life at a cost of \$1,370 per acre per year. This charge represents the annual payment, or opportunity cost, required to repay a loan taken out to establish an acre of pears.^[4] Alternatively, it can represent the income you could earn over the next 25 years if you had invested in something which earned you a 10 percent return.

Total variable cost is \$2,139 per acre. Projected net returns over variable cost is \$6,061 per acre. Total fixed cost is \$2,474; fixed cash cost is \$99 per acre and fixed non-cash is \$2,376 per acre. Total long-term costs to produce 40 bins of pears is \$4,613 per acre per year. This enterprise budget projects a \$3,587 per acre return over total costs to a producer with this type of orchard establishment technique.

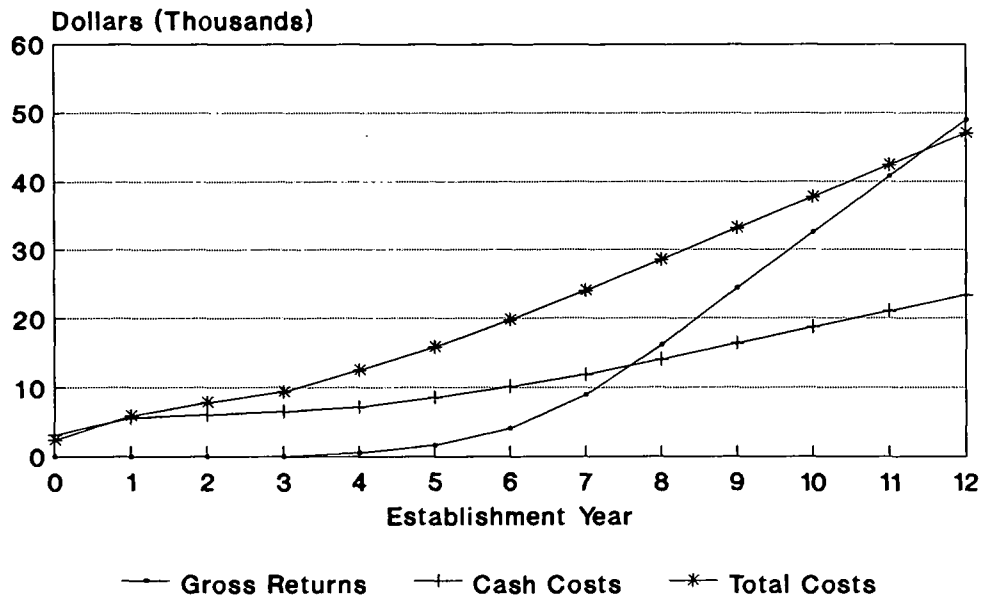
Using the projected prices, the break-even yield to cover total variable cost is approximately 10.50 bins per acre and 22.50 bins per acre to cover total costs. Break-even prices for this type of orchard is \$53 per bin for variable costs and \$115 per bin for total costs. In the 1989 crop year, the estimated weighted average price for red d'Anjou, green Bartlett and Bosc pears was \$170 per bin. At these prices, establishing a high density pear block would cover all costs of production and a positive net return to management and risk.

Table 14. Pears, Full Production Years, \$/Acre Economic Costs and Returns.

<u>GROSS INCOME</u>	<u>Description</u>	<u>Quantity</u>	<u>Unit</u>	<u>\$/Unit</u>	<u>Total</u>
Pears		40.00	bins	205.00	8,200.00
Total GROSS Income					8,200.00
<u>VARIABLE COSTS</u>	<u>Description</u>	<u>Labor</u>	<u>Machinery</u>	<u>Materials</u>	<u>Total</u>
Pruning & Training		455.00	0.00	0.00	455.00
Tree Removal (4 Trees)		9.75	0.00	45.00	54.75
Tree Replacement (4 Trees)		6.50	3.08	22.00	31.58
Raking and Shredding Brush		9.75	7.82	0.00	17.57
Fertilizer		7.80	4.15	60.45	72.40
Ca Nitrate	650# x.093=60.45				
Herbicide - Strip Maintenance (.33x)		13.65	6.70	31.66	52.01
Roundup	2.0 qts x 16.10=32.20				
Kerb	4.0 lbs x 14.76=59.04				
Surfactant	1.0 qt x 3.75=3.75				
Insecticides & Fungicides		21.45	30.60	438.58	490.63
For Trade Names, Application Rates, Costs/Unit and Costs/Acre, Refer to Table 3.					
Hive Rental	1.5 Hives	0.00	0.00	30.00	30.00
Flailing		32.50	24.69	0.00	57.19
Rodent Control		0.00	0.75	3.50	4.25
Frost Protection		0.00	19.38	0.00	19.38
Irrigation		0.00	12.00	35.00	47.00
Ladders, Pruning & Picking Equipment		0.00	0.68	0.00	0.68
Harvesting Costs		570.50	77.14	0.00	647.64
Pickups, Trucks & ATV's		0.00	56.35	0.00	56.35
Labor Facilities - Repairs & Maintenance		0.00	0.00	10.71	10.71
Miscellaneous		0.00	0.00	50.00	50.00
Interest: Operating Capital		0.00	0.00	41.52	41.52
Total VARIABLE COSTS					2,138.66
GROSS INCOME minus VARIABLE COSTS					6,061.34

<u>FIXED COSTS</u>	<u>Description</u>	<u>Units</u>	<u>Total</u>
CASH Costs			
	Machinery and Equipment Insurance	acre	14.75
	Pickups, Trucks & ATV's Insurance	acre	3.82
	Property Insurance, etc.	acre	50.00
	Property Taxes	acre	30.00
Total CASH Costs			98.57
NON-CASH Costs			
	Machinery and Equipment Deprec., Interest & Housing	acre	429.10
	Pickups, Trucks & ATV's Deprec., Interest & Housing	acre	88.21
	Labor Facilities Depreciation & Interest	acre	35.71
	Owner Labor	acre	102.68
	Land Interest Charge	acre	350.00
	Amortized Establishment Costs	acre	1,370.05
Total NON-CASH Costs			2,375.75
Total FIXED COSTS			2,474.32
Total of All Costs Per Acre			4,612.98
NET PROJECTED RETURNS			3,587.02
	Break-Even Price, Total Variable Cost	\$ 53.47 per bin	
	Break-Even Price, Total Cost	\$115.32 per bin	
	Break-Even Yield, Total Variable Cost	10.43 tons	
	Break-Even Yield, Total Cost	22.50 tons	

FIGURE 2. ACCUMULATIVE RETURNS, CASH & TOTAL COSTS IN ESTABLISHMENT YEARS



ON A PER ACRE BASIS

Cumulative gross returns, cash and non-cash costs are illustrated in Figure 2 and shown in Table 15, page 33. Figure 2 highlights the large investment in establishing pears and provides an estimate of the capital required to establish an acre of high density pears.

Table 15 also shows that Year 12 is the point, in establishing a pear orchard, that cumulative gross returns are greater than cumulative economic costs. This year would be considered the break-even year of establishment. Most producers would agree that this time frame is unacceptable to their current way of farming. However, a producer should not forget the cost items included in this economic analysis. In Year 12, the producer would cover all costs of production including opportunity costs, accumulated interest, depreciation, and a return to labor and land. Any net returns over these costs are returns to management and risk.

Table 15. Pear Establishment, Economic Costs and Returns, 1 Acre¹

Item	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Total
RETURNS					\$525	\$1,050	\$2,460	\$4,920	\$7,175	\$8,200	\$8,200	\$8,200	\$8,200	\$48,930
OPERATING COSTS														
Variable Cost	\$1,778	\$2,184	\$364	\$413	541	1,199	1,412	1,644	1,999	2,139	2,139	2,139	2,139	15,351
Fixed Cash Costs	93	93	86	87	88	90	96	97	97	99	99	99	99	864
Fixed Non-Cash Costs	473	1,276	1,433	1,657	1,937	2,049	2,356	2,533	2,488	2,376	2,376	2,376	2,376	20,867
ANNUAL COSTS	-2,344	-3,553	-1,883	-2,157	-2,041	-2,288	-1,404	646	2,591	3,586	3,586	3,586	3,586	11,848
CUMULATIVE COSTS	-2,344	-5,897	-7,780	-9,937	-11,978	-14,266	-15,670	-15,024	-12,433	-8,847	-5,261	-1,675	1,911	

¹Totals for the Cumulative Costs are not identical to the Economic Cost and Return Budgets due to the rounding of numbers to the nearest whole number.

Table 16. Pear Establishment, Cash Flow Analysis, 1 Acre²

Item	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Total
RETURNS					\$525	\$1,050	\$2,460	\$4,920	\$7,175	\$8,200	\$8,200	\$8,200	\$8,200	\$48,930
OPERATING COSTS														
Variable Cost	\$1,778	\$2,411	\$378	\$429	562	1,246	1,468	1,709	2,078	2,223	2,223	2,223	2,223	15,955
Fixed Cash Costs	1,293	93	86	87	88	90	96	97	97	99	99	99	99	864
ANNUAL CASH FLOW	-3,071	-2,504	-464	-516	-125	-286	896	3,114	5,000	5,878	5,878	5,878	5,878	32,111
CUMULATIVE CASH FLOW	-3,071	-5,575	-6,039	-6,555	-6,680	-6,966	-6,070	-2,956	2,044	7,922	13,800	19,678	25,556	

²The cash flow variable costs are not identical to the total variable costs shown in the Economic Costs and Return Budgets. This is due to the interest charge assessed on all cash costs for a 12 month period rather than one-third of the cash expenses borrowed for a 6 month period that's assumed in the Economic Costs and Return Budgets. Also in Year 0, the cash flow fixed cash cost is higher, then in Year 0's Economic Cost and Return Budget, because it reflects the purchase of the irrigation system. The Economic Costs and Return Budget depreciates the irrigation system over a 25 year period.

CASH FLOW ANALYSIS

Financial institutions have concerns about the cash flow capabilities of the orchard industry. Lenders require financial documents that demonstrate the cash flow repayment schedule of the farm business. Obsolete and depreciated orchards do not meet cash flow requirements of a farm business and need to be replaced for a positive economic return. Many producers and lenders need assistance in calculating these costs of establishment for a better financial analysis. This portion of the study will benefit those producers and lenders in analyzing the cash flow requirements to establish a high density pear orchard.

The enterprise budgets presented in this study illustrate the economic costs and returns of establishing a high density pear orchard. These costs included cash costs as well as non-cash costs. The cost of fixed assets were spread over their useful lives in the form of depreciation and interest.^[4] A cash flow analysis is similar; however, it does not include depreciation, opportunity costs, owner labor and a return to land. This cash flow analysis projects only the cash requirements to establish a high density pear orchard, assuming the land, machinery and equipment, labor facilities, wind machines is owned and paid for.

As shown in Table 16, page 33, in Year 6, projected gross returns are greater than the establishment cash costs incurred. By Year 8, the producer will receive sufficient gross returns to repay all incurred cash costs. However, it must be stressed, this is not the break-even year of establishment. This is only the year in which cumulative gross returns are greater than cash costs without any regard to opportunity costs, interest charges, depreciation, owner labor and a return to land. Over the long-run, assets must be replaced.

SUMMARY

This study suggests Year 12 as the economic break-even point for establishing a high density pear orchard in the Hood River Valley. At this point in time, all costs of production are covered with a return to management and risk. However, the higher levels of input required for earlier and greater production must be emphasized. Producers must change from traditional management practices and adapt new ideas and technology to achieve these yields and gross returns assumed in this study.

At full production, the break-even yield is 10.50 bins per acre to cover variable costs and 22.50 bins per acre to cover total costs. Break-even prices, at the assumed 40 bins per acre yield, to cover variable cost is \$53 per bin and \$115 per bin to cover total costs.

The cash flow analysis probably shows the most important information to a producer and lender. This analysis shows the flow of funds required to establish an acre of high density orchard and the capability of the producer to repay these funds. Table 16 shows that in establishment Year 6, the producer will receive revenues greater than expenses. In establishment Year 8, the producer should be able to begin repaying all cash costs to a financial institution. Consequently, this cash flow analysis will assist producers and lenders in their management decision to establish a high density pear orchard in the Hood River Valley.

Establishing an acre of orchard is an expensive investment. Producers must estimate the consumer's demand for fruit in 20 to 30 years. This is a decision that should be made with caution and implemented with maximizing profits in mind. Theories in the orchard industry suggest that high density orchards, as in our study, are planted for a maximum of 25 to 35 years. At that time the producer will replace the orchard with newer fruit varieties that can be adapted to changes in consumers demand. This theory requires that the

producer use the most efficient techniques and technology available. High density orchards require large capital purchases and high levels of input which must be analyzed carefully. This study is based on the premise that the selection of varieties are appropriate for future consumer's demand.

If a grower does not elect to incorporate new techniques and ideas into his/her establishment plans, the ability to recover establishment costs will be delayed over what is projected in this study. The authors feel that one of the values of this study is that growers will realize the importance of early training and higher density plantings.

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