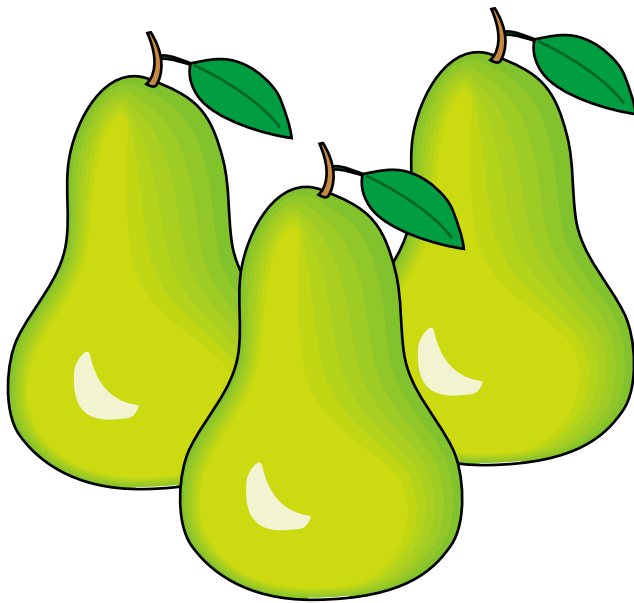


Orchard Economics

Establishing and Producing High-Density Pears in Hood River County



Orchard Economics: Establishing and Producing High-Density Pears in Hood River County

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Introduction

Many factors enter into the decision to renew an existing orchard or develop a new one. Both require the commitment of considerable effort and financial resources. Planting a high-density orchard can increase production during the establishment years and reduce the time to reach full production compared to a standard-density orchard. Consequently, the high-density orchard has higher economic potential, but also has greater financial risk associated with it.

This analysis is intended for growers and investors who are considering the economic and financial consequences of planting a high-density pear orchard. It is impossible to cover all pear variety, rootstock, and training system combinations in a publication of this type, so an attempt has been made to reflect the typical production practices performed in the Hood River County pear industry.

Assumptions

In the preparation of this publication, several assumptions were made that reflect current trends in orchard design for establishing a high-density pear orchard. These assumptions include:

1. Typical acreage for a farm in Hood River County is 70 acres of irrigated land. Bearing acres include: 30 acres of winter pears, 8 acres of fresh market Bartlett pears, 4 acres of canning market Bartlett pears, 8 acres of high-density pears, 5 acres of medium-density apples, 5 acres of high-density sweet cherries or wine grapes, and 10 acres, or approximately 15 percent, of the orchard under establishment.
2. Remove 8 acres of orchard consisting of 110 trees per acre and plant 272 pear trees per acre (10' x 16' spacing) with a productive life of 25 years, once full production of 40 bins per acre is reached.

3. The high-density orchard is trained to a central leader system.
4. Pear prices are \$150 per 1,050 pound bin.
5. Commercial yields begin in year 4, and full production is reached in 9 years after planting, with yields of 3, 6, 12, 24, 32, and 40 bins per acre in years 4 through 9, respectively.
6. All labor is hired at a rate of \$10.00 per hour and \$14.40 per bin to harvest pears, which includes worker's compensation, unemployment insurance, and other labor overhead expenses. All labor is treated as a cash variable expense.
7. The owner provides housing facilities for seasonal labor at a cost of \$40,000 for a 10-person unit. The life of the facility is 30 years, and it is 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 an 8 percent interest rate $((\text{cost} + \text{salvage value}) \div 2 \times 0.08)$. Repairs and maintenance for these facilities cost 2.5 percent of the purchase price per year.
8. Foreman housing with all utilities, except telephone, is provided at no cost to the employee, valued at \$600 per month, or \$103 per acre, and is treated as a fixed non-cash opportunity cost to the operator. This is the estimated market rental rate for a three-bedroom, two-bathroom house in the area.

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9. The machinery and equipment used in the budget reflects the typical machinery complement of a farm in Hood River County. A detailed breakdown of machinery values is shown in Table 1. Estimated machinery costs from the American Society of Agricultural Engineers are shown in Table 2. The 70-hp tractor is used for flailing, shredding brush, pulling an air-blast sprayer, and during harvest. The 50-hp tractor is used to auger holes for new trees, spread fertilizer, pull an older air-blast sprayer, apply gopher bait, and used at harvest. The 35-hp tractor is used to spray weeds, assist in harvest, and as a general utility tractor. Table 3 lists the estimated cost of each operation with 16' tree row spacing. Gasoline and diesel costs per gallon are \$1.70 and \$1.40, respectively.
10. The interest rate on operating funds is 10 percent, which is treated as a cash expense. One-half of the cash expenses are borrowed for a six-month period.
11. Machinery and land are owned by the operator and assessed 10 and 8 percent rates of interest, respectively, as opportunity costs. Land is valued at \$6,000 per acre.
12. Previous years' establishment costs are funded by the operator at a charge of 8 percent interest and are considered an opportunity cost.
13. Herbicides used for strip maintenance are applied to 30 percent of each acre.
14. A micro-sprinkler irrigation system with poly-tube is used at an estimated cost of \$1,200 per acre. The life of the system is 25 years, and it is depreciated using the straight-line method of depreciation with a zero salvage value. Interest is calculated using the average value of the system multiplied by an 8 percent interest rate $((\text{cost} + \text{salvage value}) \div 2 \times 0.08)$. Repairs and maintenance for the system costs 1 percent of the purchase price per year.
15. Two wind machines are used for frost control along with three smudge pots per acre. The wind machines are valued at \$17,000 each, and smudge pots cost \$10 each. Salvage value is zero. Depreciation periods are 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 an 8 percent interest rate $((\text{cost} + \text{salvage value}) \div 2 \times 0.08)$. Repairs and maintenance are estimated to cost 1 percent of the purchase price of the wind machines and smudge pots per year.
16. Additional assumptions for variable, cash fixed, and non-cash fixed cost are listed in Table 4.
17. Price inflation for the duration of this study was ignored.
18. Income tax consequences are also ignored for this study.

Table 1. Machinery cost assumptions.

Machine	Size or description	Market value	Hours or miles of annual use	Expected life (yrs)
Tractor	4 wheel dr 70hp, new	\$ 30,000	579	10
Tractor	2 wheel dr 50hp, old	17,000	193	20
Tractor	2 wheel dr 35hp, old	7,500	176	20
Air-blast sprayer	400 gallon unit, PTO, new	15,000	167	10
Air-blast sprayer	400 gallon unit, PTO, older	5,000	111	10
Flail chopper	8' unit	6,000	166	7
Weed sprayer	100 gallon unit	2,000		15
			41	
Fertilizer spreader		2,300		20
			13	
Brush windrow		3,500		20
			31	
Gopher machine		1,200		20
			13	
Pickup	1/2 ton 4x4, new	20,000	12,000	10
Truck	2 ton, used	15,000	3,500	20
ATV	4 wheeler, new	5,500	3,000	5
Auger		1,700	N/A	20
Front-end loader & backforks		5,800	N/A	10
Bin trailer		5,000	N/A	10
Ladders	35 units	4,500	N/A	10
Picking bags	35 units	1,500	N/A	5
Picking buckets for wine grapes			N/A	5
		500		
Chain & pruning saws	3 units each, 1-loppers	3,000	N/A	3
Irrigation system	Solid set, per acre	1,500	N/A	25
Irrigation system	Handlines, per acre		N/A	25
		400		
Irrigation system	Micro, per acre	1,200	N/A	25
Irrigation system	Drip system, per acre	1,400	N/A	25
Wind machine	2 units, gasoline	34,000		25
			35	
Smudge pots	3 units, per acre			10
		30	15	
Trellis system - med.-density apples	Three-wire vertical, per acre	1,250	N/A	25
Trellis system - wine grapes	per acre	2,000	N/A	25
Housing facilities	1 10-person unit	40,000	N/A	30

Table 2. Machinery cost calculations.

Machine	Size or description	--- Variable costs ---		--- Fixed costs ---		Total cost
		Fuel & lube	Repairs & maintenance	Depr. & interest	Insurance	
----- Costs per hour -----						
Tractor	4 wheel dr 70hp, new	\$9.66	\$0.52	\$6.70	\$0.47	\$17.35
Tractor	2 wheel dr 50hp, old	8.05	0.46	8.82	0.79	18.13
Tractor	2 wheel dr 35hp, old	8.05	0.18	4.26	0.38	12.88
Air-blast sprayer	400 gallon unit, PTO, new	0.00	7.17	11.74	0.54	19.45
Air-blast sprayer	400 gallon unit, PTO, older	0.00	2.12	5.87	0.27	8.26
Flail chopper	8' unit	0.00	2.51	6.27	0.22	9.00
Weed sprayer	100 gallon unit	0.00	0.71	5.61	0.30	6.61
Fertilizer spreader		0.00	0.96	18.10	1.09	20.15
Brush windrow		0.00	1.92	11.15	0.67	13.74
Gopher machine		0.00	0.51	8.99	0.54	10.04
----- Costs per mile -----						
Pickup	1/2 ton 4x4, new	\$0.20	\$0.05	\$0.21	\$0.02	\$0.47
Truck	2 ton, used	0.39	0.29	0.34	0.04	1.07
ATV	4 wheeler, new	0.04	0.02	0.04	0.02	0.12
----- Costs per acre -----						
Auger		\$0.00	\$0.24	\$2.43	\$0.00	\$2.67
Front-end loader & backforks		0.00	2.32	34.80	0.00	37.12
Bin trailer		0.00	0.71	10.71	0.00	11.43
Ladders	35 units	0.00	3.86	9.64	0.00	13.50
Picking bags	35 units	0.00	1.29	5.36	0.00	6.64
Picking buckets for wine grapes		0.00	1.20	5.00	0.00	6.20
Chain & pruning saws	3 units each, 1-loppers	3.40	2.57	16.43	0.00	22.40
Irrigation system	Solid set, per acre	0.00	15.00	120.00	0.00	135.00
Irrigation system	Handlines, per acre	0.00	4.00	32.00	0.00	36.00
Irrigation system	Micro, per acre	0.00	12.00	96.00	0.00	108.00
Irrigation system	Drip system, per acre	0.00	14.00	112.00	0.00	126.00
Wind machine	2 units, gasoline	25.50	9.71	38.86	0.00	74.07
Smudge pots	3 units, per acre	1.50	0.01	0.18	0.00	1.69
Trellis system - apples	Three-wire vertical, per acre	0.00	12.50	100.00	0.00	112.50
Trellis system - wine grapes	per acre	0.00	20.00	160.00	0.00	180.00
Housing facilities	1 10-person unit	0.00	14.29	41.90	0.00	56.19

Table 3. Estimated cost of each operation with power-unit for a 16' between-row spacing.

Operation	Tractor	Miles per hour	Acres per hour	Labor cost per acre	-- Machine costs --		Total cost per acre
					Variable cost per acre	Fixed cost per acre	
Air-blast sprayer	4 wheel dr 70hp	2.00	1.94	\$5.16	\$8.94	\$10.03	\$24.13
Flail chopper	2 wheel dr 50hp	2.00	1.65	6.07	10.03	9.77	25.86
Weed sprayer	2 wheel dr 35hp	3.50	2.55	3.93	3.51	4.15	11.59
Fertilizer spreader	2 wheel dr 50hp	3.00	4.07	2.46	2.32	7.07	11.85
Brush windrow	2 wheel dr 50hp	2.00	1.65	6.07	6.32	13.00	25.39
Gopher machine	2 wheel dr 50hp	2.50	3.88	2.58	2.32	4.94	9.84

Table 4. Input assumptions for establishing a high-density pear orchard (per acre basis).

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Full Prod
Prices per bin	\$ 150	\$ 150	\$ 150	\$ 150	\$ 150	\$ 150	\$ 150	\$ 150	\$ 150	\$ 150
Bins per acre	0.00	0.00	0.00	0.00	3	6	12	24	32	40
Cost of general orchard labor, per hour	\$ 10.00	\$ 10.00	\$ 10.00	\$ 10.00	\$ 10.00	\$ 10.00	\$ 10.00	\$ 10.00	\$ 10.00	\$ 10.00
Cost of harvest labor, per bin	0.00	0.00	0.00	0.00	14.40	14.40	14.40	14.40	14.40	14.40
Production mgmt consultant fees	0.00	0.00	0.00	0.00	30.00	30.00	30.00	30.00	30.00	30.00
Hours of pruning and training labor	0.00	2.00	4.00	6.00	13.00	20.00	24.00	28.00	32.00	32.00
Hours of thinning labor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	6.00	8.00
Hours of irrigating labor	0.00	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
Hours to install pheromone disruption	0.00	0.00	0.00	0.00	0.50	0.75	0.75	1.00	1.25	1.50
Hours to remove & replace tree labor	0.00	0.50	1.00	1.00	1.50	1.50	2.50	2.50	2.50	2.50
Hours for frost protection labor	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Hours of general labor during harvest	0.00	0.00	0.00	0.00	2.25	4.50	9.00	18.00	24.00	30.00
Cost of fertilizer - broadcast applied	80.00	0.00	27.20	27.20	27.20	27.20	53.60	53.60	80.00	80.00
Cost of fertilizer - lime	144.00	0.00	0.00	144.00	0.00	0.00	144.00	0.00	0.00	48.00
Cost of herbicide strip maintenance	0.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Cost of insecticides & fungicides	0.00	0.00	18.00	54.00	360.00	450.00	450.00	450.00	450.00	450.00
Cost of pheromone disruption	0.00	0.00	0.00	0.00	50.00	50.00	50.00	50.00	50.00	50.00
Cost of rodent materials	0.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Cost per bee hive	0.00	0.00	0.00	0.00	28.00	28.00	28.00	28.00	28.00	28.00
Times for fertilizer - broadcast applied	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Times for herbicide strip spray	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Times for insecticides & fungicides	0.00	0.00	2.00	4.00	10.00	10.00	10.00	10.00	10.00	10.00
Number of bee hives per acre	0.00	0.00	0.00	0.00	1.00	1.00	1.50	2.00	2.00	2.00
Times for rodent control	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Times for flailing/mowing orchard floor	0.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00

Table 4. Input assumptions for establishing a high-density pear orchard (per acre basis) (continued).

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Full Prod
Property taxes	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Property insurance	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
Land values	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Foreman housing (per month)	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00
Irrigation assessment	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Miscellaneous & overhead	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00
Tree cost	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Gasoline price	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70
Diesel fuel price	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
Operating interest rate	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%
Machinery interest rate	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%
Land interest rate	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
Establishment interest rate	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
% of operating capital borrowed	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%
Months to borrow operating capital	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Planted trees	0.00	272	2	2	2	2	2	2	2	2

Results of establishing a high-density pear orchard in Hood River County

Cash flow analysis

A cash flow analysis for establishing a high-density pear planting is contained in Table 5. A cash flow analysis shows the cash costs required to establish an orchard. Cash costs include labor, trees, irrigation system, fertilizer, chemicals, bee hives, machinery repairs, fuel, lube and oil, labor housing repairs and maintenance, operating (short-term) interest, machinery and housing insurance, irrigation water assessments, and property taxes. The income, variable costs, and cash fixed costs are shown for each of the 10 establishment years. Production begins in year 4 with 3 bins of pears per acre and increases to 40 bins at full production. Total variable costs are \$2,386 in the first year, with an additional \$106 of cash fixed costs for a total cash cost of \$2,492 per acre.

A positive cash flow begins in year 7, with gross income exceeding total cash costs by \$1,255 per acre. At full production, or in 9 years after planting, the orchard does not return a sufficient amount of gross income to pay all previous years' costs. There is \$4,153 per acre remaining over and above prior costs, and it is not until year 11 that all previous years' production costs are paid, Figure 3, page 11.

The major cost components in relation to total cash costs are shown in Figure 1 on page 11. Hired labor represents 30 percent of the total cash costs to establish this orchard. Together, fertilizer and chemicals is the second largest cost item, making up 21 percent of the total cash costs. Machine costs, which include fuel, oil, and repairs, are 14 percent of the cash costs. Tree and irrigation costs are only 8 and 7 percent, respectively, of the total cash costs. The remaining 20 percent of the total cash costs consists of operating interest (2 percent), insurance and taxes (3 percent), field preparations (5 percent), and other cost items (10 percent).

Economic costs and returns

The economic costs and returns for the establishment of a high-density pear orchard are shown in Table 6 (page 11). Economic costs include all cash costs and ownership costs that are either an opportunity cost to the owner or dollars borrowed from a financial institution. These ownership costs include the principal and interest payments or a return on investment to the grower, or both, for machinery, housing, land, and funds to pay for previous years' establishment costs. The gross income and variable cash costs remain the same as in Table 5 (page 10), except that the irrigation system is amortized over its productive life in this analysis and included in fixed machine costs.

Gross income exceeds variable costs beginning in year 9 (Full Production), with \$61 per acre return to the grower. Additionally, at the end of the establishment period, \$24,887 per acre remains to repay all previous establishment costs. This cost is amortized over a 25-year period as an annual payment of \$2,336 per acre as shown in Table 16, Full Production Years, page 23.

The relative contribution of each cost component to the total economic cost is shown in Figure 2 (page 12). When all economic costs are included, interest cost is the largest cost item, with 29 percent of the total costs for the first 10 years of establishment. Machine costs (fuel, oil, repairs, depreciation and interest charges) are the next largest cost, with 17 percent, and hired labor costs are third, with 15 percent of the total economic costs, respectively. Excluding the "other" cost category (13 percent), fertilizer and chemicals, and land charges are the fourth and fifth largest cost items, totaling 22 percent of the total economic costs when considered together. Trees are 4 percent of the total economic costs.

The net projected returns for establishing a high-density pear orchard are shown in Figure 3 (page 12). Both the cumulative cash and economic cost and returns are represented. The projected returns for this orchard will cover all cash costs of establishment in 11 years. With the assumptions in this study, however, this

orchard will not generate sufficient gross incomes to cover all economic costs for the 25-year period. Determining the necessary levels of change to price or inputs that will make this orchard a prudent business investment requires a sensitivity analysis. Using this approach, we determined that profitability could be achieved by doing any one of the following:

- a) increasing the pear prices by 18.5 percent from \$150 to \$178 per bin,
- b) increasing anticipated yield by 22 percent (4, 7, 15, 29, 39, and 49 bins per acre for years 4, 5, 6, 7, 8, and 9, respectively), or
- c) decreasing the rate of return for machinery, land, and previous years' establishment costs to 5.74 percent for all ownership costs.

The results of these adjustments are shown in Figure 4 (page 13). It should be noted that by reducing assumed interest rates to 5.75 percent, the amount of money required to establish this orchard in year 7 is decreased by \$5,539 per acre (from \$24,938 per acre to \$19,339). Increasing pear price or yield reduces the amount of money required in year 7 by \$2,378 per acre. While growers often focus on reducing the cost of trees, fertilizers, and chemicals, it is apparent that interest costs are the largest cost component in orchard renewal (Figure 2, page 12). Therefore, more emphasis should be placed on obtaining higher fruit prices or a combination of earlier and higher yields to reduce those interest costs. The additional revenues must be greater than the additional costs of inputs to achieve these increased prices or yields.

Table 5. Cash costs and returns of establishing a high-density pear orchard.

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Full Prod
Income:										
Yield (bins/acre)	0.00	0.00	0.00	0.00	3.00	6.00	12.00	24.00	32.00	40.00
Price (dollars/bin)	<u>150.00</u>	<u>150.00</u>	<u>150.00</u>	<u>150.00</u>	<u>150.00</u>	<u>150.00</u>	<u>150.00</u>	<u>150.00</u>	<u>150.00</u>	<u>150.00</u>
Gross income (dollars/acre)	0.00	0.00	0.00	0.00	450.00	900.00	1,800.00	3,600.00	4,800.00	6,000.00
Variable costs (per acre):										
Field preparation	1,208.08	30.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trees	0.00	1,632.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
Irrigation system	0.00	1,200.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paint trees	0.00	30.00	0.00	30.00	0.00	0.00	0.00	0.00	0.00	0.00
Fertilizer	872.65	0.00	27.20	171.20	27.20	27.20	197.60	53.60	80.00	128.00
Chemicals	0.00	30.00	48.00	84.00	390.00	480.00	480.00	480.00	480.00	480.00
Pheromone disruption	0.00	0.00	0.00	0.00	50.00	50.00	50.00	50.00	50.00	50.00
Prod. mgmt consultant fees	0.00	0.00	0.00	0.00	30.00	30.00	30.00	30.00	30.00	30.00
Bee rental	0.00	0.00	0.00	0.00	28.00	28.00	42.00	56.00	56.00	56.00
Rodent materials	0.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Harvest labor	0.00	0.00	0.00	0.00	65.70	131.40	262.80	525.60	700.80	876.00
General labor	62.46	742.91	138.53	260.97	301.90	374.40	424.40	506.90	569.40	591.90
Machine costs	95.82	423.28	218.94	253.18	327.66	335.32	354.02	373.92	387.19	400.46
Housing facilities	14.29	14.29	14.29	14.29	14.29	14.29	14.29	14.29	14.29	14.29
Miscellaneous & overhead	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00
Interest: operating capital	<u>58.21</u>	<u>74.61</u>	<u>13.52</u>	<u>22.69</u>	<u>33.22</u>	<u>39.12</u>	<u>48.73</u>	<u>54.61</u>	<u>61.54</u>	<u>68.02</u>
Total variable costs	2,386.50	4,259.08	554.47	930.33	1,361.97	1,603.72	1,997.84	2,238.92	2,523.22	2,788.67
Gross income - variable cost	-2,386.50	-4,259.08	-554.47	-930.33	-911.97	-703.72	-197.84	1,361.08	2,276.78	3,211.33
Fixed costs (per acre):										
Insurance	40.79	40.79	40.79	40.79	40.79	40.79	40.79	40.79	40.79	40.79
Water assessment	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Property taxes	<u>30.00</u>	<u>30.00</u>	<u>30.00</u>	<u>30.00</u>	<u>30.00</u>	<u>30.00</u>	<u>30.00</u>	<u>30.00</u>	<u>30.00</u>	<u>30.00</u>
Total fixed cost	105.79	105.79	105.79	105.79	105.79	105.79	105.79	105.79	105.79	105.79
Total cost	2,492.29	4,364.87	660.27	1,036.12	1,467.76	1,709.52	2,103.63	2,344.71	2,629.02	2,894.46
Net projected returns	-2,492.29	-4,364.87	-660.27	-1,036.12	-1,017.76	-809.52	-303.63	1,255.29	2,170.98	3,105.54
Cumulative returns	-2,492.29	-6,857.17	-7,517.44	-8,553.56	-9,571.31	-10,380.83	-10,684.46	-9,429.18	-7,258.19	-4,152.65

Table 6. Economic costs and returns of establishing a high-density pear orchard.

Income:	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Full Prod
Yield (bins/acre)	0.00	0.00	0.00	0.00	3.00	6.00	12.00	24.00	32.00	40.00
Price (dollars/bin)	<u>150.00</u>	<u>150.00</u>	<u>150.00</u>	<u>150.00</u>	<u>150.00</u>	<u>150.00</u>	<u>150.00</u>	<u>150.00</u>	<u>150.00</u>	<u>150.00</u>
Gross income (dollars/acre)	0.00	0.00	0.00	0.00	450.00	900.00	1,800.00	3,600.00	4,800.00	6,000.00
Variable costs (per acre):										
Field preparation	1,208.08	30.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trees	0.00	1,632.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
Paint trees	0.00	30.00	0.00	30.00	0.00	0.00	0.00	0.00	0.00	0.00
Fertilizer	872.65	0.00	27.20	171.20	27.20	27.20	197.60	53.60	80.00	128.00
Chemicals	0.00	30.00	48.00	84.00	390.00	480.00	480.00	480.00	480.00	480.00
Pheromone disruption	0.00	0.00	0.00	0.00	50.00	50.00	50.00	50.00	50.00	50.00
Prod. mgmt consultant fees	0.00	0.00	0.00	0.00	30.00	30.00	30.00	30.00	30.00	30.00
Bee rental	0.00	0.00	0.00	0.00	28.00	28.00	42.00	56.00	56.00	56.00
Rodent materials	0.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Harvest labor	0.00	0.00	0.00	0.00	65.70	131.40	262.80	525.60	700.80	876.00
General labor	62.46	742.91	138.53	260.97	301.90	374.40	424.40	506.90	569.40	591.90
Machine costs	95.82	423.28	218.94	253.18	327.66	335.32	354.02	373.92	387.19	400.46
Housing facilities	14.29	14.29	14.29	14.29	14.29	14.29	14.29	14.29	14.29	14.29
Miscellaneous & overhead	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00
Interest: operating capital	<u>58.21</u>	<u>74.61</u>	<u>13.52</u>	<u>22.69</u>	<u>33.22</u>	<u>39.12</u>	<u>48.73</u>	<u>54.61</u>	<u>61.54</u>	<u>68.02</u>
Total variable costs	2,386.50	3,059.08	554.47	930.33	1,361.97	1,603.72	1,997.84	2,238.92	2,523.22	2,788.67
Gross income - variable cost	-2,386.50	-3,059.08	-554.47	-930.33	-911.97	-703.72	-197.84	1,361.08	2,276.78	3,211.33
Fixed costs (per acre):										
Insurance	40.79	40.79	40.79	40.79	40.79	40.79	40.79	40.79	40.79	40.79
Water assessment	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Property taxes	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Machine costs	424.25	424.25	424.25	424.25	424.25	424.25	424.25	424.25	424.25	424.25
Foreman housing	102.86	102.86	102.86	102.86	102.86	102.86	102.86	102.86	102.86	102.86
Housing facilities	41.90	41.90	41.90	41.90	41.90	41.90	41.90	41.90	41.90	41.90
Land interest costs	480.00	480.00	480.00	480.00	480.00	480.00	480.00	480.00	480.00	480.00
Interest on establishment costs	<u>0.00</u>	<u>283.30</u>	<u>643.08</u>	<u>831.27</u>	<u>1,064.58</u>	<u>1,315.09</u>	<u>1,568.98</u>	<u>1,802.71</u>	<u>1,930.42</u>	<u>1,995.10</u>
Total fixed cost	1,154.80	1,438.11	1,797.88	1,986.07	2,219.38	2,469.89	2,723.78	2,957.51	3,085.23	3,149.90
Total cost	3,541.31	4,497.19	2,352.36	2,916.40	3,581.35	4,073.62	4,721.62	5,196.43	5,608.45	5,938.57
Net projected returns	-3,541.31	-4,497.19	-2,352.36	-2,916.40	-3,131.35	-3,173.62	-2,921.62	-1,596.43	-808.45	61.43
Cumulative returns	-3,541.31	-8,038.49	-10,390.85	-13,307.25	-16,438.60	-19,612.22	-22,533.84	-24,130.27	-24,938.72	-24,877.29

Figure 1. Cash Costs to Establish a High-Density Pear Orchard the First Ten Years of Establishment

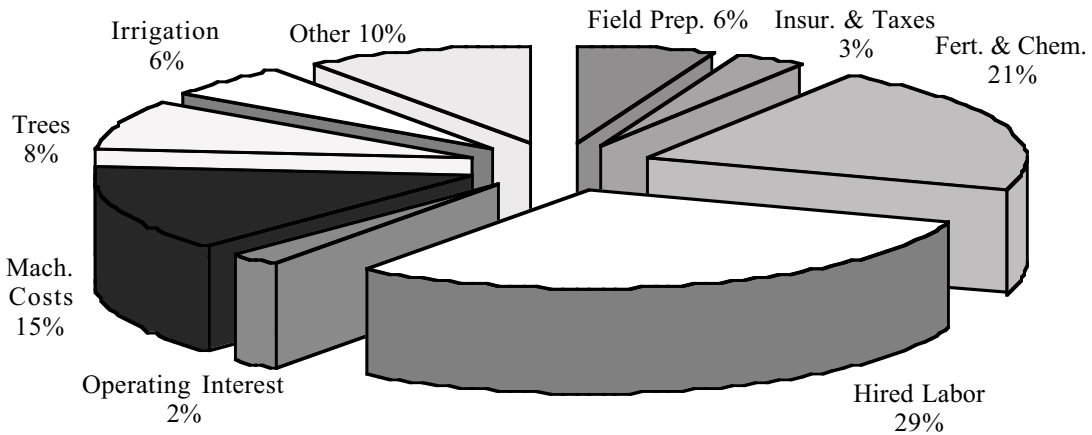


Figure 2. Economic Costs to Establish a High-Density Pear Orchard the First Ten Years of Establishment

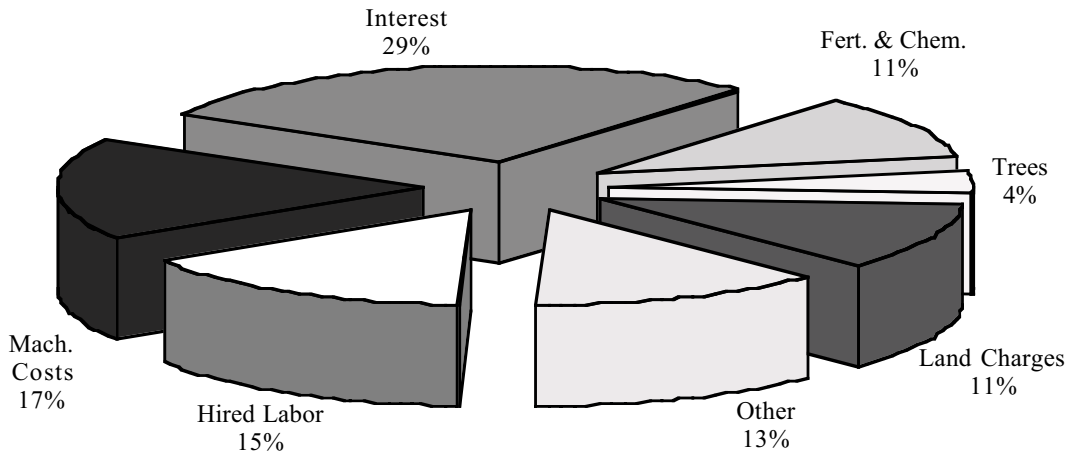


Figure 3. Economic and Cash Costs to Establish a High-Density Pear Orchard in Hood River County

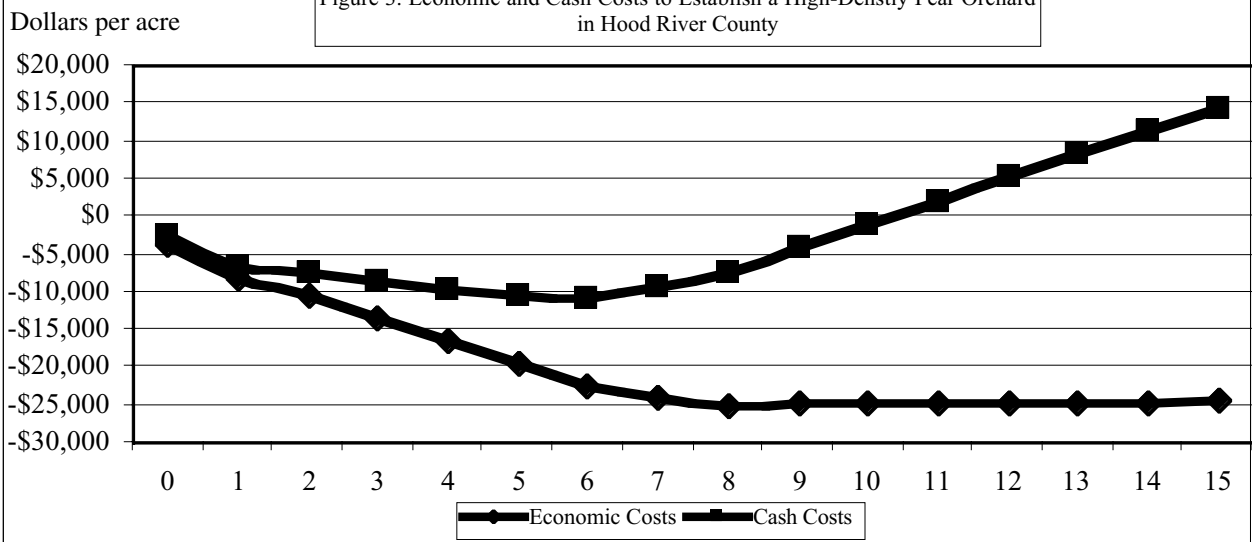
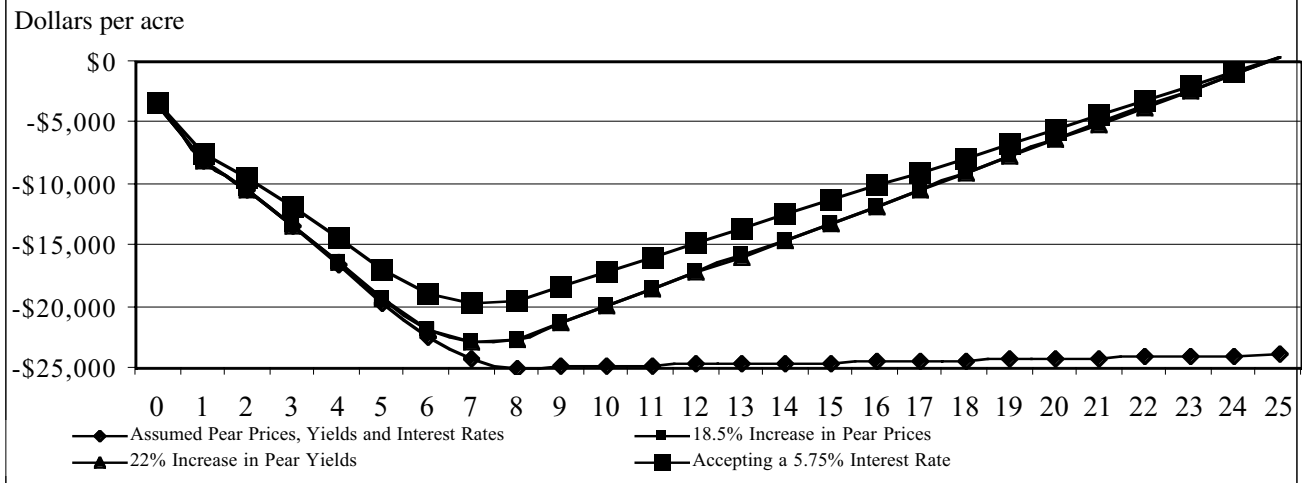


Figure 4. Net Projected Returns with Changes to Pear Price, Yield and Interest Rates Assumed in this Study.



Conclusion

Historically, most growers have renewed orchards only when production levels no longer covered the cost of production. Today, however, lack of competitive advantages in apple production in the Hood River Valley have increased interest in replacing old orchards with modern high-density pear orchards.

High-density orchards can offer higher returns that are obtained earlier in the life of the orchard. These early returns can erode interest costs that can greatly impact the profitability and feasibility of an orchard investment. The tradeoff, however, is higher risk due to larger up-front costs and significantly greater management expertise requirements.

This cost of establishment study is meant to provide useful information to pear producers who are considering replacing an existing orchard or planting a new block. As with any enterprise budget, using your own current costs in the analysis will likely make it more meaningful. Many tools are available to assist in budgeting, such as templates from university farm management specialists and computer software programs such as Crop

Profitability Analysis (CPA). Your local Extension agent can provide you with the latest in orchard replacement analysis tools and budget information.

Growers must not forget the contribution that a particular block can make to the overall financial stability of the farm business. Financial managers can recommend planting a new orchard or planting one variety over another to improve profitability. The financial requirements to complete the planting, however, could jeopardize cash flows, increase the debt-to-asset ratio, and diminish the solvency of the farm. There are many economic and financial considerations to review before such decisions are made. Seeking advice from university Extension and research faculty, industry representatives, or consultants can help in those decisions and keep your farm profitable and orchard investments feasible.

Caution is advised when considering any orchard investment. In order to meet your financial and economic goals, all competitive advantages and disadvantages of tree fruit production in your region must be determined and fully understood.

APPENDIX A

Enterprise Budgets for a High-density Pear Orchard in Hood River County

Table 7. Year 0, high-density pear establishment, \$/acre economic costs and returns.

<i>Variable cash costs</i>	Description	Labor	Machinery	Materials	Total
Remove trees, roots, and rip (2x)	custom	0.00	0.00	1,200.00	1,200.00
Disc	2.0 applications	20.00	14.76	0.00	34.76
Staking	272 stakes	40.00	0.00	8.08	48.08
Soil sampling		0.00	0.00	43.65	43.65
Fumigation	custom	0.00	0.00	605.00	605.00
Fertilizer	1.0 application	2.46	2.32	80.00	84.78
Lime	Custom	0.00	0.00	144.00	144.00
Pickup, truck, & ATV		0.00	78.74	0.00	78.74
Housing facilities		0.00	0.00	14.29	14.29
Miscellaneous & overhead		0.00	0.00	75.00	75.00
Interest: operating capital	6.0 months	<u>0.00</u>	<u>0.00</u>	<u>58.21</u>	<u>58.21</u>
Total variable costs		62.46	95.82	2,228.22	2,386.50
<i>Fixed cash costs</i>					Unit Total
Machinery & equipment insurance				acre	10.01
Pickup, truck, & ATV insurance				acre	5.79
Water assessment				acre	35.00
Property insurance				acre	25.00
Property taxes				acre	<u>30.00</u>
Total cash costs					105.79
<i>Fixed non-cash costs</i>					Unit Total
Machinery & equip - depreciation & interest				acre	370.19
Pickup, truck, & ATV - depreciation & interest				acre	54.06
Foreman housing				acre	102.86
Housing facilities				acre	41.90
Land interest charge				acre	<u>480.00</u>
Total non-cash costs					1,049.01
Total fixed costs					1,154.80
Total of all costs per acre					<u>3,541.31</u>

Table 8. Year 1, high-density pear establishment, \$/acre economic costs and returns.

<i>Variable cash costs</i>	Description	Labor	Machinery	Materials	Total
Dig holes	14.0 hours	140.00	74.35	0.00	214.35
Planting trees	40.0 hours	400.00	180.00	1,632.00	2,212.00
Painting trees	8.0 hours	80.00	0.00	30.00	110.00
Training trees	2.0 hours	20.00	0.00	0.00	20.00
Herbicide strip maintenance (0.30x)	2.0 applications	20.00	7.02	30.00	57.02
Seed cover crop	20.0 lb	15.00	15.68	30.00	60.68
Flailing/mowing orchard floor	5.0 times	30.33	50.16	0.00	80.49
Rodent control	1.0 application	2.58	2.32	7.00	11.90
Irrigation	3.5 hours	35.00	15.00	0.00	50.00
Pickup, truck, & ATV		0.00	78.74	0.00	78.74
Housing facilities		0.00	0.00	14.29	14.29
Miscellaneous & overhead		0.00	0.00	75.00	75.00
Interest: operating capital	6.0 months	<u>0.00</u>	<u>0.00</u>	<u>74.61</u>	<u>74.61</u>
Total variable costs		742.91	423.28	1,892.90	3,059.08
Fixed cash costs					
				Unit	Total
Machinery & equipment insurance				acre	10.01
Pickup, truck, & ATV insurance				acre	5.79
Water assessment				acre	35.00
Property insurance				acre	25.00
Property taxes				acre	<u>30.00</u>
Total cash costs					105.79
Fixed non-cash costs					
				Unit	Total
Machinery & equip - depreciation & interest				acre	370.19
Pickup, truck, & ATV - depreciation & interest				acre	54.06
Foreman housing				acre	102.86
Housing facilities				acre	41.90
Land interest charge				acre	480.00
Prior year's establishment costs				acre	<u>283.30</u>
Total non-cash costs					1,332.32
Total fixed costs					1,438.11
Total of all costs per acre					<u>4,497.19</u>

Table 9. Year 2, high-density pear establishment, \$/acre economic costs and returns.

<i>Variable cash costs</i>	Description	Labor	Machinery	Materials	Total
Pruning & training	4.0 hours	40.00	0.00	0.00	40.00
Tree removal & tree replacement	1.0 hour	10.00	8.75	12.00	30.75
Fertilizer	1.0 application	2.46	2.32	27.20	31.98
Herbicide strip maintenance (0.30x)	2.0 applications	7.86	7.02	30.00	44.88
Insecticides & fungicides	2.0 applications	10.31	17.89	18.00	46.20
Flailing/mowing orchard floor	5.0 times	30.33	50.16	0.00	80.49
Rodent control	1.0 application	2.58	2.32	7.00	11.90
Frost protection	0.0 Hour	0.00	36.73	0.00	36.73
Irrigation	3.5 hours	35.00	15.00	0.00	50.00
Pickup, truck, & ATV		0.00	78.74	0.00	78.74
Housing facilities		0.00	0.00	14.29	14.29
Miscellaneous & overhead		0.00	0.00	75.00	75.00
Interest: operating capital	6.0 months	<u>0.00</u>	<u>0.00</u>	<u>13.52</u>	<u>13.52</u>
Total variable costs		138.53	218.94	197.01	554.47
Fixed cash costs					
				Unit	Total
Machinery & equipment insurance				acre	10.01
Pickup, truck, & ATV insurance				acre	5.79
Water assessment				acre	35.00
Property insurance				acre	25.00
Property taxes				acre	<u>30.00</u>
Total cash costs					105.79
Fixed non-cash costs					
				Unit	Total
Machinery & equip - depreciation & interest				acre	370.19
Pickup, truck, & ATV - depreciation & interest				acre	54.06
Foreman housing				acre	102.86
Housing facilities				acre	41.90
Land interest charge				acre	480.00
Prior year's establishment costs				acre	<u>643.08</u>
Total non-cash costs					1,692.09
Total fixed costs					1,797.88
Total of all costs per acre					<u>2,352.36</u>

Table 10. Year 3, high-density pear establishment, \$/acre economic costs and returns.

<i>Variable cash costs</i>	Description	Labor	Machinery	Materials	Total	
Pruning & training	6.0 hours	60.00	0.00	0.00	60.00	
Painting trees	8.0 hours	80.00	0.00	30.00	110.00	
Tree removal & tree replacement	1.0 hour	10.00	8.75	12.00	30.75	
Raking & shredding brush		12.13	16.36	0.00	28.49	
Fertilizer	1.0 application	2.46	2.32	171.20	175.98	
Herbicide strip maintenance (0.30x)	2.0 applications	7.86	7.02	30.00	44.88	
Insecticides & fungicides	4.0 applications	20.62	35.78	54.00	110.40	
Flailing/mowing orchard floor	5.0 times	30.33	50.16	0.00	80.49	
Rodent control	1.0 application	2.58	2.32	7.00	11.90	
Frost protection	0.0 hour	0.00	36.73	0.00	36.73	
Irrigation	3.5 hours	35.00	15.00	0.00	50.00	
Pickup, truck, & ATV		0.00	78.74	0.00	78.74	
Housing facilities		0.00	0.00	14.29	14.29	
Miscellaneous & overhead		0.00	0.00	75.00	75.00	
Interest: operating capital	6.0 months	<u>0.00</u>	<u>0.00</u>	<u>22.69</u>	<u>22.69</u>	
Total variable costs		260.97	253.18	416.18	930.33	
Fixed cash costs					Unit	Total
Machinery & equipment insurance				acre	10.01	
Pickup, truck, & ATV insurance				acre	5.79	
Foreman housing				acre	102.86	
Water assessment				acre	35.00	
Property insurance				acre	25.00	
Property taxes				acre	<u>30.00</u>	
Total cash costs					208.65	
Fixed non-cash costs					Unit	Total
Machinery & equip - depreciation & interest				acre	370.19	
Pickup, truck, & ATV - depreciation & interest				acre	54.06	
Housing facilities				acre	41.90	
Land interest charge				acre	480.00	
Prior year's establishment costs				acre	<u>831.27</u>	
Total non-cash costs					1,777.42	
Total fixed costs					1,986.07	
Total of all costs per acre					<u>2,916.40</u>	

Table 11. Year 4, high-density pear establishment, \$/acre economic costs and returns.

<i>Gross income</i>		Quantity	Unit	\$/unit	Total	Price/bin	
Pears		3.00	bins	150.00	<u>450.00</u>	<u>150.00</u>	
Total gross income					450.00	150.00	
<i>Variable cash costs</i>		Description	Labor	Machinery	Materials	Total	Cost/bin
Pruning & training		13.0 hours	130.00	0.00	0.00	130.00	43.33
Tree removal & tree replacement		1.5 hours	15.00	13.13	12.00	40.13	13.38
Raking & shredding brush			12.13	16.36	0.00	28.49	9.50
Fertilizer		1.0 application	2.46	2.32	27.20	31.98	10.66
Herbicide strip maintenance (0.30x)		2.0 applications	7.86	7.02	30.00	44.88	14.96
Insecticides & fungicides		10.0 applications	51.56	89.44	360.00	500.99	167.00
Pheromone disruption (1/2 rate)		0.50 hour	5.00	0.00	50.00	55.00	18.33
Production mgmt consultant fees			0.00	0.00	30.00	30.00	10.00
Bee rental		1.0 hive	0.00	0.00	28.00	28.00	9.33
Flailing/mowing orchard floor		5.0 times	30.33	50.16	0.00	80.49	26.83
Rodent control		1.0 application	2.58	2.32	7.00	11.90	3.97
Frost protection		1.0 hour	10.00	36.73	0.00	46.73	15.58
Irrigation		3.5 hours	35.00	11.11	0.00	46.11	15.37
Ladders, pruning, & picking equip.			0.00	12.31	0.00	12.31	4.10
Harvesting costs		3.0 bins	65.70	8.01	0.00	73.71	24.57
Pickup, truck, & ATV			0.00	78.74	0.00	78.74	26.25
Housing facilities			0.00	0.00	14.29	14.29	4.76
Miscellaneous & overhead			0.00	0.00	75.00	75.00	25.00
Interest: operating capital		6.0 months	<u>0.00</u>	<u>0.00</u>	<u>33.22</u>	<u>33.22</u>	<u>11.07</u>
Total variable costs			367.60	327.66	666.70	1,361.97	453.99
<i>Fixed cash costs</i>			Unit	Total	Cost/bin		
Machinery & equipment insurance			acre	10.01	3.34		
Pickup, truck, & ATV insurance			acre	5.79	1.93		
Water assessment			acre	35.00	11.67		
Property insurance			acre	25.00	8.33		
Property taxes			acre	<u>30.00</u>	<u>10.00</u>		
Total cash costs				105.79	35.26		
<i>Fixed non-cash costs</i>			Unit	Total	Cost/bin		
Machinery & equip - depreciation & interest			acre	370.19	123.40		
Pickup, truck, & ATV - depreciation & interest			acre	54.06	18.02		
Foreman housing			acre	102.86	34.29		
Housing facilities			acre	41.90	13.97		
Land interest charge			acre	480.00	160.00		
Prior year's establishment costs			acre	<u>1,064.58</u>	<u>354.86</u>		
Total non-cash costs				2,113.59	704.53		
Total fixed costs				2,219.38	739.79		
Total of all costs per acre					3,581.35	1,193.78	
Net projected returns					-3,131.35	-1,043.78	

Table 12. Year 5, high-density pear establishment, \$/acre economic costs and returns.

Gross income		Quantity	Unit	\$/unit	Total	Price/bin	
Pears		6.00	bins	150.00	900.00	150.00	
Total gross income					900.00	150.00	
Variable cash costs		Description	Labor	Machinery	Materials	Total	Cost/bin
Pruning & training		20.0 hours	200.00	0.00	0.00	200.00	33.33
Tree removal & tree replacement		1.5 hours	15.00	13.13	12.00	40.13	6.69
Raking & shredding brush			12.13	16.36	0.00	28.49	4.75
Fertilizer		1.0 application	2.46	2.32	27.20	31.98	5.33
Herbicide strip maintenance (0.30x)		2.0 applications	7.86	7.02	30.00	44.88	7.48
Insecticides & fungicides		10.0 applications	51.56	89.44	450.00	590.99	98.50
Pheromone disruption (1/2 rate)		0.75 hour	7.50	0.00	50.00	57.50	9.58
Production mgmt consultant fees			0.00	0.00	30.00	30.00	5.00
Bee rental		1.0 hive	0.00	0.00	28.00	28.00	4.67
Flailing/mowing orchard floor		5.0 times	30.33	50.16	0.00	80.49	13.41
Rodent control		1.0 application	2.58	2.32	7.00	11.90	1.98
Frost protection		1.0 hour	10.00	36.73	0.00	46.73	7.79
Irrigation		3.5 hours	35.00	15.00	0.00	50.00	8.33
Ladders, pruning, & picking equip.			0.00	11.11	0.00	11.11	1.85
Harvesting costs		6.0 bins	131.40	12.99	0.00	144.39	24.06
Pickup, truck, & ATV			0.00	78.74	0.00	78.74	13.12
Housing facilities			0.00	0.00	14.29	14.29	2.38
Miscellaneous & overhead			0.00	0.00	75.00	75.00	12.50
Interest: operating capital		6.0 months	<u>0.00</u>	<u>0.00</u>	<u>39.12</u>	<u>39.12</u>	<u>6.52</u>
Total variable costs			505.80	335.32	762.60	1,603.72	267.29
Fixed cash costs				Unit	Total	Cost/bin	
Machinery & equipment insurance				acre	10.01	1.67	
Pickup, truck, & ATV insurance				acre	5.79	0.96	
Water assessment				acre	35.00	5.83	
Property insurance				acre	25.00	4.17	
Property taxes				acre	<u>30.00</u>	<u>5.00</u>	
Total cash costs					105.79	17.63	
Fixed non-cash costs				Unit	Total	Cost/bin	
Machinery & equip - depreciation & interest				acre	370.19	61.70	
Pickup, truck, & ATV - depreciation & interest				acre	54.06	9.01	
Foreman housing				acre	102.86	17.14	
Housing facilities				acre	41.90	6.98	
Land interest charge				acre	480.00	80.00	
Prior year's establishment costs				acre	<u>1,315.09</u>	<u>219.18</u>	
Total non-cash costs					2,364.10	394.02	
Total fixed costs					2,469.89	411.65	
Total of all costs per acre					4,073.62	678.94	
Net projected returns					-3,173.62	-528.94	

Table 13. Year 6, high-density pear establishment, \$/acre economic costs and returns.

Gross income		Quantity	Unit	\$/unit	Total	Price/bin	
Pears		12.00	bins	150.00	<u>1,800.00</u>	<u>150.00</u>	
Total gross income					1,800.00	150.00	
Variable cash costs		Description	Labor	Machinery	Materials	Total	Cost/bin
Pruning & training		24.0 hours	240.00	0.00	0.00	240.00	20.00
Tree removal & tree replacement		2.5 hours	25.00	21.88	12.00	58.88	4.91
Raking & shredding brush			12.13	16.36	0.00	28.49	2.37
Fertilizer		1.0 application	2.46	2.32	197.60	202.38	16.86
Herbicide strip maintenance (0.30x)		2.0 applications	7.86	7.02	30.00	44.88	3.74
Insecticides & fungicides		10.0 applications	51.56	89.44	450.00	590.99	49.25
Pheromone disruption (1/2 rate)		0.75 hour	7.50	0.00	50.00	57.50	4.79
Production mgmt consultant fees			0.00	0.00	30.00	30.00	2.50
Bee rental		1.5 hives	0.00	0.00	42.00	42.00	3.50
Flailing/mowing orchard floor		5.0 times	30.33	50.16	0.00	80.49	6.71
Rodent control		1.0 application	2.58	2.32	7.00	11.90	0.99
Frost protection		1.0 hour	10.00	36.73	0.00	46.73	3.89
Irrigation		3.5 hours	35.00	15.00	0.00	50.00	4.17
Ladders, pruning, & picking equip.			0.00	11.11	0.00	11.11	0.93
Harvesting costs		12.0 bins	262.80	22.94	0.00	285.74	23.81
Pickup, truck, & ATV			0.00	78.74	0.00	78.74	6.56
Housing facilities			0.00	0.00	14.29	14.29	1.19
Miscellaneous & overhead			0.00	0.00	75.00	75.00	6.25
Interest: operating capital		6.0 months	<u>0.00</u>	<u>0.00</u>	<u>48.73</u>	<u>48.73</u>	<u>4.06</u>
Total variable costs			687.20	354.02	956.61	1,997.84	166.49
Fixed cash costs			Unit	Total	Cost/bin		
Machinery & equipment insurance			acre	10.01	0.83		
Pickup, truck, & ATV insurance			acre	5.79	0.48		
Water assessment			acre	35.00	2.92		
Property insurance			acre	25.00	2.08		
Property taxes			acre	<u>30.00</u>	<u>2.50</u>		
Total cash costs				105.79	8.82		
Fixed non-cash costs			Unit	Total	Cost/bin		
Machinery & equip - depreciation & interest			acre	370.19	30.85		
Pickup, truck, & ATV - depreciation & interest			acre	54.06	4.50		
Foreman housing			acre	102.86	8.57		
Housing facilities			acre	41.90	3.49		
Land interest charge			acre	480.00	40.00		
Prior year's establishment costs			acre	<u>1,568.98</u>	<u>130.75</u>		
Total non-cash costs				2,617.99	218.17		
Total fixed costs				2,723.78	226.98		
Total of all costs per acre					4,721.62	393.47	
Net projected returns					-2,921.62	-243.47	

Table 14. Year 7, high-density pear establishment, \$/acre economic costs and returns.

Gross income		Quantity	Unit	\$/unit	Total	Price/bin	
Pears		24.00	bins	150.00	<u>3,600.00</u>	<u>150.00</u>	
Total gross income					3,600.00	150.00	
Variable cash costs		Description	Labor	Machinery	Materials	Total	Cost/bin
Pruning & training		28.0 hours	280.00	0.00	0.00	280.00	11.67
Thinning		4.0 hours	40.00	0.00	0.00	40.00	1.67
Tree removal & tree replacement		2.5 hours	25.00	21.88	12.00	58.88	2.45
Raking & shredding brush			12.13	16.36	0.00	28.49	1.19
Fertilizer		1.0 application	2.46	2.32	53.60	58.38	2.43
Herbicide strip maintenance (0.30x)		2.0 applications	7.86	7.02	30.00	44.88	1.87
Insecticides & fungicides		10.0 applications	51.56	89.44	450.00	590.99	24.62
Pheromone disruption (1/2 rate)		1.00 hour	10.00	0.00	50.00	60.00	2.50
Production mgmt consultant fees			0.00	0.00	30.00	30.00	1.25
Bee rental		2.0 hives	0.00	0.00	56.00	56.00	2.33
Flailing/mowing orchard floor		5.0 times	30.33	50.16	0.00	80.49	3.35
Rodent control		1.0 application	2.58	2.32	7.00	11.90	0.50
Frost protection		1.0 hour	10.00	36.73	0.00	46.73	1.95
Irrigation		3.5 hours	35.00	15.00	0.00	50.00	2.08
Ladders, pruning, & picking equip.			0.00	11.11	0.00	11.11	0.46
Harvesting costs		24.0 bins	525.60	42.84	0.00	568.44	23.68
Pickup, truck, & ATV			0.00	78.74	0.00	78.74	3.28
Housing facilities			0.00	0.00	14.29	14.29	0.60
Miscellaneous & overhead			0.00	0.00	75.00	75.00	3.13
Interest: operating capital		6.0 months	<u>0.00</u>	<u>0.00</u>	<u>54.61</u>	<u>54.61</u>	<u>2.28</u>
Total variable costs			1,032.50	373.92	832.49	2,238.92	93.29
Fixed cash costs			Unit	Total	Cost/bin		
Machinery & equipment insurance			acre	10.01	0.42		
Pickup, truck, & ATV insurance			acre	5.79	0.24		
Water assessment			acre	35.00	1.46		
Property insurance			acre	25.00	1.04		
Property taxes			acre	<u>30.00</u>	<u>1.25</u>		
Total cash costs				105.79	4.41		
Fixed non-cash costs			Unit	Total	Cost/bin		
Machinery & equip - depreciation & interest			acre	370.19	15.42		
Pickup, truck, & ATV - depreciation & interest			acre	54.06	2.25		
Foreman housing			acre	102.86	4.29		
Housing facilities			acre	41.90	1.75		
Land interest charge			acre	480.00	20.00		
Prior year's establishment costs			acre	<u>1,802.71</u>	<u>75.11</u>		
Total non-cash costs				2,851.72	118.82		
Total fixed costs				2,957.51	123.23		
Total of all costs per acre					5,196.43	216.52	
Net projected returns					-1,596.43	-66.52	

Table 15. Year 8, high-density pear establishment, \$/acre economic costs and returns.

Gross income		Quantity	Unit	\$/unit	Total	Price/bin	
Pears		32.00	bins	150.00	4,800.00	150.00	
Total gross income					4,800.00	150.00	
Variable cash costs		Description	Labor	Machinery	Materials	Total	Cost/bin
Pruning & training	32.0 hours		320.00	0.00	0.00	320.00	10.00
Thinning	6.0 hours		60.00	0.00	0.00	60.00	1.88
Tree removal & tree replacement	2.5 hours		25.00	21.88	12.00	58.88	1.84
Raking & shredding brush			12.13	16.36	0.00	28.49	0.89
Fertilizer	1.0 application		2.46	2.32	80.00	84.78	2.65
Herbicide strip maintenance (0.30x)	2.0 applications		7.86	7.02	30.00	44.88	1.40
Insecticides & fungicides	10.0 applications		51.56	89.44	450.00	590.99	18.47
Pheromone disruption (1/2 rate)	1.25 hours		12.50	0.00	50.00	62.50	1.95
Production mgmt consultant fees			0.00	0.00	30.00	30.00	0.94
Bee rental	2.0 hives		0.00	0.00	56.00	56.00	1.75
Flailing/mowing orchard floor	5.0 times		30.33	50.16	0.00	80.49	2.52
Rodent control	1.0 application		2.58	2.32	7.00	11.90	0.37
Frost protection	1.0 hour		10.00	36.73	0.00	46.73	1.46
Irrigation	3.5 hours		35.00	15.00	0.00	50.00	1.56
Ladders, pruning, & picking equip.			0.00	11.11	0.00	11.11	0.35
Harvesting costs	32.0 bins		700.80	56.11	0.00	756.91	23.65
Pickup, truck, & ATV			0.00	78.74	0.00	78.74	2.46
Housing facilities			0.00	0.00	14.29	14.29	0.45
Miscellaneous & overhead			0.00	0.00	75.00	75.00	2.34
Interest: operating capital	6.0 months		<u>0.00</u>	<u>0.00</u>	<u>61.54</u>	<u>61.54</u>	<u>1.92</u>
Total variable costs			1,270.20	387.19	865.83	2,523.22	78.85
Fixed cash costs			Unit	Total	Cost/bin		
Machinery & equipment insurance			acre	10.01	0.31		
Pickup, truck, & ATV insurance			acre	5.79	0.18		
Water assessment			acre	35.00	1.09		
Property insurance			acre	25.00	0.78		
Property taxes			acre	<u>30.00</u>	<u>0.94</u>		
Total cash costs				105.79	3.31		
Fixed non-cash costs			Unit	Total	Cost/bin		
Machinery & equip - depreciation & interest			acre	370.19	11.57		
Pickup, truck, & ATV - depreciation & interest			acre	54.06	1.69		
Foreman housing			acre	102.86	3.21		
Housing facilities			acre	41.90	1.31		
Land interest charge			acre	480.00	15.00		
Prior year's establishment costs			acre	<u>1,930.42</u>	<u>60.33</u>		
Total non-cash costs				2,979.43	93.11		
Total fixed costs				3,085.23	96.41		
Total of all costs per acre					5,608.45	175.26	
Net projected returns					-808.45	-25.26	

Table 16. Full production, high-density pear establishment, \$/acre economic costs and returns.

Gross income					
	Quantity	Unit	\$/unit	Total	Price/bin
Pears	40.00	bins	150.00	6,000.00	150.00
Total gross income				6,000.00	150.00
Variable cash costs					
Description	Labor	Machinery	Materials	Total	Cost/bin
Pruning & training	32.0 hours	320.00	0.00	0.00	320.00 8.00
Thinning	8.0 hours	80.00	0.00	0.00	80.00 2.00
Tree removal & tree replacement	2.5 hours	25.00	21.88	12.00	58.88 1.47
Raking & shredding brush		12.13	16.36	0.00	28.49 0.71
Fertilizer	1.0 application	2.46	2.32	128.00	132.78 3.32
Herbicide strip maintenance (0.30x)	2.0 applications	7.86	7.02	30.00	44.88 1.12
Insecticides & fungicides	10.0 applications	51.56	89.44	450.00	590.99 14.77
Pheromone disruption (1/2 rate)	1.5 hours	15.00	0.00	50.00	65.00 1.63
Production mgmt consultant fees		0.00	0.00	30.00	30.00 0.75
Bee rental	2.0 hives	0.00	0.00	56.00	56.00 1.40
Flailing/mowing orchard floor	5.0 times	30.33	50.16	0.00	80.49 2.01
Rodent control	1.0 application	2.58	2.32	7.00	11.90 0.30
Frost protection	1.0 hour	10.00	36.73	0.00	46.73 1.17
Irrigation	3.5 hours	35.00	15.00	0.00	50.00 1.25
Ladders, pruning, & picking equip.		0.00	11.11	0.00	11.11 0.28
Harvesting costs	40.0 bins	876.00	69.38	0.00	945.38 23.63
Pickup, truck, & ATV		0.00	78.74	0.00	78.74 1.97
Housing facilities		0.00	0.00	14.29	14.29 0.36
Miscellaneous & overhead		0.00	0.00	75.00	75.00 1.88
Interest: operating capital	6.0 months	<u>0.00</u>	<u>0.00</u>	<u>68.02</u>	<u>68.02</u> <u>1.70</u>
Total variable costs		1,467.90	400.46	920.30	2,788.67 69.72
Fixed cash costs					
			Unit	Total	Cost/bin
Machinery & equipment insurance			acre	10.01	0.25
Pickup, truck, & ATV insurance			acre	5.79	0.14
Water assessment			acre	35.00	0.88
Property insurance			acre	25.00	0.63
Property taxes			acre	<u>30.00</u>	<u>0.75</u>
Total cash costs				105.79	2.64
Fixed non-cash costs					
			Unit	Total	Cost/bin
Machinery & equip - depreciation & interest			acre	370.19	9.25
Pickup, truck, & ATV - depreciation & interest			acre	54.06	1.35
Foreman housing			acre	102.86	2.57
Housing facilities			acre	41.90	1.05
Land interest charge			acre	480.00	12.00
Amortized establishment costs			acre	<u>2,336.23</u>	<u>58.41</u>
Total non-cash costs				3,385.24	84.63
Total fixed costs				3,491.03	87.28
Total of all costs per acre				6,279.70	156.99
Net projected returns				-279.70	-6.99

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