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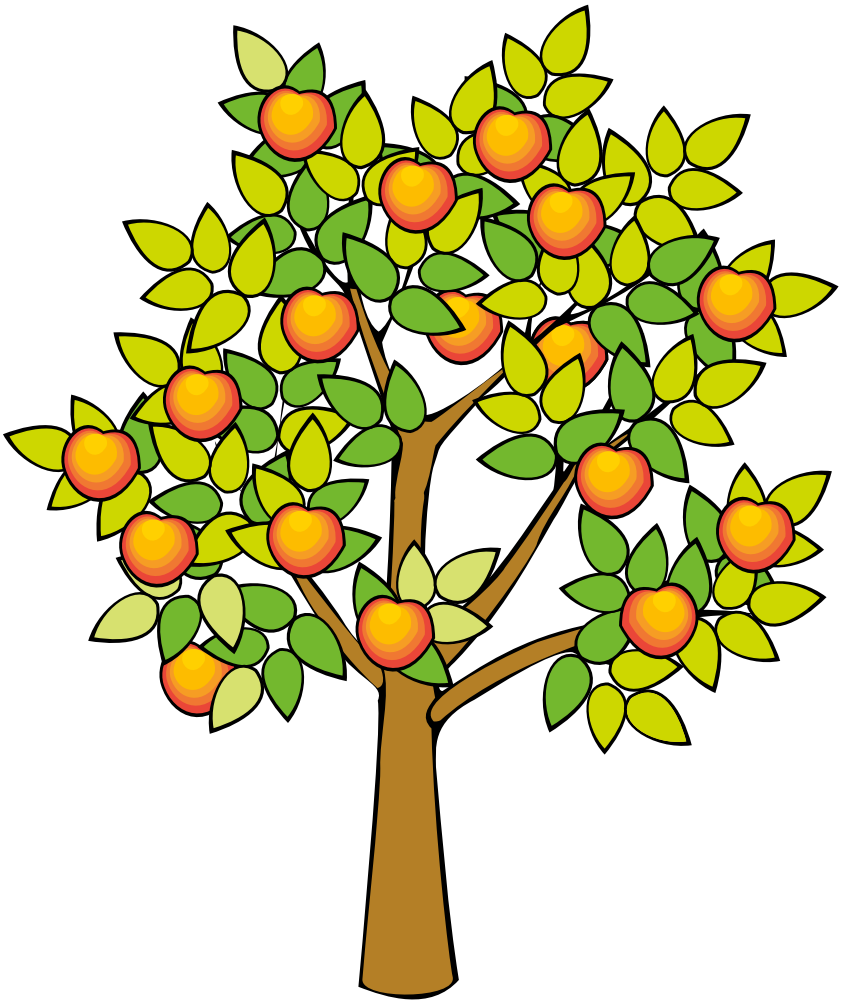
Orchard Economics

Establishing and Producing Medium-Density Apples in Hood River County



OREGON STATE UNIVERSITY
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Orchard Economics: Establishing and Producing Medium-Density Apples 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 medium-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 medium-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 medium-density apple orchard. It is impossible to cover all apple 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 apple industry.

Assumptions

In the preparation of this publication, several assumptions were made that reflect current trends in orchard design for establishing a medium-density apple 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 5 acres of orchard consisting of 110 trees per acre and plant 558 apple trees per acre (6' x 13' spacing) with a productive life of 25 years, once full production of 50 bins per acre is reached.
3. The medium-density orchard is trained to a central leader on a three-wire vertical support system.
4. Apple prices are $150 per 850-pound bin.
5. Commercial yields begin in year 3, and full production is reached in 6 years after planting with yields of 15, 25, 40, and 50 bins per acre in years 4 through 9, respectively.
6. All labor is hired at a rate of $10.00 per hour and $20.00 per bin to harvest apples, 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 ((cost + salvage value) ÷ 2 x 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 ((cost + salvage value) ÷ 2 x 0.08). Repairs and maintenance for the system costs 1 percent of the purchase price per year.
15. The trellis system is installed at a cost of $1,250 per acre, not including stringing the wire. 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 a 8 percent interest rate((cost + salvage value) ÷ 2 x .08). Repairs and maintenance for the system costs 1 percent of the purchase price per year.
16. 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 ((cost + salvage value) ÷ 2 x 0.08). Repairs and maintenance are estimated to cost 1 percent of the purchase price of the wind machines and smudge pots per year.
17. Additional assumptions for variable, cash fixed, and non-cash fixed cost are listed in Table 4.
18. Price inflation for the duration of this study was ignored.
19. 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	41	15
Fertilizer spreader		2,300	13	20
Brush windrow		3,500	31	20
Gopher machine		1,200	13	20
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		500	N/A	5
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	400	N/A	25
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	35	25
Smudge pots	3 units, per acre	30	15	10
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 unit	40,000	N/A	30

Table 2. Machinery cost calculations.

Machine	Size or description	--- Variable costs --- Fuel & lube	Repairs & maintenance	--- Fixed costs --- Depr. & interest	Insurance	Total cost
			----- 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 unit	0.00	14.29	41.90	0.00	56.19

Table 3. Estimated cost of each operation with power-unit for a 13' between-row spacing.

Operation	Tractor	Miles per hour	Acres per hour	Labor cost per acre	-- Machine costs -- Variable cost per acre	Fixed cost per acre	Total cost per acre
Air-blast sprayer	4 wheel dr 70hp	2.00	1.58	$6.35	$11.01	$12.34	$29.69
Flail chopper	2 wheel dr 50hp	2.00	2.68	3.73	9.45	6.01	19.19
Weed sprayer	2 wheel dr 35hp	3.50	2.07	4.83	4.32	5.10	14.26
Fertilizer spreader	2 wheel dr 50hp	3.00	3.31	3.02	2.86	8.70	14.59
Brush windrow	2 wheel dr 50hp	2.00	1.34	7.47	7.78	16.00	31.25
Gopher machine	2 wheel dr 50hp	2.50	3.15	3.17	2.86	6.08	12.11

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

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Full Prod
Prices per bin	$ 150	$ 150	$ 150	$ 150	$ 150	$ 150	$ 150
Bins per acre	0	0	0	15	25	40	50
Cost of general orchard labor, per hour	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00
Cost of harvest labor, per bin	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Production mgmt consultant fees	0.00	0.00	0.00	30.00	30.00	30.00	30.00
Hours of pruning and training labor	0.00	10.00	15.00	22.00	33.00	55.00	55.00
Hours of thinning labor	0.00	0.00	0.00	20.00	30.00	40.00	55.00
Hours of irrigating labor	0.00	3.50	3.50	3.50	3.50	3.50	3.50
Hours to install pheromone disruption	0.00	0.00	0.00	2.00	2.00	2.00	2.00
Hours to remove & replace tree labor	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Hours for frost protection labor	0.00	0.00	0.00	1.00	1.00	1.00	1.00
Hours of general labor during harvest	0.00	0.00	0.00	11.25	18.75	30.00	37.50
Cost of fertilizer - broadcast applied	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 50.00
Cost of fertilizer – lime	144.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost of herbicide strip maintenance	0.00	40.00	40.00	40.00	40.00	40.00	40.00
Cost of insecticides & fungicides	0.00	150.00	200.00	250.00	300.00	350.00	450.00
Cost of pheromone disruption	0.00	0.00	0.00	75.00	75.00	75.00	75.00
Cost of rodent materials	0.00	7.00	7.00	7.00	7.00	7.00	7.00
Cost per bee hive	0.00	0.00	0.00	28.00	28.00	28.00	28.00
Times for fertilizer - broadcast applied	2.00	2.00	2.00	1.00	1.00	1.00	1.00
Times for herbicide strip spray	0.00	3.00	3.00	2.00	2.00	2.00	2.00
Times for insecticides & fungicides	0.00	4.00	6.00	8.00	10.00	12.00	15.00
Number of bee hives per acre	0.00	0.00	0.00	2.00	2.00	2.00	2.00
Times for rodent control	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
Property taxes	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
Land values	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Foreman housing (per month)	600	600	600	600	600	600	600
Irrigation assessment	35	35	35	35	35	35	35
Miscellaneous & overhead	75.00	75.00	75.00	75.00	75.00	75.00	75.00
Tree cost	6.50	6.50	6.50	6.50	6.50	6.50	6.50
Gasoline price	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
Operating interest rate	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%
Land interest rate	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%
% of operating capital borrowed	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
Planted trees	558	2	2	2	2	2	2

Results of establishing a medium-density apple orchard in Hood River County

Cash flow analysis

A cash flow analysis for establishing a medium-density apple 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 and trellis support systems, 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 7 establishment years. Production begins in year 3 with 15 bins of apples per acre and increases to 50 bins at full production. Total variable costs are $2,306 in the first year, with an additional $106 of cash fixed costs for a total cash cost of $2,412 per acre.

A positive cash flow begins in year 3, with gross income exceeding total cash costs by $145 per acre. At full production, or in 5 years after planting, the orchard does not return a sufficient amount of gross income to pay all previous years' costs. There is $4,711 per acre remaining over and above prior costs, and it is not until year 8 that all previous years' production costs are paid, Figure 3, page 12.

The major cost components in relation to total cash costs are shown in Figure 1 on page 11. Hired labor represents 35 percent of the total cash costs to establish this orchard, followed by trees at 15 percent. Together, fertilizer and chemicals is the third largest cost item, making up 13 percent of the total cash costs. Machine costs, which include fuel, oil, and repairs, are 11 percent of the cash costs. The trellis support and irrigation system costs are 5 percent each of the total cash costs. The remaining 16 percent of the total cash costs consists of operating interest (2 percent), insurance and taxes (2 percent), field preparations (5 percent), and other cost items (7 percent).

Economic costs and returns

The economic costs and returns for the establishment of a medium-density apple orchard are shown in Table 6 (page 10). 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 9) except that the trellis support and irrigation systems are amortized over their productive life in this analysis and included in fixed machine costs.

Gross income exceeds variable costs beginning in year 6 (Full Production) with $785 per acre return to the grower. Additionally, at the end of the establishment period, $16,576 per acre remains to repay all previous establishment costs. This cost is amortized over a 25-year period as an annual payment of $1,626 per acre as shown in Table 13, Full Production Years, page 20.

The relative contribution of each cost component to the total economic cost is shown in Figure 2 (page 11). When all economic costs are included, hired labor remains the largest cost item, at 24 percent of the total costs for the first 7 years of establishment. Interest cost is second, with 19 percent of the total economic cost. Machine costs (fuel, oil, repairs, depreciation and interest charges) are the third largest cost item, with 18 percent, and tree costs are fourth with 10 percent. The remaining cost items, fertilizer and chemicals, land charges, and "other," are 29 percent of the total economic costs.

The net projected returns for establishing a medium-density apple 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 used in this study, however, this

orchard is short $1,657 from covering all economic costs for the 25-year period. Slight changes in price or yield can easily make up the difference to make this orchard establishment an economic investment.

While growers often focus on reducing the cost of trees, fertilizers, and chemicals, it is apparent that labor and interest costs are the largest cost components in apple orchard renewal (Figures 1 and 2). Therefore, more emphasis should be placed on labor efficiencies and obtaining higher fruit prices or a combination of earlier and higher yields to reduce labor and interest costs.

Table 5. Cash costs and returns of establishing a medium-density apple orchard.

Income:	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Full Prod
Yield (bins/acre)	0.00	0.00	0.00	15.00	25.00	40.00	50.00
Price (dollars/bin)	150.00	150.00	150.00	150.00	150.00	150.00	150.00
Gross income (dollars/acre)	0.00	0.00	0.00	2,250.00	3,750.00	6,000.00	7,500.00
Variable costs (per acre):							
Field preparation	1,200.00	30.00	0.00	0.00	0.00	0.00	0.00
Trees	0.00	3,627.00	13.00	13.00	13.00	13.00	13.00
Irrigation system	0.00	1,200.00	0.00	0.00	0.00	0.00	0.00
Trellis system	0.00	1,250.00	0.00	0.00	0.00	0.00	0.00
Paint trees	0.00	30.00	0.00	0.00	0.00	0.00	0.00
Fertilizer	842.65	0.00	50.00	50.00	50.00	50.00	50.00
Chemicals	0.00	190.00	240.00	290.00	340.00	390.00	490.00
Pheromone disruption	0.00	0.00	0.00	75.00	75.00	75.00	75.00
Prod. mgmt consultant fees	0.00	0.00	0.00	30.00	30.00	30.00	30.00
Bee rental	0.00	0.00	0.00	56.00	56.00	56.00	56.00
Rodent materials	0.00	7.00	7.00	7.00	7.00	7.00	7.00
Harvest labor	0.00	0.00	0.00	412.50	687.50	1,100.00	1,375.00
General labor	22.46	746.34	329.54	581.49	804.18	1,136.87	1,305.90
Machine costs	95.82	623.75	348.22	345.85	384.45	431.34	480.95
Housing facilities	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
Interest: operating capital	56.26	133.58	26.93	48.75	63.41	84.46	99.30
Total variable costs	2,306.47	7,926.96	1,103.97	1,998.87	2,599.82	3,462.96	4,071.44
Gross income - variable cost	-2,306.47	-7,926.96	-1,103.97	251.13	1,150.18	2,537.04	3,428.56
Fixed costs (per acre):							
Insurance	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
Property taxes	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Total fixed cost	105.79	105.79	105.79	105.79	105.79	105.79	105.79
Total cost	2,412.26	8,032.75	1,209.76	2,104.66	2,705.61	3,568.75	4,177.24
Net projected returns	-2,412.26	-8,032.75	- 1,209.76	145.34	1,044.39	2,431.25	3,322.76
Cumulative returns	-2,412.26	-10,445.01	-11,654.78	-11,509.44	-10,465.06	-8,033.81	-4,711.04

Table 6. Economic costs and returns of establishing a medium-density apple orchard.

Income:	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Full Prod
Yield (pounds/acre)	0.00	0.00	0.00	15.00	25.00	40.00	50.00
Price (dollars/pound)	150.00	150.00	150.00	150.00	150.00	150.00	150.00
Gross income (dollars/acre)	0.00	0.00	0.00	2,250.00	3,750.00	6,000.00	7,500.00
Variable costs (per acre):							
Field preparation	1,200.00	30.00	0.00	0.00	0.00	0.00	0.00
Trees	0.00	3,627.00	13.00	13.00	13.00	13.00	13.00
Paint trees	0.00	30.00	0.00	0.00	0.00	0.00	0.00
Fertilizer	842.65	0.00	50.00	50.00	50.00	50.00	50.00
Chemicals	0.00	190.00	240.00	290.00	340.00	390.00	490.00
Pheromone disruption	0.00	0.00	0.00	75.00	75.00	75.00	75.00
Prod. mgmt consultant fees	0.00	0.00	0.00	30.00	30.00	30.00	30.00
Bee rental	0.00	0.00	0.00	56.00	56.00	56.00	56.00
Rodent materials	0.00	7.00	7.00	7.00	7.00	7.00	7.00
Harvest labor	0.00	0.00	0.00	412.50	687.50	1,100.00	1,375.00
General labor	22.46	746.34	329.54	581.49	804.18	1,136.87	1,305.90
Machine costs	95.82	623.75	348.22	345.85	384.45	431.34	480.95
Housing facilities	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
Interest: operating capital	56.26	133.58	26.93	48.75	63.41	84.46	99.30
Total variable costs	2,306.47	5,476.96	1,103.97	1,998.87	2,599.82	3,462.96	4,071.44
Gross income - variable cost	-2,306.47	-5,476.96	-1,103.97	251.13	1,150.18	2,537.04	3,428.56
Fixed costs (per acre):							
Insurance	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
Property taxes	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Machine costs	523.89	523.89	523.89	523.89	523.89	523.89	523.89
Foreman housing	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
Land interest cost	480.00	480.00	480.00	480.00	480.00	480.00	480.00
Interest on estab. costs	0.00	284.87	846.18	1,102.54	1,271.01	1,381.03	1,388.91
Total fixed cost	1,254.45	1,539.32	2,100.62	2,356.99	2,525.46	2,635.48	2,643.36
Total cost	3,560.92	7,016.28	3,204.59	4,355.86	5,125.28	6,098.44	6,714.80
Net projected returns	-3,560.92	-7,016.28	-3,204.59	-2,105.86	-1,375.28	-98.44	785.20
Cumulative returns	-3,560.92	-10,577.20	-13,781.79	-15,887.65	-17,262.93	-17,361.37	-16,576.17

Figure 1. Cash Costs to Establish a Medium-Density Apple Orchard the First Seven Years of Establishment

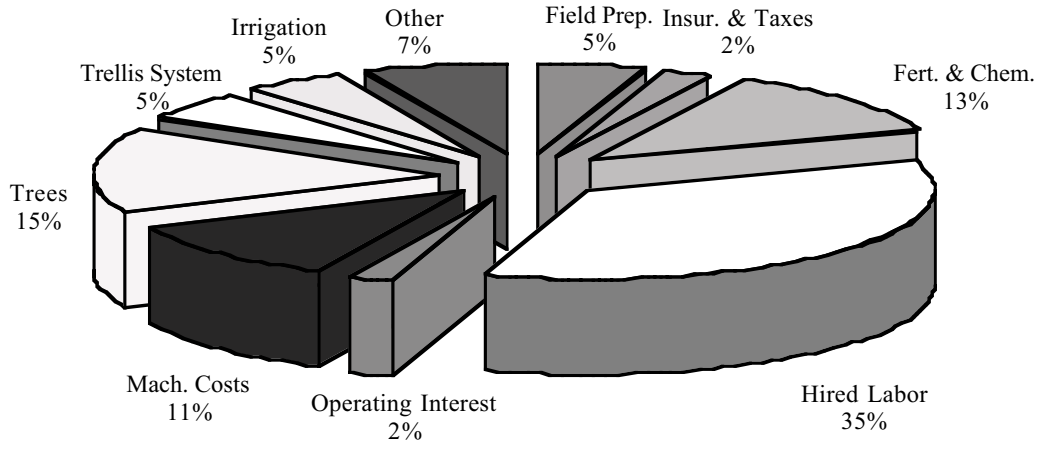
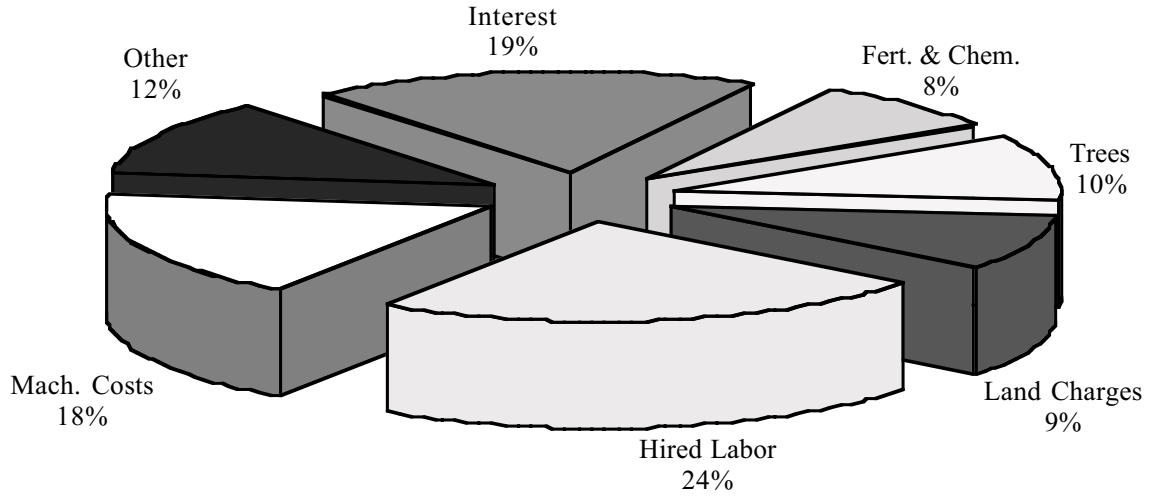
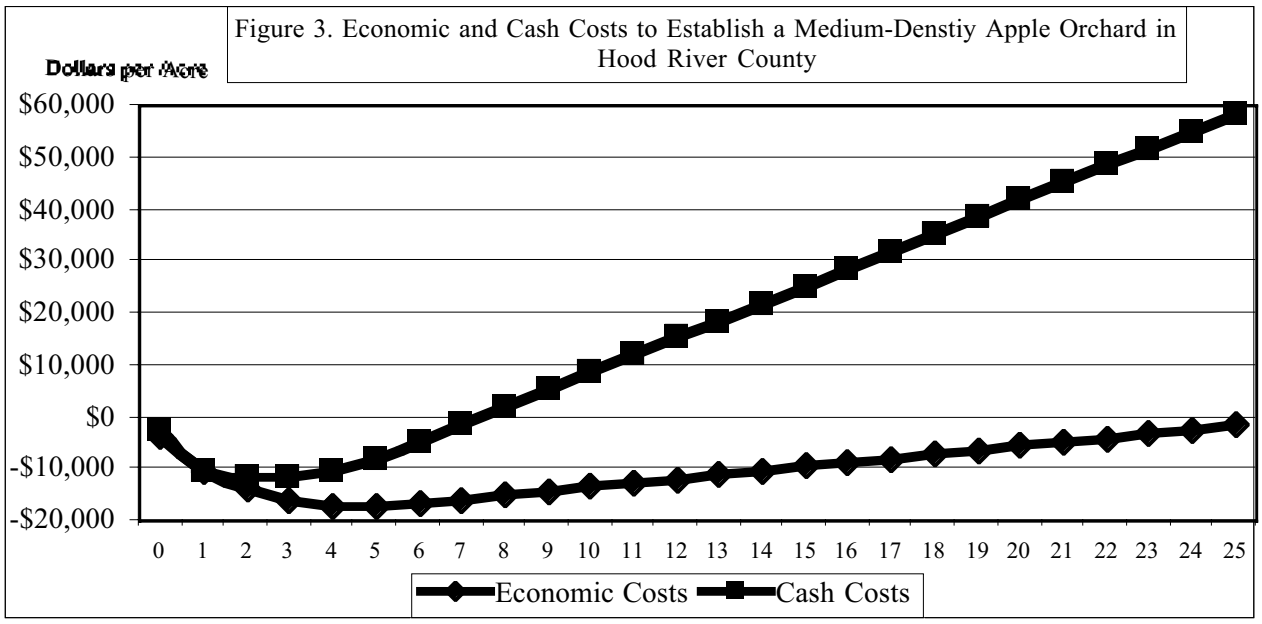


Figure 2. Economic Costs to Establish a Medium-Density Apple Orchard the First Seven Years of Establishment





Conclusion

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

Higher-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 trade-off, 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 apple 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 your 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 Medium-Density Apple Orchard in Hood River County

Table 7. Year 0, medium-density apple establishment, $/acre economic costs and returns.

Variable cash costs	Description	Labor	Machinery	Materials	Total
Remove trees, roots, & rip (2x)	custom	0.00	0.00	1,200.00	1,200.00
Disc	2.00 applications	20.00	14.76	0.00	34.76
Soil sample		0.00	0.00	43.65	43.65
Fumigation	custom	0.00	0.00	605.00	605.00
Fertilizer	1.00 application	2.46	2.32	50.00	54.78
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	6.00 months	0.00	0.00	56.26	56.26
Total **variable** costs		22.46	95.82	2,188.19	2,306.47

Fixed cash costs	Unit	Total
Machinery & equip insurance	acre	10.01
Pickup, truck, & ATV insurance	acre	5.79
Water assessment	acre	35.00
Property insurance	acre	25.00
Property taxes	acre	30.00
Total **cash** costs		105.79

Fixed non-cash costs	Unit	Total
Machinery & equip - depreciation & interest	acre	469.84
Pickup, truck, & ATV - depreciation & interest	acre	54.06
Foreman housing	acre	102.86
Housing facilities	acre	41.90
Land interest charge	acre	480.00
Total **non-cash** costs		1,148.65
Total **fixed** costs		1,254.45
Total of all costs per acre		3,560.92

Table 8. Year 1, medium-density apple establishment, $/acre economic costs and returns.

Variable cash costs	Description	Labor	Machinery	Materials	Total
Plant trees	40.00 hours	400.00	407.24	3,627.00	4,434.24
Painting trees	12.00 hours	120.00	0.00	30.00	150.00
Training trees	10.00 hours	100.00	0.00	0.00	100.00
Insecticides and fungicides	4.00 applications	40.00	44.03	150.00	234.03
Herbicide strip maintenance (0.30x)	3.00 applications	14.50	12.97	40.00	67.47
Seed cover crop	20.00 lbs	15.00	15.68	30.00	60.68
Flailing/mowing orchard floor	5.00 times	18.66	47.23	0.00	65.89
Rodent control	1.00 application	3.17	2.86	7.00	13.03
Irrigation	3.50 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	6.00 months	0.00	0.00	133.58	133.58
Total **variable** costs		746.34	623.75	4,106.87	5,476.96

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	30.00
Total **cash** costs		105.79

Fixed non-cash costs	Unit	Total
Machinery & equip - depreciation & interest	acre	469.84
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	284.87
Total **non-cash** costs		1,433.53
Total **fixed** costs		1,539.32
Total of all costs per acre		7,016.28

Table 9. Year 2, medium-density apple establishment, $/acre economic costs and returns.

Variable cash costs	Description	Labor	Machinery	Materials	Total
Pruning & training	15.00 hours	150.00	0.00	0.00	150.00
Tree removal & tree replacement	1.00 hour	10.00	8.75	13.00	31.75
Fertilizer & lime - custom applied	2.00 applications	3.02	5.72	50.00	58.74
Herbicide strip maintenance (0.30x)	3.00 applications	14.50	12.97	40.00	67.47
Insecticides & fungicides	15.00 applications	95.18	165.12	200.00	460.30
Flailing/mowing orchard floor	5.00 times	18.66	47.23	0.00	65.89
Rodent control	1.00 hour	3.17	2.86	7.00	13.03
Irrigation	3.50 hours	35.00	15.00	0.00	50.00
Ladders, pruning, & picking equip.		0.00	11.83	0.00	11.83
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	6.00 months	0.00	0.00	26.93	26.93
Total **variable** costs		329.54	348.22	426.21	1,103.97

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	30.00
Total **cash** costs		105.79

Fixed non-cash costs	Unit	Total
Machinery & equip - depreciation & interest	acre	469.84
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 years' etablishment costs	acre	846.18
Total **non-cash** costs		1,994.83
Total **fixed** costs		2,100.62
Total of all costs per acre		3,204.59

Table 10. Year 3, medium-density apple establishment, $/acre economic costs and returns.

Gross income	Quantity	Unit	$/unit	Total	Price/bin
Apples	15.00	bins	150.00	2,250.00	150.00
Total **gross** income				2,250.00	150.00

Variable cash costs	Description	Labor	Machinery	Materials	Total	Cost/bin
Pruning & training	22.00 hours	220.00	0.00	0.00	220.00	14.67
Thinning	20.00 hours	200.00	0.00	0.00	200.00	13.33
Tree removal & tree replacement	1.00 Hour	10.00	8.75	13.00	31.75	2.12
Raking & shredding brush		11.20	17.23	0.00	28.43	1.90
Fertilizer & lime - custom applied	1.00 application	3.02	2.86	50.00	55.88	3.73
Herbicide strip maintenance (0.30x)	2.00 applications	9.67	8.65	40.00	58.31	3.89
Insecticides and fungicides	8.00 applications	50.76	88.06	250.00	388.82	25.92
Pheromone disruption (1/2 rate)	1.00 hour	10.00	0.00	75.00	85.00	5.67
Production mgmt consultant fees		0.00	0.00	30.00	30.00	2.00
Bee rental	2.00 hives	0.00	0.00	56.00	56.00	3.73
Flailing/mowing orchard floor	5.00 times	18.66	47.23	0.00	65.89	4.39
Rodent control	1.00 hour	3.17	2.86	7.00	13.03	0.87
Frost protection	1.00 hour	10.00	36.73	0.00	46.73	3.12
Irrigation	3.50 hours	35.00	15.00	0.00	50.00	3.33
Ladders, pruning, & picking equip.		0.00	11.83	0.00	11.83	0.79
Harvesting costs	15.00 bins	412.50	27.91	0.00	440.41	29.36
Pickup, truck, & ATV		0.00	78.74	0.00	78.74	5.25
Housing facilities		0.00	0.00	14.29	14.29	0.95
Miscellaneous & overhead		0.00	0.00	75.00	75.00	5.00
Interest: operating capital	6.00 months	0.00	0.00	48.75	48.75	3.25
Total **variable** costs		993.99	345.85	659.04	1,998.87	133.26

Fixed cash costs	Unit	Total	Cost/bin
Machinery & equipment insurance	acre	10.01	0.67
Pickup, truck, & ATV insurance	acre	5.79	0.39
Water assessment	acre	35.00	2.33
Property insurance	acre	25.00	1.67
Property taxes	acre	30.00	2.00
Total **cash** costs		105.79	7.05

Fixed non-cash costs	Unit	Total	Cost/bin
Machinery & equip - depreciation & interest	acre	469.84	31.32
Pickup, truck, & ATV - depreciation & interest	acre	54.06	3.60
Foreman housing	acre	102.86	6.86
Housing facilities	acre	41.90	2.79
Land interest charge	acre	480.00	32.00
Prior year's establishment costs	acre	1,102.54	73.50
Total **non-cash** costs		2,251.20	150.08
Total **fixed** costs		2,356.99	157.13
Total of all costs per acre		4,355.86	290.39
Net projected returns		-2,105.86	-140.39

Table 11. Year 4, medium-density apple establishment, $/acre economic costs and returns.

Gross income		Quantity	Unit	$/unit	Total	Price/bin
Apples		25.00	bins	150.00	3,750.00	150.00
Total **gross** income					3,750.00	150.00
Variable cash costs	Description	Labor	Machinery	Materials	Total	Cost/bin
Pruning & training	33.00 hours	330.00	0.00	0.00	330.00	13.20
Thinning	30.00 hours	300.00	0.00	0.00	300.00	12.00
Tree removal & tree replacement	1.00 hour	10.00	8.75	13.00	31.75	1.27
Raking & shredding brush		11.20	17.23	0.00	28.43	1.14
Fertilizer & lime - custom applied	1.00 application	3.02	2.86	50.00	55.88	2.24
Herbicide strip maintenance (0.30x)	2.00 applications	9.67	8.65	40.00	58.31	2.33
Insecticides and fungicides	10.00 applications	63.45	110.08	300.00	473.53	18.94
Pheromone disruption (1/2 rate)	1.00 hour	10.00	0.00	75.00	85.00	3.40
Production mgmt consultant fees		0.00	0.00	30.00	30.00	1.20
Bee rental	2.00 hives	0.00	0.00	56.00	56.00	2.24
Flailing/mowing orchard floor	5.00 times	18.66	47.23	0.00	65.89	2.64
Rodent control	1.00 hour	3.17	2.86	7.00	13.03	0.52
Frost protection	1.00 hour	10.00	36.73	0.00	46.73	1.87
Irrigation	3.50 hours	35.00	15.00	0.00	50.00	2.00
Ladders, pruning, & picking equip.		0.00	11.83	0.00	11.83	0.47
Harvesting costs	25.00 bins	687.50	44.50	0.00	732.00	29.28
Pickup, truck, & ATV		0.00	78.74	0.00	78.74	3.15
Housing facilities		0.00	0.00	14.29	14.29	0.57
Miscellaneous & overhead		0.00	0.00	75.00	75.00	3.00
Interest: operating capital	6.00 months	0.00	0.00	63.41	63.41	2.54
Total **variable** costs		1,491.68	384.45	723.70	2,599.82	103.99
Fixed cash costs				Unit	Total	Cost/bin
Machinery & equipment insurance				acre	10.01	0.40
Pickup, truck, & ATV insurance				acre	5.79	0.23
Water assessment				acre	35.00	1.40
Property insurance				acre	25.00	1.00
Property taxes				acre	30.00	1.20
Total **cash** costs					105.79	4.23
Fixed non-cash costs				Unit	Total	Cost/bin
Machinery & equip - depreciation & interest				acre	469.84	18.79
Pickup, truck, & ATV - depreciation & interest				acre	54.06	2.16
Foreman housing				acre	102.86	4.11
Housing facilities				acre	41.90	1.68
Land interest charge				acre	480.00	19.20
Prior year's establishment costs				acre	1,271.01	50.84
Total **non-cash** costs					2,419.67	96.79
Total **fixed** costs					2,525.46	101.02
Total of all costs per acre					5,125.28	205.01
Net projected returns					-1,375.28	-55.01

Table 12. Year 5, medium-density apple establishment, $/acre economic costs and returns.

Gross income	Quantity	Unit	$/unit	Total	Price/bin
Apples	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	55.00 hours	550.00	0.00	0.00	550.00	13.75
Thinning	40.00 hours	400.00	0.00	0.00	400.00	10.00
Tree removal & tree replacement	1.00 hour	10.00	8.75	13.00	31.75	0.79
Raking & shredding brush		11.20	17.23	0.00	28.43	0.71
Fertilizer & lime - custom applied	1.00 application	3.02	2.86	50.00	55.88	1.40
Herbicide strip maintenance (0.30x)	2.00 applications	9.67	8.65	40.00	58.31	1.46
Insecticides and fungicides	12.00 applications	76.14	132.09	350.00	558.24	13.96
Pheromone disruption (1/2 rate)	1.00 hour	10.00	0.00	75.00	85.00	2.13
Production mgmt consultant fees		0.00	0.00	30.00	30.00	0.75
Bee rental	2.00 hives	0.00	0.00	56.00	56.00	1.40
Flailing/mowing orchard floor	5.00 times	18.66	47.23	0.00	65.89	1.65
Rodent control	1.00 hour	3.17	2.86	7.00	13.03	0.33
Frost protection	1.00 hour	10.00	36.73	0.00	46.73	1.17
Irrigation	3.50 hours	35.00	15.00	0.00	50.00	1.25
Ladders, pruning, & picking equip.		0.00	11.83	0.00	11.83	0.30
Harvesting costs	40.00 bins	1,100.00	69.38	0.00	1,169.38	29.23
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	6.00 months	0.00	0.00	84.46	84.46	2.11
Total **variable** costs		2,236.87	431.34	794.75	3,462.96	86.57

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	30.00	0.75
Total **cash** costs		105.79	2.64

Fixed non-cash costs	Unit	Total	Cost/bin
Machinery & equip - depreciation & interest	acre	469.84	11.75
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
Prior year's establishment costs	acre	1,381.03	34.53
Total **non-cash** costs		2,529.69	63.24
Total **fixed** costs		2,635.48	65.89
Total of all costs per acre		6,098.44	152.46
Net projected returns		-98.44	-2.46

Table 13. Full production, medium-density apple establishment, $/acre economic costs and returns.

Gross income		Quantity	Unit	$/unit	Total	Price/bin
Apples		50.00	bins	150.00	7,500.00	150.00
Total **gross** income					7,500.00	150.00
Variable cash costs	Description	Labor	Machinery	Materials	Total	Cost/bin
Pruning & training	55.00 hours	550.00	0.00	0.00	550.00	11.00
Thinning	55.00 hours	550.00	0.00	0.00	550.00	11.00
Tree removal & tree replacement	1.00 hour	10.00	8.75	13.00	31.75	0.64
Raking & shredding brush		11.20	17.23	0.00	28.43	0.57
Fertilizer & lime - custom applied	1.00 application	3.02	2.86	50.00	55.88	1.12
Herbicide strip maintenance (0.30x)	2.00 applications	9.67	8.65	40.00	58.31	1.17
Insecticides and fungicides	15.00 applications	95.18	165.12	450.00	710.30	14.21
Pheromone disruption (1/2 rate)	1.00 hour	10.00	0.00	75.00	85.00	1.70
Production mgmt consultant fees		0.00	0.00	30.00	30.00	0.60
Bee rental	2.00 hives	0.00	0.00	56.00	56.00	1.12
Flailing/mowing orchard floor	5.00 times	18.66	47.23	0.00	65.89	1.32
Rodent control	1.00 hour	3.17	2.86	7.00	13.03	0.26
Frost protection	1.00 hour	10.00	36.73	0.00	46.73	0.93
Irrigation	3.50 hours	35.00	15.00	0.00	50.00	1.00
Ladders, pruning, & picking equip.		0.00	11.83	0.00	11.83	0.24
Harvesting costs	50.00 bins	1,375.00	85.96	0.00	1,460.96	29.22
Pickup, truck, & ATV		0.00	78.74	0.00	78.74	1.57
Housing facilities		0.00	0.00	14.29	14.29	0.29
Miscellaneous & overhead		0.00	0.00	75.00	75.00	1.50
Interest: operating capital	6.00 months	0.00	0.00	99.30	99.30	1.99
Total **variable** costs		2,680.90	480.95	909.59	4,071.44	81.43
Fixed cash costs				Unit	Total	Cost/bin
Machinery & equipment insurance				acre	10.01	0.20
Pickup, truck, & ATV insurance				acre	5.79	0.12
Water assessment				acre	35.00	0.70
Property insurance				acre	25.00	0.50
Property taxes				acre	30.00	0.60
Total **cash** costs					105.79	2.12
Fixed non-cash costs				Unit	Total	Cost/bin
Machinery & equip - depreciation & interest				acre	469.84	9.40
Pickup, truck, & ATV - depreciation & interest				acre	54.06	1.08
Foreman housing				acre	102.86	2.06
Housing facilities				acre	41.90	0.84
Land interest charge				acre	480.00	9.60
Amortized establishment costs				acre	1,626.39	32.53
Total **non-cash** costs					2,775.05	55.50
Total **fixed** costs					2,880.84	57.62
Total of all costs per acre					6,952.28	139.05
Net projected returns					547.72	10.95

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