EM 8878-E
October 2007

Vineyard Economics:
Establishing and Producing Wine Grapes in Hood River County

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Oregon State University | Extension Service

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Introduction

The Hood River Valley is world renowned for producing high quality tree fruits with winter pears comprising the majority of the orchard acreage and production in the valley. Recent trends toward decreasing profitability for pear and apple production have led orchardists to consider alternative farming enterprises.

The Hood River area is not an established winegrowing region. In 2003, there were only 83 acres of producing vineyards in Hood River County, under one percent of the state total. Nonetheless, several award winning wines have been produced by local wineries, and vineyard designated wines are made with fruit grown in Mid-Columbia vineyards. This suggests that with careful attention to site selection, variety selection, and vineyard management practices high quality wine grapes can be produced in the Hood River area.

Vineyard establishment requires considerable effort and financial resources. This may limit the extent of local vineyard expansion. This publication is intended primarily for those considering the economic and financial consequences of planting a vineyard in Hood River County. It may also be useful to those with existing vineyards. Together with existing analyses of tree fruit production, this publication provides a tool for comparing the profitability of wine grapes with alternative farm and non-farm investments for growers, bankers and other investors.

Assumptions

In the preparation of this publication, a set of assumptions were made that provided a basis for the wine grape vineyard analysis. These assumptions are:

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 medium-density pears, 5 acres of medium-density apples, 5 acres of wine grapes, and 10 acres, or approximately 15 percent, of orchard under establishment.
2. Plant 871 own-rooted vines per acre (5' x 10') spacing with a productive life of 25 years, once full production of 3 ton per acre is reached.
3. The wine grape vineyard is trained to a vertically shoot positioned system.
4. Wine grape prices are $1,500 per ton.
5. Commercial yields begin in year 3 and full production is reached in 5 years with yields of 0.75, 2, and 3 tons per acre, respectively.
6. General labor is hired at a rate of $11.50 per hour and machine labor at $13.00 per hour, which includes worker's compensation, unemployment insurance, and other labor overhead expenses.

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Harvest labor costs are custom hired at a cost of $170 per ton. 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 depreciated using the straight-line method of depreciation with a zero salvage value.
8. Foreman housing with all utilities, is provided at no cost to the employee and valued at $600 per month, or $103 per acre, and is 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.
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. Table 2 provides estimated machinery costs from the American Society of Agricultural Engineers. 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 vines, 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 a 10' vine row spacing. Gasoline and diesel costs per gallon are $3.00 and $3.30, respectively.
10. The interest rate on operating funds is 8.5 percent and treated as a cash expense. One-half of the cash expenses are borrowed for a six-month period.
11. Machinery, housing facilities, and land are owned by the operator and assessed 8.5 and 8 percent rates of interest, respectively, as opportunity costs. Land is valued at $6,000 per acre.
12. Previous year's establishment costs are funded by the operator at a charge of 10 percent interest and are considered an opportunity cost.
13. Herbicides used for strip maintenance are applied to 30 percent of each acre.
14. A drip irrigation system is used at an estimated cost of $1,250 per acre. The life of the system is 25 years and 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 8.5 percent interest rate ((cost + salvage value) ÷ 2 x .085). Repairs and maintenance for the system costs one percent of the purchase price per year.
15. The trellis system is installed at a cost of $5,000 per acre. The life of the system is 25 years and 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 8.5 percent interest rate ((cost + salvage value) ÷ 2 x .085). Repairs and maintenance for the system costs one percent of the purchase price per year.
16. Two wind machines are used for frost control along with three vineyard heaters per acre. The wind machines are valued at $17,000 each and heaters cost $10 each. Depreciation periods are 25 years for the wind machines and 10 years for the heaters using the straight-line method of depreciation.
17. Additional assumptions are listed for variable, fixed cash, and fixed non-cash costs in Table 4.
18. Price inflation for the time period 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 (years)	Salvage Value
Tractor	4 wheel dr 70hp, new	$ 33,000	523	10	$ 9,748
Tractor	2 wheel dr 50hp, old	18,000	179	20	2,310
Tractor	2 wheel dr 35 hp, old	7,500	163	20	962
Air-blast sprayer	400 gallon unit, PTO, new	17,500	156	10	3,095
Air-blast sprayer	400 gallon unit, PTO, older	5,000	104	10	884
Flail chopper	8' unit	6,000	138	7	1,531
Weed sprayer	100 gallon unit	2,000	38	15	192
Fertilizer spreader		2,300	12	20	120
Brush windrow		3,500	29	20	182
Gopher machine		1,200	13	20	63
Pickup	1/2 ton 4x4, new	22,000	*12,000*	10	8,319
Truck	2 ton, used	18,000	*3,500*	20	2,710
ATV	4 wheeler, new	5,500	*3,000*	5	2,465
Auger		1,700	35	20	89
Front-end loader & backforks		5,800	64	10	1,026
Bin trailer		5,000	64	10	884
Picking buckets for wine grapes		500	N/A	5	N/A
Chain & pruning saws	3 units each, 1-loppers	3,000	N/A	3	N/A
Irrigation system	Drip system, per acre	1,250	N/A	25	N/A
Wind machine	2 units, gasoline	34,000	35	25	962
Smudge Pots	3 units, per acre	30	15	10	5
Trellis system - wine grapes	per acre	5,000	N/A	25	N/A
Housing facilities	1 unit	40,000	N/A	30	0.00

Table 2. Machinery Cost Calculations.

Machine	Size or description	---Variable costs -- Fuel & Lube	Repairs & Maint.	------ Fixed costs ------ Depr. & Interest	Insurance	Total cost
				----- Costs per hour -----		
Tractor	4 wheel dr 70hp, new	$22.77	$0.52	$7.92	$0.37	$31.58
Tractor	2 wheel dr 50hp, old	18.98	0.45	9.22	0.51	29.16
Tractor	2 wheel dr 35 hp, old	18.98	0.17	4.21	0.23	23.59
Air-blast sprayer	400 gallon unit, PTO, new	0.00	8.20	14.84	0.40	23.44
Air-blast sprayer	400 gallon unit, PTO, older	0.00	2.07	6.36	0.17	8.61
Flail chopper	8' unit	0.00	2.55	6.95	0.16	9.66
Weed sprayer	100 gallon unit	0.00	0.69	5.60	0.17	6.47
Fertilizer spreader		0.00	0.94	17.77	0.61	19.32
Brush windrow		0.00	0.48	10.95	0.38	11.80
Gopher machine		0.00	0.50	8.83	0.30	9.63
				----- Costs per mile -----		
Pickup	1/2 ton 4x4, new	$0.29	$0.05	$0.22	$0.07	$0.63
Truck	2 ton, used	0.58	0.57	0.47	0.27	1.89
ATV	4 wheeler, new	0.83	0.02	0.32	0.01	1.18
				----- Costs per acre -----		
Auger		$0.00	$0.29	$4.47	$0.00	$4.76
Front-end loader & backforks		0.00	0.88	10.91	0.00	11.79
Bin trailer		0.00	0.76	9.41	0.00	10.16
Picking buckets for wine grapes		0.00	0.43	4.85	0.00	5.28
Chain & pruning saws	3 units each, 1-loppers	5.18	2.57	16.11	0.00	23.85
Irrigation system	Drip system, per acre	0.00	12.50	103.13	0.00	115.63
Wind machines	2 units, gasoline	25.88	6.28	40.11	0.00	72.26
Smudge Pots	3 units, per acre	3.21	0.00	0.00	0.00	3.22
Trellis system - wine grapes	per acre	0.00	50.00	412.50	0.00	462.50
Housing facilities	1 unit	0.00	43.21	41.90	0.00	85.11

Table 3. Estimated cost of each operation with power-unit for a 10' between row spacing.

Operation	Tractor	Miles per hour	Acres per hour	-- Machine costs -- Labor cost per acre	Variable cost per acre	Fixed cost per acre	Total cost per acre
Air-blast sprayer	4 wheel dr 70hp	2.00	1.21	$10.72	$25.97	$19.41	$56.11
Flail chopper	4 wheel dr 70hp	2.00	2.06	6.31	12.54	7.48	26.32
Weed sprayer	2 wheel dr 35hp	3.50	3.18	4.09	6.23	3.21	13.53
Fertilizer spreader	2 wheel dr 50hp	3.00	2.55	5.11	8.00	11.04	24.15
Gopher machine	2 wheel dr 50hp	2.50	2.42	5.36	8.22	7.78	21.36

Table 4. Input assumptions for establishing wine grapes, (per acre basis).					
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Full Prod**
Prices per ton	$1,500	$1,500	$1,500	$1,500	$1,500
Tons per acre	0.00	0.00	0.75	2.00	3.00
Cost of general vineyard labor, per hour	$11.50	$11.50	$11.50	$11.50	$11.50
Cost of tractor driver, per hour	$13.00	$13.00	$13.00	$13.00	$13.00
Cost of harvest labor, per ton	$0.00	$0.00	$170.00	$170.00	$170.00
Hours of pruning labor	0.00	4.00	24.00	24.00	24.00
Hours of labor to pull brush	0.00	0.00	16.00	16.00	16.00
Hours of labor to tie canes	0.00	0.00	12.00	12.00	12.00
Hours of irrigating labor	10.00	10.00	10.00	10.00	10.00
Hours to remove & replace vine labor	0.00	2.50	2.50	2.50	2.50
Hours to maintain trellis labor	0.00	0.00	0.00	2.00	2.00
Hours for frost protection labor	0.00	0.00	0.50	0.50	0.50
Hours for training	4.00	12.00	15.00	15.00	15.00
Hours for sucker removal	0.00	0.00	15.00	15.00	15.00
Hours for cluster thinning	0.00	0.00	10.00	10.00	10.00
Hours for leaf pulling	0.00	0.00	0.00	3.00	6.00
Hours for hedging	0.00	0.00	4.00	4.00	4.00
Hours for bird control	0.00	0.00	20.00	20.00	20.00
Cost of fertilizer - foliar applied	$31.25	$31.25	$62.50	$62.50	$62.50
Cost of herbicide strip maintenance	$25.00	$50.00	$50.00	$50.00	$50.00
Cost of fungicides	$0.00	$62.50	$218.75	$281.25	$281.25
Cost of rodent materials	$20.00	$20.00	$20.00	$20.00	$20.00
Cost of ties for canes	$4.00	$4.00	$4.00	$4.00	$4.00
Cost for bird control & clip netting	$0.00	$0.00	$800.00	$0.00	$0.00
Times for herbicide strip spray	1.00	2.00	2.00	2.00	2.00
Times for fungicides	0.00	2.00	7.00	7.00	7.00
Times for rodent control	1.00	1.00	1.00	1.00	1.00
Times for mowing vineyard floor	4.00	4.00	4.00	4.00	4.00
Property taxes	$30.00	$30.00	$30.00	$30.00	$30.00
Property insurance	$25.00	$25.00	$25.00	$25.00	$25.00
Land values	$6,000	$6,000	$6,000	$6,000	$6,000
Foreman housing (per month)	$600.00	$600.00	$600.00	$600.00	$600.00
Irrigation assessment	$35.00	$35.00	$35.00	$35.00	$35.00
Miscellaneous & overhead	$75.00	$75.00	$75.00	$75.00	$75.00
Vine cost	$0.75	$0.75	$0.75	$0.75	$0.75
Vine grow tubes	$0.50	$0.50	$0.50	$0.50	$0.50
Gasoline price	$3.00	$3.00	$3.00	$3.00	$3.00
Diesel fuel price	$3.30	$3.30	$3.30	$3.30	$3.30
Operating interest rate	8.50%	8.50%	8.50%	8.50%	8.50%
Machinery interest rate	8.50%	8.50%	8.50%	8.50%	8.50%
Land interest rate	8.00%	8.00%	8.00%	8.00%	8.00%
Establishment interest rate	10.00%	10.00%	10.00%	10.00%	10.00%
% of operating capital borrowed	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
Planted vines	871	20	20	20	20

Results of establishing wine grapes in Hood River County

Cash flow analysis

Table 5 contains a cash flow analysis for establishing a wine grape vineyard. The analysis shows the cash costs required to establish a vineyard. Cash costs include labor, vines, trellis, fertilizer, chemicals, 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 five establishment years, at which time full production of the vineyard is reached. Production begins in year 3 with 0.75 tons of wine grapes per acre and increases to 3 tons at full production. Total variable costs are $3,322 in the first year with an additional $117 of cash fixed costs for a total cash cost of $3,438 per acre.

A positive cash flow begins in year 5 with gross income exceeding total cash costs by $933 per acre. At full production, or in five years, the vineyard does not return a sufficient amount of gross income to pay all previous years' cash costs. There is $13,258 per acre remaining over and above prior costs.

Figure 1 shows the major cost components in relation to total cash costs. Hired labor represents 37 percent of the total cash costs to establish this vineyard. The trellis system is next with 23 percent. Machine costs, which include fuel, oil, and repairs, are third with 12 percent of the cash costs. The irrigation system, and fertilizer & chemicals are each 6 percent of the total cash costs. Vine costs are relatively low, accounting for 5 percent of the total cash costs. The remaining cost items encompass 11 percent of the total cash costs.

Economic costs and returns

Table 6 details the economic costs and returns for the establishment of a wine grape vineyard. Economic costs include all the cash costs, listed in Table 5, and the ownership costs that are either a opportunity cost to the owner or money 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 year's establishment costs. The gross income and variable cash costs remain the same as in Table 5 except that the irrigation and trellis systems are amortized over their productive life in this analysis and included in fixed machine costs.

Gross income exceeds variable costs beginning in Year 5 with a $1,099 per acre return to the grower. Gross income, however, never exceeds total economic costs during the 25-year amortization period and, as a result, this particular vineyard has an annual deficit of $1,993 per acre. In addition, at the end of the establishment period $17,492 per acre remains to repay all previous establishment costs. This cost is amortized over a 25-year period as an annual payment of $1,746 per acre as shown in Table 11, Full Production Years, page 18.

Figure 2 shows the cost components in relation to total economic costs. When all economic costs are included, labor costs remain the largest cost item with 24 percent of the total costs for the first five years of establishment. Interest costs are the next highest cost item with 21 percent of the total economic costs and machine costs (fuel, oil, repairs, depreciation and interest charges) are 18 percent. The combined costs of vines, trellising, and the irrigation system account for 24 percent. The remaining cost items are 13 percent of the total economic costs.

The net projected economic returns for establishing a wine grape vineyard are shown in Figure 3. Both the cumulative cash and economic cost and returns are represented. The projected returns for this vineyard will cover all cash costs of establishment in 20 years. With the assumptions in this study, however, this vineyard 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 vineyard 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 wine grape prices by 53.5 percent from $1,500 to $2,302.50 per ton,
b) increasing anticipated yield by 53.5 percent (to 1.15, 3.07, 4.61 tons per acre for years 3, 4, and 5, respectively), or
c) decreasing the rate of return previous years' establishment costs to -8.8 percent for all ownership costs.

The results of these adjustments are shown in Figure 4. It should be noted that by reducing assumed interest rates to -8.8 percent, the amount of money required to establish this vineyard in year 5 is decreased by $6,947 per acre (from $17,492 per acre in Table 6, to $10,545). Increasing grape price or yield reduces the amount of money required for vineyard establishment in year 5 by $4,835 per acre.

Growers often focus on reducing vine costs, fertilizers, and chemicals as a means of reducing costs. In order to increase the chances of financial success, more emphasis should be placed on varieties and practices that optimize yields and fruit quality for a particular location or increasing crop yield and income.

Table 5. Cash costs and returns of establishing a vineyard.					
Income:	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Full Prod**
Yield (tons/acre)	0.00	0.00	0.75	2.00	3.00
Price (dollars/ton)	1,500.00	1,500.00	1,500.00	1,500.00	1,500.00
Gross Income(dollars/acre)	0.00	0.00	1,125.00	3,000.00	4,500.00
Variable Costs (per acre):					
Field Preparation	27.33	0.00	0.00	0.00	0.00
Vines	1,088.75	25.00	25.00	25.00	25.00
Irrigation system	0.00	1,250.00	0.00	50.00	50.00
Trellis installation & maintenance	0.00	2,000.00	3,000.00	0.00	50.00
Tie for canes	0.00	0.00	4.00	4.00	4.00
Fertilizer	31.25	31.25	62.50	62.50	62.50
Chemicals	25.00	112.50	268.75	331.25	331.25
Rodent materials	20.00	20.00	20.00	20.00	20.00
Harvest labor	0.00	0.00	127.50	340.00	510.00
General labor	1,337.09	520.77	1,833.64	1,661.14	1,695.64
Bird netting	0.00	0.00	800.00	0.00	0.00
Machine costs	603.99	395.20	505.64	505.64	513.38
Housing facilities	43.21	43.21	43.21	43.21	43.21
Miscellaneous & overhead	75.00	75.00	75.00	75.00	75.00
Interest: operating capital	70.11	26.07	80.01	66.25	70.76
Total **variable** costs	3,321.73	4,499.00	6,845.25	3,183.99	3,450.74
Gross Income - variable cost	-3,321.73	-4,499.00	-5,720.25	-183.99	1,049.26
Fixed cash costs (per acre):					
Insurance	51.53	51.53	51.53	51.53	51.53
Water assessment	35.00	35.00	35.00	35.00	35.00
Property taxes	30.00	30.00	30.00	30.00	30.00
Total **fixed** cash cost	116.53	116.53	116.53	116.53	116.53
Total **cost**	3,438.27	4,615.54	6,961.78	3,300.52	3,567.28
Net projected returns	-3,438.27	-4,615.54	-5,836.78	-300.52	932.72
Cumulative returns	-3,438.27	-8,053.80	-13,890.59	-14,191.11	-13,258.38

Table 6. Economic costs and returns of establishing a vineyard.					
Income:	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Full Prod**
Yield (tons/acre)	0.00	0.00	0.75	2.00	3.00
Price (dollars/ton)	1,500.00	1,500.00	1,500.00	1,500.00	1,500.00
Gross Income(dollars/acre)	0.00	0.00	1,125.00	3,000.00	4,500.00
Variable Costs (per acre):					
Field preparation	27.33	0.00	0.00	0.00	0.00
Vines	1,088.75	25.00	25.00	25.00	25.00
Tie for canes	0.00	0.00	4.00	4.00	4.00
Trellis maintenance	0.00	0.00	0.00	50.00	50.00
Fertilizer	31.25	31.25	62.50	62.50	62.50
Chemicals	25.00	112.50	268.75	331.25	331.25
Rodent materials	20.00	20.00	20.00	20.00	20.00
Harvest labor	0.00	0.00	127.50	340.00	510.00
General labor	1,337.09	520.77	1,833.64	1,661.14	1,695.64
Bird netting	0.00	0.00	800.00	0.00	0.00
Machine costs	603.99	395.20	505.64	505.64	513.38
Housing facilities	43.21	43.21	43.21	43.21	43.21
Miscellaneous & overhead	75.00	75.00	75.00	75.00	75.00
Interest: operating capital	70.11	26.07	80.01	66.25	70.76
Total **variable** costs	3,321.73	1,249.00	3,845.25	3,183.99	3,400.74
Gross Income - variable cost	-3,321.73	-1,249.00	-2,720.25	-183.99	1,099.26
Fixed costs (per acre):					
Insurance	51.53	51.53	51.53	51.53	51.53
Water assessment	35.00	35.00	35.00	35.00	35.00
Property taxes	30.00	30.00	30.00	30.00	30.00
Machine costs	332.92	628.28	800.89	800.89	800.89
Foreman housing	102.86	102.86	102.86	102.86	102.86
Housing facilties	41.90	41.90	41.90	41.90	41.90
Land interest cost	480.00	480.00	480.00	480.00	480.00
Interest on establishment costs	0.00	451.86	766.79	1,277.21	1,549.90
Total **fixed** cost	1,074.22	1,821.43	2,308.98	2,819.40	3,092.09
Total **cost**	4,395.95	3,070.44	6,154.23	6,003.39	6,492.83
Net projected returns	**-4,395.95**	**-3,070.44**	**-5,029.23**	**-3,003.39**	**-1,992.83**
Cumulative returns	**-4,395.95**	**-7,466.39**	**-12,495.62**	**-15,499.00**	**-17,491.84**

Figure 1. Cash Costs to Establish a Vineyard the First Five Years of Establishment

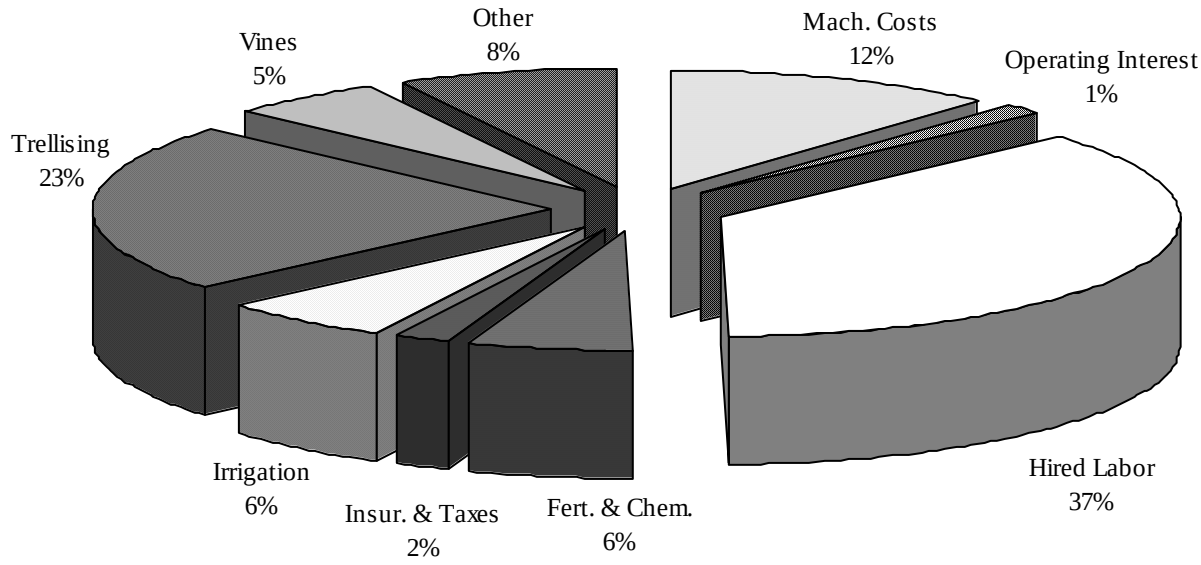


Figure 2. Economic Costs to Establish a Vineyard the First Five Years of Establishment

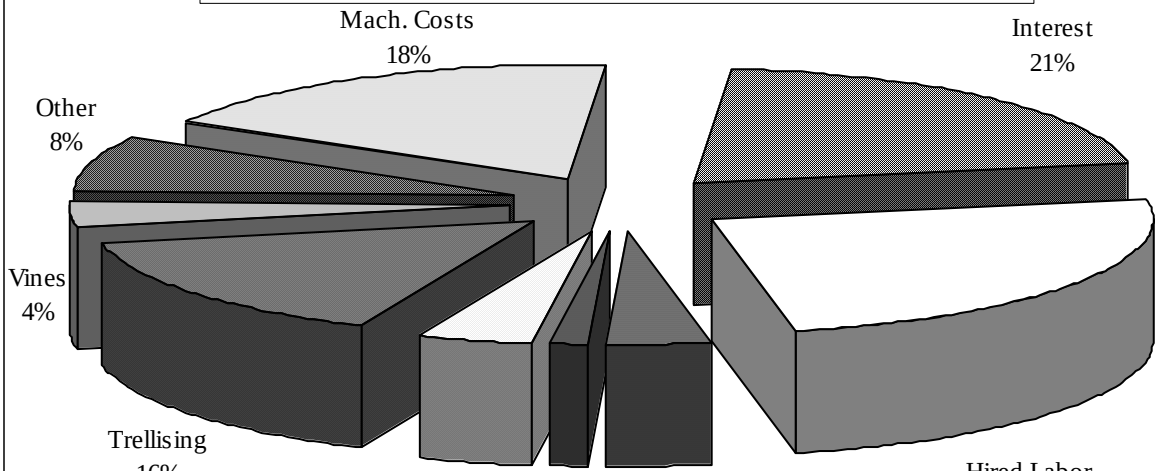


Figure 3. Economic and Cash Costs to Establish a Vineyard in Hood River County

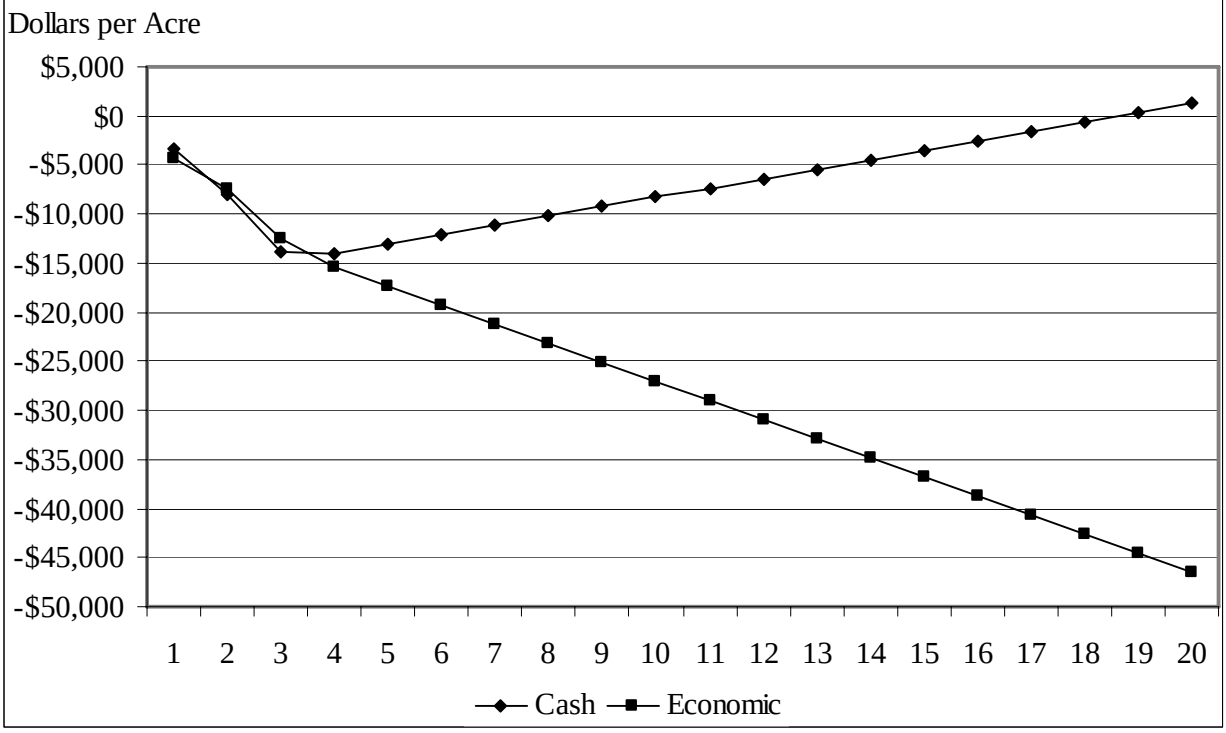
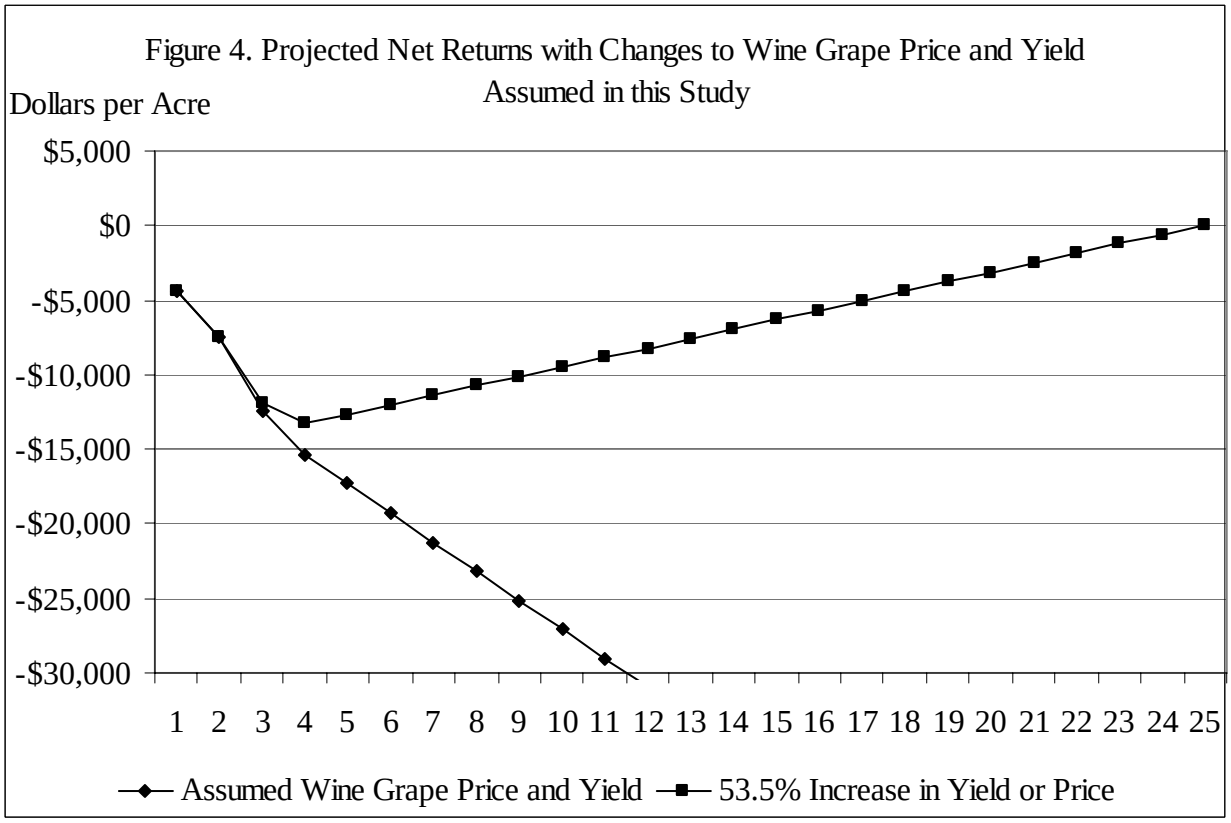


Figure 4. Projected Net Returns with Changes to Wine Grape Price and Yield Assumed in this Study



Conclusion

The results of the sensitivity analysis indicated that profitability could be achieved by increasing fruit prices by 53.5 percent, increasing yield by 53.5 percent, or accepting a -8.8 percent rate of return on investment. Of course, a combination of increased prices, yield, or lower rates of return on investment, is also a possibility. Achieving any of these outcomes in a cool climate grape growing region, such as the Mid-Columbia, generally depends on careful attention to detail in vineyard establishment and management practices.

In cool climate areas, the regional climate (macroclimate) may be well suited to the production of high quality fruit. Many potential vineyard sites, however, may be unsuitable for the successful production of high quality fruit on a consistent basis due to limitations of the site climate (mesoclimate). Vineyard mesoclimate is affected by several factors that must be considered during vineyard site selection.

Moderately productive, well-drained soils are often favored over deep, fertile, highly productive soils in order to balance vegetative growth and fruit production and quality. On more productive sites, growers must carefully manage this balance to avoid overly vegetative vines that may produce lower quality fruit. Canopy management and other practices would be critical to achieving vine balance.

Sloping ground with southern or southwestern exposure contributes to good air drainage for frost avoidance and high interception of solar radiation for photosynthetic activity critical for production of sugar and other fruit constituents. Low to moderate elevation sites are often chosen over high elevation sites because the latter may result in insufficient heat units for fruit maturation. Prime sites for wine grape production may be limited, but suitable sites can be identified in the Hood River Valley.

The choice of variety is a critical factor in successful wine grape production. Grape varieties have different requirements for accumulated heat units during the growing season. The variety choice must match the site potential for heat units over the course of the growing season to achieve optimum fruit maturity.

Many agricultural products have a value added component which increases profitability to the producer. If grape growers are able to share in the value-added process of winemaking, they may be more likely to profit financially.

This cost of establishment study is meant to provide useful information to wine grape producers and investors who are considering planting a new vineyard. However, like any other enterprise budget, putting your own current costs in the budget will make it more meaningful.

Using the Crop Profitability Analysis (CPA) Program to Analyze Different Price and Yield Scenarios

So many different types of scenarios as to price and yields over the years can occur due to freeze, rain, hail, birds and market conditions that it is infeasible to cover even a small sample of these scenarios in this bulletin. However, the Crop Profitability Analysis (CPA) program developed by Oregon State University, Washington State University, and the University of California at Davis, is a Windows based program designed to help agricultural producers in making long-run cropping decisions. CPA is designed to use data from annual budgets as input and generate financial analyses of the potential economic performance of perennial crops such as tree fruit, nut, berry and wine grapes under numerous different long-run scenarios. The CPA program can be

obtained free of charge by going on the Internet at http://oregonstate.edu/oain click on the Ag Tools for Managing Risk and download it along with the companion Budget Editor program. Both programs are fully documented. In addition, the data from this publication for the establishment and production of wine grapes can also be downloaded by clicking on Oregon under "Ready-to-use budget files for CPA and ECL," and then clicking on Wine Grapes. All assumptions as to prices received, yields obtained, or input items, amounts, and costs can be readily changed using Budget Editor and CPA to modify the budgets provided so the user can develop a set of annual budgets that most fit his/her situation.

CPA generates three reports for each plan analyzed. "Net Returns and Present Value by Year" gives the net returns and net present value by year and the total net returns and total net present value for each plan along with the annual equivalent. "Accumulated Net Returns" shows the annual returns, annual cost, net returns, and accumulated net returns for each plan. It calculates the number of years the returns are greater than costs, the year returns are greater than total costs of previous years, and the total
cash costs to establish. "Net Present Value Profile" calculates the net present value and the annual equivalent at various interest rates for the base plan and the comparison plan. It also calculates the beginning and ending investment values and the internal rate of return for each plan. CPA also graphs the net returns by year, accumulated net returns by year, the net present value at varying discount rates, and the annual equivalent at varying discount rates.

It is recommended by the authors that before investing in any long-run perennial crop, that the potential investor use the CPA program to fully analyze the potential investment under varying price and yield scenarios to help decided if the potential investment is likely to be economical feasible to or not.

APPENDIX A

Enterprise Budgets for Wine grapes in Hood River County

Table 7. Year 1, wine grape establishment, $/acre economic costs and returns.

VARIABLE CASH COSTS	Description		Labor	Machinery	Materials	Total
Soil Sample	1.0	x/acre	$0.00	$0.00	$43.65	$43.65
Disc & cultivate	2.0	applications	26.00	14.76	0.00	40.76
Mark rows	10.0	hours	115.00	0.00	1.20	116.20
Rototill strips	1.0	applications	6.31	12.54	0.00	18.84
Mark plants	20.0	hours	230.00	0.00	26.13	256.13
Plant vines with grow tubes	35.0	hours	402.50	339.94	1,088.75	1,831.19
Tie Canes	1.0	x/acre	11.50	0.00	4.00	15.50
Install irrigation system	10.0	hours	115.00	0.00	0.00	115.00
Hoeing around vines	20.0	hours	230.00	0.00	0.00	230.00
Fertilizer	1.0	applications	5.11	8.00	31.25	44.36
Herbicide strip maintenance	1.0	applications	4.09	6.23	25.00	35.32
Vine training	4.0	hours	46.00	0.00	0.00	46.00
Mowing vineyard floor	4.0	times	25.23	50.15	0.00	75.38
Rodent control	1.0	applications	5.36	8.22	20.00	33.58
Irrigation	10.0	hours	115.00	12.50	0.00	127.50
Pickup, truck & ATV	1.0	x/acre	0.00	151.65	0.00	151.65
Housing facilities	1.0	x/acre	0.00	0.00	43.21	43.21
Miscellaneous and overhead	1.0	x/acre	0.00	0.00	75.00	75.00
Interest: operating capital	6.0	month	0.00	0.00	70.11	70.11
Total **variable** costs			1,337.09	603.99	1,428.30	3,369.38

FIXED CASH COSTS	Unit	Total
Pickup, truck & ATV insurance	acre	26.53
Water assessment	acre	35.00
Property insurance	acre	25.00
Property taxes	acre	30.00
Total **fixed cash** costs		116.53

FIXED NON-CASH COSTS	Unit	Total
Machinery and equipment insurance, depreciation & interest	acre	332.92
Pickup, truck & ATV - depreciation & interest	acre	74.95
Foreman housing	acre	102.86
Housing facilities	acre	41.90
Land interest charge	acre	480.00
Total **fixed non-cash** costs		1,032.64
Total **fixed** costs		1,149.17
Total of all costs per acre		**$4,518.55**

Table 8. Year 2, wine grape establishment, $/acre economic costs and returns.

VARIABLE CASH COSTS	Description	Labor	Machinery	Materials	Total
Prune	4.0 hours	$46.00	$0.00	$0.00	$46.00
Tie Canes	1.0 x/acre	11.50	0.00	4.00	15.50
Vine replacement with grow tubes	2.5 hours	28.75	0.00	25.00	53.75
Install trellis system	10.0 hours	115.00	95.73	0.00	210.73
Shredding brush	1.0 x/acre	6.31	12.54	0.00	18.84
Fertilizer - foliar applied	1.0 x/acre	0.00	0.00	31.25	31.25
Herbicide strip maintenance	2.0 applications	8.17	12.47	50.00	70.64
Fungicides	2.0 applications	21.45	51.95	62.50	135.89
Vine training	12.0 hours	138.00	0.00	0.00	138.00
Mowing vineyard floor	4.0 times	25.23	50.15	0.00	75.38
Rodent control	1.0 applications	5.36	8.22	20.00	33.58
Irrigation	10.0 hours	115.00	12.50	0.00	127.50
Pickup, truck & ATV	1.0 x/acre	0.00	151.65	0.00	151.65
Housing facilities	1.0 x/acre	0.00	0.00	43.21	43.21
Miscellaneous and overhead	1.0 x/acre	0.00	0.00	75.00	75.00
Interest: operating capital	6.0 months	0.00	0.00	26.07	26.07
Total **variable** costs		520.77	395.20	337.03	1,253.00

FIXED CASH COSTS	Unit	Total
Pickup, truck & ATV insurance	acre	26.53
Water assessment	acre	35.00
Property insurance	acre	25.00
Property taxes	acre	30.00
Total **fixed cash** costs		116.53

FIXED NON-CASH COSTS	Unit	Total
Machinery and equipment insurance, depreciation & interest	acre	628.28
Pickup, truck & ATV - depreciation & interest	acre	74.95
Foreman housing	acre	102.86
Housing facilities	acre	41.90
Land interest charge	acre	480.00
Prior year's establishment costs - Interest	acre	451.86
Total **fixed non-cash** costs		1,779.85

Total **fixed** costs	1,896.39
Total of all costs per acre	**$3,149.39**

Table 9. Year 3, wine grape establishment, $/acre economic costs and returns.

TOTAL GROSS INCOME	Quantity	Unit	$/Unit	Total	Price/ton
Pinot Noir grapes	0.75	Tons	1,500.00	1,125.00	1,500.00
Total **gross** income				1,125.00	1,500.00

VARIABLE CASH COSTS	Description	Labor	Machinery	Materials	Total	Cost/ton
Prune	24.0 hours	$276.00	$0.00	$0.00	$276.00	$368.00
Pull brush	16.0 hours	184.00	0.00	0.00	184.00	245.33
Tie canes	12.0 hours	138.00	0.00	4.00	142.00	189.33
Vine replacement with grow tubes	2.5 hours	28.75	0.00	25.00	53.75	71.67
Install trellis system	20.0 hours	230.00	0.00	0.00	230.00	306.67
Shredding brush	1.0 x/acre	6.31	12.54	0.00	18.84	25.13
Fertilizer - foliar applied	1.0 x/acre	0.00	0.00	62.50	62.50	83.33
Herbicide strip maintenance	2.0 applications	8.17	12.47	50.00	70.64	94.19
Fungicides	7.0 applications	75.07	181.81	218.75	475.63	634.17
Vine training	15.0 hours	172.50	0.00	0.00	172.50	230.00
Sucker removal	15.0 hours	172.50	0.00	0.00	172.50	230.00
Cluster thinning	10.0 hours	115.00	0.00	0.00	115.00	153.33
Hedging	4.0 hours	46.00	0.00	0.00	46.00	61.33
Mowing vineyard floor	4.0 times	25.23	50.15	0.00	75.38	100.50
Bird control & clipping net	20.0 hours	230.00	0.00	800.00	1,030.00	1,373.33
Rodent control	1.0 applications	5.36	8.22	20.00	33.58	44.77
Frost protection	0.5 hours	5.75	35.37	0.00	41.12	54.83
Irrigation	10.0 hours	115.00	12.50	0.00	127.50	170.00
Picking equipment	1.0 x/acre	0.00	0.43	0.00	0.43	0.57
Harvesting costs	0.8 tons	127.50	40.50	0.00	168.00	224.00
Pickup, truck & ATV	1.0 x/acre	0.00	151.65	0.00	151.65	202.21
Housing facilities	1.0 x/acre	0.00	0.00	43.21	43.21	57.61
Miscellaneous and overhead	1.0 x/acre	0.00	0.00	75.00	75.00	100.00
Interest: operating capital	6.0 months	0.00	0.00	80.01	80.01	106.68
Total **variable** costs		1,961.14	505.64	1,378.47	3,845.25	5,127.00

FIXED CASH COSTS	Unit	Total	Cost/ton
Pickup, truck & ATV insurance	acre	26.53	35.38
Water assessment	acre	35.00	46.67
Property insurance	acre	25.00	33.33
Property taxes	acre	30.00	40.00
Total **fixed cash** costs		116.53	155.38

FIXED NON-CASH COSTS	Unit	Total	Cost/ton
Machinery and equipment insurance, depreciation & interest	acre	800.89	1,067.86
Pickup, truck & ATV - depreciation & interest	acre	74.95	99.94
Foreman housing	acre	102.86	137.14
Housing facilities	acre	41.90	55.87
Land interest charge	acre	480.00	640.00
Prior year's establishment costs - Interest	acre	766.79	1,022.39
Total **fixed non-cash** costs		2,267.40	3,023.21
Total **fixed** costs		2,383.94	3,178.58
Total of all costs per acre		**$6,229.18**	**$8,305.58**
Net projected returns		**$5,104.18**	**$6,805.58**

Table 10. Year 4, wine grape establishment, $/acre economic costs and returns.

TOTAL GROSS INCOME	Quantity	Unit	$/Unit	Total	Price/ton
Pinot Noir grapes	2.00	Tons	1,500.00	3,000.00	1,500.00
Total **gross** income				3,000.00	1,500.00

VARIABLE CASH COSTS	Description	Labor	Machinery	Materials	Total	Cost/ton
Prune	24.0 hours	$276.00	$0.00	$0.00	$276.00	$138.00
Pull brush	16.0 hours	184.00	0.00	0.00	184.00	92.00
Tie canes	12.0 hours	138.00	0.00	4.00	142.00	71.00
Vine replacement with grow tubes	2.5 hours	28.75	0.00	25.00	53.75	26.88
Trellis maintenance	2.0 hours	23.00	0.00	50.00	73.00	36.50
Shredding brush	1.0 x/acre	6.31	12.54	0.00	18.84	9.42
Fertilizer - foliar applied	1.0 x/acre	0.00	0.00	62.50	62.50	31.25
Herbicide strip maintenance	2.0 applications	8.17	12.47	50.00	70.64	35.32
Fungicides	7.0 applications	75.07	181.81	281.25	538.13	269.06
Vine training	15.0 hours	172.50	0.00	0.00	172.50	86.25
Sucker removal	15.0 hours	172.50	0.00	0.00	172.50	86.25
Cluster thinning	10.0 hours	115.00	0.00	0.00	115.00	57.50
Leaf pulling	3.0 hours	34.50	0.00	0.00	34.50	17.25
Hedging	4.0 hours	46.00	0.00	0.00	46.00	23.00
Mowing vineyard floor	4.0 times	25.23	50.15	0.00	75.38	37.69
Bird control & clipping net	20.0 hours	230.00	0.00	0.00	230.00	115.00
Rodent control	1.0 applications	5.36	8.22	20.00	33.58	16.79
Frost protection	0.5 hours	5.75	35.37	0.00	41.12	20.56
Irrigation	10.0 hours	115.00	12.50	0.00	127.50	63.75
Picking equipment	1.0 x/acre	0.00	0.43	0.00	0.43	0.21
Harvesting costs	2.0 tons	340.00	40.50	0.00	380.50	190.25
Pickup, truck & ATV	1.0 x/acre	0.00	151.65	0.00	151.65	75.83
Housing facilities	1.0 x/acre	0.00	0.00	43.21	43.21	21.61
Miscellaneous and overhead	1.0 x/acre	0.00	0.00	75.00	75.00	37.50
Interest: operating capital	6.0 months	0.00	0.00	66.25	66.25	33.13
Total **variable** costs		2,001.14	505.64	677.21	3,183.99	1,591.99

FIXED CASH COSTS	Unit	Total	Cost/ton
Pickup, truck & ATV insurance	acre	26.53	13.27
Water assessment	acre	35.00	17.50
Property insurance	acre	25.00	12.50
Property taxes	acre	30.00	15.00
Total **fixed cash** costs		116.53	58.27

FIXED NON-CASH COSTS	Unit	Total	Cost/ton
Machinery and equipment insurance, depreciation & interest	acre	800.89	400.45
Pickup, truck & ATV - depreciation & interest	acre	74.95	37.48
Foreman housing	acre	102.86	51.43
Housing facilities	acre	41.90	20.95
Land interest charge	acre	480.00	240.00
Prior year's establishment costs - Interest	acre	1,277.21	638.61
Total **fixed non-cash** costs		2,777.82	1,388.91
Total **fixed** costs		2,894.36	1,447.18
Total of all costs per acre		**$6,078.34**	**$3,039.17**
Net projected returns		**-$3,078.34**	**$1,539.17**

Table 11. Full production, wine grape establishment, $/acre economic costs and returns.

TOTAL GROSS INCOME	Quantity	Unit	$/Unit	Total	Price/ton
Pinot Noir grapes	3.00	Tons	1,500.00	4,500.00	1,500.00
Total **gross** income				4,500.00	1,500.00

VARIABLE CASH COSTS	Description	Labor	Machinery	Materials	Total	Cost/ton
Prune	24.0 hours	$276.00	$0.00	$0.00	$276.00	$92.00
Pull brush	16.0 hours	184.00	0.00	0.00	184.00	61.33
Tie canes	12.0 hours	138.00	0.00	4.00	142.00	47.33
Vine replacement with grow tubes	2.5 hours	28.75	0.00	25.00	53.75	17.92
Trellis maintenance	2.0 hours	23.00	0.00	50.00	73.00	24.33
Shredding brush	1.0 x/acre	6.31	12.54	0.00	18.84	6.28
Fertilizer - foliar applied	1.0 x/acre	0.00	0.00	62.50	62.50	20.83
Herbicide strip maintenance	2.0 applications	8.17	12.47	50.00	70.64	23.55
Fungicides	7.0 s	75.07	181.81	281.25	538.13	179.38
Vine training	15.0 hours	172.50	0.00	0.00	172.50	57.50
Sucker removal	15.0 hours	172.50	0.00	0.00	172.50	57.50
Cluster thinning	10.0 hours	115.00	0.00	0.00	115.00	38.33
Leaf pulling	6.0 hours	69.00	0.00	0.00	69.00	23.00
Hedging	4.0 hours	46.00	0.00	0.00	46.00	15.33
Mowing vineyard floor	4.0 times	25.23	50.15	0.00	75.38	25.13
Bird control & clipping net	20.0 hours	230.00	0.00	0.00	230.00	76.67
Rodent control	1.0 applications	5.36	8.22	20.00	33.58	11.19
Frost protection	0.5 hours	5.75	35.37	0.00	41.12	13.71
Irrigation	10.0 hours	115.00	12.50	0.00	127.50	42.50
Picking equipment	1.0 x/acre	0.00	8.18	0.00	8.18	2.73
Harvesting costs	3.0 tons	510.00	40.50	0.00	550.50	183.50
Pickup, truck & ATV	1.0 x/acre	0.00	151.65	0.00	151.65	50.55
Housing facilities	1.0 x/acre	0.00	0.00	43.21	43.21	14.40
Miscellaneous and overhead	1.0 x/acre	0.00	0.00	75.00	75.00	25.00
Interest: operating capital	6.0 mons	0.00	0.00	70.76	70.76	23.59
Total **variable** costs		2,205.64	513.38	681.72	3,400.74	1,133.58

FIXED CASH COSTS	Unit	Total	Cost/ton
Pickup, truck & ATV insurance	acre	26.53	8.84
Water assessment	acre	35.00	11.67
Property insurance	acre	25.00	8.33
Property taxes	acre	30.00	10.00
Total **fixed cash** costs		116.53	38.84

FIXED NON-CASH COSTS	Unit	Total	Cost/ton
Machinery and equipment insurance, depreciation & interest	acre	800.89	266.96
Pickup, truck & ATV - depreciation & interest	acre	74.95	24.98
Foreman housing	acre	102.86	34.29
Housing facilities	acre	41.90	13.97
Land interest charge	acre	480.00	160.00
Amortized establishment costs	acre	1,746.22	582.07
Total **fixed non-cash** costs		3,246.83	1,082.28
Total **fixed** costs		3,363.36	1,121.12
Total of all costs per acre		**$6,764.10**	**$2,254.70**
Net projected returns		**$2,264.10**	**-$754.70**