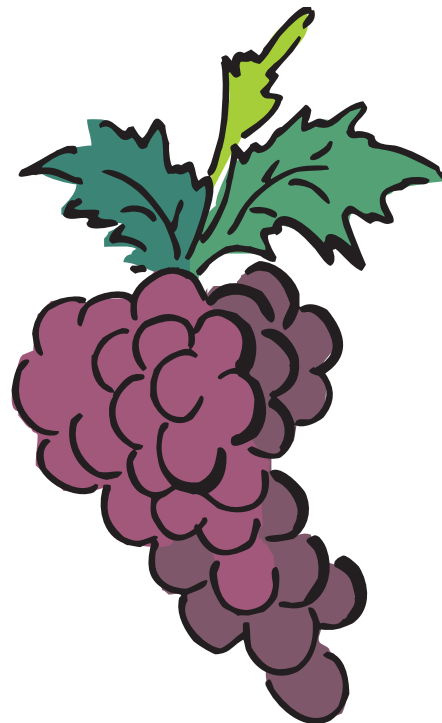


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Vineyard Economics: Establishing and Producing Pinot Noir Wine Grapes in Western Oregon

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Philip VanBuskirk, and Steve Castagnoli*



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Introduction

In 2007, US wine grape production was 3.8 million tons valued at \$2.1 billion. Oregon wine grape production that year was valued at \$78 million, ranking 3rd behind California and Washington. Oregon had 792 vineyards with 17,400 acres planted. In 2007, Oregon wine grapes averaged \$1,880 per ton, more than three times the national average. Pinot noir, the most popular wine grape variety, averaged \$2,290 per ton.

Oregon has six defined grape growing regions: the, Columbia Gorge, Walla Walla, and the Willamette, Umpqua, Rogue, and Applegate valleys. The regions are differentiated by unique climates and soil types. The Willamette, Umpqua, Rogue, and Applegate valleys make up the western Oregon wine grape production region. The Willamette Valley is home to nearly 70 percent of the state's vineyard acreage, growing and producing Pinot noir grapes and wine. Pinot noir is Oregon's most famed wine grape variety, making up 57% of the planted acreage (NASS, 2007). The demand for Oregon Pinot noir has increased significantly, resulting in the fruit being in short supply. Expansion of the Oregon wine industry is taking place yearly; new vineyards are being planted to meet this

need. With this growth, it is necessary for those planning new vineyards as well as existing owners to be aware of the economics of establishment, and management of a vineyard enterprise.

Vineyard establishment requires considerable effort and financial resources. The economics of vineyard establishment and wine grape production may limit participation in vineyard expansion. This publication is intended primarily for those considering the economic and financial consequences of planting a vineyard in western Oregon. It may also be useful to those with existing vineyards.

This cost of establishment and production study provides growers with a tool for economic management and decision making. This study is a product of cooperative input from selected growers, field representatives, researchers, and farm suppliers. The study provides typical costs and returns to a well managed 10-acre vineyard. Growers are encouraged to substitute their own costs to get an accurate accounting of their costs.

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Assumptions

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

1. The typical acreage for a vineyard in western Oregon is 10 acres of irrigated land.
2. A planting density of 1,245 grafted vines per acre (5' x 7') vine and row 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 \$2,300 per ton.
5. Commercial yields begin in year 3 and full production is reached in 5 years after planting with yields of 1.0, 2.5, and 3.0 tons per acre during years 3-5, respectively.
6. General labor is hired at a rate of \$13.50 per hour and machine labor at \$17.00 per hour, which includes worker's compensation, unemployment insurance, and other labor overhead expenses. Harvest labor is custom hired at a cost of \$170 per ton. All labor is treated as a cash variable expense.
7. The machinery and equipment used in the budget reflects the typical machinery complement of a small western Oregon vineyard. 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 45-hp tractor is used for flailing, shredding brush, pulling an air-blast sprayer, and hauling fruit during harvest. The front-end loader is used to assist in harvest, and as a general utility tractor. Table 3 lists the estimated cost of each operation with a 7' vine row spacing.
- Gasoline and diesel costs per gallon are \$3.50 and \$4.00, respectively.
8. 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.
9. Machinery and land are owned by the operator and assessed 8.5 and 8 percent rates of interest, respectively, as a return on owner's investment. Land is valued at \$10,000 per acre.
10. Previous year's net establishment costs are funded by the operator at a charge of 10 percent interest as a return on owner's investment.
11. Herbicides used for strip maintenance are applied to 30 percent of each acre.
12. A drip irrigation system is used at an estimated cost of \$3,000 per acre, custom installed. Repairs and maintenance for the system costs one percent of the purchase price per year.
13. The trellis system is custom installed at a cost of \$3,750 per acre. Repairs and maintenance for the system costs one percent of the purchase price per year.
14. Additional assumptions are listed for variable, fixed cash, and fixed non-cash costs in Table 4.
15. Price inflation for the time period of this study was ignored.
16. Income tax consequences are also ignored for this study.

Table 1. Machinery cost assumptions.

Machine	Size or Description	Market Value	Hours or	Expected	Salvage Value
			Miles of Annual Use	Life (Years)	
Tractor	4 wheel dr 45hp, new	\$35,000	294	20	\$4,491
Air-blast sprayer	100 gallon unit, PTO, new	8,000	71	20	417
Mower	4' unit	6,000	23	20	313
Weed sprayer	100 gallon unit	2,000	21	15	192
Hedger	single-sided on tractor	9,000	29	20	469
Pickup	1/2 ton 4x4, gas, new	22,000	12,000	10	8,319
ATV	4 wheeler, new	5,500	3,000	5	2,465
Front-end loader		6,000	N/A	20	313
Bin trailer		3,000	150	20	156
Picking buckets for wine grapes		500	N/A	5	0
Irrigation system	Drip system, per acre	3,000	N/A	10	0
Trellis system	per acre	3,750	N/A	25	0
Shop and Machine Shed	1 unit	12,000	N/A	30	0

Table 2. Machinery cost calculations.

Machine	Size or Description	--- Variable costs --- ----- Fixed costs -----				Total
		Fuel & Lube	Repairs & Maint.	Depr. & Interest	Insurance	
----- Costs per hour -----						
Tractor	4 wheel dr 45hp, new	\$9.20	\$0.62	\$10.90	\$0.60	\$21.32
Air-blast sprayer	100 gallon unit, PTO, new	0.00	3.64	10.42	0.36	14.42
Mower	4' unit	0.00	1.22	23.92	0.82	25.96
Weed sprayer	100 gallon unit	0.00	0.58	10.31	0.32	11.21
Hedger		0.00	3.15	27.34	0.96	31.45
----- Costs per mile -----						
Pickup	1/2 ton 4x4, gas, new	\$0.34	\$0.05	\$0.22	\$0.07	\$0.68
ATV	4 wheeler, new	0.09	0.05	0.32	0.08	0.53
----- Costs per acre -----						
Front-end loader		\$0.00	\$36.00	\$24.75	\$0.00	\$60.75
Bin trailer		0.00	30.00	20.63	0.00	50.63
Picking buckets for wine grapes		0.00	3.00	8.25	0.00	11.25
Irrigation system	Drip system, per acre	0.00	30.00	312.75	0.00	342.75
Trellis system	per acre	0.00	37.50	156.38	0.00	193.88
Shop and Machine Shed	1 unit	0.00	31.80	136.00	0.00	167.80

Table 3. Estimated cost of each operation with power-unit for a 7' between row spacing.

Operation	-- Machine costs --					
	Miles per hour	Acres per hour	Labor cost per acre	Variable cost per acre	Fixed cost per acre	Total cost per acre
Air-blast sprayer	3.00	1.27	\$13.36	\$10.57	\$17.50	\$41.43
Mower	3.00	2.16	7.86	5.10	16.75	29.70
Weed sprayer	3.50	0.97	17.61	10.77	22.93	51.31
Hedger	3.00	1.02	16.69	12.73	39.87	69.30

Table 4. Input assumptions to establishing a Pinot noir vineyard in western Oregon, (per acre basis).

	Year 1	Year 2	Year 3	Year 4	Full
Prices per ton	\$2,300.00	\$2,300.00	\$2,300.00	\$2,300.00	\$2,300.00
Tons per acre	0.00	0.00	1.00	2.50	3.00
Cost of general vineyard labor, per hour	\$13.50	\$13.50	\$13.50	\$13.50	\$13.50
Cost of tractor driver, per hour	\$17.00	\$17.00	\$17.00	\$17.00	\$17.00
Cost of harvest labor, per ton	\$0.00	\$170.00	\$170.00	\$170.00	\$170.00
Hours of harvest equipment utilization	0.00	0.00	5.00	5.00	5.00
Hours of labor pruning & brush removal	0.00	15.00	24.00	30.00	30.00
Hours of labor to tie canes	0.00	0.00	15.00	15.00	15.00
Hours of irrigating labor	4.00	4.00	4.00	4.00	4.00
Hours to remove &/or plant vine labor	35.00	2.50	2.50	2.50	2.50
Hours to maintain trellis labor	0.00	2.00	2.00	2.00	2.00
Hours for frost protection labor	0.00	0.00	0.50	0.50	0.50
Hours for shoot positioning/Training	0.00	0.00	30.00	35.00	35.00
Hours for Disbudding	0.00	0.00	25.00	30.00	30.00
Hours for sucker removal	0.00	0.00	20.00	20.00	25.00
Hours for cluster thinning	0.00	0.00	0.00	40.00	40.00
Hours for leaf pulling	0.00	0.00	0.00	20.00	20.00
Hours for bird control	0.00	0.00	5.00	5.00	5.00
Cost of fertilizer - foliar applied	\$0.00	\$10.00	\$10.00	\$10.00	\$10.00
Cost of herbicide strip maintenance	\$25.00	\$25.00	\$25.00	\$25.00	\$25.00
Cost of fungicides	\$0.00	\$0.00	\$200.00	\$200.00	\$200.00
Cost of rodent materials	\$80.00	\$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	\$0.00	\$0.00	\$0.00
Times for herbicide strip spray	2.00	2.00	2.00	2.00	2.00
Times for fungicides	0.00	7.00	9.00	9.00	9.00
Times for mowing vineyard floor	5.00	5.00	5.00	5.00	5.00
Times for hedging	0.00	3.00	3.00	3.00	3.00
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	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000
Miscellaneous & overhead	\$200.00	\$200.00	\$200.00	\$200.00	\$200.00
Vine cost	\$3.75	\$3.75	\$3.75	\$3.75	\$3.75
Vine grow tubes	\$0.50	\$0.00	\$0.00	\$0.00	\$0.00
Fuel use/gal for tractor	2.00	2.00	2.00	2.00	2.00
Gasoline price	\$3.50	\$3.50	\$3.50	\$3.50	\$3.50
Diesel fuel price	\$4.00	\$4.00	\$4.00	\$4.00	\$4.00
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	1,245	20	20	20	20

Results of establishing Pinot noir wine grapes in western Oregon

Cash flow analysis

Table 5 contains a cash flow analysis for establishing a wine grape vineyard planting. A cash flow analysis shows the cash costs required to establish a vineyard. Cash costs include labor, vines, trellis, irrigation system, fertilizer, chemicals, machinery repairs, fuel, lube, and oil, operating (short-term) interest, machinery insurance, and property taxes. The income, variable costs and cash fixed costs are shown for each of the four establishment years and at full production. Production begins in year 3 with 1 ton of wine grapes per acre and increases to 3 tons at full production. Total variable costs are \$11,235 in the first year with an additional \$166 of cash fixed costs for a total cash cost of \$11,401 per acre.

A positive cash flow begins in year 4 with gross income exceeding total cash costs by \$383 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' costs. There is an accumulated \$17,705 per acre of prior costs remaining following the fifth year.

Figure 1 shows the major cost components in relation to total cash costs. Hired labor represents 35 percent of the total cash costs to establish this vineyard. The vines are next with 17 percent. The trellis system and machine costs, which include fuel, oil, and repairs, are each 12 percent of the cash costs. The irrigation system, and fertilizer & chemicals are 10 and 3 percent of the total cash costs, respectively. The remaining cost items account for 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 along with the 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 year's establishment costs.

Gross income exceeds variable costs beginning in Year 4 with a \$383 per acre return to the grower. Gross income, however, never exceeds total economic costs. This vineyard has an annual deficit of \$3,842 per acre at full production. In addition, this vineyard falls short of repaying all previous establishment costs by \$28,959 per acre at the end of the establishment period. This cost is amortized over a 25-year period as an annual payment of \$2,767 per acre as shown in Table 11.

Figure 2 shows the cost components in relation to total economic costs. When all economic costs are included, interest and labor costs are the largest cost items each at 26 percent of the total costs for the first five years of establishment. Machine costs (fuel, oil, repairs, depreciation, and interest charges) are the next highest cost item at 18 percent of the total economic costs. Vines account for 13 percent of total economic costs. The remaining cost items account for 17 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 do not cover all cash costs of establishment in 20 years. Nor does this vineyard generate sufficient gross income to cover all economic costs for the 25-year investment period (Figure 4). In fact, even if the owner's rate of return on invested capital is zero, this vineyard is \$19,684 short of breaking even over the 25-year investment period. A sensitivity analysis of changes in price or yield necessary to make this vineyard a prudent business investment indicates profitability could be achieved by doing any one of the following:

- a) increasing the wine grape prices by 62 percent from \$2,300 to \$3,715 per ton,
- b) increasing anticipated yield by 69 percent (to 1.69, 4.21, 5.06 tons per acre for years 3, 4, and 5, respectively) . However, it must be realized that by increasing yields, quality may decrease leading to lower prices per ton, depending on the crop load, climate and vine capacity to ripen fruit.

The results of these adjustments are shown in Figure 4. Increasing grape price or yield reduces the amount of money required for vineyard establishment in year 5 by approximately \$9,900 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 Pinot noir vineyard in western Oregon.

Income:	Year 1	Year 2	Year 3	Year 4	Full Prod
Yield (tons/acre)	0.00	0.00	1.00	2.50	3.00
Price (dollars/ton)	<u>2,300.00</u>	<u>2,300.00</u>	<u>2,300.00</u>	<u>2,300.00</u>	<u>2,300.00</u>
Gross Income(dollars/acre)	0.00	0.00	2,300.00	5,750.00	6,900.00
Variable Costs (per acre):					
Field Preparation	486.54	0.00	0.00	0.00	0.00
Vines and tubes	5,289.43	75.00	75.00	75.00	75.00
Tie for vines	4.00	4.00	4.00	4.00	4.00
Fertilizer	0.00	10.00	10.00	10.00	10.00
Chemicals	105.00	245.00	245.00	245.00	245.00
Harvest labor	0.00	0.00	170.00	425.00	510.00
General labor	1,303.00	556.68	2,157.39	3,183.39	3,250.89
Machine costs	551.37	668.68	861.20	951.20	981.20
Irrigation	3,030.00	30.00	30.00	30.00	30.00
Trellis	0.00	3,787.50	37.50	37.50	37.50
Grape Board Assessment	0.00	0.00	25.00	62.50	75.00
Shop and Machine Shed	31.80	31.80	31.80	31.80	31.80
Miscellaneous & overhead	200.00	200.00	200.00	200.00	200.00
Interest: operating capital	<u>233.77</u>	<u>119.18</u>	<u>81.75</u>	<u>111.68</u>	<u>115.82</u>
Total variable costs	11,234.92	5,727.84	3,928.64	5,367.07	5,566.21
Gross Income - Variable Cost	-11,234.92	-5,727.84	-1,628.64	382.93	1,333.79
Fixed cash costs (per acre):					
Insurance	136.02	136.02	136.02	136.02	136.02
Property taxes	<u>30.00</u>	<u>30.00</u>	<u>30.00</u>	<u>30.00</u>	<u>30.00</u>
Total fixed cash cost	166.02	166.02	166.02	166.02	166.02
Total cost	11,400.94	5,893.87	4,094.66	5,533.09	5,732.23
Net projected returns	-11,400.94	-5,893.87	-1,794.66	216.91	1,167.77
Cumulative returns	-11,400.94	-17,294.81	-19,089.47	-18,872.56	-17,704.80

Table 6. Economic costs and returns of establishing a Pinot noir vineyard in western Oregon

Income:	Year 1	Year 2	Year 3	Year 4	Full Prod
Yield (tons/acre)	0.00	0.00	1.00	2.50	3.00
Price (dollars/ton)	<u>2,300.00</u>	<u>2,300.00</u>	<u>2,300.00</u>	<u>2,300.00</u>	<u>2,300.00</u>
Gross Income(dollars/acre)	0.00	0.00	2,300.00	5,750.00	6,900.00
Variable Costs (per acre):					
Field Preparation	486.54	0.00	0.00	0.00	0.00
Vines and tubes	5,289.43	75.00	75.00	75.00	75.00
Tie for vines	4.00	4.00	4.00	4.00	4.00
Fertilizer	0.00	10.00	10.00	10.00	10.00
Chemicals	105.00	245.00	245.00	245.00	245.00
Harvest labor	0.00	0.00	170.00	425.00	510.00
General labor	1,303.00	556.68	2,157.39	3,183.39	3,250.89
Machine costs	551.37	668.68	861.20	951.20	981.20
Irrigation	30.00	30.00	30.00	30.00	30.00
Trellis	0.00	37.50	37.50	37.50	37.50
Grape Board Assessment	0.00	0.00	25.00	62.50	75.00
Shop and Machine Shed	31.80	31.80	31.80	31.80	31.80
Miscellaneous & overhead	200.00	200.00	200.00	200.00	200.00
Interest: operating capital	<u>170.02</u>	<u>39.50</u>	<u>81.75</u>	<u>111.68</u>	<u>115.82</u>
Total variable costs	8,171.17	1,898.16	3,928.64	5,367.07	5,566.21
Gross Income - Variable Cost	-8,171.17	-1,898.16	-1,628.64	382.93	1,333.79
Fixed costs (per acre):					
Insurance	136.02	136.02	136.02	136.02	136.02
Property taxes	30.00	30.00	30.00	30.00	30.00
Machine costs	543.43	802.34	837.35	837.35	837.35
Irrigation	312.75	312.75	312.75	312.75	312.75
Trellis	0.00	156.38	156.38	156.38	156.38
Shop and machine shed	136.00	136.00	136.00	136.00	136.00
Land interest cost	800.00	800.00	800.00	800.00	800.00
Interest on establishment costs	<u>0.00</u>	<u>1,012.94</u>	<u>1,541.40</u>	<u>2,099.25</u>	<u>2,767.12</u>
Total fixed cost	1,958.21	3,386.42	3,949.89	4,507.74	5,175.62
Total cost	10,129.38	5,284.58	7,878.53	9,874.81	10,741.83
Net projected returns	-10,129.38	-5,284.58	-5,578.53	-4,124.81	-3,841.83
Cumulative returns	-10,129.38	-15,413.96	-20,992.49	-25,117.30	-28,959.12

Figure 1. Cash costs per acre to establish a Pinot noir vineyard in western Oregon, the first five years of establishment

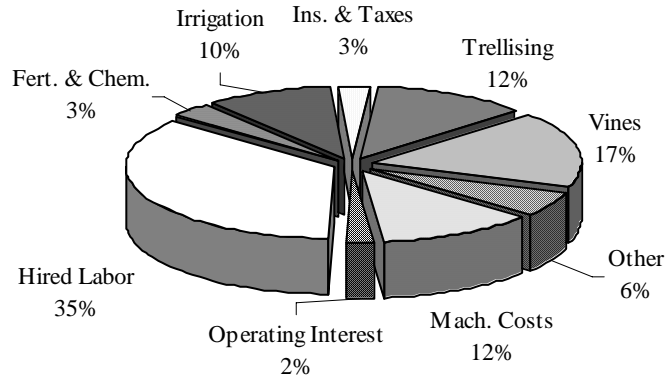


Figure 2. Economic costs per acre to establish a Pinot noir vineyard in western Oregon, the first five years of establishment

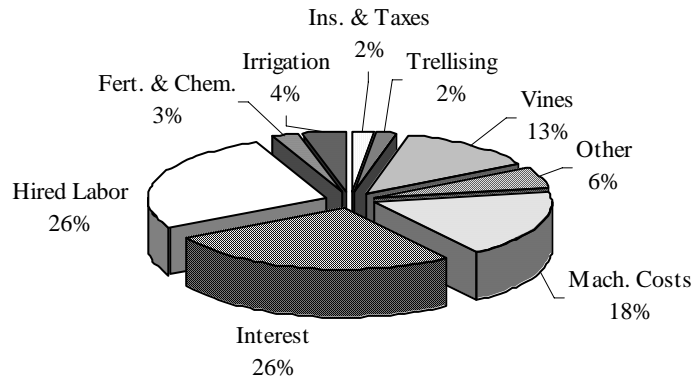


Figure 3. Comparing cash and economic net returns per acre to establish a Pinot noir vineyard in western Oregon over 20 years.

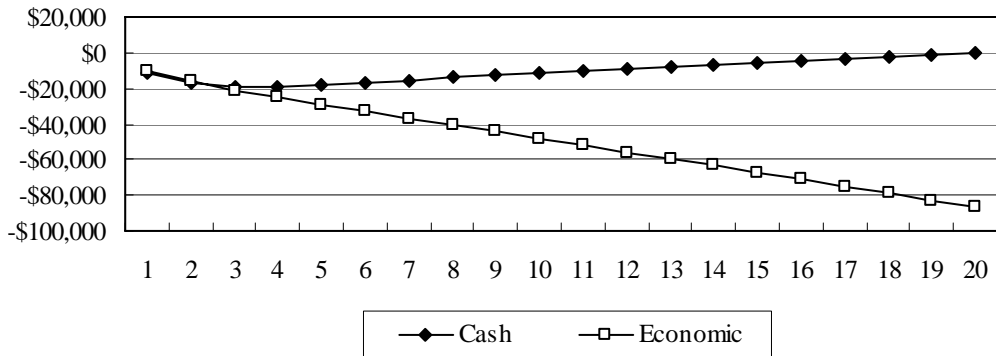
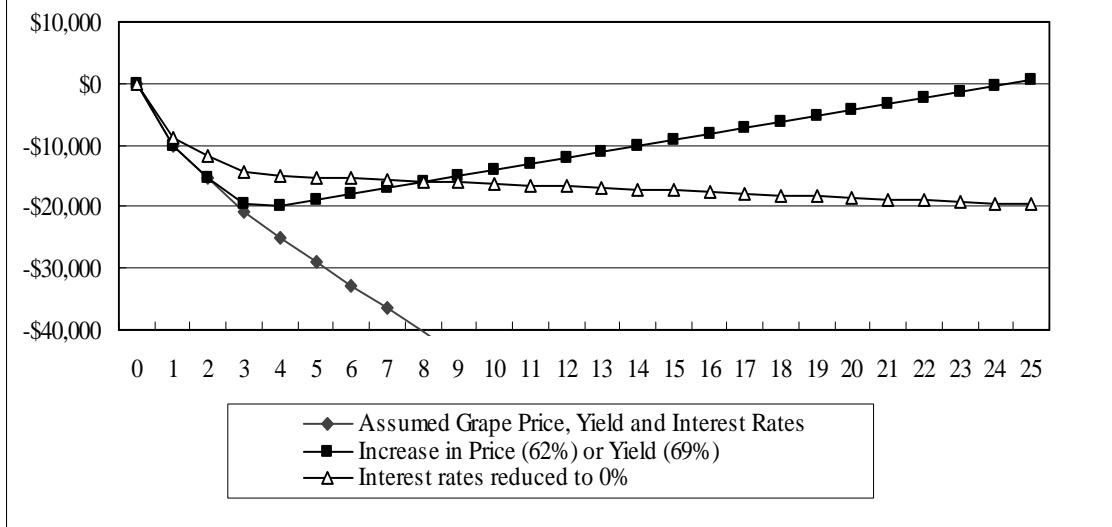


Figure 4. Projected net returns per acre with changes to grape prices, yields and interest rates assumed in this study, over 25 years



Discussion

The results of the sensitivity analysis indicate that profitability can be achieved by increasing fruit prices by 62 percent or increasing yield by 69 percent. Of course, a combination of increased prices, yield, and/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 western Oregon, 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 wine grapes. Many potential vineyard sites, however, may be unsuitable for the successful production 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 quality. On more productive sites, growers must carefully manage this balance to avoid overly vegetative vines that may produce lower quality fruit. Canopy management, crop load management and other practices would be critical to achieving vine balance.

Choosing vineyard sites on southern or southwestern slopes contributes to good air drainage for frost avoidance, high interception of solar radiation for photosynthetic activity critical for berry ripening, and enhanced accumulation of heat units. 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 western Oregon.

The choice of grape cultivar is a critical factor in successful wine grape production. Grape cultivars have different requirements

for accumulated heat units to ripen during the growing season. The cultivar 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. Many tools are available to assist in budgeting such as templates from university farm management specialists and computer software programs such as “*A Grower’s Technology Economic Assessment Model (TEAM)*”. This program is free for download at the Oregon

Agriculture Information Network website (www.oregonstate.edu/oain) under the *Agtools* for risk management menu link. Talk with your local Extension Agent to find the latest in vineyard replacement tools and budget information.

Growers must not forget the importance that a particular enterprise such as a vineyard can have in the overall financial stability of the farm business. Financial managers can recommend planting a new vineyard or planting one grape cultivar over another to improve profitability, but the financial requirements to complete the planting 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 vineyard investments feasible.

APPENDIX A

**Enterprise Budgets for Pinot Noir Wine Grapes
in Western Oregon**

Table 7. Year 1, Pinot noir vineyard establishment, dollars per acre economic costs and returns.

VARIABLE CASH COSTS	Description	Labor	Machinery	Materials	Total
Soil sample	1.00 x/acre	\$0.00	\$0.00	\$50.00	\$50.00
Tile, Custom		0.00	0.00	173.00	173.00
Lime, Custom	1.00 x/acre	0.00	0.00	75.00	75.00
Fertilizer, Custom	1.00 x/acre	0.00	0.00	75.00	75.00
Disc & Cultivate, Custom	2.00 x/acre	0.00	0.00	50.00	50.00
Mark rows	10.00 hours	135.00	0.00	1.20	136.20
Rototill strips	1.00 x/acre	0.00	0.00	25.00	25.00
Mark plants	20.00 hours	270.00	0.00	37.34	307.34
Plant vines with grow tubes	35.00 hours	472.50	0.00	5,289.43	5,761.93
Tie Vines	1.00 hour	13.50	0.00	4.00	17.50
Hoeing around vines	20.00 hours	270.00	0.00	0.00	270.00
Rodent Control	1.0 appl.	13.50	0.00	80.00	93.50
Herbicide strip maintenance	2.00 x/acre	35.22	21.54	25.00	81.76
Mowing vineyard floor	5.00 times	39.28	25.50	0.00	64.78
Irrigation, Repair & Maintenance	4.00 hours	54.00	0.00	30.00	84.00
Pickup	1.00 x/acre	0.00	462.50	0.00	462.50
ATV	1.00 x/acre	0.00	41.83	0.00	41.83
Shop and Machine Shed	1.00 x/acre	0.00	0.00	31.80	31.80
Miscellaneous and overhead	1.00 x/acre	0.00	0.00	200.00	200.00
Interest: operating capital	6.00 month	<u>0.00</u>	<u>0.00</u>	<u>170.02</u>	<u>170.02</u>
Total variable costs		1,303.00	551.37	6,316.79	8,171.17
FIXED CASH COSTS				Unit	Total
Pickup & ATV insurance				acre	111.02
Property insurance				acre	25.00
Property taxes				acre	<u>30.00</u>
Total fixed cash costs					166.02
FIXED NON-CASH COSTS				Unit	Total
Machinery & equipment - insurance, depreciation, & interest				acre	183.22
Pickup & ATV - depreciation & interest				acre	360.21
Irrigation - depreciation & interest				acre	312.75
Shop & machine shed				acre	136.00
Land interest charge				acre	<u>800.00</u>
Total fixed non-cash costs					1,792.18
Total fixed costs					1,958.21
Total of all costs per acre					\$10,129.38

Table 8. Year 2, Pinot noir vineyard establishment, dollars per acre economic costs and returns.

TOTAL GROSS INCOME		<u>Quantity</u>	<u>Unit</u>	<u>\$/Unit</u>	<u>Total</u>	
Pinot noir grapes		0.00	Tons	2,300	<u>0.00</u>	
Total gross income					0.00	
VARIABLE CASH COSTS		<u>Description</u>	<u>Labor</u>	<u>Machinery</u>	<u>Materials</u>	<u>Total</u>
Vine replacement with grow tubes		2.50 hours	33.75	0.00	75.00	108.75
Tie vines		0.00 hours	0.00	0.00	4.00	4.00
Prune & Brush removal		15.00 hours	\$202.50	\$0.00	\$0.00	\$202.50
Hedging		3.00 applications	50.08	38.20	0.00	88.28
Shredding brush		1.00 x/acre	7.86	5.10	0.00	12.96
Fungicides		7.00 applications	93.49	74.00	200.00	367.49
Fertilizer - foliar applied		1.00 x/acre	0.00	0.00	10.00	10.00
Rodent Control		1.0 appl.	13.50	0.00	20.00	33.50
Herbicide strip maintenance		2.00 applications	35.22	21.54	25.00	81.76
Mowing vineyard floor		5.00 times	39.28	25.50	0.00	64.78
Irrigation, Repairs & maintenance		4.00 hours	54.00	0.00	30.00	84.00
Trellis, Repairs & Maintenance		2.00 hours	27.00	0.00	37.50	64.50
Pickup		1.00 x/acre	0.00	462.50	0.00	462.50
ATV		1.00 x/acre	0.00	41.83	0.00	41.83
Shop and Machine Shed		1.00 x/acre	0.00	0.00	31.80	31.80
Miscellaneous and overhead		1.00 x/acre	0.00	0.00	200.00	200.00
Interest: operating capital		6.00 months	<u>0.00</u>	<u>0.00</u>	<u>39.50</u>	<u>39.50</u>
Total variable costs			556.68	668.68	672.80	1,898.16
FIXED CASH COSTS				<u>Unit</u>	<u>Total</u>	
Pickup & ATV insurance				acre	111.02	
Property insurance				acre	25.00	
Property taxes				acre	<u>30.00</u>	
Total fixed cash costs					166.02	
FIXED NON-CASH COSTS				<u>Unit</u>	<u>Total</u>	
Machinery & equipment - insurance, depreciation, & interest				acre	442.12	
Pickup & ATV - depreciation & interest				acre	360.21	
Irrigation & trellis - depreciation & interest				acre	469.13	
Shop & machine shed				acre	136.00	
Land interest charge				acre	800.00	
Prior year's establishment costs				acre	<u>1,012.94</u>	
Total fixed non-cash costs					3,220.40	
Total fixed costs					3,386.42	
Total of all costs per acre					\$5,284.58	
Net projected returns					-\$5,284.58	

Table 9. Year 3, Pinot noir vineyard establishment, dollars per acre economic costs and returns.

TOTAL GROSS INCOME						
	Quantity	Unit	\$/Unit	Total	Price/ton	
Pinot noir grapes	1.00	Tons	2,300	<u>2,300</u>	<u>2,300</u>	
Total gross income				2,300	2,300	
VARIABLE CASH COSTS						
	Description	Labor	Machinery	Materials	Total	Cost/ton
Vine replacement with grow tubes	2.50 hours	33.75	0.00	75.00	108.75	108.75
Tie vines	15.00 hours	202.50	0.00	4.00	206.50	206.50
Prune & Brush removal	24.00 hours	\$324.00	\$0.00	\$0.00	\$324.00	\$324.00
Hedging	3.00 applications	50.08	38.20	0.00	88.28	88.28
Shredding brush	1.00 x/acre	7.86	5.10	0.00	12.96	12.96
Fungicides	9.00 applications	120.20	95.15	200.00	415.35	415.35
Fertilizer, foliar applied	1.00 x/acre	0.00	0.00	10.00	10.00	10.00
Vine training	30.00 hours	405.00	0.00	0.00	405.00	405.00
Sucker removal	20.00 hours	270.00	0.00	0.00	270.00	270.00
Disbudding	25.00 hours	337.50	0.00	0.00	337.50	337.50
Bird control	5.00 hours	67.50	0.00	0.00	67.50	67.50
Rodent Control	1.00 hours	13.50	0.00	20.00	33.50	33.50
Herbicide strip maintenance	2.00 applications	35.22	21.54	25.00	81.76	81.76
Mowing vineyard floor	5.00 times	39.28	25.50	0.00	64.78	64.78
Irrigation, Repairs & maintenance	4.00 hours	54.00	0.00	30.00	84.00	84.00
Trellis, Repair & maintenance	2.00 hours	27.00	0.00	37.50	64.50	64.50
Bin Trailer	5.00 hours	85.00	50.63	0.00	135.63	135.63
Front Loader	5.00 hours	85.00	60.75	0.00	145.75	145.75
Harvest Labor	1.00 tons	170.00	0.00	0.00	170.00	170.00
Truck Harvest Freight, Leased	1.00 tons	0.00	60.00	0.00	60.00	60.00
Grape Board Assessment	1.00 tons	0.00	0.00	25.00	25.00	25.00
Pickup	1.00 x/acre	0.00	462.50	0.00	462.50	462.50
ATV	1.00 x/acre	0.00	41.83	0.00	41.83	41.83
Shop and Machine Shed	1.00 x/acre	0.00	0.00	31.80	31.80	31.80
Miscellaneous and overhead	1.00 x/acre	0.00	0.00	200.00	200.00	200.00
Interest: operating capital	6.00 months	<u>0.00</u>	<u>0.00</u>	<u>81.75</u>	<u>81.75</u>	<u>81.75</u>
Total variable costs		2,327.39	861.20	740.05	3,928.64	3,928.64
FIXED CASH COSTS						
				Unit	Total	Cost/ton
Pickup & ATV insurance				acre	111.02	111.02
Property insurance				acre	25.00	25.00
Property taxes				acre	<u>30.00</u>	<u>30.00</u>
Total fixed cash costs					166.02	166.02
FIXED NON-CASH COSTS						
				Unit	Total	Cost/ton
Machinery & equipment - insurance, depreciation, & interest				acre	477.13	477.13
Pickup & ATV - depreciation & interest				acre	360.21	360.21
Irrigation & trellis - depreciation & interest				acre	469.13	469.13
Shop & machine shed				acre	136.00	136.00
Land interest charge				acre	800.00	800.00
Prior year's establishment costs				acre	<u>1,541.40</u>	<u>1,541.40</u>
Total fixed non-cash costs					3,783.87	3,783.87
Total fixed costs					3,949.89	3,949.89
Total of all costs per acre					\$7,878.53	\$7,878.53
Net projected returns					-\$5,578.53	-\$5,578.53

Table 10. Year 4, Pinot noir vineyard establishment, dollars per acre economic costs and returns.

Table 10. Year 4, Pinot noir vineyard establishment, dollars per acre economic costs and returns.						
TOTAL GROSS INCOME						
	Quantity	Unit	\$/Unit	Total	Price/ton	
Pinot noir grapes	2.50	Tons	2,300	5,750	2,300	
Total gross income				5,750	2,300	
VARIABLE CASH COSTS						
	Description	Labor	Machinery	Materials	Total	Cost/ton
Vine replacement with tubes	2.50 hours	33.75	0.00	75.00	108.75	43.50
Tie vines	15.00 hours	202.50	0.00	4.00	206.50	82.60
Prune & Brush removal	30.00 hours	\$405.00	\$0.00	\$0.00	\$405.00	\$162.00
Hedging	3.00 applications	50.08	38.20	0.00	88.28	35.31
Shredding brush	1.00 x/acre	7.86	5.10	0.00	12.96	5.18
Fungicides	9.00 applications	120.20	95.15	200.00	415.35	166.14
Fertilizer - foliar applied	1.00 x/acre	0.00	0.00	10.00	10.00	4.00
Vine training	35.00 hours	472.50	0.00	0.00	472.50	189.00
Sucker removal	20.00 hours	270.00	0.00	0.00	270.00	108.00
Disbudding	30.00 hours	405.00	0.00	0.00	405.00	162.00
Cluster thinning	40.00 hours	540.00	0.00	0.00	540.00	216.00
Leaf pulling	20.00 hours	270.00	0.00	0.00	270.00	108.00
Bird control	5.00 hours	67.50	0.00	0.00	67.50	27.00
Rodent Control	1.00 appl.	13.50	0.00	20.00	33.50	13.40
Herbicide strip maint.	2.00 applications	35.22	21.54	25.00	81.76	32.70
Mowing vineyard floor	5.00 times	39.28	25.50	0.00	64.78	25.91
Irrigation, Repairs & maintenance	4.00 hours	54.00	0.00	30.00	84.00	33.60
Trellis, Repairs & Maint.	2.00 hours	27.00	0.00	37.50	64.50	25.80
Bin Trailer	5.00 hours	85.00	50.63	0.00	135.63	54.25
Front Loader	5.00 hours	85.00	60.75	0.00	145.75	58.30
Harvest Labor	2.50 tons	425.00	0.00	0.00	425.00	170.00
Truck Harvest Freight, Leased	2.50 tons	0.00	150.00	0.00	150.00	60.00
Grape Board Assessment	2.50 tons	0.00	0.00	62.50	62.50	25.00
Pickup	1.00 x/acre	0.00	462.50	0.00	462.50	185.00
ATV	1.00 x/acre	0.00	41.83	0.00	41.83	16.73
Shop and Machine Shed	1.00 x/acre	0.00	0.00	31.80	31.80	12.72
Miscellaneous and overhead	1.00 x/acre	0.00	0.00	200.00	200.00	80.00
Interest: operating capital	6.00 mons	0.00	0.00	111.68	111.68	44.67
Total variable costs		3,608.39	951.20	807.48	5,367.07	2,146.83
FIXED CASH COSTS						
			Unit	Total	Cost/ton	
Pickup & ATV insurance			acre	111.02	44.41	
Property insurance			acre	25.00	10.00	
Property taxes			acre	30.00	12.00	
Total fixed cash costs				166.02	66.41	
FIXED NON-CASH COSTS						
			Unit	Total	Cost/ton	
Machinery & equipment - insurance, depreciation, & interest			acre	477.13	190.85	
Pickup & ATV - depreciation & interest			acre	360.21	144.09	
Irrigation & trellis - depreciation & interest			acre	469.13	187.65	
Shop & machine shed			acre	136.00	54.40	
Land interest charge			acre	800.00	320.00	
Prior year's establishment costs			acre	2,099.25	839.70	
Total fixed non-cash costs				4,341.72	1,736.69	
Total fixed costs				4,507.74	1,803.10	
Total of all costs per acre				\$9,874.81	\$3,949.92	
Net projected returns				-\$4,124.81	-\$1,649.92	

Table 11. Full production, Pinot noir vineyard establishment, dollars per acre economic costs and returns.

TOTAL GROSS INCOME						
	<u>Quantity</u>	<u>Unit</u>	<u>\$/Unit</u>	<u>Total</u>	<u>Price/ton</u>	
Pinot noir grapes	3.00	Tons	2,300	<u>6,900</u>	<u>2,300</u>	
Total gross income				6,900	2,300	
VARIABLE CASH COSTS						
	<u>Description</u>	<u>Labor</u>	<u>Machinery</u>	<u>Materials</u>	<u>Total</u>	<u>Cost/ton</u>
Vine replacement with grow tubes	2.50 hours	33.75	0.00	75.00	108.75	36.25
Tie vines	15.00 hours	202.50	0.00	4.00	206.50	68.83
Prune & Brush removal	30.00 hours	\$405.00	\$0.00	\$0.00	\$405.00	\$135.00
Hedging	3.00 applications	50.08	38.20	0.00	88.28	29.43
Shredding brush	1.00 x/acre	7.86	5.10	0.00	12.96	4.32
Fungicides	9.00 applications	120.20	95.15	200.00	415.35	138.45
Fertilizer - foliar applied	1.00 x/acre	0.00	0.00	10.00	10.00	3.33
Vine training	35.00 hours	472.50	0.00	0.00	472.50	157.50
Sucker removal	25.00 hours	337.50	0.00	0.00	337.50	112.50
Disbudding	30.00 hours	405.00	0.00	0.00	405.00	135.00
Cluster thinning	40.00 hours	540.00	0.00	0.00	540.00	180.00
Leaf pulling	20.00 hours	270.00	0.00	0.00	270.00	90.00
Bird control	5.00 hours	67.50	0.00	0.00	67.50	22.50
Rodent control	1.0 appl.	13.50	0.00	20.00	33.50	11.17
Herbicide strip maintenance	2.00 applications	35.22	21.54	25.00	81.76	27.25
Mowing vineyard floor	5.00 times	39.28	25.50	0.00	64.78	21.59
Irrigation, Repairs & maintenance	4.00 hours	54.00	0.00	30.00	84.00	28.00
Trellis, Repairs & maintenance	2.00 hours	27.00	0.00	37.50	64.50	21.50
Bin Trailer	5.00 hours	85.00	50.63	0.00	135.63	45.21
Front Loader	5.00 hours	85.00	60.75	0.00	145.75	48.58
Harvest Labor	3.00 tons	510.00	0.00	0.00	510.00	170.00
Truck Harvest Freight, Leased	3.00 tons	0.00	180.00	0.00	180.00	60.00
Grape Board Assessment	3.00 tons	0.00	0.00	75.00	75.00	25.00
Pickup	1.00 x/acre	0.00	462.50	0.00	462.50	154.17
ATV	1.00 x/acre	0.00	41.83	0.00	41.83	13.94
Shop and Machine Shed	1.00 x/acre	0.00	0.00	31.80	31.80	10.60
Miscellaneous and overhead	1.00 x/acre	0.00	0.00	200.00	200.00	66.67
Interest: operating capital	6.00 mons	<u>0.00</u>	<u>0.00</u>	<u>115.82</u>	<u>115.82</u>	<u>38.61</u>
Total variable costs		3,760.89	981.20	824.12	5,566.21	1,855.40
FIXED CASH COSTS						
				<u>Unit</u>	<u>Total</u>	<u>Cost/ton</u>
Pickup & ATV insurance				acre	111.02	37.01
Property insurance				acre	25.00	8.33
Property taxes				acre	<u>30.00</u>	<u>10.00</u>
Total fixed cash costs					166.02	55.34
FIXED NON-CASH COSTS						
				<u>Unit</u>	<u>Total</u>	<u>Cost/ton</u>
Machinery & equipment - insurance, depreciation, & interest				acre	477.13	159.04
Pickup & ATV - depreciation & interest				acre	360.21	120.07
Irrigation & trellis - depreciation & interest				acre	469.13	156.38
Shop & machine shed				acre	136.00	45.33
Land interest charge				acre	800.00	266.67
Amortized establishment costs				acre	<u>2,767.12</u>	<u>922.37</u>
Total fixed non-cash costs					5,009.59	1,669.86
Total fixed costs					5,175.62	1,725.21
Total of all costs per acre					\$10,741.83	\$3,580.61
Net projected returns					-\$3,841.83	-\$1,280.61