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VINEYARD ECONOMICS: ESTABLISHING AND PRODUCING PINOT NOIR WINE GRAPES IN THE WILLAMETTE VALLEY, OREGON

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Photo credit: Patricia A. Skinkis

Oregon State University OSU Extension Service

Vineyard Economics:
Establishing and Producing Pinot Noir Wine Grapes in the Willamette Valley, Oregon

Beau Olen and Patricia A. Skinkis[1]

Introduction

In 2017, United States wine grape production was valued at $3.5 billion and the entire wine industry had a total economic impact of $220 billion (Wine America 2018). Oregon produced 91,342 tons of wine grapes, with an average price of $2,056 per ton and total value of $192 million, ranking third behind California and Washington. Oregon's top wine grape cultivar produced, Pinot noir, averaged $2,375 per ton. Oregon had 1,144 vineyards, 769 wineries and 33,631 planted acres (University of Oregon 2018).

Oregon has five main wine grape production regions: the Columbia Gorge, Willamette Valley, eastern Oregon, southern Oregon and central Oregon. Unique climates and soil types differentiate the production regions. The Willamette Valley produces 73 percent of Oregon's wine grapes and grows several cool climate grape cultivars, with Pinot noir accounting for 60 percent of production. Pinot noir is the leader in vineyard planted acreage and production in Oregon, accounting for 64 percent of all planted acreage and 57 percent of production. Indeed, Oregon has developed a world-class reputation for producing high quality Pinot noir wine. The Oregon wine industry is expanding yearly to meet the growing demand for the product. On average, Oregon wine grape planted acres increased by 753 acres per year between 1981 and 2016, and the number of vineyards increases by 27 per year (figure 1).

Vineyard establishment requires considerable risk, effort and financial resources. Insufficient knowledge about the economics of vineyard establishment and wine grape production may deter vineyard establishment and expansion. Credit markets, labor markets, disease, pests, natural disasters, weather variation, technological improvements and the potential for trade wars are some of the factors that can affect economic decisions for a vineyard business. This publication is intended primarily for those considering the economic and financial consequences of planting a vineyard in the Willamette Valley, Oregon. It may also be useful to those with existing vineyards. A deeper understanding of the economics of establishing and managing a vineyard enterprise can help investors and current vineyard owners make more informed business decisions.

This cost of establishment and production study provides a tool for economic management and decision-making. Several aspects of wine grape establishment and production have changed since the last published enterprise budget for wine grapes in western Oregon (Julian et al. 2008), including changes to input and output prices and adoption of improved technologies. 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 20-acre vineyard in the Willamette Valley, Oregon. Vineyard owners are encouraged to substitute their own information into this analysis to get an accurate accounting of their costs and returns of vineyard establishment and wine grape production.

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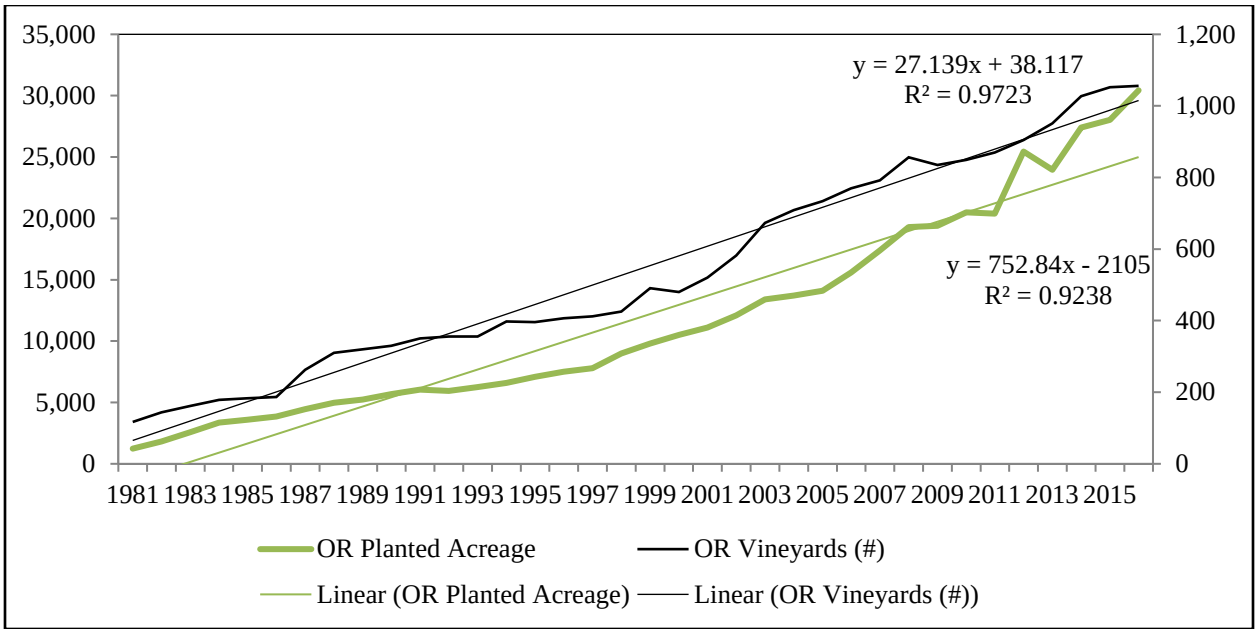

Figure 1. Oregon planted acres and number of vineyards has grown significantly. Data obtained from *Oregon Vineyard and Winery Reports* compiled by Southern Oregon University, National Agricultural Statistic Service and Oregon State University.

Assumptions

To prepare this publication, numerous assumptions are necessary to provide a basis for the wine grape vineyard analysis. These assumptions include the following:

1. The vineyard grows 20 acres of Pinot noir grapes that are irrigated during the first 5 years of establishment. A deer fence is not needed because the surrounding land is not heavily forested.
2. The planting density is 1,362 grafted vines per acre (4' x 8' vine and row spacing) with a productive life of 25 years, once full production is reached 5 years after planting. The planting density results in 5,445 linear feet of row per acre.
3. Wine grape vines are trained to a Guyot system with vertical shoot positioning.
4. In 2018, the price of Pinot noir wine grapes is $3,000 per ton. To be consistent with the linear price trend over the last 30 years (figure 2), we assume that price increases by 4 percent per year ($72.04 / $1,716.30 ≈ 0.04).
5. Commercial yields begin in year 3, and full production is reached 5 years after planting with yields of 2.0, 2.5 and 3.5 tons per acre during years 3-5, respectively.
6. The vineyard pays an assessment of $12.50 per ton of wine grapes. The Oregon Wine Board charges an assessment of $25 per ton of wine grapes, half of which is paid by the vineyard and half by the winery. An estate winery that grows grapes and produces its own wine would pay the full assessment. The $25 per ton assessment rate has not changed over the last 35 years.
7. A vineyard management company is hired to handle all vineyard operations and labor contracts. However, the vineyard is required to own equipment for operations to be used by the vineyard management company which is a standard practice. A foreman does not live on site and foreman housing is not needed.
8. In 2018, general labor is hired at a rate of $19.75 per hour, machine labor at $24.00 per hour and harvest labor is custom hired at a cost of $295 per ton. Labor rates include a 35-45 percent mark-up for employee benefits, including workers' compensation, unemployment insurance and other labor overhead expenses. Labor rates are expected to increase at the same rate as the Oregon minimum wage for standard counties, which excludes non-urban counties and the Portland metropolitan area: 2019 – 4.65 percent, 2020 – 6.67 percent, 2021 – 6.25 percent and 2022 – 5.88 percent. After 2022, labor rates are adjusted annually based on the increase, if any, to the U.S. City average Consumer Price Index for All Urban Consumers (Oregon Bureau of Labor and Industries 2018). Labor hours include time for morning and afternoon breaks but do

not include time for gathering supplies and labor crew movement between activities. All labor is treated as a cash variable expense.

9. The machinery and equipment reflect the typical machinery complement of a Willamette Valley vineyard. Table 1 shows a detailed breakdown of machinery values. Table 2 provides estimated machinery costs using coefficients from the American Society of Agricultural Engineers. The 70-hp tractor is used for mowing, shredding brush, hauling fruit during harvest, and pulling an air-blast sprayer, in-row cultivator, drop seeder, hedger and leaf puller. The front-end loader is a general utility tractor that is also used for harvest. Table 3 lists the estimated cost of each operation with an 8' between-row spacing. Gasoline and diesel price per gallon are $3.10 and $3.00, respectively.
10. The interest rate on operating funds is 6 percent in 2018 and is expected to be 7 percent in 2019. It is uncertain whether the interest rate would increase or decrease after 2019. This is treated as a cash expense. Half the cash expenses are borrowed for a six-month period.
11. Machinery and land are owned by the operator and assessed 6 percent interest rates, respectively, as a return on the owner's investment. Land is valued at $35,000 per acre.
12. Previous year's net establishment costs are funded by the operator at a charge of 6 percent interest as a return on the owner's investment.
13. Herbicides used for strip maintenance are applied to 30 percent of each acre.
14. A drip irrigation system is custom installed at a cost of $4,000 per acre. While irrigation is used during the first 5 years of establishment, repairs and maintenance for the system cost one percent of the purchase price per year.
15. The trellis system is custom installed at a cost of $4,000 per acre. Repairs and maintenance for the system cost one percent of the purchase price per year.
16. Alleyway management: Winter cover crops are planted for the first three years and are tilled during each growing season. Perennial grass is planted in year 4 and established as a turf cover. In year 5, alternating alleyways are tilled and remaining alleyways are maintained as turf by mowing. After harvest, a winter cover crop is planted in all of the tilled rows. Table 4 reports additional input assumptions.
17. Income tax consequences are ignored for this study.

Table 1. Machinery cost assumptions

Machine	Size or description	Value ($)	Hours or *miles* of annual use	Expected life (years)	Salvage value ($)
Tractor	70 HP, 4WD, cabin	$56,000	618	15	$10,902
Air-blast sprayer	Rears, 1-row, 200-gallon	15,000	103	20	782
Mower	Acampo, 4' unit	8,500	10	20	443
Soil cultivator	3-in-1	9,000	10	15	864
Drop seeder	Brillion	6,000	10	20	313
Weed sprayer	50-gallon unit	1,500	41	15	144
Hedger	Collard, 2-row	22,000	41	20	1,147
Leafer	Clemens, interchangeable mast	25,000	21	20	1,303
All-terrain vehicle (ATV)	Single-person, 4WD	6,000	*1,000*	10	2,269
Front-end loader		8,000	N/A	17.5	566
Picking buckets	100 count	600	N/A	5	N/A
Irrigation system	Drip system, pump, pump house, filtration, existing well	4,000	N/A	10	N/A
Trellis system	8 wire, 14 guage, rib back anchor, steel	4,000	N/A	27.5	N/A
Shop and machine shed	24'x36'	35,000	N/A	30	0

Table 2. Machinery cost calculations

		- Variable costs -		---- Fixed costs ----		
Machine	Size or description	Fuel & lube	Repairs & maint.	Depr. & interest	Insurance	Total cost
		----- Costs per hour -----				
Tractor	70 HP, 4WD, cabin	$21.39	$1.56	$8.11	$0.49	$31.55
Air-blast sprayer	Rears, 1-row, 200-gallon	0.00	7.64	11.49	$0.69	19.82
Mower	Acampo, 4' unit	0.00	0.77	65.09	$3.90	69.76
Soil cultivator	3-in-1	0.00	0.61	81.30	$4.30	86.22
Drop seeder	Brillion	0.00	0.54	45.94	$2.75	49.24
Weed sprayer	50-gallon unit	0.00	0.53	3.39	$0.18	4.10
Hedger	Collard, 2-row	0.00	7.99	42.12	$2.53	52.63
Leafer	Clemens, interchangeable mast	0.00	4.54	95.72	$5.74	105.99
		----- Costs per mile -----				
All-terrain vehicle (ATV)	Single-person, 4WD	0.12	0.16	0.62	0.24	1.14
		----- Costs per acre -----				
Front-end loader		0.00	12.00	27.89	0.00	39.89
Picking buckets	100 count	0.00	0.90	5.52	0.00	6.42
Irrigation system	Drip system, pump, pump house, filtration, existing well	0.00	40.00	20.80	0.00	60.80
Trellis system	8 wire, 14 guage, rib back anchor, steel	0.00	40.00	10.62	0.00	50.62
Shop and machine shed	24'x36'	0.00	23.19	81.67	0.00	104.85

Table 3. Estimated cost of each operation with power-unit for an 8' between row spacing

				Machine costs		
Operation	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	2.50	1.94	$15.54	$15.77	$10.71	$42.02
Mower	2.50	1.94	15.54	12.23	40.00	67.77
Soil cultivator	2.50	1.94	15.54	12.15	48.57	76.25
Drop seeder	2.50	1.94	15.54	12.11	29.54	57.19
Weed sprayer	2.50	0.97	31.08	24.21	12.54	67.83
Hedger	2.50	0.97	31.08	31.90	54.90	117.87
Leafer	2.50	0.97	31.08	28.34	113.48	172.90

Table 4. Input assumptions for establishing a Pinot noir vineyard in the Willamette Valley, per acre basis

Inputs (units)	Year 1	Year 2	Year 3	Year 4	Full
Price per ton ($)	$3,000	$3,120	$3,245	$3,375	$3,510
Yield (tons per acre)	0	0	2	2.5	3.5
Labor rate for general vineyard labor, incl. supervisor ($/hour)	$19.75	$20.67	$22.05	$23.42	$24.80
Labor rate for tractor driver/irrigator ($/hour)	$24.00	$25.12	$26.79	$28.47	$30.14
Labor rate for harvest labor ($/ton)	$295.00	$308.72	$329.31	$349.89	$370.46
Hours of labor to remove &/or plant vine (hours)	54.00	2.25	2.25	2.25	2.25
Hours of labor for irrigation (hours)	3.60	3.60	3.60	3.60	3.60
Hours of labor for rodent and bird control (hours)	1.80	1.80	6.30	6.30	6.30
Hours of labor to tie vines/canes (hours)	1.80	0.00	10.80	10.80	10.80
Hours of labor for shoot positioning & raising wire (hours)	9.00	18.00	58.50	58.50	58.50
Hours of labor for cluster thinning (hours)	13.50	22.50	22.50	40.50	40.50
Hours of labor for dormant pruning (hours)	0.00	14.40	21.60	21.60	21.60
Hours of labor to pull brush (hours)	0.00	7.20	10.80	10.80	10.80
Hours of labor to maintain trellis (hours)	0.00	1.80	1.80	1.80	1.80
Hours of labor for sucker removal and disbudding (hours)	0.00	0.00	27.00	27.00	27.00
Cost of vines ($)	$4.25	$4.25	$4.25	$4.25	$4.25
Cost of vine grow tubes ($)	$0.40	$0.40	$0.40	$0.40	$0.40
Cost of fertilizer - foliar applied, spot treatment ($)	$20.00	$20.00	$20.00	$20.00	$20.00
Cost of herbicide strip maintenance ($)	$50.00	$50.00	$50.00	$50.00	$50.00
Cost of fungicides ($)	$0.00	$300.00	$400.00	$400.00	$400.00
Cost of seed for winter cover crop and perennial grass	$75.00	$75.00	$75.00	$75.00	$75.00
Cost of rodent and bird control materials ($)	$80.00	$20.00	$20.00	$20.00	$20.00
Cost of ties for vines/canes ($)	$10.00	$0.00	$10.00	$10.00	$10.00
Cost of renting bin trailer ($/day)	$8.00	$8.00	$8.00	$8.00	$8.00
Times for mower (#)	1	1	2	2	2
Times for soil cultivator (#)	2	2	2	2	2
Times for drop seeder (#)	1	1	1	1	1
Times for weed sprayer (#)	2	2	2	2	2
Times applying fertilizer (#)	1	1	1	1	1
Times for air blast sprayer (#)	0	8	10	10	10
Times for hedger (#)	0	1	2	2	2
Times for leafer (#)	0	1	1	1	1
Times shredding brush (#)	0	1	1	1	1
Days renting bin trailer (days)	0	0	20	25	30
Property taxes ($)	$52.50	$52.50	$52.50	$52.50	$52.50
Property insurance ($)	$43.75	$43.75	$43.75	$43.75	$43.75
Land values (#)	$35,000	$35,000	$35,000	$35,000	$35,000
Water assessment ($)	$0.00	$0.00	$0.00	$0.00	$0.00
Foreman housing ($)	$0.00	$0.00	$0.00	$0.00	$0.00
Miscellaneous & overhead, 4-hour management fee, portable toilets, etc. ($)	$800.00	$800.00	$800.00	$800.00	$800.00
Gasoline price ($)	$3.00	$3.00	$3.00	$3.00	$3.00
Diesel price ($)	$3.10	$3.10	$3.10	$3.10	$3.10
Operating interest rate (%)	6.00%	7.00%	7.00%	7.00%	7.00%
Machinery interest rate (%)	6.00%	6.00%	6.00%	6.00%	6.00%
Land interest rate (%)	6.00%	6.00%	6.00%	6.00%	6.00%
Establishment interest rate (%)	6.00%	6.00%	6.00%	6.00%	6.00%
Operating capital borrowed (%)	50.00%	50.00%	50.00%	50.00%	50.00%
Months to borrow operating capital (months)	6.00	6.00	6.00	6.00	6.00
Planted vines (#)	1,362	22	22	22	22

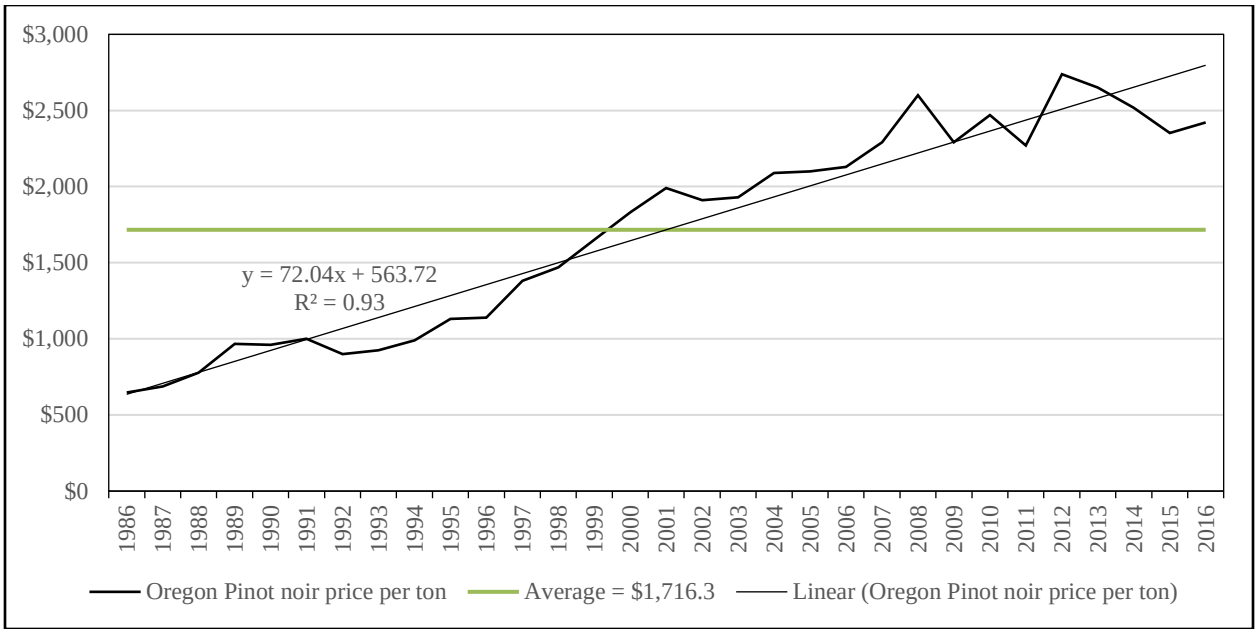

Figure 2. Oregon Pinot noir price per ton, average and linear trend, over a 30 year period.

Results of establishing a Pinot noir vineyard in the Willamette Valley

Cash flow analysis

Table 5 contains a cash flow analysis for establishing a Pinot noir vineyard in the Willamette Valley, Oregon. A cash flow shows a vineyard's accounting profit—annual cash income minus its cash operating expenses for the production year. Accounting profit is the most important financial indicator to monitor in the short-term because it is the primary component of working capital—all cash available to a vineyard in a short period of time. To avoid farm failure, growers need sufficient working capital to pay the costs of current farming operations. The income, or revenue, is generated by selling wine grapes at the market price. A half crop begins in year 3 with 2 tons of wine grapes per acre, increasing to 2.5 tons in year 4 and 3.5 tons at full production in year 5. Cash costs include labor, vines, trellis, irrigation system, seed for cover crops and perennial grass turf, fertilizer, chemicals, pest control, machinery repairs, fuel, lube, oil, a shop and machine shed, operating interest (short-term), machinery insurance, property taxes and overhead. The income, variable costs and cash fixed costs are shown for each of the four establishment years and at full production. Total variable costs in the first year are $19,650 with an additional $102 of cash fixed costs for a total cash cost of $19,752 per acre.

A positive cash flow begins in year 4 with gross income exceeding total cash costs by $135 per acre. The vineyard does not return a sufficient amount of gross income in the first 5 years to pay all of its costs; there is an accumulated $21,131 per acre of prior costs remaining following year 5.

Figure 3 shows the total cash cost components for the first 5 years of establishment. Hired labor represents 43 percent of total cash costs. The vines are the second largest component of cash costs, accounting for 14 percent. The trellis system and irrigation system each represent 9 percent of cash costs. Machine costs, which include fuel, oil and repairs, are 6 percent of cash costs. Fertilizer and chemicals are 4 percent of total cash costs, with all remaining cost items accounting for 15 percent of total cash costs.

Figure 4 shows the projected cumulative net cash returns per acre for establishing a Pinot noir vineyard in the Willamette Valley, Oregon. The net cash returns for this vineyard are negative for the first 12 years but become positive beginning in year 13. In other words, cumulative accounting profit is negative for the first 12 years but is positive for the remaining life of the investment. The projected cumulative net cash returns per acre at the end of the 25-year investment period are $32,994.

Economic costs and returns

Table 6 reports the economic costs and returns for establishing Pinot noir vineyard in the Willamette Valley, Oregon. Economic costs include all the cash costs listed in table 5 in addition to 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 years' establishment costs. Economic profit equals zero if the returns (gross income) equal the economic cost. Zero economic profit, also known as "normal profit", is often considered the minimum earnings necessary to justify an enterprise relative to all other options, such as investing in the stock market.

Net economic returns are always negative for the vineyard in this analysis because economic costs always exceed gross income. This vineyard has an annual deficit of $2,679 per acre at full production. At the end of the 5-year establishment period, this vineyard falls short of repaying all previous establishment costs by $32,322 per acre. Amortizing this cost over a 25-year period is an annual payment of $2,355 per acre as shown in table 11 (see Appendix).

Figure 5 shows the total economic cost components for the first 5 years of establishment. Hired labor accounts for 30 percent of total economic costs and is the largest component. Interest is the second largest component, representing 25 percent of total economic costs. Vines are the third highest component, accounting for 10 percent of the total economic costs. Machine costs (fuel, oil, repairs, depreciation and interest charges), irrigation and trellising, respectively, are the next highest cost items accounting for 8 percent, 6 percent and 6 percent of total economic costs. Fertilizer and chemicals are 2 percent of the total economic costs, with all remaining items accounting for 13 percent of the total economic costs.

With the baseline prices, yield and costs assumed in this study, this vineyard does not generate sufficient gross income to cover all economic costs for the 25-year investment period (figure 6). The projected cumulative net economic returns per acre at the end of the 25-year investment period are negative (-$83,321). A sensitivity analysis of changes in grape price, grape yield and input costs indicate that normal profit could be achieved by year 25 through either of the following:

a) increasing wine grape prices by 28 percent,
b) increasing wine grape yield by 29 percent.

On the other hand, if fertilizer, fungicide, herbicide, gasoline and diesel were free of charge, this vineyard would still never earn a normal profit. The results of the sensitivity analysis are shown in figure 6.

Growers often focus on reducing costs to increase profit. To increase the chances of financial success, more emphasis should be on cultivars and practices that optimize yields, fruit quality and price for a particular location. The grape yield is dictated by the purchaser of wine grapes (winemakers). If the winemaker dictates lower yields than reported here, the grower should consider negotiating an acreage-based contract to cover the additional production costs, particularly when winemakers demand extra work in the block (canopy management and crop thinning) with reduced yields.

Table 5. Cash costs and returns of establishing a Pinot noir vineyard in the Willamette Valley

Income	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Full Prod**
Yield (tons/acre)	0.00	0.00	2.00	2.50	3.50
Price (dollars/ton)	3,000.00	3,120.00	3,244.80	3,374.59	3,509.58
Gross Income(dollars/acre)	0.00	0.00	6,489.60	8,436.48	12,283.51
Variable Costs (per acre)					
Field preparation	1,371.06	0.00	0.00	0.00	0.00
Vines and tubes	6,343.30	102.30	102.30	102.30	102.30
Irrigation system	4,000.00	0.00	40.00	40.00	40.00
Trellis installation & maintenance	4,000.00	0.00	40.00	40.00	40.00
Tie for canes	10.00	0.00	10.00	10.00	10.00
Fertilizer	20.00	20.00	20.00	20.00	20.00
Chemicals	50.00	350.00	450.00	450.00	450.00
Seed for cover crop and grass	75.00	75.00	75.00	75.00	75.00
Harvest labor	0.00	0.00	658.62	874.73	1,824.07
General labor	2,546.26	1,338.45	4,013.99	4,663.20	4,938.78
Bin trailer, rental	0.00	0.00	8.00	10.00	12.00
Oregon Wine Board assessment	0.00	0.00	25.00	31.25	43.75
Rodent and bird control	80.00	20.00	20.00	20.00	20.00
Machine costs	158.78	343.55	756.32	843.68	1,040.71
Shop and machine shed	23.19	23.19	23.19	23.19	23.19
Miscellaneous & overhead	800.00	800.00	800.00	800.00	800.00
Interest: operating capital	172.01	108.37	178.63	195.44	164.50
Total **variable** costs	19,649.60	3,180.85	7,221.03	8,198.79	9,604.28
Gross Income - variable cost	-19,649.60	-3,180.85	-731.43	237.69	2,679.23
Fixed cash costs (per acre)					
Insurance	49.74	49.74	24.87	49.74	49.74
Water assessment	0.00	0.00	0.00	0.00	0.00
Property taxes	52.50	52.50	52.50	52.50	52.50
Total **fixed** cash cost	102.24	102.24	77.37	102.24	102.24
Total **cost**	19,751.85	3,283.10	7,298.41	8,301.04	9,706.53
Net projected returns	-19,751.85	-3,283.10	-808.81	135.44	2,576.99
Cumulative returns	-19,751.85	-23,034.94	-23,843.75	-23,708.31	-21,131.32

Table 6. Economic costs and returns of establishing a Pinot noir vineyard in the Willamette Valley

Income	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Full Prod**
Yield (tons/acre)	0.00	0.00	2.00	2.50	3.50
Price (dollars/ton)	3,000.00	3,120.00	3,244.80	3,374.59	3,509.58
Gross Income(dollars/acre)	0.00	0.00	6,489.60	8,436.48	12,283.51
Variable Costs (per acre)					
Field preparation	1,371.06	0.00	0.00	0.00	0.00
Vines and tubes	6,343.30	102.30	102.30	102.30	102.30
Irrigation maintenance	0.00	0.00	40.00	40.00	40.00
Trellis maintenance	0.00	0.00	40.00	40.00	40.00
Tie for canes	10.00	0.00	10.00	10.00	10.00
Fertilizer	20.00	20.00	20.00	20.00	20.00
Chemicals	50.00	350.00	450.00	450.00	450.00
Seed for cover crop and grass	75.00	75.00	75.00	75.00	75.00
Harvest labor	0.00	0.00	658.62	874.73	1,824.07
General labor	2,546.26	1,338.45	4,013.99	4,663.20	4,938.78
Bin trailer, rental	0.00	0.00	8.00	10.00	12.00
Oregon Wine Board assessment	0.00	0.00	25.00	31.25	43.75
Rodent and bird control	80.00	20.00	20.00	20.00	20.00
Machine costs	158.78	343.55	756.32	843.68	1,040.71
Shop and machine shed	23.19	23.19	23.19	23.19	23.19
Miscellaneous & overhead	800.00	800.00	800.00	800.00	800.00
Interest: operating capital	172.01	108.37	178.63	195.44	164.50
Total **variable** costs	11,649.60	3,180.85	7,221.03	8,198.79	9,604.28
Gross Income - variable cost	-11,649.60	-3,180.85	-731.43	237.69	2,679.23
Fixed cash costs (per acre)					
Insurance	49.74	49.74	24.87	49.74	49.74
Water assessment	0.00	0.00	0.00	0.00	0.00
Property taxes	52.50	52.50	52.50	52.50	52.50
Machine costs	202.58	536.64	282.19	536.64	719.53
Foreman housing	0.00	0.00	0.00	0.00	0.00
Shop and Machine Shed	81.67	81.67	81.67	81.67	81.67
Land interest	2,100.00	2,100.00	2,100.00	2,100.00	2,100.00
Interest on establishment costs	0.00	847.57	1,258.50	1,544.00	2,354.99
Total **fixed** cost	2,486.49	3,668.12	3,799.74	4,364.55	5,358.43
Total **cost**	14,136.09	6,848.97	11,020.77	12,563.34	14,962.71
Net projected returns	-14,136.09	-6,848.97	-4,531.17	-4,126.86	-2,679.20
Cumulative returns	-14,136.09	-20,985.06	-25,516.23	-29,643.09	-32,322.29

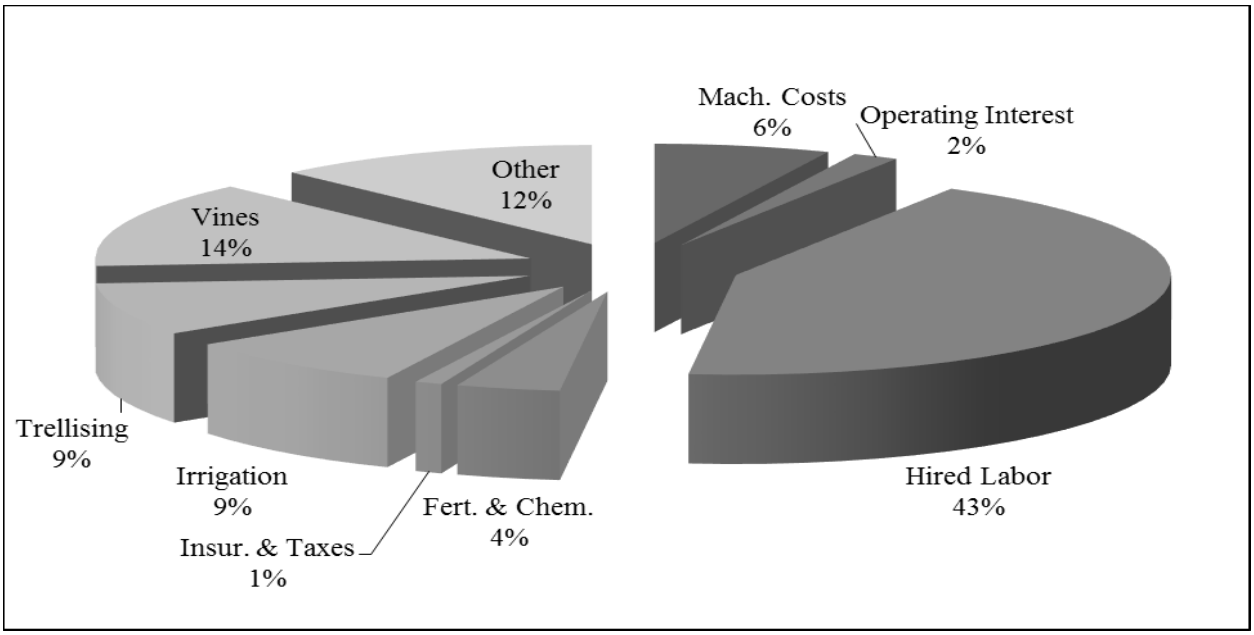

Figure 3. Cash costs to establish a Pinot noir vineyard in the Willamette Valley, the first five years of establishment

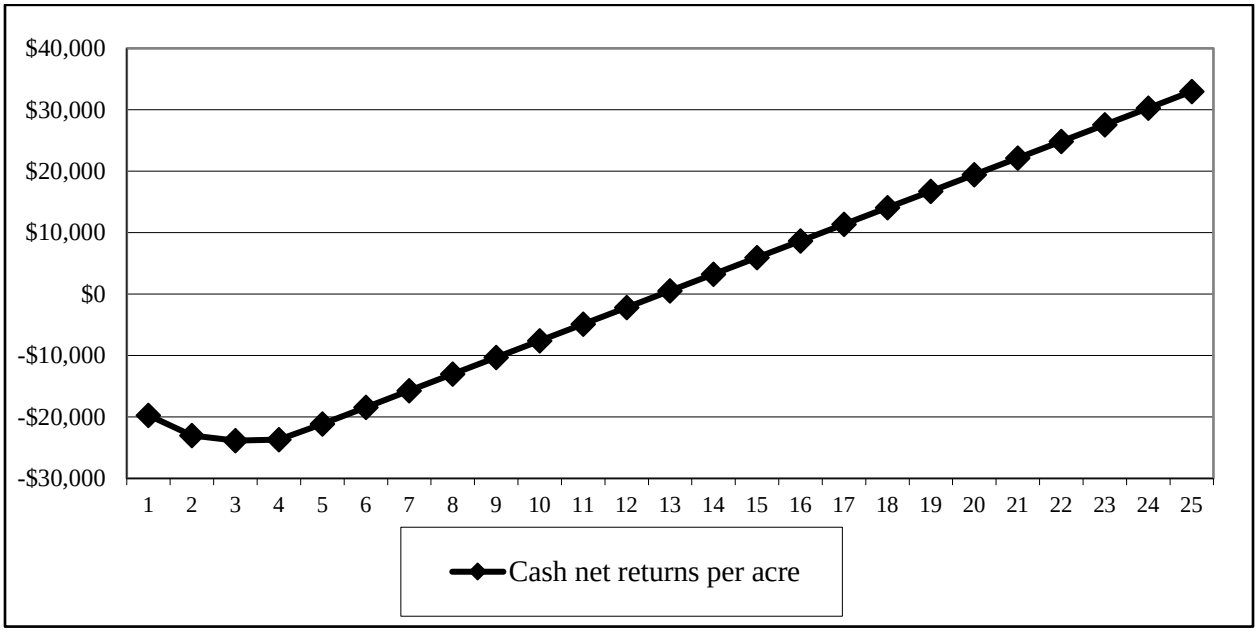

Figure 4. Cash net returns per acre to establish a Pinot noir vineyard in the Willamette Valley, over 25 years

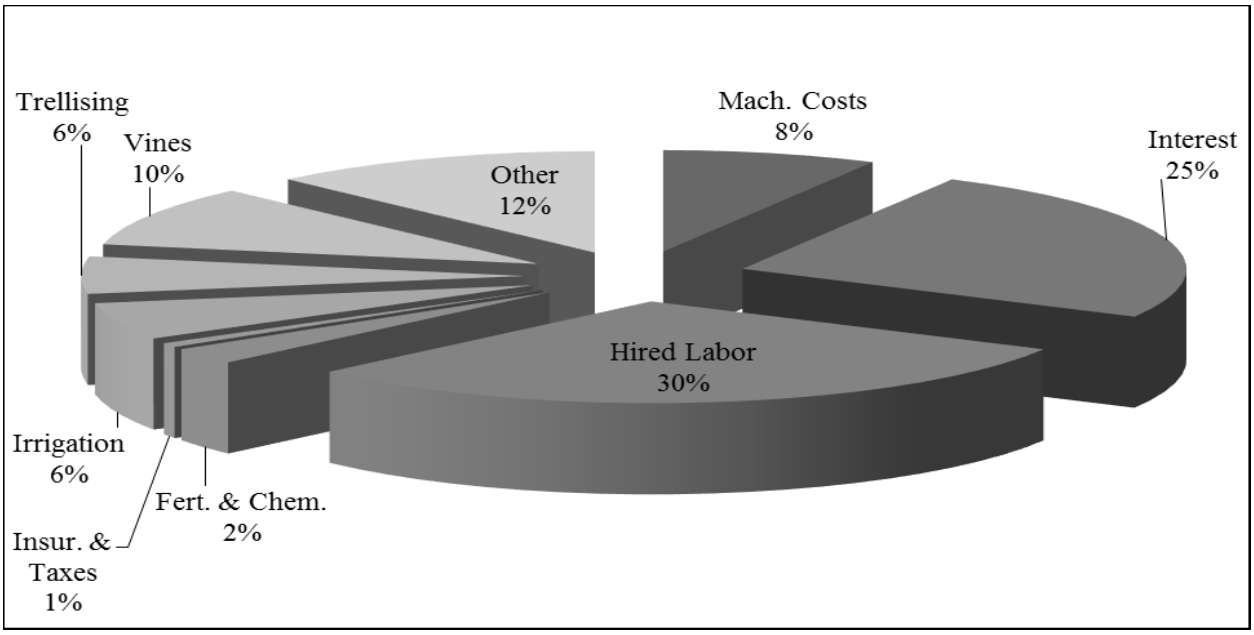

Figure 5. Economic costs to establish a Pinot noir vineyard in the Willamette Valley, the first five years of establishment

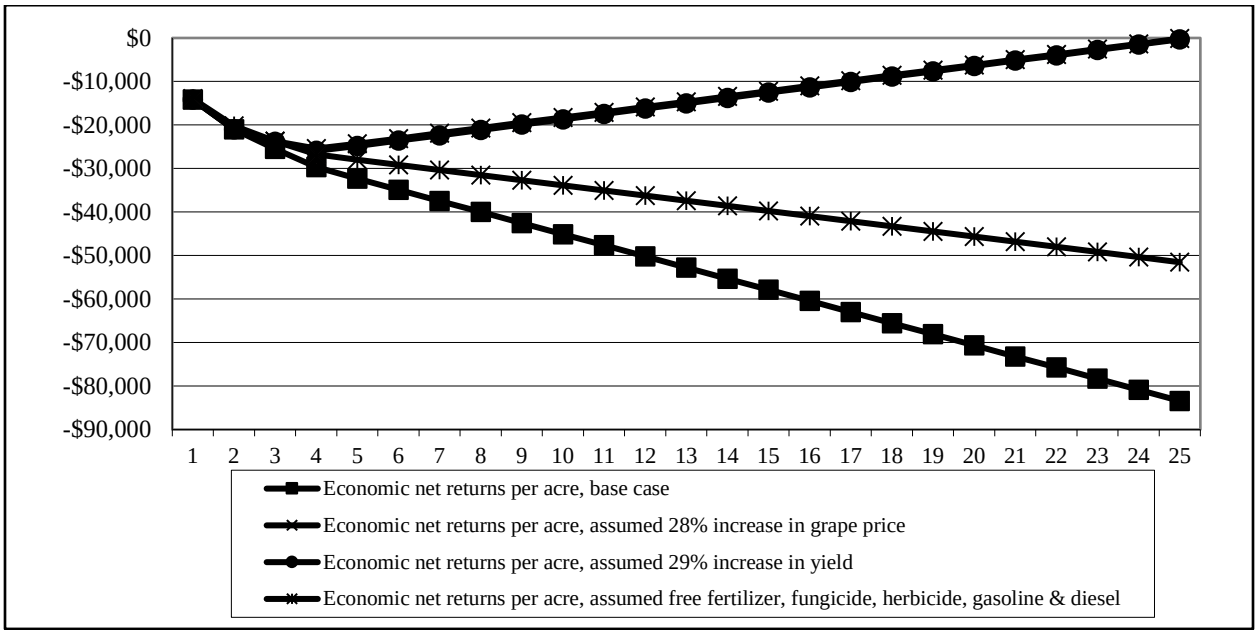

Figure 6. Economic net returns per acre to establish a Pinot noir vineyard in the Willamette Valley, over 25 years

Discussion

Grapevines grow vigorously in most areas of Oregon's Willamette Valley, in part due to the high annual precipitation and high-water holding capacity of soils in the region. Significant canopy management is required to maintain vine leaf area that is well exposed to sun and to reduce shading that can cause low fruit quality by way of increased disease potential and lower fruit quality components. Canopy management is labor-intensive, as much of it still requires manual labor (shoot thinning, shoot positioning, sucker removal, cluster thinning). To assist growers with vineyard profitability, we are suggesting wider vine and row spacing to help reduce vine vegetative growth and

inter-vine shading, particularly in the areas with higher rainfall and vigor potential. Grapevines can have reduced growth by pruning to more buds, and thus, wider spacing is required. Conversely, fewer buds per plant can lead to higher vigor, particularly in the Willamette Valley. It was popular in the early 2000s to plant high-density vineyard systems (>1500 vines/acre) in the region, and those vineyards suffer from an over-abundance of growth and higher labor inputs that are not fully compensated by higher grape prices. Wider vine spacing in rows and between rows reduces the number of vines and linear feet of wire per acre, which helps to reduce vine vegetative growth and canopy management costs. While this enterprise budget uses 4' between vines for the production scenario, in-row spacing may be increased to as much as 5' in many high vigor vineyards.

Oregon Pinot noir yield research has shown that grapevines in the Willamette Valley can ripen higher yields than originally thought, all without reducing fruit quality at harvest (Reeve et al. 2016; Reeve et al. 2018). The yields in this economic analysis reflect a conservative increase in yields relative to traditional vineyards, and some vineyards may be able to produce more, including vineyards in southern Oregon and areas in the Willamette Valley where there is high vine productivity. Research is currently underway to determine if alternative pruning methods may be used (e.g. spur pruning) to reduce pruning costs and allow partial mechanization during winter pruning. Changing current industry practices is difficult, but a process to achieve greater profitability in the vineyard includes having a lower density vineyard with moderate vigor (avoiding canopy over-growth), less labor input and reduced need to crop thin to achieve winery-acceptable yields.

For the 20-acre vineyard in this study, it takes 13 years for cash net returns (accounting profit) to become positive. The results of the sensitivity analysis indicate that normal profit (economic profit equals zero), which includes all cash costs in addition to opportunity costs and dollars borrowed from financial institutions, can be achieved by increasing wine grape price by 28 percent or increasing yield by 29 percent. On the other hand, even if fertilizer, fungicide, herbicide, gasoline and diesel were all free of charge, this vineyard could never earn a normal profit. Of course, normal profit may be achieved by a combination of increased prices and yield and lower input prices. Although growers often focus on reducing costs as a means of increasing profitability, there is a greater chance of financial success if there is more emphasis on vine density, grape cultivars that are marketed easily, and practices that optimize yield, fruit quality and price for a particular location. The grape yield is dictated by the purchaser of wine grapes (winemakers). If the winemaker dictates lower yields than reported here, the grower should consider negotiating an acreage-based contract to cover the additional production costs, particularly when winemakers demand extra work in the block (canopy management and crop thinning) with reduced yield.

There are many factors to consider when selecting your vineyard site, grape cultivar, vine density and technology. Not all areas of the Willamette Valley are conducive to growing grapes due to varying climatic and soil conditions. The Willamette Valley is a cool climate wine production region, and only cool climate grapes should be considered for commercial production (e.g. Pinot noir, Chardonnay, Pinot gris, Pinot blanc), as they are well suited for the season length and heat units of the region. Warm climate cultivars will struggle to ripen (or not ripen at all) in most areas of the region. However, since southern Oregon and the Columbia Gorge have warmer growing seasons than the Willamette Valley, they can grow warmer climate cultivars to ripeness (e.g., Syrah, Cabernet sauvignon). Diseases such as powdery mildew and botrytis must be managed in all of Oregon's wine production regions. Due to their warmer, drier conditions during the growing season, fewer fungicide sprays may be required in southern Oregon and the Columbia Gorge than in the Willamette Valley. The drier conditions in southern Oregon and the Columbia Gorge require irrigation throughout the life of the vineyard, while vineyards in the Willamette Valley can typically be grown without irrigation after the first 5 years of establishment. In southern Oregon and the Columbia Gorge, irrigation should be the primary means for managing canopy growth, applying water to grow the appropriate amount of canopy rather than growing extra canopy that must then be managed. These considerations need to be considered when finalizing your own vineyard enterprise budget.

One way for growers to add value and increase profitability is to produce wines directly through a winery business linked to the vineyard. There are state regulations governing the physical placement of a winery on agricultural land planted to a vineyard. Specifically, any vineyard that has more than 15 planted acres is eligible to be permitted as a winery. An estate winery that grows grapes and produces its own wine must pay the full Oregon Wine Board assessment of $25 per ton of wine grapes. However, keep in mind that producing and selling wine is another aspect of the business that would require full planning. Most wine grape growers would say that the challenge of selling wine is far greater than growing grapes, particularly with small production scale.

This cost of establishment study is a tool for economic management and decision-making for wine grape growers and investors who are considering planting a new vineyard in the Willamette Valley, Oregon. It may also be useful to those with existing vineyards. Like any other enterprise budget, putting your own current costs in the budget will make it more meaningful to you. 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 farm solvency. There are many economic and financial considerations to review before making such decisions. Many tools are available to assist in budgeting such as templates from university farm management specialists and computer software programs such as *AgBiz Logic*^{TM}, which is a suite of economic, financial and environmental decision tools for businesses that grow, harvest, package, add value and sell agricultural products. Producers can securely import their own data into the program and freely use select applications at the *AgBiz Logic*^{TM} website (https://www.agbizlogic.com/). Seeking advice from university Extension, industry representatives, or consultants can assist with those decisions and help to keep your farm profitable and vineyard investments feasible.

References

Julian, J.W., C.F. Seavert, P.A. Skinkis, P. VanBuskirk and S. Castagnoli. 2008. "Vineyard Economics: Establishing and Producing Pinot Noir Wine Grapes in Western Oregon." Oregon State University Extension Service, EM 8969-E. Available online: http://arec.oregonstate.edu/oaeb/files/pdf/EM8969-E.pdf

Oregon Bureau of Labor and Industries. 2018. "Oregon Minimum Wage Rate Summary." Available online: http://www.oregon.gov/boli/WHD/OMW/Pages/Minimum-Wage-Rate-Summary.aspx

Reeve, A.L., P.A. Skinkis, A.J. Vance, J. Lee and J.M. Tarara. 2016. "Vineyard floor management influences 'Pinot noir' vine growth and productivity more than cluster thinning. *HortScience* 51(10): 1233-1244.

Reeve, A.L., P.A. Skinkis, A.J. Vance, K.R. McLaughlin, E. Tomasino, J. Lee and J.M. Tarara. 2018. "Vineyard Floor Management and Cluster Thinning Inconsistently Affect 'Pinot noir' Crop Load, Berry Composition, and Wine Quality." *HortScience* 53(3): 318-328.

University of Oregon. 2018. "2017 Oregon Vineyard and Winery Report." Available online: https://industry.oregonwine.org/resources/#filter=combo%3A.winery-vineyard-report

Wine America, the National Association of American Wineries. 2018. "Economic Impact Reports." Available online: http://wineamerica.org/impact

Appendix

Enterprise budgets for establishing a Pinot noir vineyard in the Willamette Valley

Table 7. Year 1, Pinot noir grape 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	$54.00	$54.00
Tile, custom	1.00	count	$0.00	$0.00	$1,200.00	$1,200.00
Lime, custom	1.00	times	$0.00	$0.00	$75.00	$75.00
Disc & cultivate	2.00	times	48.00	14.76	0.00	62.76
Mark rows	10.00	hours	197.50	0.00	1.20	198.70
Mark plants	20.00	hours	395.00	0.00	40.86	435.86
Plant vines with grow tubes	54.00	hours	1,066.50	0.00	6,333.30	7,399.80
Tie vines	1.80	hour	35.55	0.00	10.00	45.55
Hoeing around vines	20.00	hours	395.00	0.00	0.00	395.00
Rodent and bird control	1.80	hours	35.55	0.00	80.00	115.55
Fertilizer - foliar applied, spot treatment	1.00	times	0.00	0.00	20.00	20.00
Herbicide strip maintenance	2.00	times	62.16	48.42	50.00	160.58
Mowing vineyard floor	1.00	times	15.54	12.23	0.00	27.77
Soil cultivation	2.00	times	31.08	24.29	0.00	55.37
Seeding winter cover crop	1.00	times	15.54	12.11	75.00	102.65
Vine training	9.00	hours	177.75	0.00	0.00	177.75
Irrigation	3.60	hours	71.10	40.00	0.00	111.10
ATV	1.00	count	0.00	6.97	0.00	6.97
Shop and machine shed	1.00	count	0.00	0.00	23.19	23.19
Miscellaneous and overhead	1.00	count	0.00	0.00	800.00	800.00
Interest: operating capital	6.00	months	0.00	0.00	172.01	172.01
Total **variable** costs			2,546.26	158.78	8,934.56	11,639.60

FIXED CASH COSTS	Unit	Total
ATV insurance	acre	5.99
Water assessment	acre	0.00
Property insurance	acre	43.75
Property taxes	acre	52.50
Total **fixed cash** costs		102.24

FIXED NON-CASH COSTS	Unit	Total
Machinery and equipment insurance, depreciation & interest	acre	187.05
ATV - depreciation & interest	acre	15.53
Foreman housing	acre	0.00
Shop and machine shed - depreciation & interest	acre	81.67
Land interest	acre	2,100.00
Total **fixed non-cash** costs		2,384.24
Total **fixed** costs		2,486.49
Total of all costs per acre		**$14,126.09**

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

TOTAL GROSS INCOME			Quantity	Unit	$/Unit	Total
Pinot noir grapes			0.00	Tons	3,120.00	0.00
Total **gross** income						0.00
VARIABLE CASH COSTS	**Description**		**Labor**	**Machinery**	**Materials**	**Total**
Prune	14.40	hours	$297.62	$0.00	$0.00	$297.62
Pull brush	7.20	hours	148.81	0.00	0.00	148.81
Vine replacement with grow tubes	2.25	hours	46.50	0.00	102.30	148.80
Install trellis	1.80	hours	35.55	0.00	0.00	35.55
Shredding brush	1.00	times	15.54	12.23	0.00	27.77
Fertilizer - foliar applied, spot treatment	1.00	times	0.00	0.00	20.00	20.00
Herbicide strip maintenance	2.00	times	62.16	48.42	50.00	160.58
Fungicides	8.00	times	124.31	126.16	300.00	550.47
Leaf pulling by machine	1.00	times	31.08	28.34	0.00	59.42
Vine training	18.00	hours	372.03	0.00	0.00	372.03
Hedging	1.00	times	31.08	31.90	0.00	62.97
Mowing vineyard floor	1.00	times	15.54	12.23	0.00	27.77
Soil cultivation	2.00	times	31.08	24.29	0.00	55.37
Seeding winter cover crop	1.00	times	15.54	12.11	75.00	102.65
Rodent and bird control	1.80	hours	37.20	0.00	20.00	57.20
Irrigation	3.60	hours	74.41	40.00	0.00	114.41
Picking buckets	100.00	count	0.00	0.90	0.00	0.90
ATV	1.00	count	0.00	6.97	0.00	6.97
Shop and machine shed	1.00	count	0.00	0.00	23.19	23.19
Miscellaneous and overhead	1.00	count	0.00	0.00	800.00	800.00
Interest: operating capital	6.00	months	0.00	0.00	108.37	108.37
Total **variable** costs			1,338.45	343.55	1,498.86	3,180.85
FIXED CASH COSTS					**Unit**	**Total**
ATV insurance					acre	5.99
Water assessment					acre	0.00
Property insurance					acre	43.75
Property taxes					acre	52.50
Total **fixed cash** costs						102.24
FIXED NON-CASH COSTS					**Unit**	**Total**
Machinery and equipment insurance, depreciation & interest					acre	521.11
ATV - depreciation & interest					acre	15.53
Foreman housing					acre	0.00
Shop and machine shed - depreciation & interest					acre	81.67
Land interest					acre	2,100.00
Prior year's establishment costs					acre	847.57
Total **fixed non-cash** costs						3,565.87
Total **fixed** costs						3,668.12
Total of all costs per acre						**$6,848.97**
Net projected returns						**-$6,848.97**

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			2.00	Tons	$3,244.80	$6,489.60	$3,244.80
Total **gross** income						$6,489.60	$3,244.80
VARIABLE CASH COSTS	**Description**		**Labor**	**Machinery**	**Materials**	**Total**	**Cost/ton**
Prune	21.60	hours	$476.21	$0.00	$0.00	$476.21	$238.11
Pull brush	10.80	hours	238.11	0.00	0.00	238.11	119.05
Tie canes	10.80	hours	238.11	0.00	10.00	248.11	124.05
Vine replacement with grow tubes	2.25	hours	49.61	0.00	102.30	151.91	75.95
Maintain trellis	1.80	hours	39.68	0.00	0.00	39.68	19.84
Shredding brush	1.00	times	15.54	12.23	0.00	27.77	13.88
Fertilizer - foliar applied, spot treatment	1.00	times	0.00	0.00	20.00	20.00	10.00
Herbicide strip maintenance	2.00	times	62.16	48.42	50.00	160.58	80.29
Fungicides	10.00	times	155.39	157.71	400.00	713.09	356.55
Leaf pulling by machine	1.00	times	31.08	28.34	0.00	59.42	29.71
Vine training	58.50	hours	1,289.75	0.00	0.00	1,289.75	644.87
Sucker removal	27.00	hours	595.27	0.00	0.00	595.27	297.63
Cluster thinning	22.50	hours	496.06	0.00	0.00	496.06	248.03
Hedging	2.00	times	62.16	63.79	0.00	125.95	62.97
Mowing vineyard floor	2.00	times	15.54	12.23	0.00	27.77	13.88
Soil cultivation	2.00	times	15.54	12.15	0.00	27.69	13.84
Seeding winter cover crop	1.00	times	15.54	12.11	75.00	102.65	51.33
Rodent and bird control	6.30	hours	138.90	0.00	20.00	158.90	79.45
Irrigation	3.60	hours	79.37	40.00	0.00	119.37	59.68
Picking buckets	100.00	count	0.00	0.90	0.00	0.90	0.45
Days renting bin trailer	20.00	count	0.00	0.00	8.00	8.00	4.00
Harvesting costs for tractor and front-end loader	2.00	x/ton	658.62	241.48	0.00	900.09	450.05
Truck harvest freight, lease	1.00	x/ton	0.00	120.00	0.00	120.00	60.00
Oregon Wine Board assessment	1.00	x/ton	0.00	0.00	25.00	25.00	12.50
ATV	1.00	count	0.00	6.97	0.00	6.97	3.48
Shop and machine shed	1.00	count	0.00	0.00	23.19	23.19	11.59
Miscellaneous and overhead	1.00	count	0.00	0.00	800.00	800.00	400.00
Interest: operating capital	6.00	months	0.00	0.00	178.63	178.63	89.31
Total **variable** costs			4,672.60	756.32	1,712.11	7,141.03	3,570.52
FIXED CASH COSTS					**Unit**	**Total**	**Cost/ton**
ATV insurance					acre	5.99	3.00
Water assessment					acre	0.00	0.00
Property insurance					acre	43.75	21.88
Property taxes					acre	52.50	26.25
Total **fixed cash** costs						102.24	51.12
FIXED NON-CASH COSTS					**Unit**	**Total**	**Cost/ton**
Machinery and equipment insurance, depreciation & interest					acre	548.86	274.43
ATV - depreciation & interest					acre	15.53	7.76
Foreman housing					acre	0.00	0.00
Shop and machine shed - depreciation & interest					acre	81.67	40.83
Land interest					acre	2,100.00	1,050.00
Prior year's establishment costs					acre	1,258.50	629.25
Total **fixed non-cash** costs						4,004.56	2,002.28
Total **fixed** costs						4,106.80	2,053.40
Total of all costs per acre						**$11,247.84**	**$5,623.92**
Net projected returns						**-$4,758.24**	**-$2,379.12**

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	$3,244.80	$8,112.00	$3,244.80
Total **gross** income						$8,112.00	$3,244.80
VARIABLE CASH COSTS	**Description**		**Labor**	**Machinery**	**Materials**	**Total**	**Cost/ton**
Prune	21.60	hours	$505.98	$0.00	$0.00	$505.98	$202.39
Pull brush	10.80	hours	252.99	0.00	0.00	252.99	101.20
Tie canes	10.80	hours	252.99	0.00	10.00	262.99	105.20
Vine replacement with grow tubes	2.25	hours	52.71	0.00	102.30	155.01	62.00
Maintain trellis	1.80	hours	42.16	0.00	0.00	42.16	16.87
Shredding brush	1.00	times	15.54	12.23	0.00	27.77	11.11
Fertilizer - foliar applied, spot treatment	1.00	times	0.00	0.00	20.00	20.00	8.00
Herbicide strip maintenance	2.00	times	62.16	48.42	50.00	160.58	64.23
Fungicides	10.00	times	155.39	157.71	400.00	713.09	285.24
Leaf pulling by machine	1.00	times	31.08	28.34	0.00	59.42	23.77
Vine training	58.50	hours	1,370.36	0.00	0.00	1,370.36	548.14
Sucker removal	27.00	hours	632.47	0.00	0.00	632.47	252.99
Cluster thinning	40.50	hours	948.71	0.00	0.00	948.71	379.48
Hedging	2.00	times	62.16	63.79	0.00	125.95	50.38
Mowing vineyard floor	2.00	times	15.54	12.23	0.00	27.77	11.11
Soil cultivation	2.00	times	15.54	12.15	0.00	27.69	11.07
Seeding perennial grass	1.00	times	15.54	12.11	75.00	102.65	41.06
Rodent and bird control	6.30	hours	147.58	0.00	20.00	167.58	67.03
Irrigation	3.60	hours	84.33	40.00	0.00	124.33	49.73
Picking buckets	100.00	count	0.00	0.90	0.00	0.90	0.36
Days renting bin trailer	25.00	count	0.00	0.00	10.00	10.00	4.00
Harvesting costs for tractor and front-end loader	2.50	tons	874.73	298.84	0.00	1,173.57	469.43
Truck harvest freight, lease	1.00	x/ton	0.00	150.00	0.00	150.00	60.00
Oregon Wine Board assessment	1.00	x/ton	0.00	0.00	31.25	31.25	12.50
ATV	1.00	count	0.00	6.97	0.00	6.97	2.79
Shop and machine shed	1.00	count	0.00	0.00	23.19	23.19	9.28
Miscellaneous and overhead	1.00	count	0.00	0.00	800.00	800.00	320.00
Interest: operating capital	6.00	months	0.00	0.00	195.44	195.44	78.18
Total **variable** costs			5,537.93	843.68	1,737.18	8,118.79	3,247.52
FIXED CASH COSTS					**Unit**	**Total**	**Cost/ton**
ATV insurance					acre	5.99	2.40
Water assessment					acre	0.00	0.00
Property insurance					acre	43.75	17.50
Property taxes					acre	52.50	21.00
Total **fixed cash** costs						102.24	40.90
FIXED NON-CASH COSTS					**Unit**	**Total**	**Cost/ton**
Machinery and equipment insurance, depreciation & interest					acre	521.11	208.44
ATV - depreciation & interest					acre	15.53	6.21
Foreman housing					acre	0.00	0.00
Shop and machine shed - depreciation & interest					acre	81.67	32.67
Land interest					acre	2,100.00	840.00
Prior year's establishment costs					acre	1,544.00	617.60
Total **fixed non-cash** costs						4,262.30	1,704.92
Total **fixed** costs						4,364.55	1,745.82
Total of all costs per acre						**$12,483.34**	**$4,993.34**
Net projected returns						**-$4,371.34**	**-$1,748.54**

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

GROSS INCOME			Quantity	Unit	$/Unit	Total	Price/ton
Pinot noir grapes			3.50	Tons	$3,509.58	$12,283.51	$3,509.58
Total **gross** income						$12,283.51	$3,509.58
VARIABLE CASH COSTS	**Description**		**Labor**	**Machinery**	**Materials**	**Total**	**Cost/ton**
Prune	21.60	hours	$535.73	$0.00	$0.00	$535.73	$153.07
Pull brush	10.80	hours	267.86	0.00	0.00	267.86	76.53
Tie canes	10.80	hours	267.86	0.00	10.00	277.86	79.39
Vine replacement with grow tubes	2.25	hours	55.81	0.00	102.30	158.11	45.17
Trellis maintenance	1.80	hours	44.64	0.00	40.00	84.64	24.18
Shred brush	1.00	times	15.54	12.23	0.00	27.77	7.93
Fertilizer - foliar applied, spot treatment	1.00	times	0.00	0.00	20.00	20.00	5.71
Herbicide strip maintenance	2.00	times	62.16	48.42	50.00	160.58	45.88
Fungicides	10.00	times	155.39	157.71	400.00	713.09	203.74
Hours for shoot positioning & raising wire	58.50	hours	1,450.93	0.00	0.00	1,450.93	414.55
Sucker removal	27.00	hours	669.66	0.00	0.00	669.66	191.33
Cluster thinning	40.50	hours	1,004.49	0.00	0.00	1,004.49	287.00
Leaf pulling by machine	2.00	times	62.16	56.68	0.00	118.84	33.95
Hedging	2.00	times	62.16	63.79	0.00	125.95	35.98
Mowing vineyard floor	2.00	times	15.54	12.23	0.00	27.77	7.93
Soil cultivation	2.00	times	15.54	12.15	0.00	27.69	7.91
Seeding winter cover crop in tilled rows	0.50	times	7.77	6.06	75.00	88.83	25.38
Rodent and bird control	6.30	hours	156.25	0.00	20.00	176.25	50.36
Irrigation	3.60	hours	89.29	40.00	0.00	129.29	36.94
Picking buckets	100.00	count	0.00	0.90	0.00	0.90	0.26
Bin trailer, rental	30.00	days	0.00	0.00	12.00	12.00	3.43
Harvesting costs for tractor and front-end loader	3.50	tons	1,824.07	413.58	0.00	2,237.65	639.33
Truck harvest freight, lease	1.00	x/ton	0.00	210.00	0.00	210.00	60.00
Oregon Wine Board assessment	1.00	x/ton	0.00	0.00	43.75	43.75	12.50
ATV	1.00	count	0.00	6.97	0.00	6.97	1.99
Shop and machine shed	1.00	count	0.00	0.00	23.19	23.19	6.63
Miscellaneous and overhead	1.00	count	0.00	0.00	800.00	800.00	228.57
Interest: operating capital	6.00	months	0.00	0.00	164.50	164.50	47.00
Total **variable** costs			6,762.84	1,040.71	1,760.73	9,564.28	2,732.65
FIXED CASH COSTS					**Unit**	**Total**	**Cost/ton**
ATV insurance					acre	5.99	1.71
Water assessment					acre	0.00	0.00
Property insurance					acre	43.75	12.50
Property taxes					acre	52.50	15.00
Total **fixed cash** costs						102.24	29.21
FIXED NON-CASH COSTS					**Unit**	**Total**	**Cost/ton**
Machinery and equipment - insurance, depreciation & interest					acre	704.00	201.14
ATV - depreciation & interest					acre	15.53	4.44
Foreman housing					acre	0.00	0.00
Shop and machine shed - depreciation & interest					acre	81.67	23.33
Land interest					acre	2,100.00	600.00
Amortized establishment costs					acre	2,354.99	672.85
Total **fixed non-cash** costs						5,256.19	1,501.77
Total **fixed** costs						5,358.43	1,530.98
Total of all costs per acre						**$14,922.71**	**$4,263.63**
Net projected returns						**-$2,639.20**	**-$754.06**