

Sample Establishment and Production Costs and Profitability Analysis for Wine Grapes
Temecula, Riverside, CA 2002

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SECTION I

Background

The wine grape industry in Riverside County constitutes a small but stable acreage of about 2,100 acres in the 1990s. Figure 1 presents the historical wine grape acreage trends in Riverside County from 1975 to 2000. The main wine grape production area is around the Temecula area where it constitutes about 80% of the county's bearing acreage.

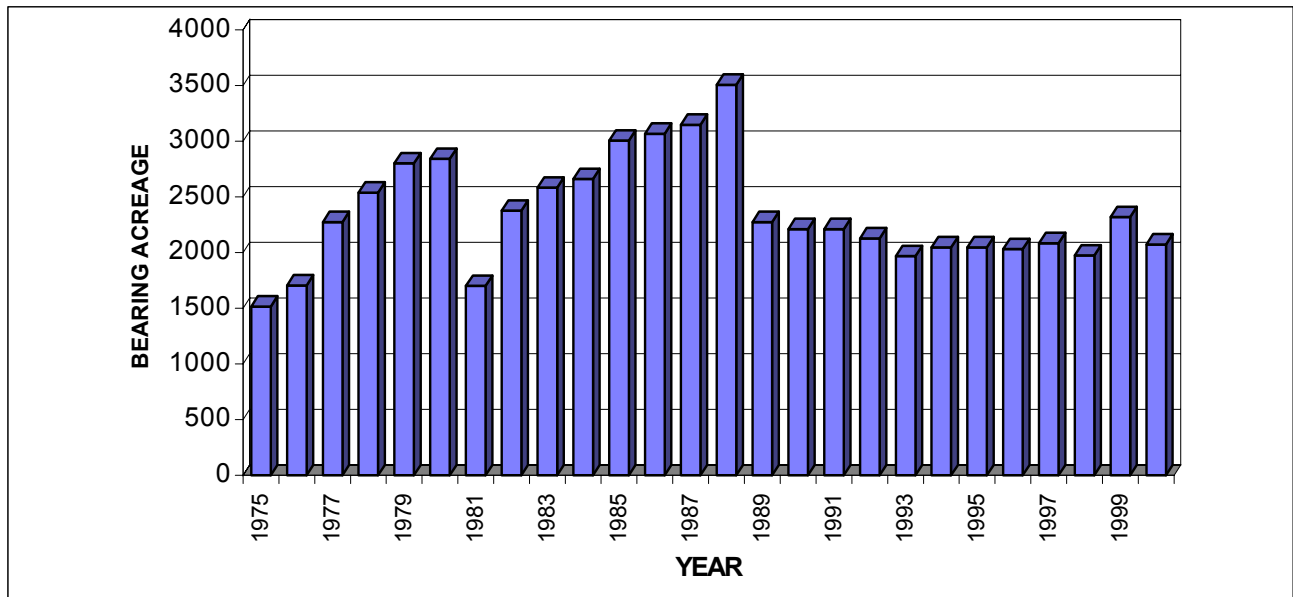


Figure 1. Wine Grape Bearing Acreage in Riverside County, 1975-2000

Source: 1975-2000 Agricultural Crop Report, County of Riverside, Protection and Service, Agricultural Commissioner, Weights and Measures.

In recent years the grape industry in Temecula Valley has experienced an epidemic of Pierce's disease, a malady caused by *Xylella fastidiosa*, a bacterium transmitted by the Glassy Winged Sharp Shooter (*Homalodisca coagulata*). Several vineyards were removed from production due to infection and are now being replanted. New methods and practices such as narrow space plantings and new trellising systems are being incorporated to improve the quality of wine grapes and to increase efficacy of fungicide and pesticide applications. This study provides economic analyses as a basis for growers to evaluate the profitability and future prospects of their investment using these new methods/systems of establishment and production practices of wine grapes in Temecula, Riverside County. The study includes:

- ◆ Estimates and analyses of establishment and production costs
- ◆ Analyses of profitability

Data on production practices and costs for this study was collected from growers, management companies, and dealers primarily through personal and telephone interviews conducted in February of 2002. *The authors wish to express their appreciation to those growers and other cooperators who provided data and review in the development of this study*

SECTION II

ASSUMPTIONS OF ESTABLISHMENT AND PRODUCTION PRACTICES

To simplify information, trade names of some products have been used in this report. No endorsement of named products is intended, nor criticism implied of similar products that are not mentioned.

The study is based on current practices of wine grape production in Temecula, Riverside County. While the practices outlined in this study may not fit all situations, they represent current trends of production. The cost development and analysis methodology can also be easily adapted to address individual situations to evaluate investment needs and profits, not only in Temecula, Riverside County but also in other production areas throughout California. When practices deviate from those given in this publication, growers can enter and substitute their own costs for comparison with this study.

Following is a discussion of the assumptions and calculation methods we used in this study. Cultural practices and cost data are presented in detail in several tables in the Appendix. *Please note that because of rounding, the totals given in the tables may differ slightly from the sums of the components.*

1. ORCHARD SPECIFICATIONS

We used a vineyard size of 20 acres as a basis for evaluating investment and production costs. Appendix Table A provides the machinery complement we developed for an owner-operated vineyard. Please also note that vineyards of this size are mostly operated by management companies in which case machinery costs are included as part of operation charges.

Major grape varieties in Temecula Valley for white wine include Chardonnay and Sauvignon Blanc and for red wine Cabernet Sauvignon, Merlot, and Zinfandel.

Cultural practices were considered common to all varieties; however, we encourage growers to make adjustments for variety differences where they exist. For instance, yield differences will lead to differences in harvesting costs. Also varieties may differ in pruning requirements and costs.

2. ESTABLISHMENT AND PRODUCTION PRACTICES

Land Preparation for Orchard Establishment. Land preparation begins with grading and ripping. Most growers or management companies hire contractors to have these operations done. Costs are estimated at \$1,300 per acre.

Survey and Mark. The ground is surveyed using about 15 wooden stakes per acre. Then plastic knives are used to mark the points where the vines will be planted.

Trellis System. The trellis system is designed to support a vertical bilateral cordon system. Steel end posts are installed at the end of each row. Then steel line posts are put along side one-thirds of the vine plants and training stakes are used along side the remainder two-thirds of the vine plants. These posts are used to spread and support the six to seven wires (a cordon wire at the bottom, followed by a drip wire and four to five catch wires) needed to

train the vine cordons. The cordon and drip wires approximately 12 and 14 gauge thick, respectively are installed during the first year. The catch wires, which are approximately 13 gauges thick, are installed in the second year.

Planting. Selections of vine varieties are based on resistance to nematodes and *Phylloxera* as well as suitability to soil conditions. Vines are planted in early spring of the first year. We used a price of \$4.00/plant in this study, which is the most common price obtained from our producers interview. Vine costs range from \$3.50/plant to 5.00/plant.

Planting spaces vary depending on location and topography of field. In Temecula, planting spaces of 9' x 6' and 10' x 6' are common. We based this study on 9' x 6' spacing (806 plants/acre).

Weed Management. Weed management includes both spraying and mowing several times usually from March through June every year.

Fertilization. Nitrogen and potassium fertilizers are applied through three or more times a year depending on need of the vineyard through the drip irrigation. Beginning year three, foliar or micro nutrient fertilizers are sprayed three to six times, in spring and fall. Fertilizer costs in this study include the average of several growers.

Pest and Disease Management. Pest and disease management include controls for gophers, squirrel, GWSS and Pierce's disease. Disease control also involves treatments for powdery mildew. In any year, multiple applications may be needed for both pest and disease control. Weather conditions determine the type of material, the frequency and number of times of applications.

Other pests and diseases may be present in the orchard. Information and pesticide use permits are available from the county Agricultural Commissioner's office. Pest management information is also available from the University of California Statewide Integrated Pest Management Project website, <http://www.ipm.ucdavis.edu/PMG/selectnewpest.grapes.html>.

Training, Tying and Suckering. Training, tying and suckering operations are done in the first year after the shoots extend beyond the top of the grow tubes and also in the second year of establishment. The operations involve directing, tying and suckering selected shoots along the cordon wire in three passes. The tying operation continues through out the life of the orchard. It involves checking and retying as well as replacing the green or tying tapes where necessary.

Pruning and Shoot Thinning. These operations are done annually beginning year 3 of the vine establishment. During establishment pruning involves only trimming and shaving the cordon extensions to the appropriate girth and selecting spur positions on the original cordons.

Irrigation. A drip irrigation system, which includes, drippers/emitters (two per plant), irrigation lines, valves, flow meters, controller, and miscellaneous fittings is installed before planting in year 1.

The frequency and amount of water use depends on weather and rainfall. In some years irrigation is needed every month of the year, and in other years irrigation may not be required for more than four to five months. In this study we assumed irrigation taking place two times per week from April through June and three times a week from July through September. The amount of water use in acre-feet includes 0.50 in the first year, 1 in the second year, 1.50 in the third year and 2 thereafter. Also deficit irrigation is being practiced to improve grape quality in which case the amount and the cost of water would be lower.

Water costs vary, depending on location. We used a charge for the most typical situation of a medium-sloped vineyard of \$360/acre-foot. Water is purchased from the local irrigation district.

Labor cost to inspect the irrigation system for water flows and to fix any problems such as leaks or emitter clogging caused by squirrels, insects, chemical precipitation etc. is estimated to take 30 minutes per 10 acres per irrigation.

3. HARVEST COSTS

Harvest begins in year three and is mostly done in late summer. Harvesting costs for this study include picking and hauling to local buyers. The costs are \$110/ton for picking and \$15/ton for hauling.

4. INTEREST ON OPERATING CAPITAL

We calculated interest on operating capital at a nominal rate of 9% per year. This rate is a three-year average (1999 to 2001) collected from some local banks. Interest on operating capital reflects the costs of borrowing or an opportunity cost for using non-borrowed money.

5. LABOR

Both owner and hired labor are estimated at hourly rates (including benefits) of \$9.50 for manual work and \$12 for operating machines.

7. EQUIPMENT OPERATING CASH COSTS

Equipment operating cash costs including fuel, lubrication, and repairs are calculated using formulas and coefficients developed by the American Society of Agricultural Engineers (ASAE). Repair costs are based on purchase price, annual hours of use, total hours of life, and repair coefficients formulated by the ASAE. Fuel and lubrication costs are also determined by ASAE equations based on machinery horsepower (maximum PTO hp) and type of fuel used.

8. CASH OVERHEAD

Property taxes. Property taxes in this study are calculated at 1%, the same as the base rate that most counties assess on land, equipment, buildings, and improvements. Special

assessment districts in some counties may have additional taxes on property.

Property insurance. Growers also carry insurance for property protection, which is typically calculated at 0.66 percent of the average value of assets. In addition, a 20 acres vineyard would carry a liability insurance of \$409 per year to cover accidents on the entire farm.

Sanitation Costs: Sanitation facilities are rented year round. Usually one system could serve several acres.

Office expenses. Expenses in this category include office supplies, telephone services, operating costs for office equipment such as fax machines, photocopiers and computers as well as bookkeeping, accounting, legal fees, and so on. The overall office expense is estimated at \$120 per acre

Investment repairs. Investment repairs and maintenances are calculated at 1 to 3.5 percent of the investment values as suggested in some farm management books.

Interest on establishment. Interest on establishment is calculated to reflect the accruing of charges on loans or returns forgone for resources used during the establishment years.

9. NON-CASH OVERHEAD COSTS

This category includes land rent and ownership (fixed) costs of farm equipment and investments such as buildings, tools, fuel tanks and pumps, irrigation systems, and amortized tree establishment costs.

Land rent. Recent cases of vineyard developments in Temecula are on previous vineyard ground. Therefore outstanding loans on the land may not exist. However, we place an opportunity cost for the use of land in wine grape production to show that the land or its value could have been used in other return (interest) yielding alternatives. The land rent is to reflect the return foregone from those alternatives.

Land rent is estimated at 6.5% (California's long-term rate of return on agricultural production assets from current income) of the value of open land. The idea is that the use of land should at least earn this rate. Growers indicated that open land values for vineyard vary tremendously but on average approximate \$15,000/acre. Growers should pay particular attention to the value of land when evaluating profitability.

The total land used in this study is 20 acres; 19 planted and one acre used to build roads and farmstead.

Ownership costs of farm equipment and investments. These costs are calculated using the capital recovery method. This method allows growers to calculate an annual amount of money to charge the enterprise so that the value of assets will be recovered within a specified period of time at a designated interest rate. The formula to calculate capital recovery is as follows:

$$[(Purchase\ Price - Salvage\ Value) \times (Capital\ Recovery\ Factor)] + [(Salvage\ Value) \times (Interest\ Rate)]$$

The various parts of the capital recovery calculation include a 10% salvage value and a capital recovery factor calculated at 6.5% interest rate-- (California's long-term rate of return of agricultural production assets from current income) and the number of years service of equipments and investments. Because farms use a mix of old and new equipment, we estimated the values at 60% of the current year's (2002) prices.

Amortized tree establishment cost. This is the annual capital recovery of the accumulated tree establishment costs. It is calculated by amortizing the net establishment costs (income-costs) at the 6.5% (California's long-term rate of return of agricultural production assets from current income) interest rate over a 27 years productive life.

YIELD AND PRICES

Yield. Yield estimates include 2.5 tons per acre in the third year of establishment and an average of 6 tons per acre (~15 lbs/vine) in production years. However, for those growers whose yield may differ from our assumption, we analyzed returns and profitability using other scenarios (Table 3).

Prices. We used the county five-year (1997-2001) weighted average price of \$1,025/ton for Chardonnay, Cabernet Sauvignon, and Merlot varieties as a basis to estimate returns. Also, we analyzed the impact on returns and profits of a range of prices (Table 3).

SUMMARY OF ESTABLISHMENT AND PRODUCTION COSTS

Based on our assumptions of cultural practices and methods of analyses, vineyard establishment in Temecula, Riverside is estimated to cost \$21,356/acre: \$12,248/acre in the first year, \$5,195/acre in the second year, and \$3,912/acre in the third year (Tables 1 and 2). The detail cultural practices and costs for each of the establishment and the production year are presented in Appendix Tables A to L.

The annual production cost is estimated at \$7,645/acre (Tables 1 and 2). The pie graph below shows the breakdown of costs which includes 37% for operating cultural cash costs, 10% for harvesting costs using the 6 tons yield assumption constitute, 2% for interest on operating capital, 10% for cash overhead, and 41% for non-cash overhead.

Table 1. Costs per Acre for Establishment and Production of Wine Grapes
by Production Practices
Temecula, Riverside County, 2002

	Year 1	Year 2	Year 3	Production Year
I. OPERATING (CASH) COSTS (Materials, Labor, Fuel, Lube, & Repair)				
A. Cultural Costs (preharvest)				
Grade & Rip	1,300			
Survey & Mark	266			
Trellis System Installation	2,618	410		
Plant Vine	4,410	389		
Pest & Disease Control	255	255	303	303
Train & Tie & Sucker	398	398	143	143
Shoot Thin			510	510
Prune			319	447
Fertilize	30	30	228	228
Weed Control	19	19	19	14
Cover Crop	105	105	105	105
Irrigate	212	392	572	752
B. Machinery Costs (Fuel, Lube, & Repair)	176	133	294	294
C. Harvest Costs			283	783
TOTAL OPERATING COSTS	9,789	2,130	2,776	3,579
II. CASH OVERHEAD COSTS				
Office Expenses	120	120	120	120
Taxes & Insurance	198	284	330	528
Liability Insurance	20	20	20	20
Investment Repair	62	62	62	62
Interest on Establishment	0	1,102	1,570	0
TOTAL CASH OVERHEAD COSTS	400	1,589	2,102	730
Interest on Operating Capital and Cash Overhead	682	128	128	167
TOTAL CASH COSTS	10,871	3,847	5,007	4,476
LESS INCOME FROM PRODUCTION	0	0	-2,563	-6,150
NET CASH COSTS FOR THE YEAR	10,871	3,847	2,444	-1,674
ACCUMULATED NET CASH COSTS	10,871	14,717	17,162	
III. NON-CASH OVERHEAD COSTS (Depreciation & Interest)				
Land Rent	1,027	1,027	1,027	1,027
Building	23	23	23	23
Tools	6	6	6	6
Fuel Tanks & Pumps	7	7	7	7
Sanitation Costs	6	6	6	6
Drip Irrigation	169	169	169	169
Depr. & Interest	140	112	232	232
Amortized Tree Establishment Cost	0	0	0	1,700
TOTAL NON-CASH OVERHEAD COSTS	1,377	1,349	1,468	3,168
TOTAL COSTS FOR THE YEAR	12,248	5,195	6,475	7,645
TOTAL NET COSTS FOR THE YEAR	12,248	5,195	3,912	1,495
ACCUMULATED NET COSTS	12,248	17,443	21,356	

Table 2. Costs per Acre for Establishment and Production of Wine Grapes
(by Custom, Material, & Labor Costs)
Temecula, Riverside County, 2002

	Year 1	Year 2	Year 3	Production Year
I. OPERATING (CASH) COSTS (Materials, Labor, Fuel, Lube, & Repair)				
A. Cultural Costs (preharvest)				
Custom:				
Grade & Rip	1,300			
Material:				
Survey & Mark	114			
Trellis System	2,005	153		
Plant Vine	3,748	322		
Pest & Disease Control	193	193	241	241
Train & Tie & Sucker	15	15	15	15
Shoot Thin				
Prune				
Fertilize	30	30	228	228
Weed Control	19	19	19	14
Cover Crop	105	105	105	105
Irrigate	180	360	540	720
Material Costs Total:	6,409	1,197	1,147	1,323
Labor:				
Survey & Mark	152			
Trellis System Installation	613	257		
Plant Vine	662	66		
Pest & Disease Control	63	63	63	63
Train & Tie & Sucker	383	383	128	128
Shoot Thin			510	510
Prune			319	447
Fertilize				
Weed Control				
Cover Crop				
Irrigate	32	32	32	32
Labor Costs Total:	1,904	800	1,052	1,179
B. Machinery Costs (Fuel, Lube, & Repair)	176	133	294	294
C. Harvest Costs			283	783
TOTAL OPERATING COSTS	9,789	2,130	2,776	3,579
II. CASH OVERHEAD COSTS				
Office Expenses	120	120	120	120
Taxes & Insurance	198	284	330	528
Liability Insurance	20	20	20	20
Investment Repair	62	62	62	62
Interest on Establishment	0	1,102	1,570	0
TOTAL CASH OVERHEAD COSTS	400	1,589	2,102	730
Interest on Operating Capital and Cash Overhead	682	128	128	167
TOTAL CASH COSTS	10,871	3,847	5,007	4,476
LESS INCOME FROM PRODUCTION	0	0	-2,563	-6,150
NET CASH COSTS FOR THE YEAR	10,871	3,847	2,444	-1,674
ACCUMULATED NET CASH COSTS	10,871	14,717	17,162	0

Table 2. Contd.				
	Year 1	Year 2	Year 3	Production Year
III. NON-CASH OVERHEAD COSTS (Depreciation & Interest)				
Land Rent	1,027	1,027	1,027	1,027
Building	23	23	23	23
Tools	6	6	6	6
Fuel Tanks & Pumps	7	7	7	7
Sanitation Costs	6	6	6	6
Drip Irrigation	169	169	169	169
Depr. & Interest	140	112	232	232
Amortized Tree Establishment Cost	0	0	0	1,700
TOTAL NON-CASH OVERHEAD COSTS	1,377	1,349	1,468	3,168
TOTAL COSTS FOR THE YEAR	12,248	5,195	6,475	7,645
TOTAL NET COSTS FOR THE YEAR	12,248	5,195	3,912	1,495
ACCUMULATED NET COSTS	12,248	17,443	21,356	0

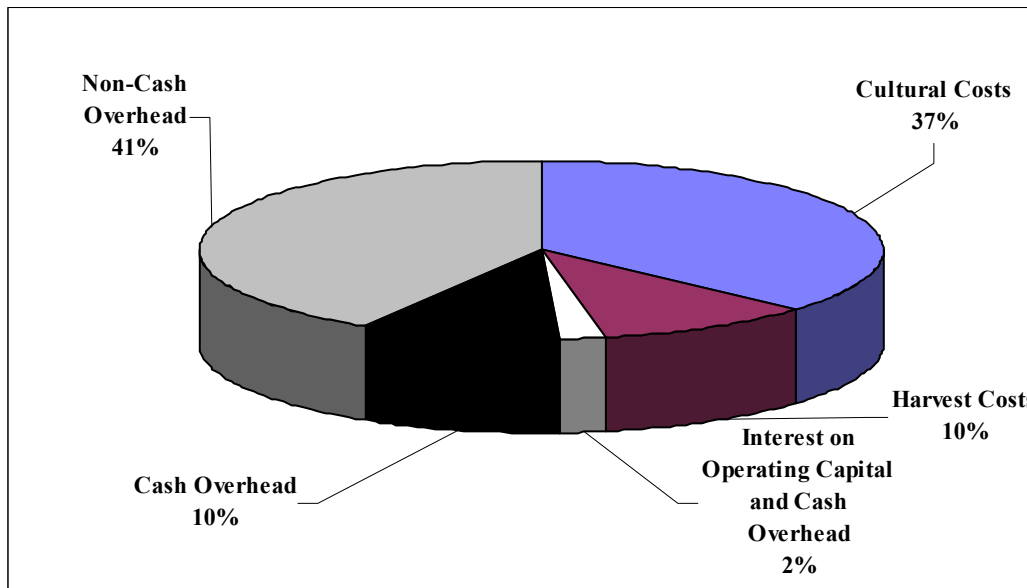


Figure 2. Proportion of Wine Grape Production Costs Temecula, California, 2002 (based on 20-acre Vineyard)

SECTION III

Profitability Analysis

Profitability is analyzed by calculating costs per unit/breakeven prices as well as gross and economic margins at various yield and prices (Table 3).

Table 3. Profitability Analyses: Range Analyses
 Costs Per Ton, Gross Margins and Returns to Management
 Temecula, Riverside County, 2002

Yield/Acre	4	5	6	7	8
Part A. Costs per acre and per ton at varying yields					
Operating costs/acre:					
Cultural Costs	2,796	2,796	2,796	2,796	2,796
Harvesting Costs	533	658	783	908	1,033
TOTAL OPERATING COSTS/ACRE	3,329	3,454	3,579	3,704	3,829
TOTAL OPERATING COSTS/TON	832	691	597	529	479
CASH OVERHEAD COSTS/ACRE	730	730	730	730	730
Interest on Operating Capital and Cash Overhead					
	163	165	167	169	171
TOTAL CASH COSTS/ACRE	4,222	4,349	4,476	4,603	4,730
TOTAL CASH COSTS/TON	1,056	870	746	658	591
NON-CASH OVERHEAD COSTS/ACRE	3,168	3,168	3,168	3,168	3,168
TOTAL COSTS/ACRE	7,391	7,517	7,645	7,771	7,898
TOTAL COSTS/TON	1,848	1,503	1,274	1,110	987
Part B. Returns per acre above all cash costs (gross margin)					
Price (\$/ton):					
800	-1,022	-349	324	997	1,670
900	-622	151	924	1,697	2,470
1,000	-222	651	1,524	2,397	3,270
1,025	-122	776	1,674	2,572	3,470
1,100	178	1,151	2,124	3,097	4,070
1,200	578	1,651	2,724	3,797	4,870
1,300	978	2,151	3,324	4,497	5,670
Part C. Returns per acre above total costs (returns to management)					
Price (\$/ton):					
800	-4,191	-3,517	-2,845	-2,171	-1,498
900	-3,791	-3,017	-2,245	-1,471	-698
1,000	-3,391	-2,517	-1,645	-771	102
1,025	-3,291	-2,392	-1,495	-596	302
1,100	-2,991	-2,017	-1,045	-71	902
1,200	-2,591	-1,517	-445	629	1,702
1,300	-2,191	-1,017	155	1,329	2,502

Breakeven costs allow growers to compare the unit cost of production with expected market prices. It is calculated as the cost of production per acre divided by yield per acre. Gross margin is returns above cash costs. It approximates the returns to management and investment. It is what growers often refer to as *profit* if there are no capital debts. Deduct depreciation it also approximates taxable income. Gross margin is calculated as gross returns (price times yield) minus cash costs of production.

Economic profit is returns above total costs of production including management. It is a very useful measure of how attractive the enterprise is for potential investors and entrants into the business. Economic profit can be positive or zero. A zero economic profit should not be alarming if all costs, including the owners' labor and management fees, are included in the production cost. In this study we do not include management charges, so the returns after all costs are deducted reflects returns to management. Returns to management are calculated as gross returns minus cash and non-cash costs of production.

Cash costs/ton are lower than the average price of \$1,025/ton for yield level above 4 tons/acre (Table 3 Part A). Similarly, at the average price of \$1,025/ton, gross margins would be positive for yield level above 4 tons/acre (Table 3 part B), but positive returns to management would be attained at above 7.5 tons/acre (Table 3 Part C). Cash costs/ton at other yield levels as well as gross margins and returns to management at various combinations of yield and prices are presented in the range analyses for growers to find figures that best match their specific situations.

Summary and Conclusion

Temecula Valley is the major wine grape production in Riverside County. Currently the region has experienced a severe Pierce's disease epidemic vectored by the GWSS. Several vineyards were pulled out but are now being replanted applying new cultural and management methods. The new practices include narrower space planting, changes in trellis system maintenance, pruning and shoot thinning.

This study provides cost estimates based on current establishment and production practices for growers to use (i) as a guide to evaluate the profitability and future prospects of their investment and (ii) as a tool for financial and business transactions. Also, growers can modify these costs and analyses to fit their specific situations.

The vineyard of our assumption costs \$21,356/acre to establish and \$7,645/acre/year to produce wine grapes. Gross margins (returns above variable costs) would be positive for yield above 4 tons/acre at the county average price of \$1,025/ton, but would require above 7.5 tons/acre to attain positive returns to management. Positive returns to management can also be attained at higher prices and lower yield or some combination as shown in our range analyses. Growers to maximize their returns must understand the relationship of prices and productivity in wine grape production and must watch both the quality and quantity of their production. We suggest that growers and buyers talk with each other to establish expectations regarding quality standards, crop volume and prices.

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