
UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

2003

SAMPLE COSTS
TO ESTABLISH A VINEYARD AND PRODUCE
WINE GRAPES

Cabernet Sauvignon



NORTH COAST REGION
NAPA COUNTY

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Acknowledgment. Appreciation is expressed to the Napa Valley Grape Growers Association and Napa County Farm Bureau members who provided time and input for this study. Thank you to the staff at the Napa Valley Grape Growers Association, Sandy Elles and Jennifer Kopp, for coordinating the data collection and providing facilities for the meetings.

INTRODUCTION

Sample costs to establish a vineyard and produce wine grapes under drip irrigation in the North Coast Region, Napa County are presented in this study. This study is intended as a guide only, and can be used to make production decisions, determine potential returns, prepare budgets and evaluate production loans. Practices described are based on production practices considered typical for the crop and area, but these same practices will not apply to every situation. The sample costs for labor, materials, equipment and custom services are based on current figures. A blank column, “*Your Costs*”, in Tables 2 and 3 is provided for entering your farming costs.

The hypothetical farm operation, production practices, overhead, and calculations are described under the assumptions. For additional information or an explanation of the calculations used in the study call the Department of Agricultural and Resource Economics, University of California, Davis, (530) 752-3589 or your local UC Cooperative Extension office.

Sample Cost of Production Studies for many commodities are available and can be requested through the Department of Agricultural and Resource Economics, UC Davis. Current studies can be downloaded from the department website at <http://coststudies.ucdavis.edu> or obtained from selected county UC Cooperative Extension offices.

ASSUMPTIONS

The assumptions refer to Tables 1 to 8 and pertain to sample costs to establish a vineyard and produce wine grapes in the North Coast – Napa County or Napa Valley Appellation. Within the Napa Valley Appellation are 13 subappellations. For district location and other related information see the websites www.napavintners.com and www.napagrowers.org. The cultural practices shown represent operations and materials considered typical in a well-managed vineyard in the region. The costs, materials, and practices shown in this study will not be applicable to all situations. Establishment and cultural practices vary by grower and the differences can be significant. *The trade names and cultural practices shown in this report do not constitute an endorsement or recommendation by the University of California nor is any criticism implied by omission of similar products or practices.*

Farm. The hypothetical farm, located on land with a 10% slope, is owned and operated by the grower. The 35 contiguous acre farm consists of 30 acres on which wine grapes are being replanted, and five acres occupied by roads, irrigation systems, fencing, and farmstead. Management companies farm approximately 40% of the farms in the area (NVGGA). In this study we incorporated information from both farmer and management company operations to present a farm managed by the owner. Management companies will charge a fee for their services, but farms operated by management companies will not have an equipment inventory as shown in Table 6.

Establishment Operating Costs

The following practices refer to table 1.

Environmental Preparation. The Napa County Conservation, Development, and Planning Department administers regulations for planting and replanting vineyard sites that have a 5% or greater slope. Environmental regulations and costs will differ depending upon whether the vineyard is on the valley floor or on a slope including the degree of slope. The 10% slope in this study is designated as Level II or Track II. Prior to any site development, a permit must be obtained which ranges from \$800 to \$1,000. An Erosion Control Plan is required and for this study is estimated to cost \$7,500. No additional drainage is required for this site, but some sites may require subdrains with costs ranging from \$5,000 to \$10,000 per acre.

Vineyard Conversion and Site Preparation. The new vineyard is being planted on land that had an existing vineyard. The old grapevines are removed, stacked and burned. Rock removal may be required on some new plantings, but is not accounted for in this study. A company is hired to collect, crush and remove the old steel trellis components. A hand crew cleans and hauls miscellaneous debris left in the field using the grower's tractor and trailer. The field is ripped four to five feet deep in three passes - line of planting, crossways, diagonally. The field is again hand cleaned using the grower's tractor and trailer to remove debris pulled up from the ripping. A custom operator then disks the land in two directions and landplanes the site. Landplaning is assumed to be necessary on the site. Soil amendments (lime or gypsum and compost) are applied. A commercial company is hired to layout the field, mark/stake vine sites and irrigation lines. In the row middles, a cover crop (Bell bean, oat, vetch mix) is planted. The trellis system endposts and stakes are installed. All operations that prepare the vineyard for planting are done in the fall, beginning in the year prior to planting, but costs are shown in the first year.

Vines. Field-grown dormant benchgraft vines, Cabernet Sauvignon variety, are planted on a 7 X 4-foot spacing at 1,555 vines per acre. Vines will be trained to a bilateral cordon and spur pruned. Cordons are the horizontal branches, and spurs are the bearing units on the cordon. The grapevines are assumed to begin yielding fruit in three years and to produce for an additional 22 years.

Planting. Planting in this study occurs in mid-April and is done by hand. Holes are dug and the dormant vines are planted to the appropriate depth. The hole is filled with soil, and the vine is covered with a protective mound of soil. In June the plants are unmounted and an open topped carton is placed over the vine. In the following year an average of 2% or 13 vines per acre will be replanted.

Trellis System. The trellis is a vertical shoot positioning system (VSP). The system in this study utilizes 3-inch X 8-foot notched steel line posts spaced 16-feet apart (every 4th vine), with three training stakes (1/4-inch round tensile rod X 4-feet) at the vine locations in between. End posts are 3-7/8 inch X 10-foot steel tube (well casing) with a spade. No additional anchors are required. Seven permanent wires are secured to the end posts – 14-gauge fruit wire and 14 gauge drip wire, 2 pairs of 13 gauge canopy wires and a single canopy wire at the top. The system is considered as part of the vineyard since it will be removed when the vines are removed. Therefore it is included in the establishment cost. The trellis system is installed during the first 2 years as follows:

First Year. In the fall of the year prior to planting, end-posts and stakes are laid out by the grower and installed by a trellis company. The grower lays out the stakes and end-posts, using a tractor and trailer. Hauling the posts takes 2 men and 1 tractor driver approximately 0.83 hours per acre but uses a total of 2.5 man-hours per acre. The drip wire is installed after planting.

Second Year. Two pairs of canopy wires, a single canopy wire at the top and the fruit wire are installed

Drip System (Irrigation). Mainlines are laid out in the fall prior to trellis installation. After planting the drip line is attached to the drip wire on the trellis system and emitters are punched. Drip system labor is included in the total drip system costs. The system is considered part of the vineyard since it will be removed when the vines are removed; therefore it is included in the establishment costs.

Training/Pruning. Training and pruning establish the vine framework and these techniques will vary with variety and trellis system. In this study training includes pruning, tying, suckering, shoot positioning and thinning. The prunings are placed in between the vine rows and are chopped during the first discing.

First Year. The vines are allowed to grow freely the first year with no attempt at training. A good root system should develop this year to support vine training in the second year.

Second Year. In February the vines are pruned back to two buds. In June, the vines are suckered to one shoot. Vines are trained by tying one shoot to the post to become the main trunk. Later in the season this shoot is topped at or slightly below the cordon wire. Two lateral shoots are selected from the trunk as the bilateral cordons. Any remaining lower laterals are removed. In July and August, two passes are made to top the vines, remove extra shoots (suckering) and tie the canes loosely on the wire.

Third Year. In February, cordons are pruned back to the appropriate length as determined by girth. These canes are then tied trimly to the fruiting wire. Training vines in the third year includes extending the cordons along the permanent cordon wire and selecting spur positions. Suckering is done in May; shoot positioning in June and July. Crop thinning is done in June to remove about 50% of the crop from these young vines. Slower growing vines continue to be trained; however, year three is the last year that the vines are trained in this study. After the vines are trained, canopy management begins and includes suckering trunks and cordons, shoot positioning, and thinning.

Irrigation. Water is from wells and does not have a cost. Pumping costs from grower input ranged from \$30 to \$50 per acre. An average of \$40 per acre is used in this study. During the first and second year, irrigation is from late May to late September/early October, a total of 20 weeks, (2 irrigations per week at 2 gallons per vine per irrigation). In this study 4.58 acre-inches are applied and water is calculated to cost \$8.73 per acre-inch. No assumption is made about effective rainfall. In the third year five gallons per week (5.73 acre inches) at one irrigation per week is applied over a 20-week period. Water cost based on a pumping cost of \$40 per acre equals \$6.98 per acre-inch. Labor is calculated at .03 hours per acre per irrigation.

Frost Protection. A propane powered wind machine is installed in the summer of the second year for protection of the lower ten acres. The machine begins operation in the third year. It is assumed that the wind machine will run 50 hours per season.

Pest Management. The pesticides and rates mentioned in this cost study as well as other materials are listed in *UC Integrated Pest Management Guidelines, Grapes*, available at www.ipm.ucdavis.edu. Pesticides mentioned in the study are commonly used, but are not recommendations.

Insects. Leafhoppers are the most common insect pest in the North Coast. In Napa County, populations are usually below treatment thresholds. In this study, we assume that no insecticides are needed.

Diseases. Many pathogens attack grapevines, but the major disease assumed in this study is powdery mildew (*Uncinula necator*). Powdery mildew control begins in September of the second year with Flint fungicide applied by the grower. In the third year, wettable sulfur is applied in mid-April and mid-May, dusting sulfur once in May and twice in June, and Flint in July. All are applied by ground with the grower's equipment. A fungicide application may be made to pruning wounds in February for control of *Eutypa*, but is not included as a cost in this study.

Weeds. In late January/early February of the first year, prior to planting, Roundup is applied to the vine row (24-inch band) with an ATV and sprayer. In March the middles are mowed and in early May disked. In July or August, hand hoeing is done around the vines. In the second year, Roundup is applied as a strip spray in February prior to pruning: the middles (cover crop) are mowed in March, disked in May and October. In the third year, Roundup is applied as a strip spray with the ATV and sprayer in February, and the middles are mowed in March and May.

Cover Crop. After land preparation in the fall of the year prior to planting, an annual cover crop is planted in the vine middles, mowed in March of the following year, and then disked in May. In the fall of the first year, an annual cover crop (bell bean, oat, vetch) is planted and disked in May of the second year. In October of the second year a permanent cover crop is planted and allowed to reseed thereafter in the spring.

Fertilization. Beginning in the first year, an NPK fertilizer, 8-8-8, is applied in equal amounts through the drip line in June, July, and September. A total of five gallons or 51 pounds of material per acre is applied. In the third year, the fertilizer is applied in May and in September after harvest.

Erosion Control. Farms located on a slope must implement an erosion control plan. In this study the grower uses silt fencing and straw around the field perimeter. The erosion control cost is a typical value over years as suggested by participating growers. The cost includes the reusable silt fencing, additional straw if necessary and labor for winter maintenance and checking the system, especially during rainfall periods.

Harvesting. Harvesting starts in the third year. In this study the crop is hand harvested. Labor contractors charge \$250 per ton for young vineyards. See Harvest in production section for operation explanations.

Yield. Average yields in the third year are assumed to be one ton per acre.

Production Cultural Practices and Material Inputs

Refers to tables 2 - 8

Pruning. Pruning is done during the winter months, February in this study. The prunings are placed in the vine centers and chopped during the first mowing. Winter tying, where cordons are tied to the cordon wire with twine at the trunk and at each end of the cordons is done in March. Pruning costs in this study are based on an hourly rate, although much of the pruning in the region may be done by piecework.

Canopy Management. Canopy management begins with trunk and cordon suckering in April. A second suckering pass in May also includes shoot thinning and positioning. Passes in June and July are made for leaf removal, lateral removal, and wire lifting. Crop thinning and vine/cane trimming are done in separate passes in July. Shoot removal is the operation whereby weak shoots, which lack vigor and do not originate from the fruiting spur buds, are removed. In early June after fruit set, some basal leaves are removed in and around the fruit zone to allow for exposure and better air movement. Positioning and thinning shoots allows vines space to develop good fruit clusters, and opens the canopy to allow greater air movement through the vines and around the clusters. Canopy management varies among growers.

Irrigation. Water is from wells and does not have a cost. Pumping costs from grower input ranged from \$30 to \$50 per acre. In this study 5.73 acre-inches are applied and water is calculated to cost \$6.98 per acre-inch based on the \$40 grower average for pumping cost. Once per week over 20 weeks, water at five gallons per vine is applied from late May to September/early October. Irrigation labor is calculated at 0.10 hours per acre per irrigation. No assumption is made about effective rainfall.

Frost Protection. It is assumed in this study, that the wind machine will run 50 hours per season. The machine provides frost protection for the lower 10 acres.

Fertilization. An NPK fertilizer, 8-8-8, at 51 pounds per acre is applied through the irrigation system equally in May and in September after harvest.

Pest Management. The pesticides and rates mentioned in this cost study are listed in *UC Integrated Pest Management Guidelines, Grapes*. **Pesticides mentioned in the study are not recommendations, but those commonly used in the region.** For information on other pesticides available, pest identification, monitoring, and management visit the UC IPM website at www.ipm.ucdavis.edu. For additional information and pesticide use permits, contact the local county Agricultural Commissioner's office.

Pest Control Adviser. Written recommendations are required for many pesticides commercially applied and are made by licensed pest control advisors (PCA's). In addition the PCA will monitor the field for pests and nutrition. Growers may hire private PCA's or receive the service as part of a service agreement with an agricultural chemical and fertilizer company. Management companies may have their own PCA.

Insects. Leafhoppers are the most common insect pest in the North Coast. In Napa County, populations are usually below treatment thresholds. In this study, we assume that no insecticides are needed.

Diseases. Powdery mildew treatments begin in mid-April with two wettable sulfur applications during April and one application in May. Sulfur dust is applied three times in May and three times in June. An application of Flint is made in July. All applications are made with the grower's equipment. Wettable sulfur and Flint are applied to every row and sulfur dust at full rate to alternate rows.

Weeds. In this vineyard, vine row weeds are controlled with Roundup applied as a strip spray (28.6% of the acreage) in February and again in July. A permanent cover crop is planted in the row middles and is described under cover crop.

Cover Crop. In October of the second year a permanent cover crop is planted and allowed to reseed in the spring. The crop is mowed once in March and again in May after seed formation. The cover crop is dried down by late spring/early summer.

Erosion Control. Farms located on a slope must implement an erosion control plan. In this study the grower uses silt fencing and straw around the field perimeter. The erosion control cost is a typical value over years as suggested by participating growers. The cost includes the reusable silt fencing, additional straw if necessary and labor for winter maintenance and checking the system, especially during rainfall periods.

Harvest. The crop is hand picked by a labor contractor. In normal producing vineyards (4-5 tons), contractors may charge \$120 to \$150 per ton. Charges may be lower or higher due to yield, trellis system, and ground terrain. To determine number of pickers for harvest, an industry assumption is one-ton per day per picker, assuming an eight-hour day. Bin handling includes use of the grower owned tractor and three bin trailers with one-half ton bins, two tractors rented and a forklift rented each for two-weeks. The grapes are handpicked

into the bins, loaded on the grower owned flatbed truck and delivered to the winery. The truck holds 16 bins and takes one hour per roundtrip delivery.

Yields. Yield maturity is reached in the fifth or sixth year. An assumed yield of 5 tons per acre is used to calculate returns in the production years. Typical yield range for Cabernet Sauvignon in Napa County is 3.5 to 6.5 tons per acre.

Returns. A price of a \$3,638 per ton for Cabernet Sauvignon wine grapes is used in this study. The price is an average of the 1999 to 2002 weighted average grower returns as reported in Table 6 each year in the Final Grape Crush Report. Net returns at different yields and prices are shown in Table 5.

Assessments. The Napa Grape Growers Association, a voluntary organization, charges membership dues of \$10 per net acre planted, bearing and non-bearing, with a minimum annual fee of \$150 per member per year and a maximum annual fee of \$1,800. The organization's purpose is to "uphold the reputation of this valley as one of the premium winegrape growing regions in the world." The assessment is not included as a cost in this study. Other assessments not included are for Pierce's Diseases and glass-winged sharpshooter control programs in which growers are assessed \$2 per \$1,000 crop returns by the state, and approximately (assessment varies each year) \$4 per acre by the county, and a Napa County farmworker housing assessment of \$8 per acre.

Pickup/ATV. The grower uses the pickup for business and personal use. The assumed business use for the pickup is 4,500 miles per year for the ranch. In addition to spot spraying for weed control, the All Terrain Vehicle (ATV) is used on the ranch for checking the vineyard and irrigating.

Labor. Labor rates of \$18.23 per hour for machine operators and \$13.50 for general labor includes payroll overhead of 35%. The basic hourly wages are \$13.50 for machine operators and \$10.00 for general labor. The overhead includes the employers' share of federal and California state payroll taxes, workers' compensation insurance for vineyards (code 0040), and a percentage for other possible benefits. Workers' compensation insurance costs will vary among growers, but for this study the cost is based upon the average industry final rate as of January 1, 2003 (California Department of Insurance). Labor for operations involving machinery are 20% higher than the operation time given in Table 1 and 4 to account for the extra labor involved in equipment set up, moving, maintenance, work breaks, and field repair.

Equipment Operating Costs. Repair costs are based on purchase price, annual hours of use, total hours of life, and repair coefficients formulated by American Society of Agricultural Engineers (ASAE). Fuel and lubrication costs are also determined by ASAE equations based on maximum Power Take Off (PTO) horsepower, and fuel type. Prices for on-farm delivery of diesel and gasoline are \$1.11 and \$1.58 per gallon, respectively. The cost includes a 2.25% sales tax (effective September 2001) on diesel fuel and 7.25% sales tax on gasoline. Gasoline also includes federal and state excise tax, which can be refunded for on-farm use when filing your income tax. The fuel, lube, and repair cost per acre for each operation in Table 2 is determined by multiplying the total hourly operating cost in Table 7 for each piece of equipment used for the selected operation by the hours per acre. Tractor time is 10% higher than implement time for a given operation to account for setup, travel and down time.

Interest On Operating Capital. Interest on operating capital is based on cash operating costs and is calculated monthly until harvest at a nominal rate of 7.14% per year. A nominal interest rate is the typical market cost of borrowed funds. The interest cost of post harvest operations is discounted back to the last harvest month using a negative interest charge.

Risk. The risks associated with crop production should not be minimized. While this study makes every effort to model a production system based on typical, real world practices, it cannot fully represent financial, agronomic and market risks, which affect profitability and economic viability. Growers may purchase Federal crop insurance to reduce the production risk associated with specific natural hazards. Insurance policies vary and range from a basic catastrophic loss policy to one that insures losses for up to 75% of a crop. Insurance costs will depend on the type and level of coverage.

Cash Overhead

Cash overhead consists of various cash expenses paid out during the year that are assigned to the whole farm and not to a particular operation. These costs include property taxes, interest on operating capital, office expense, liability and property insurance, sanitation services, equipment repairs, and management.

Property Taxes. Counties charge a base property tax rate of 1% on the assessed value of the property. In some counties special assessment districts exist and charge additional taxes on property including equipment, buildings, and improvements. For this study, county taxes are calculated as 1% of the average value of the property. Average value equals new cost plus salvage value divided by 2 on a per acre basis.

Insurance. Insurance for farm investments varies depending on the assets included and the amount of coverage. Property insurance provides coverage for property loss and is charged at 0.676% of the average value of the assets over their useful life. Liability insurance covers accidents on the farm and costs \$516 for the entire farm.

Sanitation Services. Sanitation services provide portable toilets for the vineyard and cost the farm \$1,090 annually. The cost includes one double toilet unit with washbasins, delivery and pickup, and five months of weekly servicing. Costs also include soap or other suitable cleansing agent, and single use towels. Separate potable water and single-use drinking cups are also supplied. Contract labor providers may include this service for their work force and therefore sanitation fees would not be a direct cost to the grower.

Management/Supervisor Wages. Salary is not included. Returns above costs are considered a return to management

Office Expense. Office and business expenses are estimated at \$300 per acre. These expenses include office supplies, telephones, bookkeeping, accounting, legal fees, shop and office utilities, and miscellaneous administrative charges.

Investment Repairs. Annual repairs on investments or capital recovery items that require maintenance are calculated as 2% of the purchase price. Repairs are not calculated for land and establishment costs.

Non-Cash Overhead

Non-cash overhead is calculated as the capital recovery cost for equipment and other farm investments.

Capital Recovery Costs. Capital recovery cost is the annual depreciation and interest costs for a capital investment. It is the amount of money required each year to recover the difference between the purchase price and salvage value (unrecovered capital). It is equivalent to the annual payment on a loan for the investment with the down payment equal to the discounted salvage value. This is a more complex method of calculating ownership costs than straight-line depreciation and opportunity costs, but more accurately represents the annual costs of ownership because it takes the time value of money into account (Boehlje and Eidman). The formula for the calculation of the annual capital recovery costs is $((\text{Purchase Price} - \text{Salvage Value}) \times \text{Capital Recovery Factor}) + (\text{Salvage Value} \times \text{Interest Rate})$.

Salvage Value. Salvage value is an estimate of the remaining value of an investment at the end of its useful life. For farm machinery (tractors and implements) the remaining value is a percentage of the new cost of the investment (Boehlje and Eidman). The percent remaining value is calculated from equations developed by the American Society of Agricultural Engineers (ASAE) based on equipment type and years of life. The life in years is estimated by dividing the wear out life, as given by ASAE by the annual hours of use in this operation. For other investments including irrigation systems, buildings, and miscellaneous equipment, the value at the end of its useful life is zero. The salvage value for land is the purchase price because land does not depreciate. The purchase price and salvage value for equipment and investments are shown in Table 6.

Capital Recovery Factor. Capital recovery factor is the amortization factor or annual payment whose present value at compound interest is 1. The amortization factor is a table value that corresponds to the interest rate used and the life of the machine.

Interest Rate. The interest rate of 6.25% used to calculate capital recovery cost is the USDA-ERS's ten-year average of California's agricultural sector long-run rate of return to production assets from current income. It is used to reflect the long-term realized rate of return to these specialized resources that can only be used effectively in the agricultural sector. In other words, the next best alternative use for these resources is in another agricultural enterprise.

Establishment Cost. Costs to establish the vineyard are used to determine capital recovery expenses, depreciation, and interest on investment for the production years. Establishment cost is the sum of the costs for land preparation, trellis system, drip system, planting, vines, cash overhead and production expenses for growing the vines through the first year that grapes are harvested minus any returns from production. The Total Accumulated Net Cash Cost on Table 1, in the third year represents the establishment cost. For this study the cost is \$26,579 per acre or \$797,370 for the 30-acre vineyard. The establishment cost is spread over the remaining 22 years of the 25 years the vineyard is in production.

Irrigation System. The previous vineyard is assumed to have a well, pump, and filtration/injector station that are included in the land cost.

Land. Bare land available for vineyard establishment is valued at \$120,000 per acre or \$140,000 per net plantable (30) acre. Land planted with resistant rootstock vines is valued from \$85,000 to \$180,000.

Building. The building complex is 400 square foot metal building or buildings on a cement slab.

Tools. This includes shop tools, hand tools, and miscellaneous field tools such as pruning tools.

Equipment. Farm equipment is purchased new or used, but the study shows the current purchase price for new equipment. The new purchase price is adjusted to 60% to indicate a mix of new and used equipment. Annual ownership costs for equipment and other investments are in the Whole Farm Equipment, Investment and Business Overhead Tables. Equipment costs are composed of three parts: non-cash overhead, cash overhead, and operating costs. Both of the overhead factors have been discussed in previous sections. The operating costs consist of repairs, fuel, and lubrication and are discussed under operating costs.

Table Values. Due to rounding, the totals may be slightly different from the sum of the components.

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REFERENCES

- American Society of Farm Managers and Rural Appraisers. 2002. *Trends in Agricultural Land & Lease Values*. California Chapter of the American Society of Farm Managers and Rural Appraisers. Woodbridge, CA.
- American Society of Agricultural Engineers. 1994. *American Society of Agricultural Engineers Standards Yearbook*. Russell H. Hahn and Evelyn E. Rosentreter (ed.) St. Joseph, MO. 41st edition.
- Barker, Doug. April 22, 2003. *California Workers' Compensation Rating Data for Selected Agricultural Classifications as of January 1, 2003*. California Department of Insurance, Rate Regulation Branch.
- Boehlje, Michael D., and Vernon R. Eidman. 1984. *Farm Management*. John Wiley and Sons. New York, NY.
- California State Department of Food and Agriculture. 1998-2002. Final Grape Crush Report. California Department of Food and Agriculture. Sacramento, CA. Internet accessed March 10, 2003 <http://www.nass.usda.gov/ca/bul/crush/>
- Smart, Richard and Mike Robinson. 1991. *Sunlight into Wine*. Winetitles. Adelaide, South Australia.
- Statewide IPM Project. 2000. "UC Pest Management Guidelines, Grapes". In M. L. Flint (ed.) *UC IPM Pest Management Guidelines*. Pub. 3339. IPM Education and Publication. University of California, Division of Agriculture and Natural Resources. Oakland, CA.
- United States Department of Agriculture-Economic Reporting Service. *Farm Financial Ratios Indicating Solvency and Profitability 1960 – 02, California*. 2002. www.ers.usda.gov/data/farbalancesheet/fbsdmu.htm. Internet; accessed January 4, 2003.
- Verdegaal, Paul S., Karen M. Klonsky. Richard L. De Moura, *Sample Costs to Establish a Vineyard and Produce Wine Grapes. Lodi Appellation*. 2001. University of California Cooperative Extension. Davis, CA.
- Weaver, Robert J. 1976. *Grape Growing*. John Wiley and Sons. New York, NY.

For information concerning the above or other University of California publications, contact UC DANR Communications Services at 1-800-994-8849, online at www.ucop.edu, or your local county UC Cooperative Extension office.

UC COOPERATIVE EXTENSION
Table 1. SAMPLE COSTS PER ACRE TO ESTABLISH A VINEYARD
 NORTH COAST – Napa County

	Cost Per Acre*			
	Year:	1st	2nd	3rd
	Tons Per Acre:			1.0
Regulatory Costs				
Land Use Permit		30		
Erosion Control Plan		250		
TOTAL REGULATORY COSTS		280		
Land Preparation:				
Vineyard Removal		400		
Crush/Haul Steel		125		
Clean Field by Hand 2X		623		
Rip 3X		750		
Disk 2X/Landplane 1X		400		
Apply Soil Amendments (Gypsum or Lime and Compost)		473		
Mark , Layout, Stake Vineyard		311		
Install Trellis/Layout Posts		4,435	610	
Plant Cover Crop		18		
TOTAL LAND PREPARATION COSTS (PRIOR YEAR COSTS)		7,535	610	
Planting Costs:				
Spray Strip (Roundup)		26		
Mow Middles		29		
Vines: 1,555 Per Acre (2% Replant In 2nd Year)		5,054	88	
Dig, Plant, Mound		1,866	7	
Install Drip System		2,700		
Unmound Vines/Place Carton around Vine		731		
TOTAL PLANTING COSTS		10,406	95	
Cultural Costs:				
Prune			175	420
Sucker/Train/Wrap/Tie Vine			1,507	302
Shoot Positioning/Thin				101
Thin Crop				101
Irrigate		55	55	55
Fertilizer (8-8-8)		4	4	4
Frost Protection				31
Weed Control – Mow Middles			29	58
Weed Control – Disk Middles		21	41	
Weed Control – Winter Strip Spray (Roundup)			26	51
Weed Control – Hand Weed		270		
Disease Control – Mildew (Flint) (Wettable & Dusting Sulfur, Flint)			47	154
Plant Cover Crop		18	59	
Erosion Control		200	200	200
Pickup Truck Use		80	80	80
ATV Use		23	23	23
TOTAL CULTURAL COSTS		671	2,246	1,580
Harvest Costs:				
Pick Fruit				250
Bin Handling				179
Haul To Crusher				3
TOTAL HARVEST COSTS				432
Interest On Operating Capital @ 7.14%		963	71	45
TOTAL OPERATING COSTS/ACRE		19,855	3,022	2,057

UC COOPERATIVE EXTENSION
Table 1. continued

	Cost Per Acre*			
	Year:	1st	2nd	3rd
Tons Per Acre:				1
Cash Overhead Costs:				
Office Expense		300	300	300
Liability Insurance		17	17	17
Sanitation Fees		5	5	5
Property Taxes		1,412	1,414	1,422
Property Insurance		8	10	15
Investment Repairs		6	12	18
TOTAL CASH OVERHEAD COSTS		1,748	1,758	1,777
TOTAL CASH COSTS/ACRE		21,603	4,780	3,834
INCOME/ACRE FROM PRODUCTION				3,638
NET CASH COSTS/ACRE FOR THE YEAR		21,603	4,780	196
PROFIT/ACRE ABOVE CASH COSTS				
ACCUMULATED NET CASH COSTS/ACRE		21,603	26,383	26,579
Capital Recovery				
Shop Building		18	18	18
Shop Tools		11	11	11
Wind Machine			22	44
Land		8,750	8,750	8,750
Equipment		193	202	324
TOTAL INTEREST ON INVESTMENT		8,972	9,003	9,147
TOTAL COST/ACRE FOR THE YEAR		30,575	13,783	12,981
INCOME/ACRE FROM PRODUCTION				3,638
TOTAL NET COST/ACRE FOR THE YEAR		30,575	13,783	9,343
NET PROFIT/ACRE ABOVE TOTAL COST				
TOTAL ACCUMULATED NET COST/ACRE		30,575	44,358	53,701

*includes labor, fuel, lube, repairs, material, custom/rent costs

UC COOPERATIVE EXTENSION
Table 2. COSTS PER ACRE to PRODUCE WINE GRAPES
 NORTH COAST – Napa County 2003

Operation	Operation Time (Hrs/A)	Cash and Labor Cost per acre				Total Cost	Year Cost
		Labor Cost	Fuel, Lube & Repairs	Material Cost	Custom/ Rent		
Cultural:							
Spray Strip 2' (Roundup)	2.00	43	2	5	0	50	
Mow Middles	2.00	43	14	0	0	57	
Erosion Control-Materials/Labor	0.00	0	0	200	0	200	
Frost Protection	1.67	22	0	31	0	53	
Fertilizer through Drip	0.00	0	0	4	0	4	
Irrigation	2.00	27	0	40	0	67	
Disease - Mildew (Wettable Sulfur)	3.00	64	18	7	0	89	
Disease - Mildew (Sulfur Dust)	3.00	64	17	12	0	93	
Disease - Mildew (Flint)	1.00	21	6	19	0	47	
Prune	31.10	417	0	0	0	417	
Tying	5.00	67	0	0	0	67	
Trunk/Cordon Suckering	27.00	362	0	0	0	362	
Sucker/Shoot Thin/Shoot Position	27.00	362	0	0	0	362	
Leaf & Lateral Removal/WireLift	40.00	536	0	0	0	536	
Thin Crop	10.00	134	0	0	0	134	
Vine/Cane Trim	0.50	11	5	0	0	16	
Pickup Truck Use	2.50	53	26	0	0	79	
ATV	1.00	21	1	0	0	22	
TOTAL CULTURAL COSTS	158.77	2,246	91	318	0	2,655	
Harvest:							
Harvest-Hand Labor	0.00	0	0	0	625	625	
Harvest-Bin Handling	4.00	77	5	0	110	193	
Haul	0.31	7	2	0	0	9	
TOTAL HARVEST COSTS	4.31	84	7	0	735	827	
Interest on operating capital @ 7.14%						79	
TOTAL OPERATING COSTS/ACRE		2,330	98	318	735	3,561	
CASH OVERHEAD:							
Office Expense						300	
Liability Insurance						17	
Sanitation Fees						5	
Property Taxes						1,557	
Property Insurance						106	
Investment Repairs						18	
TOTAL CASH OVERHEAD COSTS						2,003	
TOTAL CASH COSTS/ACRE						5,563	
NON-CASH OVERHEAD:							
		Per producing Acre		Annual Cost Capital Recovery			
Land		140,000		8,750		8,750	
Building		227		18		18	
Tools-Shop/Field/Fuel Tanks		83		11		11	
Wind Machine		565		44		44	
Vineyard Establishment		26,579		2,255		2,255	
Equipment		3,038		359		359	
TOTAL NON-CASH OVERHEAD COSTS		170,491		11,438		11,438	
TOTAL COSTS/ACRE						17,002	

UC COOPERATIVE EXTENSION
Table 3. COSTS AND RETURNS PER ACRE to PRODUCE WINE GRAPES
 NORTH COAST – Napa County 2003

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS					
Cabernet Sauvignon Wine Grapes	5.00	ton	3,638.00	18,190	
OPERATING COSTS					
Herbicide:					
Roundup Ultra	0.86	pint	6.06	5	
Miscellaneous:					
Erosion Control Management - Straw/Silt Fence/Labor	1.00	acre	200.00	200	
Wind Machine Operation – Frost Protection	50.00	hrac	0.62	31	
Fertilizer:					
8-8-8	51.00	lb	0.08	4	
Water:					
Water Pumped	5.73	acin	6.98	40	
Fungicide:					
Wettable Sulfur	9.00	lb	0.75	7	
Sulfur Dust	72.00	lb	0.16	12	
Flint	1.50	oz	12.99	19	
Contract:					
Harvest Hand	5.00	ton	125.00	625	
Rent:					
Tractors (2)	4.00	acwk	21.33	85	
Forklift (1)	2.00	acwk	12.48	25	
Labor (machine)	21.98	hrs	17.76	390	
Labor (non-machine)	144.77	hrs	13.40	1,940	
Fuel - Gas	12.46	gal	1.58	20	
Fuel - Diesel	34.34	gal	1.11	38	
Lube				9	
Machinery repair				32	
Interest on operating				79	
TOTAL OPERATING COSTS/ACRE				3,561	
NET RETURNS ABOVE OPERATING COSTS				14,629	
CASH OVERHEAD COSTS:					
Office Expense				300	
Liability Insurance				17	
Sanitation Fees				5	
Property Taxes				1,557	
Property Insurance				106	
Investment Repairs				18	
TOTAL CASH OVERHEAD COSTS/ACRE				2,003	
TOTAL CASH COSTS/ACRE				5,563	
NON-CASH OVERHEAD COSTS (Capital Recovery)					
Land				8,750	
Building				18	
Tools-Shop/Field/Fuel Tanks				11	
Wind Machine				44	
Vineyard Establishment				2,255	
Equipment				359	
TOTAL NON-CASH OVERHEAD COSTS/ACRE				11,438	
TOTAL COSTS/ACRE				17,002	
NET RETURNS ABOVE TOTAL COSTS				1,188	

UC COOPERATIVE EXTENSION
Table 4. MONTHLY CASH to PRODUCE WINE GRAPES
 NORTH COAST – Napa County 2003

Beginning JAN 03	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Ending DEC 03	03	03	03	03	03	03	03	03	03	03	03	03	
Cultural:													
Spray 2 ft. Strip (Roundup)	25						25						50
Mow Middles			28		28								57
Erosion Control-Materials/Labor										200			200
Frost Protection				53									53
Fertilizer through Drip					2				2				4
Irrigation					7	13	13	17	13	3			67
Disease - Mildew (Wettable Sulfur)				59	30								89
Disease - Mildew (Sulfur Dust)					46	46							93
Disease - Mildew (Flint)							47						47
Prune		417											417
Tying			67										67
Trunk/Cordon Suckering				362									362
Sucker/Shoot Thin/Shoot Position					362								362
Leaf & Lateral Removal/Wire Lift						268	268						536
Thin Crop							134						134
Vine/Cane Trim							16						16
Pickup Truck Use	7	7	7	7	7	7	7	7	7	7	7	7	79
ATV	2	2	2	2	2	2	2	2	2	2	2	2	22
TOTAL CULTURAL COSTS	34	425	104	483	484	336	512	25	24	212	8	8	2,655
Harvest:													
Harvest-Hand Labor									625				625
Harvest-Bin Handling									193				193
Haul									9				9
TOTAL HARVEST COSTS									827				827
Interest on operating capital	0	3	3	6	9	11	14	14	19	-1	0	0	79
TOTAL OPERATING COSTS/ACRE	34	428	107	489	493	347	526	39	870	210	8	8	3,561
OVERHEAD:													
Office Expense	25	25	25	25	25	25	25	25	25	25	25	25	300
Liability Insurance		17											17
Sanitation	1	1	1	1	1	1	1	1	1	1			5
Property Taxes	778						778						1,557
Property Insurance	53						53						106
Investment Repairs	1	1	1	1	1	1	1	1	1	1	1	1	18
TOTAL CASH OVERHEAD COSTS	858	44	27	27	27	27	858	27	27	27	26	26	2,003
TOTAL CASH COSTS/ACRE	892	472	134	516	520	374	1,384	66	897	237	35	35	5,563

UC COOPERATIVE EXTENSION
Table 5. RANGING ANALYSIS
 NORTH COAST – Napa County 2003

COSTS PER ACRE TO PRODUCE GRAPES FOR WINE AT VARYING YIELDS

	YIELD (ton/acre)						
	3.50	4.00	4.50	5.00	5.50	6.00	6.50
OPERATING COSTS:							
Cultural Cost	2,655	2,655	2,655	2,655	2,655	2,655	2,655
Harvest Cost	616	686	756	827	897	967	1,037
Interest on operating capital	78	78	79	79	79	80	80
TOTAL OPERATING COSTS/ACRE	3,349	3,419	3,490	3,561	3,631	3,702	3,772
Total Operating Costs/ton	957	855	776	712	660	617	580
CASH OVERHEAD COSTS/ACRE	2,003	2,003	2,003	2,003	2,003	2,003	2,003
TOTAL CASH COSTS/ACRE	5,352	5,422	5,493	5,564	5,634	5,705	5,775
Total Cash Costs/ton	1,529	1,356	1,221	1,113	1,024	951	888
NON-CASH OVERHEAD COSTS/ACRE	11,438	11,438	11,438	11,438	11,438	11,438	11,438
TOTAL COSTS/ACRE	16,790	16,860	16,931	17,002	17,072	17,143	17,213
Total Costs/ton	4,797	4,215	3,762	3,400	3,104	2,857	2,648

NET RETURNS PER ACRE ABOVE OPERATING COSTS

PRICE \$/ton	YIELD (ton/acre)						
	3.50	4.00	4.50	5.00	5.50	6.00	6.50
2,547.00	5,566	6,769	7,972	9,174	10,378	11,580	12,784
2,910.00	6,836	8,221	9,605	10,989	12,374	13,758	15,143
3,274.00	8,110	9,677	11,243	12,809	14,376	15,942	17,509
3,638.00	9,384	11,133	12,881	14,629	16,378	18,126	19,875
4,002.00	10,658	12,589	14,519	16,449	18,380	20,310	22,241
4,366.00	11,932	14,045	16,157	18,269	20,382	22,494	24,607
4,729.00	13,203	15,497	17,791	20,084	22,379	24,672	26,967

NET RETURN PER ACRE ABOVE CASH COST

PRICE \$/ton	YIELD (ton/acre)						
	3.50	4.00	4.50	5.00	5.50	6.00	6.50
2,547.00	3,563	4,766	5,969	7,171	8,375	9,577	10,781
2,910.00	4,833	6,218	7,602	8,986	10,371	11,755	13,140
3,274.00	6,107	7,674	9,240	10,806	12,373	13,939	15,506
3,638.00	7,381	9,130	10,878	12,626	14,375	16,123	17,872
4,002.00	8,655	10,586	12,516	14,446	16,377	18,307	20,238
4,366.00	9,929	12,042	14,154	16,266	18,379	20,491	22,604
4,729.00	11,200	13,494	15,788	18,081	20,376	22,669	24,964

NET RETURNS PER ACRE ABOVE TOTAL COST

PRICE \$/ton	YIELD (ton/acre)						
	3.50	4.00	4.50	5.00	5.50	6.00	6.50
2,547.00	-7,876	-6,672	-5,470	-4,267	-3,064	-1,861	-658
2,910.00	-6,605	-5,220	-3,836	-2,452	-1,067	317	1,702
3,274.00	-5,331	-3,764	-2,198	-632	935	2,501	4,068
3,638.00	-4,057	-2,308	-560	1,188	2,937	4,685	6,434
4,002.00	-2,783	-852	1,078	3,008	4,939	6,869	8,800
4,366.00	-1,509	604	2,716	4,828	6,941	9,053	11,166
4,729.00	-239	2,056	4,350	6,643	8,938	11,231	13,526

UC COOPERATIVE EXTENSION
Table 6. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT, AND BUSINESS OVERHEAD COSTS
 NORTH COAST – Napa County 2003

ANNUAL EQUIPMENT COSTS

Yr	Description	Price	Yrs Life	Salvage Value	Capital Recovery	Cash Overhead		Total
						Insur- ance	Taxes	
03	60HP 4WD Narrow Tractor	36,000	15	7,009	3,472	145	215	3,832
03	Air Blast 13Pt Sprayer 200 gal	6,082	15	584	612	23	33	668
03	ATV 4WD	6,700	5	3,003	1,071	33	49	1,153
03	Bins 1/2 ton (2)	400	10	71	50	2	2	54
03	Bins 1/2 ton (2)	400	10	71	50	2	2	54
03	Bins 1/2 ton (2)	400	10	71	50	2	2	54
03	Bin Trailer 2Bin #2	680	15	65	68	3	4	75
03	Bin Trailer 2Bin #3	680	15	65	68	3	4	75
03	Bin Trailer 2Bin #1	680	15	65	68	3	4	75
03	Duster - 3 Pt	5,000	5	1,629	908	22	33	963
03	Mower-Flail 5'	4,504	15	432	453	17	25	495
03	Pickup Truck 1/2 Ton	26,000	7	9,863	3,533	121	179	3,833
03	Sprayer ATV 20 gal	350	10	62	43	1	2	47
03	Truck Flatbed 20' 2 Ton	49,803	10	14,711	5,744	218	323	6,285
03	Vine Trimmer 2 - 1/2 row	14,200	10	2,511	1,764	56	84	1,904
TOTAL		151,879		40,212	17,954	649	960	19,564
60% of New Cost *		91,127		24,127	10,773	390	576	11,738

*Used to reflect a mix of new and used equipment

ANNUAL INVESTMENT COSTS

Description	Price	Yrs Life	Salvage Value	Capital Recovery	Cash Overhead			Total
					Insur- ance	Taxes	Repairs	
Building 400 sq ft	6,800	25		545	23	34	136	738
Vineyard Establishment	797,370	22		67,664	2,695	3,987	0	74,346
Land 35 Acres	4,200,000	25	4,200,000	262,500	0	42,000	0	304,500
Tools-Shop/Field/Fuel Tanks	2,500	10		344	8	13	50	415
Wind Machine	16,946	25	1,695	1,327	63	93	339	1,823
TOTAL INVESTMENT	5,023,616		4,201,695	332,380	2,790	46,127	525	381,821

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/ Farm	Unit	Price/ Unit	Total Cost
Liability Insurance	30	acre	17	516
Office Expense	30	acre	300	9,000
Sanitation	30	acre	36	1,090

UC COOPERATIVE EXTENSION
Table 7. HOURLY EQUIPMENT COSTS
 NORTH COAST – Napa County 2003

Yr Description	COSTS PER HOUR							Total Costs/Hr.
	Actual	Cash Overhead			Operating			
	Hours Used	Capital Recovery	Insur- ance	Taxes	Repairs	Fuel & Lube	Total Oper.	
03 60HP 4WD Narrow Tractor	346.50	6.01	0.25	0.37	0.88	3.76	4.64	11.28
03 Air Blast 3Pt Sprayer 200 gal	120.00	3.06	0.11	0.17	0.99	0.00	0.99	4.33
03 ATV 4WD	90.00	7.14	0.22	0.32	0.50	0.61	1.11	8.79
03 Bins 1/2 ton (2)	30.00	0.99	0.03	0.05	0.00	0.00	0.00	1.07
03 Bins 1/2 ton (2)	30.00	0.99	0.03	0.05	0.00	0.00	0.00	1.07
03 Bins 1/2 ton (2)	30.00	0.99	0.03	0.05	0.00	0.00	0.00	1.07
03 Bin Trailer 2Bin #2	30.00	1.37	0.05	0.07	0.10	0.00	0.10	1.60
03 Bin Trailer 2Bin #3	30.00	1.37	0.05	0.07	0.10	0.00	0.10	1.60
03 Bin Trailer 2Bin #1	30.00	1.37	0.05	0.07	0.10	0.00	0.10	1.60
03 Duster - 3 Pt	90.00	6.05	0.15	0.22	0.73	0.00	0.73	7.15
03 Mower-Flail 5'	60.00	4.53	0.17	0.25	2.02	0.00	2.02	6.97
03 Pickup Truck 1/2 Ton	75.00	28.26	0.97	1.43	1.91	8.33	10.24	40.91
03 Sprayer ATV 20 gal	60.00	0.43	0.01	0.02	0.10	0.00	0.10	0.57
03 Truck Flatbed 20' 2 Ton	9.40	367.03	13.93	20.61	4.75	1.28	6.03	407.60
03 Vine Trimmer, 2 - 1/2 row	15.00	70.56	2.26	3.34	5.87	0.00	5.87	82.03

UC COOPERATIVE EXTENSION
Table 8. OPERATIONS WITH EQUIPMENT
 NORTH COAST - Napa County 2003

Operation	Operation Month	Equipment		Material	Rate/acre*	Unit
		Tractor	Implement			
Cultural:						
Spray Strip 2' (Roundup)	January	Sprayer ATV		Roundup	0.43	pt
	July	Sprayer ATV		Roundup	0.43	pt
Mow Middles	March	60HP 4WD	Mower Flail 5'			
	May	60HP 4WD	Mower Flail 5'			
Erosion Control-Materials/Labor	October			Straw/Silt		
Frost Protection	April	Wind Machine				
Fertilizer through Drip	May			8-8-8	25.50	lb
	September			8-8-8	25.50	lb
Irrigation	May			Water	0.57	acin
	June			Water	1.15	acin
	July			Water	1.15	acin
	August			Water	1.43	acin
	September			Water	1.15	acin
	October			Water	0.28	acin
Disease - Mildew (Wettable Sulfur)	April	60HP 4WD	Air Blast Sprayer	Wettable Sulfur	3.00	lb
	April	60HP 4WD	Air Blast Sprayer	Wettable Sulfur	3.00	lb
	May	60HP 4WD	Air Blast Sprayer	Wettable Sulfur	3.00	lb
Disease - Mildew (Sulfur Dust)	May	60HP 4WD	Duster	Sulfur Dust	12.00	lb
	May	60HP 4WD	Duster	Sulfur Dust	12.00	lb
	May	60HP 4WD	Duster	Sulfur Dust	12.00	lb
	June	60HP 4WD	Duster	Sulfur Dust	12.00	lb
	June	60HP 4WD	Duster	Sulfur Dust	12.00	lb
	June	60HP 4WD	Duster	Sulfur Dust	12.00	lb
Disease - Mildew (Flint)	July	60HP 4WD	Air Blast Sprayer	Flint	1.50	floz
Prune	February					
Tying	March					
Trunk/Cordon Suckering	April					
Sucker/Shoot Thin/Shoot Position	May					
Leaf & Lateral Removal/Wire Lift	June					
Thin Crop	June					
Vine/Cane Trim	July	60HP 4WD	Vine Trimmer			
Pickup Truck Use	Annual	Pickup 1/2 ton				
ATV	Annual	ATV				
Harvest:						
Harvest-Hand Labor	September					
Harvest-Bin Handling	September	60HP 4WD	Bin Trailer/Bins			
			Bin Trailer/Bins	Rented Tractor		
			Bin Trailer/Bins	Rented Tractor		
				Rented Forklift		
Haul	September	Truck Flatbed				

*Rates are per broadcast acres (30)