
UNIVERSITY OF CALIFORNIA AGRICULTURE AND NATURAL RESOURCES
COOPERATIVE EXTENSION
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UC DAVIS DEPARTMENT OF AGRICULTURAL AND RESOURCE ECONOMICS

2020

**SAMPLE COSTS TO ESTABLISH A VINEYARD
AND PRODUCE WINEGRAPES**



Cabernet Sauvignon
NORTH COAST REGION
NAPA COUNTY
Crush District 4

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CONTENTS

INTRODUCTION	2
ASSUMPTIONS	3
Establishment Cultural Practices and Material Inputs	4
Production Cultural Practices and Material Inputs	7
Harvest, Yields and Revenue	9
Labor, Equipment and Interest	10
Cash Overhead	12
Non-Cash Overhead	13
REFERENCES	15
Table 1. COSTS PER ACRE TO ESTABLISH WINEGRAPES	16
Table 2. COSTS PER ACRE TO PRODUCE WINEGRAPES	18
Table 3. COSTS AND RETURNS PER ACRE TO PRODUCE WINEGRAPES	20
Table 4. MONTHLY CASH COSTS PER ACRE TO PRODUCE WINEGRAPES	22
Table 5. RANGING ANALYSIS	24
Table 6. WHOLE FARM ANNUAL INVESTMENT AND BUSINESS OVERHEAD COSTS	25
Table 7. OPERATIONS WITH EQUIPMENT AND MATERIALS	26

INTRODUCTION

Sample costs to establish a vineyard and produce wine grapes are presented in this study. It is intended as a guide only, and can be used to make production decisions, estimate 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 farming operation. The sample costs for labor, materials, equipment and custom services are based on June 2020 figures. A blank column titled “Your Cost”, is provided in Tables 2 and 3 for your convenience.

For an explanation of calculations used, refer to the section titled Assumptions. For more information contact Donald Stewart, University of California Agriculture and Natural Resources, Agricultural Issues Center, Department of Agricultural and Resource Economics, at 530-752-4651 or destewart@ucdavis.edu. To discuss this study with a local county extension farm advisor, contact your county cooperative extension office. ucanr.edu/County_Offices/.

Costs and Returns Study Program/Acknowledgements. A cost and returns study is a compilation of specific crop data collected from meetings with professionals working in production agriculture from the region. The authors thank farmer cooperators, UC Cooperative Extension, and other industry representatives who provided information, assistance, and expert advice. **The use of trade names and cultural practices in this report does not constitute an endorsement or recommendation by the University of California nor is any criticism**

implied by omission of other similar products or cultural practices. *The University is an affirmative action/equal opportunity employer.*

ASSUMPTIONS

The assumptions contain background used in developing 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 15 sub-appellations. For district location and other related information see the websites napagrowers.org and napavintners.com.

This study explains the annual costs associated with an ongoing operation, under the assumptions that the farm was operated on this basis in prior years and will continue in subsequent years. The cultural practices shown represent operations and materials considered typical of a well-managed vineyard in the region. The costs, materials, and practices shown will not be applicable to all situations. Establishment and cultural practices vary and the differences can be significant.

Farm. The hypothetical farm is located on land with less than a five percent slope. The absentee owner makes no management decisions and does not work in the vineyard. The vineyard is operated by a hired, professional vineyard management company. The 12 contiguous acres, all under contract with a vineyard management company, consists of 10 acres of Cabernet Sauvignon wine grapes, which are being replanted. The two other acres are occupied by roads, irrigation systems, fencing, and riparian areas.

Vineyard Management. Vineyard management companies (VMC) farm more than 75 percent of the farms in the area (NVG). We incorporated information from both owner and vineyard management company operations to present a farm operated and managed by a VMC, which includes making all the operational decisions. In addition to the costs for operations, the VMC has a move-in charge when equipment is brought to the site. This is a charge which increases with distance and may vary depending on the type equipment transported and distance traveled. This charge is shared between clientele with vineyards in the same area requiring the same operations.

The VMC is a licensed labor contractor and supervises all labor associated with the operations, provides employee safety training, pays labor rates that meet or exceed those required by state law and required health insurance, (See section on labor). The VMC is responsible for maintaining federal, state and local licenses and permits as required by law and regulations. Management fees associated with management companies vary widely depending on individual site challenges, size of vineyard property, and other factors. The VMC charges a management fee of \$50 per month during the establishment years and \$70 per month during the production years, for ten months of each year.

The VMC is a licensed Pest Control Business. The owner/operator holds a Qualified Applicators License, (QAL) and is a licensed Pest Control Adviser/Certified Crop Adviser, (PCA/CCA). These licenses are issued from CalEPA/DPR. An individual who is licensed as a PCA and/or a CCA may monitor the field for pests and disease and collect samples for nutrient analyses. A CCA emphasizes fertilizer and plant nutrient management issues. If pest management advice is provided or an application is made by the VMC under this license, that individual is required to provide written recommendations and use reports for those pesticides that are applied. In this region, a written recommendation by a CCA for applying fertilizers is currently not required. cdpr.ca.gov/docs/license/liccert.htm

Establishment Cultural Practices and Material Inputs

Environmental Preparation. The Napa County Conservation, Development, and Planning Department administer regulations for planting and replanting vineyard sites that have a 5 percent or greater slope. If planting on slopes, contact the Napa office for further information.

Riparian Areas. The vineyard has a riparian growth area on two sides. The area requires landscape maintenance to prevent overgrowth, shading of the vines and when needed erosion control.

Vineyard Conversion and Site Preparation. The new vineyard is being planted on land that had an existing vineyard. The existing vineyard is removed and the field cleaned up by a vineyard removal service. A hand crew separates out the wood and steel components prior to vine removal. The old grapevines are removed, stacked and burned. Rock removal may be required on some new plantings. 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.

The field is ripped four to five feet deep. The field is again hand cleaned to remove debris pulled up from the ripping. A custom operator uses a tandem disc to breakup clods and then, if needed landplanes the site. Soil amendments (lime or gypsum, compost and straw hay bales) are commercially applied.

A commercial company is hired to survey and 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 end posts 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. Potted, 2" x 2" greenvine transplants, Cabernet Sauvignon variety, (\$6.50 each) are planted on 7 X 4-foot spacing at 1,555 vines per acre. Vines will be trained to a bilateral cordon and spur pruned. The current trend is to cane prune vineyards, Cordons are the horizontal branches, and spurs are the bearing units on the cordon. The grapevines are assumed to yield a harvestable crop of fruit in the third year and to produce for an additional 27 years.

Planting. Transplanting occurs in Late-May and is done by hand. Holes are dug, vines are wrapped, staked and planted to the appropriate depth. In the following years an average of 2 percent or 31 vines per acre will be replanted. Greenvines can be transplanted from late May into August. In some vineyards with early transplanting, good vine vigor and proper training a harvest of economic importance can be achieved in the second year. For this study, the vine training and the other establishment operations are based on the first harvest in the 3rd year of growth.

Note. To protect the young vines from herbicide applications after transplanting, cardboard cartons, nursery wraps or grow tubes are used to avoid getting spray on the young green vines. These covers are placed on the vines at planting.

Trellis System. The trellis is a vertical shoot positioning system (VSP). The system utilizes 3-inch X 8-foot notched steel line posts spaced 16-feet apart (every 4th vine), with three training stakes (1/2-inch rebar rod X 4-feet) at the vine locations in between. Two clips for each rebar. End posts are 3-7/8-inch X 10-foot steel tube (well casing) with a spade. No additional anchors are required. Three crossarms (8-inch) are installed at three different levels (low, middle, top). Eight wires are secured to the end posts – 12-gauge fruit wire, 14-gauge drip wire, and 3 pairs of 13-gauge movable canopy wires. Gripples are put on all wires except the cordon wire and drip wires. The trellis 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 cost (materials and labor) are

shown in the first two establishment years and installed as follows:

First Year. In the fall of the year prior to planting, end-posts and stakes are laid out by the VMC and installed by a trellis company. The VMC 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 and cordon (fruit) wire are installed after planting.

Second Year. Three pairs of canopy wires are installed.

Training/Pruning. Training and pruning establish the vine framework and these techniques will vary with variety and trellis system. Training includes pruning, tying, suckering, shoot positioning and thinning. The pruning's are placed in the vine row middles, mowed and are incorporated during the first discing.

First Year. The vines are allowed to grow freely the first year with minimal pruning and training. A good root system should develop this year to support vine training in the second year. Twenty hours per acre of hand labor (pruning labor) are allocated to the budget for topping throughout the 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 and August to remove about 50 percent 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 System (Above Ground Drip). Mainlines are laid out in the fall prior to trellis installation. After planting, the drip lines are attached to the drip wire on the trellis system and emitters are punched. Labor is included in the drip system installation 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.

A 10 horsepower (hp) booster pump, filter system, and chemical injection station were installed as part of the drip irrigation system during vineyard establishment. Water and fertilizers are pumped to the vineyard through a filtration station into a mainline, sub-mains and then into the drip laterals along the vine rows. Drip systems vary in design and cost according to vine spacing, variety and other environmental factors. The annual maintenance/repair costs for the irrigation system is calculated at \$126 per acre.

Pumping costs are estimated at \$16.50 per acre-inch (\$0.0006 per gallon). Irrigation costs include pumping and labor. Price per acre-foot of water will vary depending on quantity used, water district, power cost, various well characteristic and other irrigation factors.

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 2.5 gallons per vine per irrigation). No assumption is made about effective rainfall. In the third year, five gallons per week per vine at one irrigation per week are applied over a 20-

week period (5.72 acre-inches).

Chemical Injections/Acid Flush. All the fertilizer and some of the pesticides are injected through the drip system by the VMC. The drip irrigation system requires chemical flushing to retard chemical buildup and emitter clogging. The flushing is performed after harvest with N-pHuric acid applied through the drip system with an additional 0.10 acre-inches of water.

Well Test/Water Analysis. An annual well test is performed during the winter to monitor pumping level and efficiency (gallons/minute). A water sample is taken and analyzed for nitrogen and other minerals. Costs for the tests are allocated over the entire acreage the pump can service.

Frost Protection. The propane powered wind machine was already installed and in use on the 10 acres. The machine is fully depreciated and is not included in the non-cash overhead section. Operation begins in the third year. It is assumed that the wind machine will run 12 hours per season (March, April, May) at four hours per month. The VMC has sensors in the vineyards and the responsibility of frost control is part of the contract.

Note. In the recent past few years the low early-morning springtime temperatures that cause damage to grapevines, where frost control measures are needed, are not as severe. There is a significant difference in the charges for frost control in this study compared to the previous costs and returns study on the Napa Valley, 2012.

Pest Management. The pesticides and rates mentioned are listed in *UC Integrated Pest Management Guidelines, Grapes*, available at ipm.ucdavis.edu. Pesticides mentioned in the study are commonly used, but may not be university recommendations.

Insects. Leafhoppers and mites are the most common insect pests in the North Coast. In Napa County, populations are usually below treatment thresholds. Increasing insect pressure from European Grapevine Moth (EGVM) and vine mealybug (VMB) has forced treatment of these insects. Intrepid, Altacor, Entrust and *Bacillus thuringiensis* are applied 2-5 times per year (beginning in May) for EGVM and Applaud, Movento, or neonicotinoids may be applied to manage VMB, generally starting in June. Beginning in the third year, Intrepid is applied in May for EGVM. In June Applaud for VMB and Altacor for EGVM are applied. The materials are applied with the fungicides when possible. Mating disruption technology may also be used to manage these insects, especially in organic vineyards. Additionally, the beneficial insect, *Anagyrus pseudococci*, may be released to attack populations of VMB.

Diseases. Many pathogens attack grapevines, but the major disease assumed is powdery mildew (*Erysiphe necator*). Powdery mildew control begins in May of the second year with Stylet Oil (paraffinic oil), Rally (myclobutanil) in June, and Pristine (pyraclostrobin/boscalid) in July. Also, beginning in February of the second year, a fungicide (Rally) application is made for Eutypa control. In the third year, wettable sulfur is applied in March and mid-April, Stylet Oil in May, Rally in June, and Flint (trifloxystrobin) in July. All are applied by ground with the VMC equipment.

Vertebrate Pests. Rabbits, gophers, squirrels, deer, coyotes and birds are pests that can cause damage to the vines and irrigation lines. Various forms of control such as baiting and trapping are utilized as necessary by the VMC. Depending on the location and surrounding habitat these costs are variable.

Vineyard Floor Management/Cover Crop/Weeds. All of the following operations are performed by the VMC. Mowing and discing is used to control vegetation in row middles. Herbicides and mechanical weeders are used to control weeds in the vine rows. The pruning's are pulled into and stacked in opposite row middles of the planted cover crop middles. The March or early spring passes of the mower and disc may require more time than the

passes later in the spring and summer. Different varieties may have different cover crop plants depending on the vine growth objectives and other variables. Depending on spring rainfall the cover crop middles may be mowed more or less frequently to insure adequate soil moisture content. In dry years, alternate or all the row middles may be disced to conserve soil moisture.

Cover Crop. After land preparation in the fall of the year prior to planting, a cover crop mix is planted in the vine middles, using a tractor with metal tracks and a five-foot-wide grain drill. The cover crop is mowed in March, April or May of the following year, and then disced in May. In the fall of the first and second year, the cover crop mix is planted in October and disced in May of the second year. In October of the third year the cover crop mix is planted to alternate row middles and allowed to grow and set seed in the spring before mowing and discing. Each year thereafter, opposite row middles are planted to cover crops.

Weeds. In April of the first year, the cover crop (middles) are mowed and disced in May and again in September. In June or July, Rely 280 is sprayed around the vines. In the second year, Rely 280 is applied as a strip-spray in February prior to pruning and again in July. The middles (cover crop) are mowed and disced in April or May and August. Every other row is disced again in October (for cover crop seedbed). Beginning in the third year, Rely 280 and Alion are applied as a strip-spray in February. Rely 280 is applied again in July. Non-CC planted row middles are mowed in April. The cover crop rows are disced in May and August. The non-CC rows are diced in October for cover crop seedbed.

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 March, May and in October, after harvest.

Harvesting/Hauling. Harvesting starts in the third year. The crop is machine harvested and hauled to the winery by the VMC. Picking and hauling costs are estimated at \$350 per ton. See Harvest in production section for operation explanations.

Yield. Average yields in the third year are assumed to be one and half tons per acre.

Production Cultural Practices and Material Inputs

Pruning. Pruning is done mechanically during the winter months (January) and final pruned, by hand in February or early March. The pruning's are placed in the non-cover crop planted vine middles and chopped during the first mowing. Winter tying, where cordons are tied to the cordon wire at the trunk, and at each end of the cordons, is done in March. Pruning costs are based on an hourly rate, although much of the pruning in the region may be done by piecework.

Vine Canopy Management. Canopy management begins with trunk and cordon suckering and shoot thinning in April. A second pass is made in May (July). Shoot positioning and wire lift is done in April, May and June. Passes in June and July are made for leaf removal, lateral removal, and wire lifting. Crop thinning is done in two passes, once in July for crop thin and once in August for color thin. 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/July after fruit set, some basal leaves are removed, mechanically and by hand in and around the fruit zone to allow for exposure and better air movement. Hedging is done mechanically in July. 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.

Irrigation. The applied water, 5.74 acre-inches (155,866 gallons per acre) is calculated to cost \$16.50 per acre-inch. 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 0.33 hours per acre per irrigation. No assumption is made about effective rainfall.

Frost Protection. It is assumed that the wind machines will run 12 hours per season, 4 hours per month during March, April and May.

Fertilization. An NPK fertilizer, 8-8-8, at 51 pounds per acre is applied through the irrigation system equally in March, July and in October 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 ipm.ucdavis.edu.

For additional information and pesticide use permits, contact the local county Agricultural Commissioner's office. **The vineyard owner/manager who applies pesticides to his or her property may need to hold a valid private applicator certificate that is issued by the agricultural commissioner's office.** Pesticides with different active ingredients, mode of action, and sites of action should be rotated as needed to combat species shift and resistance. Adjuvants are recommended for use with many pesticides for effective control, however, adjuvants and their costs are not included.

Pest Control Adviser/Certified Crop Advisor, (PCA/CCA). An individual who is licensed as a PCA and/or a CCA may monitor the field for pests and disease and collect samples for nutrient analyses. A CCA emphasizes fertilizer and plant nutrient management issues. Costs for the PCA to monitor insect pheromone disruptor traps and for diseases are included in the monthly VMC charges. In this region, a written recommendation for fertilizer applications is currently not required.

Insects. Leafhoppers and mites are the most common insect pests in the North Coast, but it is assumed that levels are not high enough to warrant control. The PCA hangs one trap per 10 acres for vine mealybug monitoring. The vine mealybug (VMB) and the European Grapevine Moth (EGVM) are invasive insects of growing concerns in Napa Valley vineyards. Intrepid and/or Altacor, Entrust and *Bacillus thuringiensis* are applied 2-5 times per year (beginning in May) for EGVM and Applaud and/or Movento, or neonicotinoids may be applied to manage VMB, generally starting in June. Intrepid is applied in May and Applaud and Altacor in June. The materials are applied with the fungicides when possible. Mating disruption technology may also be used to manage these insects, especially in organic vineyards. Additionally, the beneficial insect, *Anagyrus pseudococci*, may be released to attack populations of VMB.

Diseases. Powdery mildew treatments begin in mid-March with two wettable sulfur (Sulfur DF) applications one during March and one in April. In addition, Stylet Oil (paraffinic oil) is applied in May, Rally (myclobutanol) in June, Flint (trifloxystrobin) in July and Pristine (pyraclostrobin/boscalid) in August. It is recommended that applicators rotate fungicides among different modes of action in order to avoid fungicide resistance in powdery mildew populations. Applicators have the option of using contacts, sterol inhibitors (SI), quinolins, strobilurins, or sulfur, which are classes of fungicides with different modes of action. See the UC IPM website for further information.

There are no costs assigned to control Pierce's disease. The incidence of this disease in Napa County vineyards is quite variable: however, control measures and annual replanting costs can be significant.

Vertebrate Pests. Rabbits, gophers, squirrels, deer, coyotes and birds are pests that can cause damage to the vines and irrigation lines. Various forms of control such as baiting and trapping are utilized as necessary by the VMC. Depending on the location and surrounding habitat these costs are variable.

Vineyard Floor Management/Cover Crop/Weeds. All of the following operations are performed by the VMC. Review the section under establishment cultural practices.

Cover Crop. In October of the third year, and every year thereafter a cover crop seed mix is planted to every other row and allowed to reseed in the following spring. The cover crop, and the alternate un-planted rows are mowed once in March and again in May after seed formation. The cover crop is dried down by late spring/early summer. All rows are disced in June to incorporate the biomass, conserve soil moisture. The second pass in October is for weed control and to prepare the soil for cover crop planting.

Weeds. In this vineyard, vine row weeds are controlled in January, (Rely 280 and Alion) and again in July, (Rely 280) applied as a strip-spray (36% of the acreage).

Endangered Species. It is important to know if your vineyard is located in an area where endangered species reside. Trapping and killing endangered species can result in fines. Contact your County Agricultural Commissioner for additional information.

Harvest, Yields and Revenue

More than 95 percent of the grape fruit produced in the Napa Valley is contracted through a local winery. There are many different types of contracts which are influenced by location, quality, variety, years of selling to the same winery, and many other factors.

Harvest. The VMC, as part of the contract with the owner, mechanically picks and hauls the fruit to the winery. Charges may be lower or higher due to yield, trellis system, ground terrain and distance to the winery. Bin handling includes the use of tractors with a bin trailer attachment holding one-half ton bins.

Hand Harvest. To determine number of pickers for harvest, an industry assumption is one-ton per day per picker, assuming an eight-hour day. The grapes are handpicked and dumped into the bins, loaded on trucks and delivered to the winery.

Yields. Yield maturity is reached in the fifth or sixth year. An assumed yield of 4.0 tons per acre over the life of the vineyard is used to calculate returns in the production years.

Revenue. A price of \$8,200 per ton for Cabernet Sauvignon wine grapes is used in this analysis. Table 10 of the Final Grape Crush Report has revenue and yield information. [nass.usda.gov/Statistics by State/California/Publications/Specialty and Other Releases/Grapes/Crush/Final/index.php](http://nass.usda.gov/Statistics_by_State/California/Publications/Specialty_and_Other_Releases/Grapes/Crush/Final/index.php)

Ranging Analysis. Table 5 has a range of return prices used for calculating net returns per acre at different yields. The yield range used for this study is 1.75 to 6.25 tons per acre with the price range from \$7,450 - \$8,950 per ton.

Risk. The risks associated with wine grape production should not be underestimated. 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 of agricultural production. Because

of many potential risk factors, effective risk management must combine specific tactics in a detailed manner, in various combinations for a sustainable operation. Moreover, Table 5 reflects a ranging analysis of returns based on various assumptions which is therefore, hypothetical in nature. **It is important to realize that actual results may differ from the returns contained in this study.** Any returns above total costs are considered returns on risk and investment to management (or owners).

Assessments/Membership. Membership in organizations or donations to non-profit foundations that provide funding for research is voluntary. Examples include California Association of Winegrape Growers and the American Vineyard Foundation.

The Napa Valley Grape growers, (NVG) a voluntary organization, charges membership dues of \$21.60 per net acre planted, bearing and non-bearing, with a minimum annual fee of \$432 for 20 acres or less and a maximum of \$4,320 for 200 acres or more. The organization's mission is to "to promote and preserve Napa Valley's world-class vineyards". napagrowers.org/

Additionally, Napa growers are assessed \$15 per acre by the Napa County Housing Commission for operation of the Napa County farmworker housing facilities. napavintners.com/community/farmworkers.asp

Other assessments not included are the Pierce's Disease/Glassy Winged Sharpshooter Board (*PD/GWSS Board*) assessment for 2019 in which growers are assessed \$1.00 per \$1,000 of crop returns. pdgwss.net/assessmentandreferendum

The Napa County Pest and Disease Control District Board annual assessment is \$8.00 per acre for 2019/20.

Auditing and Compliance. The California Department of Food and Agriculture (CDFA) and the USDA's National Agricultural Statistics Service (NASS) conduct annual acreage and crop surveys of California grape growers. The time and cost involved for completing these surveys is included in the VMC annual fee. Other private inspectors/buyers and environmental groups assess additional costs.

Labor, Equipment and Interest

VMC Labor. All the labor is hired and supervised by the VMC which includes assistant field supervisors needed for each individual working crew. The VMC manages other vineyards and maintains specialized crews such as pruning, re-planting/budding and canopy management. Each crew is transported from vineyard to vineyard which requires a supervisor and infrastructure i.e. vehicle, field toilet, wash station and shade for required breaks.

Labor Rates. Rates are \$33.72 per hour for machine operators, \$29.51 for hand labor, \$33.72 for irrigation labor and \$36.54 for assistant supervisor. These rates include payroll overhead of 40.53 percent. The basic hourly wages are \$24.00 for machine operators, \$21.00 for hand labor, \$24.00 for irrigation labor and \$26.00 for the assistant supervisor. Hand labor includes non-machine, pruning, and canopy and fruit management. These are actual rates paid by the cooperators. The overhead includes the employer's share of federal and California state payroll taxes (14.85%), workers' compensation insurance (9.26%) for vineyards, and a percentage for other possible benefits (16.42%). These costs are based on the average industry final rate as of January, 2020.

Workers' compensation insurance costs will vary among farms. Some vineyard management companies' percentage for other possible benefits is significantly higher, and depending on the employee's position and salary, the total payroll overhead may be 60 percent, which could include bonuses and a retirement plan.

California Minimum Wage and Overtime Rules. In 2016, The California State Government passed new legislation concerning overtime and minimum wage rates that may affect farm labor costs. The California minimum wage rate for companies with more than 25 employees and will rise each year by \$1.00 per hour until it reaches \$15.00 per hour in 2022. Businesses with 25 or fewer employees are given an additional year to comply with the changes. The minimum wage rate increases \$1.00 per hour each year to \$15.00 per hour in 2023.

Recent California regulations also decrease the overtime threshold—the number of hours required to be worked before overtime benefits are received—for agricultural workers. The regulations decrease the overtime threshold for agricultural workers from 60 hours per week and 10 hours per day by 5.0 hours per week and 0.5 hours per day each year until it reaches 40 hours per week and 8.0 hours per day in 2022. Businesses with 25 or fewer employees are given an additional three years to comply with the regulation’s changes. January 1st, 2019 (2022 for employers with 25 or fewer employees) employees will also be entitled to overtime for 8 hours on the seventh consecutive day of work. These regulations may cause increased cost of labor used on farms, whether as direct hires, as farm labor contractor employees or as a component of custom services.

For more information and to view the California minimum wage and overtime phase-in schedules visit www.dir.ca.gov/dlse/faq_minimumwage.htm

Management. Owner/Grower. The vineyard owner does not perform physical work in the vineyard. He uses his own personal vehicles in or around the vineyard while visiting or giving tours.

VMC Equipment. The VMC has various pieces of equipment that he owns, operates and maintains. A few of the major pieces of equipment are listed below. There is no equipment list or table of operating costs. The VMC provides their own farming equipment and trained operators as well as laborers for hand operations such as suckering, shoot thinning, tucking and pruning. The VMC performs all operations that require equipment e.g. mowing/discing, hedging, mechanical leaf removing and harvesting. In addition, the VMC operates a ripper, gypsum/lime spreader, seed drill and harvester. Charges associated with all equipment operated by the VMC appear in the “custom” column in Table 1. Operations that require hand labor only show those charges under the “labor” column in Table 1 and are itemized under “labor” in Table 2.

Pickup Truck. (Diesel, 1-ton, 4-door, 4WD). This pickup is used for towing the trailers and transporting heavy equipment, field workers and supplies. It has three tool boxes, air compressor/welder and an auxiliary fuel tank for refueling equipment.

Pickup Trucks. (1/2-ton, 4-door, 2WD). The VMC has multiple pickups that are used to tow the ATV and sprayer trailer, break station trailers, and to transport workers and supplies to the various vineyard locations.

Truck, Flat-bed. (6-ton capacity, 2-door, 2WD with dual rear axle). These trucks have a 22’ x 8’ flat-bed and can carry 12 harvest bins. These trucks are rented and used for hauling the bins of grape fruit to the winery. They are not in the VMC inventory.

All-Terrain Vehicles (ATV-4WD). The VMC maintains multiple all-terrain vehicles (ATV) are that are used for spraying weeds and are included in those line item operating costs. It is assumed that the (ATV) will be used on the ranch for checking the vineyards including the irrigation system.

Major Equipment Owned by VMC. The VMC owns, operates and maintains various mechanical implements: pre-pruner, leafing machine, hedger, under-row weeder and a self-propelled harvester.

Tractors. The VMC owns, operates and maintains multiple tractors of various horsepower, (25hp – 65hp) and

size (2WD, 4WD w/cab, narrow tracked crawler) to perform all the operations required for wine grape production. The operations requiring a tractor would be vineyard floor management, hedging, leafing, pre-pruning, air blast spraying and transporting fruit bins in/out of the field during harvest.

Trailers. Various size trailers are operated and maintained by the VMC. They are used to transport the equipment needed for operations. The lighter, single axle trailer would be used for the ATV/sprayer, irrigation supplies, and tractor/mower. The medium duty, dual axle trailer would be used to transport the tractor with hedger, disc and seed drill. The VMC uses an even heavier, dual axle trailer to transport the heavier equipment e.g. tractor/ripper and self-propelled harvester.

Hand Tools. The VMC maintains an inventory of hand tools. Pruning and canopy management tools, painting, trellis repair tools and harvesting equipment.

VMC 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 and Biological Engineers (ASABE). Fuel and lubrication costs are also determined by ASABE equations based on maximum power takeoff (PTO) horsepower, and fuel type. Average prices for on-farm delivery of diesel and gasoline, based on June 2020 data from the Energy Information Administration, are \$2.95 and \$3.20 per gallon, respectively. The cost includes a 13.0 percent sales tax on diesel and 2.25 percent sales tax on gasoline. Federal and state excise taxes on diesel (\$0.36/gal) and gasoline (\$0.473/gal) are refunded for on-farm use when filing the farm income tax return.

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 5.25 percent per year. A nominal interest rate is the typical market cost of borrowed funds (Line of credit). The interest cost of post-harvest operations is discounted back to the last harvest month using a negative interest charge. The interest rate will vary depending upon various factors: the rate utilized is considered a typical lending rate by a farm lending agency as of June 2020.

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 can include property taxes, interest on operating capital, liability and property insurance, sanitation services, equipment repairs, and management.

Property Taxes. Counties charge a base property tax rate of 1 percent 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. Property taxes are calculated as 1 percent of the average value of the property and not influenced by the Williamson Act or additional county taxes. Average value equals new cost, plus salvage value divided by 2 on a per acre basis.

The Williamson Act. California Land Conservation Act has helped preserve agricultural and open space lands since 1965. Local governments and landowners enter into voluntary contracts to restrict enrolled lands to agricultural and open space uses in exchange for property tax reductions. The impact of the Williamson Act on property taxes will vary from year to year and property to property. This is due to how it is annually calculated and then compared to its Proposition 13 (factored base year value). The lower of the two is used for the annual assessment. boe.ca.gov/proptaxes/pdf/lta19029.pdf
boe.ca.gov/proptaxes/faqs/changeinownership.htm

Insurance. Insurance for farm investments varies depending on the assets included and the amount of coverage.

Property Insurance. This provides coverage for property loss and is charged at 0.886 percent of the average value of the assets over their useful life.

Liability Insurance. A standard farm liability insurance policy fee of \$546 is included as a cost for the entire farm. This is the cost of the basic policy and paperwork. Addition coverage will incur addition costs. A standard farm liability insurance policy will help cover the expenses for which the owner becomes legally obligated to pay for bodily injury claims on owned property and damages to another person's property as a result of a covered accident.

Crop Insurance. A significant number of vineyard owners purchase crop insurance in this region. Due to variability in coverages, none is purchased. This is available to wine grape growers for unavoidable loss of production, damage or poor quality resulting from adverse weather conditions such as cool wet weather, freeze, frost, hail, excessive heat, rain, wind and damage from birds, drought, earthquakes and fire. Coverage levels are from 50-85 percent of the approved average yield as established by verifiable production records from the farm. Actual insurance coverage is by unit, not by acre. rma.usda.gov/.

Sanitation Services. Sanitation services provide portable toilets for the vineyard and cost the farm \$80 per acre or \$800 per 10 acres annually. The cost includes one double toilet unit with washbasins, delivery and pickup with weekly servicing. Costs also include soap or other suitable cleansing agent, and single use towels. Separate potable water and single-use drinking cups and shaded area are supplied. Contract labor providers may include this service for their work force in the sanitation fees.

Frost Protection (Wind Machines). Three wind machines are installed on the farm (one per 10 acres). The cost of operating the wind machine is a line item under production. The cost of annual maintenance for one machine for the replanted 10 acres is included in non-cash overhead. The machines are fully depreciated and not included as an investment in the non-cash overhead.

Irrigation System. The previous vineyard is assumed to have a well with adequate water supply. 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. The annual maintenance/repair costs for the irrigation system is calculated at \$126 per acre.

Investment Repairs. Annual repairs on investments or capital recovery items that require maintenance are calculated as 2 percent 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. The equipment used is owned and operated by the VMC. There is no table for itemized equipment operating costs.

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 & Biological Engineers (ASABE) based on equipment type and years of life. The life in years is estimated by dividing the wear out life, as given by ASABE 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 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 5.5 percent used to calculate capital recovery cost is the effective long-term interest rate effective June 2020. The interest rate is provided by a local farm lending agency and will vary according to risk and amount of loan.

Land. A key factor driving Napa's market in recent years is that the Napa Valley is effectively planted out, with no significant acreage available for future vineyard development or expansion. Since wine prices ultimately drive the market, it is important to note that grape and vineyard prices are going up faster than wine prices, resulting in an economically unsustainable trend.

Prime Napa Valley established vineyards, depending on age and production, range in price from \$300,000 to \$400,000 per acre. Secondary Napa Valley established vineyards range in price from \$120,000 to \$340,000 per acre. Plantable-Prime Napa Valley land values range from \$200,000 - \$250,000 per acre. Plantable-Secondary Napa Valley land values range from \$50,000 - \$240,000 per acre. (*Trends*). For this study, the land value used is \$200,000 per acre and \$240,000 per planted acre for the entire 12 acres.

Establishment Costs. 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 from Table 1, in the third year represents the establishment cost. The cost is \$45,837 per acre or \$458,370 for the 10-acre vineyard. The establishment cost is spread over the remaining 27 years the vineyard is in production.

Equipment. There is no equipment list. Farm equipment is purchased new or used. The overhead factors have been discussed in previous sections. The operating costs consist of repairs, fuel, and lubrication and are discussed under VMC equipment operating costs.

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

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UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
Table 1. COSTS PER ACRE TO ESTABLISH WINEGRAPES
 North Coast-Napa County-2020

	Year:	Cost Per Acre		
		1st	2nd	3rd
Operations:	Tons Per Acre:			1.50
Pre-Planting Costs:				
Custom: Vineyard Removal and Clean Field by Hand		4,500		
Custom: Soil Amendments/Hay Bales		870		
Custom: Rip 3x		975		
Custom: Disc 3x (weeds-2x/cover crop-1x)		270		
Custom: Level-Landplane 3x		300		
VMC: Cover Crop: Plant		308		
VMC: Weeds: Pre-plant Strip Spray (Rely 280)		115		
Custom Survey: Layout Vineyard: Rebar/Stakes/End Posts		8,775		
VMC: Cover Crop Mowing		85		
Custom: Irrigation System: Installation		250		
VMC: Trellis System Installation			3,200	
TOTAL PRIOR YEAR PRE-PLANTING COSTS		16,448	3,200	
Planting Costs:				
Vines: 1,555 Per Acre (2% Replant 2 nd – 15 th Years)		10,108	202	202
Custom: Plant; Dig, Place Cartons, Plant Vines		3,888	85	85
TOTAL PLANTING COSTS		13,995	287	287
Cultural Costs:				
Well Test/Water Analysis		20	20	20
VMC: In/Out Fee		75	75	75
VMC: Cover Crop: Mow/Disc Middles			88	88
VMC: Irrigation: (water & labor)		206	206	206
VMC: Irrigation: Acid Flush		16	16	16
VMC: Miscellaneous Labor: (various hand operations)		590		
VMC: Fertigate: (8-8-8) Yr. 1: 3x/Yr. 2&3: 3x		32	41	54
VMC: Weeds: Spray Around Vines (Rely 280)		115		
VMC: Cover Crop: Plant		154	154	154
VMC: Disease: Eutypa (Rally)			117	117
VMC: Mow Middles			43	
VMC: Weeds: Disc Middles		90	90	90
VMC: Weeds: Strip-spray Vine Rows 2x, Yr.2 (Rely 280, Chataeu), Yr. 3 (Rely 280/Alion)			238	239
VMC: Prune: Prune to 2 buds			384	
VMC: Leaf Lateral Removal: Machine				100
VMC: Disease: Mildew (Oil)			105	106
VMC: Disease: Mildew (Rally)			114	114
VMC: Train: Train/Tie Canes			1,476	608
VMC: Disease: Mildew (Pristine)			135	
VMC: Train: Sucker/Train/Wrap on wire 2x			1,535	
VMC: Insects: EGVM, VMB (Applaud/Altacor)				116
VMC: Insects: EGVM, (Intrepid)				126
VMC: Disease: Mildew (Sulfur)				196
VMC: Disease: Mildew (Flint)				129
VMC: Pre-Prune: Mechanical				90
VMC: Hedging: Mechanical				95
VMC: Sucker/Shoot Thin 2x				608
VMC: Train: Shoot Position/Move Wires 3x				642
VMC: Fruit Thin 2x				502
VMC: Frost Protection (wind machine)				243
VMC: Vertebrate Pest (bait/trapping)		125	188	188
VMC: Riparian Area: Erosion Control		1,000	200	200
VMC: Management Fee		500	500	700
TOTAL CULTURAL COSTS		2,923	5,722	5,822
Harvest Costs:				
VMC: Pick and Haul Fruit				525
TOTAL HARVEST COSTS				525
Interest on Operating Capital: 5.25%		1,289	269	128
TOTAL OPERATING COSTS/ACRE		34,665	9,478	6,762
VMC: Vineyard Management Company				

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER

Table 1. CONTINUED
North Coast-Napa County-2020

Operation:	Year:	Cost Per Acre		
		1 st	2 nd	3 rd
	Tons Per Acre:			1.00
Cash Overhead Costs:				
Liability Insurance		46	46	46
Field Sanitation Fees		80	80	80
Napa County Housing Commission		15	15	15
Napa Grape Growers membership		0	0	36
Planting & Development Permits		200	0	0
Wind Machine Maintenance		0	0	150
Irrigation System Maintenance		0	126	126
Property Taxes		2,012	2,012	2,012
Property Insurance		1	1	1
Investment Repairs		48	48	48
TOTAL CASH OVERHEAD COSTS		2,402	2,328	2,514
TOTAL CASH COSTS/ACRE		37,056	11,806	9,275
INCOME/ACRE FROM PRODUCTION				12,300
NET CASH COSTS/ACRE FOR THE YEAR		37,056	11,806	
PROFIT/ACRE ABOVE CASH COSTS				3,025
ACCUMULATED NET CASH COSTS/ACRE		37,056	48,862	45,837
Non-Cash Overhead (Capital Recovery):				
Land: Napa (12 acres)		11,000	11,000	11,000
Irrigation System		165	165	165
Equipment		0	0	0
TOTAL NON-CASH OVERHEAD COSTS		11,165	11,165	11,165
TOTAL COST/ACRE FOR THE YEAR		48,222	22,971	20,440
INCOME/ACRE FROM PRODUCTION				12,300
TOTAL NET COST/ACRE FOR THE YEAR		48,222	22,971	8,140
NET PROFIT/ACRE ABOVE TOTAL COST				
TOTAL ACCUMULATED NET COST/ACRE		48,222	71,193	79,333

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
Table 2. COSTS PER ACRE TO PRODUCE WINEGRAPES
 North Coast-Napa County-2020

Operation:	Equipment	Cash and Labor Costs per Acre					Total Cost	Your Cost
	Time (Hrs./Acre)	Labor Cost	Fuel	Lube & Repairs	Material Cost	Custom/Rent		
Cultural:								
Well Test/Water Analysis	0.00	0	0	0	20	0	20	
VMC: In/Out Fee	0.00	0	0	0	75	0	75	
VMC: Prune: Mechanical	0.00	0	0	0	90	0	90	
VMC: Weeds: Strip-spray (Rely 280/Chateau) 2x	0.00	0	0	0	238	0	238	
VMC: Pune: Cleanup/Tying Canes	0.00	863	0	0	0	0	863	
VMC: Disease: Mild Eutypa (Sulfur/Rally)	0.00	0	0	0	124	0	124	
VMC: Vertebrate Pests 2x	0.00	0	0	0	188	0	188	
VMC: Frost Protection: (wind machine)	0.00	27	0	0	216	0	243	
VMC: Disease: Mildew (Sulfur)	0.00	0	0	0	98	0	98	
VMC: Trunk/Cordon Sucker/Shoot Thin 2x	0.00	686	0	0	0	0	686	
VMC: Shoot Position/Move Wires 3x	0.00	763	0	0	0	0	763	
VMC: Sucker Cordons/Trunks	0.00	608	0	0	0	0	608	
VMC: Insect: EGVM (Intrepid)	0.00	0	0	0	126	0	126	
VMC: Mow Middles: CC/Unplanted	0.00	0	0	0	170	0	170	
VMC: Irrigation: (water & labor)	0.00	111	0	0	94	0	206	
VMC: Fertigate: (8-8-8) 3x	0.00	41	0	0	13	0	54	
VMC: Disease: Mildew (Oil)	0.00	0	0	0	106	0	106	
VMC: Disc Middles: Cover Crop	0.00	0	0	0	90	0	90	
VMC: Insect: VMB, EGVM (Applaud/Altacor)	0.00	0	0	0	171	0	171	
VMC: Disease: Mildew (Rally)	0.00	0	0	0	114	0	114	
VMC: Lateral Leaf Removal: Mechanical	0.00	0	0	0	100	0	100	
VMC: Thin Crop 2x	0.00	520	0	0	0	0	520	
VMC: Disease: Mildew (Flint)	0.00	0	0	0	129	0	129	
VMC: Hedging: Mechanical	0.00	0	0	0	95	0	95	
VMC: Disease: Mildew (Pristine)	0.00	0	0	0	135	0	135	
VMC: Weeds: Disc Middles	0.00	0	0	0	90	0	90	
VMC: Plant: Cover Crop	0.00	0	0	0	154	0	154	
VMC: Erosion Control: Riparian Area	0.00	0	0	0	200	0	200	
VMC: Irrigation: Acid Flush	0.00	9	0	0	7	0	16	
VMC: Management Fee	0.00	0	0	0	700	0	700	
TOTAL CULTURAL COSTS	0.00	3,629	0	0	3,544	0	7,173	
Planting:								
Vine: Replant 2%	0.00	0	0	0	202	0	202	
VMC: Dig/Stake/Plant Vines	0.00	0	0	0	85	0	85	
TOTAL PLANTING COSTS	0.00	0	0	0	287	0	287	
Harvest:								
VMC: Harvest/Haul: Machine	0.00	0	0	0	1,400	0	1,400	
TOTAL HARVEST COSTS	0.00	0	0	0	1,400	0	1,400	
Interest on Operating Capital: 5.25%							159	
TOTAL OPERATING COSTS/ACRE	0.00	3,629	0	0	5,230	0	9,019	

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
Table 2. CONTINUED
 North Coast-Napa County-2020

Operation:	Total Cost	Your Cost
CASH OVERHEAD:		
Liability Insurance	46	
Field Sanitation	80	
Napa County Housing Commission	15	
Napa Grape Growers Membership	36	
Irrigation System Maintenance	126	
Wind Machine Maintenance	150	
Trellis Repair	150	
Property Taxes	2,229	
Property Insurance	20	
Investment Repairs	0	
TOTAL CASH OVERHEAD COSTS/ACRE	2,852	
TOTAL CASH COSTS/ACRE	11,871	
NON-CASH OVERHEAD:	Per Producing Acre	Annual Cost Capital Recovery
Land: Napa (12 acres)	200,000	11,000
Vineyard Establishment	45,837	3,298
TOTAL NON-CASH OVERHEAD COSTS	245,837	14,298
TOTAL COSTS/ACRE		26,169

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
Table 3. COSTS AND RETURNS PER ACRE TO PRODUCE WINEGRAPES
 North Coast-Napa County-2020

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS REVENUE					
Cabernet Sauvignon	4.0	Ton	8,200.00	32,800	
TOTAL GROSS REVENUE				32,800	
Operating Costs:					
Herbicide:					58
Rely 280	16.80	FlOz	2.10	35	
Chateau	4.20	Oz	5.50	23	
Insecticide:					97
Intrepid 2F	12.00	FlOz	2.19	26	
Applaud 70DF	12.00	Oz	2.81	34	
Altacor	3.50	FlOz	10.61	37	
Fungicide:					116
Sulfur Micronized	5.00	Lb.	0.58	3	
Rally 40WSP	10.00	Oz	3.49	35	
Sulfur DF	5.00	Lb.	1.57	8	
JMS Stylet Oil	2.00	Pint	3.11	6	
Flint	2.00	Oz	14.49	29	
Pristine	10.00	Oz	3.47	35	
Fertilizer:					13
8-8-8	51.00	Lb.	0.26	13	
Water:					122
Well Test/Water Analysis	1.00	Acre	20.00	20	
Water Pumped	5.84	AcIn	16.50	96	
N-pHuric Acid	0.12	Gal	47.54	6	
Custom:					78
Dig/Stake/Place Cartons/Plant	31.00	Each	2.50	78	
VMC Operations:					4,215
In/Out Fee	1.00	Acre	75.00	75	
Prune: (mechanical)	1.00	Acre	90.00	90	
Weeds: Strip Spray	2.00	Acre	90.00	180	
Air Blast	7.00	Acre	100.00	700	
Vertebrate Pest (bait/trapping)	1.50	Acre	125.00	188	
Dusting (sulfur)	1.00	Acre	90.00	90	
Cover Crop: Mowing	2.00	Acre	85.00	170	
Cover Crop: Discing	1.00	Acre	90.00	90	
Leafing: (mechanical)	1.00	Acre	100.00	100	
Hedge: (mechanical)	1.00	Acre	95.00	95	
VMC: Harvest/Haul (mechanical)	4.00	Ton	350.00	1,400	
Weeds: Discing	1.00	Acre	90.00	90	
Cover Crop Planting	0.50	Acre	95.00	48	
Riparian Area: Maintenance	1.00	Acre	200.00	200	
Management: Production	10.00	Month	70.00	700	
Seed:					106
Seed/Soil Builder Mix	12.50	Lb.	8.50	106	
Vine:					202
Greenvine Transplants	31.00	Each	6.50	202	
Vine Aids:					8
Cartons	31.00	Each	0.25	8	
Frost Protection:					216
Wind Machine (Operation)	12.00	Hour	18.00	216	
VMC Labor:					3,629
Equipment Operator Labor:	**	Hours	33.72	0	
Pruning Labor:	28.00	Hours	29.51	862	
Assistant Supervisor labor:	6.63	Hours	36.54	242	
Irrigation Labor:	3.30	Hours	33.72	111	
Canopy Management Labor:	66.00	Hours	29.51	1,948	
Fruit Management Labor:	17.00	Hours	29.51	502	
Interest on Operating Capital: 5.25%				159	
TOTAL OPERATING COSTS/ACRE				9,019	
TOTAL OPERATING COSTS/TON				2,255	
NET RETURNS ABOVE OPERATING COSTS				23,781	

** Equipment operator labor costs are included in the individual VMC operation charges.

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER

Table 3. CONTINUED

North Coast-Napa County-2020

	Value or Cost/Acre	Your Cost
CASH OVERHEAD COSTS		
Liability Insurance	46	
Field Sanitation	80	
Napa County Housing Commission	15	
Napa Grape Grower Membership	36	
Irrigation System Maintenance	126	
Wind Machine Maintenance	150	
Trellis Repair	150	
Property Taxes	2,229	
Property Insurance	20	
Investment Repairs	0	
TOTAL CASH OVERHEAD COSTS/ACRE	2,853	
TOTAL CASH OVERHEAD COSTS/TON	713	
TOTAL CASH COSTS/ACRE	11,871	
TOTAL CASH COSTS/TON	2,968	
NET RETURNS ABOVE CASH COSTS	20,929	
NON-CASH OVERHEAD COSTS (Capital Recovery)		
Land: Napa 12 acres	11,000	
Vineyard Establishment	3,298	
TOTAL NON-CASH OVERHEAD COSTS/ACRE	14,298	
TOTAL NON-CASH OVERHEAD COSTS/TON	3,575	
TOTAL COST/ACRE	26,169	
TOTAL COST/TON	6,542	
NET RETURNS ABOVE TOTAL COST	6,631	

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
Table 4. MONTHLY CASH COSTS PER ACRE TO PRODUCE WINEGRAPES
 North Coast-Napa County-2020

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	Total
Cultural:											
Well Test/Water Analysis	20										20
VMC: In/Out	75										75
VMC: Prune: Mechanical	90										90
VMC: Weeds: Strip Spray 2x	131						108				238
VMC: Prune: Cleanup/Tie Canes			863								863
VMC: Disease: Mild Eutypa (Sulfur/Rally)			124								124
VMC: Vertebrate Pests 2x			125						63		188
VMC: Frost Protection			81	81	81						243
VMC: Fertigate (8-8-8) 3x			18								18
VMC: Mow Middles: Cover Crop/Unplanted 2x			85		85						170
VMC: Disease: Mildew (Sulfur)				98							98
VMC: Sucker/Shoot Thin 2x				372			313				686
VMC: Shoot Position/Move Wires 3x				254	254	254					763
VMC: Sucker Trunks/Cordons				608							608
VMC: Insects: EGVM (Intrepid)					126						126
VMC: Irrigation					21	41	41	41	41	21	206
VMC: Fertigate (8-8-8) 2x					18					18	36
VMC: Disease: Mildew (oil)					106						106
VMC: Disc Middles: Cover Crop						90					90
VMC: Insects: VMB/EGVM (Applaud/Altacor)						171					171
VMC: Disease: Mildew (Rally)						114					114
VMC: Lateral Leaf Removal: Mechanical						100					100
VMC: Fruit Thin 2x							260	260			520
VMC: Disease: Mildew (Flint)							129				129
VMC: Hedging: Mechanical							95				95
VMC: Disease: Mildew (Pristine)								135			135
VMC: Weeds: Disc Middles										90	90
VMC: Plant: Cover Crop										154	154
VMC: Erosion Control										200	200
VMC: Irrigation: Acid Flush										16	16
VMC: Management	70	70	70	70	70	70	70	70	70	70	700
TOTAL CULTURAL COSTS	386	70	1,366	1,484	762	840	1,016	506	174	569	7,173
Planting:											
Vine: Replant 2%				202							202
Dig/Stake/Plant Vines				85							85
TOTAL PLANTING COSTS	0	0	0	287	0	0	0	0	0	0	287
Harvest:											
VMC: Harvest/Haul: Mechanical									1,400		1,400
TOTAL HARVEST COSTS	0	0	0	0	0	0	0	0	1,400	0	1,400
Interest on Operating Capital @5.25%	2	2	8	16	19	23	27	29	36	-2	159
TOTAL OPERATING COSTS/ACRE	387	72	1,374	1,787	781	863	1,043	535	1,610	566	9,019

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER

Table 4. CONTINUED
North Coast-Napa County-2020

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	Total
CASH OVERHEAD											
Liability Insurance									46		46
Field Sanitation	8	8	8	8	8	8	8	8	8	8	80
Napa County Housing Commission									15		15
Napa Grape Growers Membership									36		36
Irrigation System Maintenance									126		126
Wind Machine Maintenance					150						150
Trellis Repair									150		150
Property Taxes		1,115					1,115				2,229
Property Insurance		10					10				20
Investment Repairs	0	0	0	0	0	0	0	0	0	0	0
TOTAL CASH OVERHEAD COSTS	8	1,133	8	8	158	8	1,133	8	381	8	2,852
TOTAL CASH COSTS/ACRE	395	1,205	1,382	1,795	939	871	2,176	543	1,990	574	11,871

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER

Table 5. RANGING ANALYSIS

North Coast-Napa County-2020

	YIELD (tons/acre)						
	1.75	2.50	3.25	4.00	4.75	5.50	6.25
OPERATING COSTS/ACRE:							
Cultural	7,173	7,173	7,173	7,173	7,173	7,173	7,173
Planting	287	287	287	287	287	287	287
Harvest	613	875	1,138	1,400	1,663	1,925	2,188
Interest on Operating Capital: 5.25%	156	157	158	159	161	162	163
TOTAL OPERATING COSTS/ACRE	8,228	8,492	8,755	9,019	9,282	9,546	9,810
TOTAL OPERATING COSTS/TON	4,701.65	3,396.62	2,693.90	2,254.71	1,954.21	1,735.66	1,569.57
CASH OVERHEAD COSTS/ACRE	2,852	2,852	2,852	2,852	2,852	2,852	2,852
TOTAL CASH COSTS/ACRE	11,080	11,344	11,607	11,871	12,134	12,398	12,662
TOTAL CASH COSTS/TON	6,331.36	4,537.41	3,571.44	2,967.71	2,554.63	2,254.20	2,025.88
NON-CASH OVERHEAD COSTS/ACRE	14,298	14,298	14,298	14,298	14,298	14,298	14,298
TOTAL COSTS/ACRE	25,378	25,642	25,905	26,169	26,433	26,696	26,960
TOTAL COSTS/TON	14,502.00	10,257.00	7,971.00	6,542.00	5,565.00	4,854.00	4,314.00

Net Return per Acre above Operating Costs for Cabernet Sauvignon

PRICE (\$/ton)	YIELD (tons/acre)						
Cabernet	1.75	2.50	3.25	4.00	4.75	5.50	6.25
7,450	4,810	10,133	15,457	20,781	26,105	31,429	36,753
7,700	5,247	10,758	16,270	21,781	27,293	32,804	38,315
7,950	5,685	11,383	17,082	22,781	28,480	34,179	39,878
8,200	6,122	12,008	17,895	23,781	29,668	35,554	41,440
8,450	6,560	12,633	18,707	24,781	30,855	36,929	43,003
8,700	6,997	13,258	19,520	25,781	32,043	38,304	44,565
8,950	7,435	13,883	20,332	26,781	33,230	39,679	46,128

Net Return per Acre above Cash Costs for Cabernet Sauvignon

PRICE (\$/ton)	YIELD (tons/acre)						
Cabernet	1.75	2.50	3.25	4.00	4.75	5.50	6.25
7,450	1,958	7,281	12,605	17,929	23,253	28,577	33,901
7,700	2,395	7,906	13,418	18,929	24,441	29,952	35,463
7,950	2,833	8,531	14,230	19,929	25,628	31,327	37,026
8,200	3,270	9,156	15,043	20,929	26,816	32,702	38,588
8,450	3,708	9,781	15,855	21,929	28,003	34,077	40,151
8,700	4,145	10,406	16,668	22,929	29,191	35,452	41,713
8,950	4,583	11,031	17,480	23,929	30,378	36,827	43,276

Net Return per Acre above Total Costs for Cabernet Sauvignon

PRICE (\$/ton)	YIELD (tons/acre)						
Cabernet	1.75	2.50	3.25	4.00	4.75	5.50	6.25
7,450	-12,340	-7,017	-1,693	3,631	8,955	14,279	19,603
7,700	-11,903	-6,392	-880	4,631	10,142	15,654	21,165
7,950	-11,465	-5,767	-68	5,631	11,330	17,029	22,728
8,200	-11,028	-5,142	745	6,631	12,517	18,404	24,290
8,450	-10,590	-4,517	1,557	7,631	13,705	19,779	25,853
8,700	-10,153	-3,892	2,370	8,631	14,892	21,154	27,415
8,950	-9,715	-3,267	3,182	9,631	16,080	22,529	28,978

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
Table 6. WHOLE FARM ANNUAL INVESTMENT, AND BUSINESS OVERHEAD COSTS
 North Coast-Napa County-2020

ANNUAL INVESTMENT COSTS

Description	Price	Yrs. Life	Salvage Value	Capital Recovery	Cash Overhead			Total
					Insurance	Taxes	Repairs	
INVESTMENT								
Land-Napa 12 acres	2,400,000	30	2,400,000	132,000	0	24,000	0	156,000
Vineyard Establishment	458,370	27	0	32,981	203	2,292	0	35,476
TOTAL INVESTMENT	2,858,370	-	2,400,000	164,981	203	26,292	0	191,476

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/ Farm	Unit	Price/ Unit	Total Cost
Liability Insurance	12	Acre	45.50	546
Field Sanitation	10	Acre	80.00	800
Napa County Housing Commission	10	Acre	15.00	150
Napa Grape Grower Membership	10	Acre	36.00	360
Irrigation System Maintenance	10	Acre	126	1,260
Wind Machine Maintenance	10	Acre	150	1,500
Trellis Repair	10	Acre	150	1,500

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
Table 7. OPERATIONS WITH EQUIPMENT & MATERIALS
 North Coast-Napa County-2020

Operation	Month	Labor Type/ Materials	Rate/ Acre	Unit
Well Test/Water Analysis	Jan	Well Test/Water Analysis	1.00	Acre
VMC: In/Out	Jan	In/Out Fee	1.00	Acre
Prune: Mechanical	Jan	Pre-Pruning (Mechanical)	1.00	Acre
Weeds: Strip Spray 2x	Jan	Rely 280	8.40	FLOz
		Chateau	4.20	Oz
		Weeds: Strip Spray	1.00	Acre
	July	Rely 280	8.40	FLOz
		Weeds: Strip Spray	1.00	Acre
Prune/Tie (Canes)	Feb	VMC: Pruning Labor	28.00	Hours
		VMC: Assistant Supervisor labor	1.00	Hours
Disease: Mild Eutypa	Mar	Sulfur Micronized	5.00	Lb.
		Rally 40WSP	6.00	Oz
		Air Blast	1.00	Acre
Vertebrate Pest	Mar	Vertebrate Pest (bait/trapping)	1.00	Acre
	Sept	Vertebrate Pest (bait/trapping)	0.50	Acre
Frost Protection	Mar	VMC: Assistant Supervisor labor	0.25	Hours
		Wind Machine (Operation)	4.00	Hours
	Apr	VMC: Assistant Supervisor labor	0.25	Hours
		Wind Machine (Operation)	4.00	Hours
	May	VMC: Assistant Supervisor labor	0.25	Hours
		Wind Machine (Operation)	4.00	Hours
Vine: Replant 2%	Apr	Green vine Transplants	31.00	Each
Dig/Stake/Plant Vine	Apr	Dig/ Stake/Place Cartons/Plant	31.00	Each
		Cartons	31.00	Each
Fertigate (8-8-8) 3x	Mar	VMC: Assistant Supervisor labor	0.38	Hours
		8-8-8	17.00	Lb.
	May	VMC: Assistant Supervisor labor	0.38	Hours
		8-8-8	17.00	Lb.
	Oct	VMC: Assistant Supervisor labor	0.38	Hours
		8-8-8	17.00	Lb.
Disease: Mildew	Apr	Sulfur DF	5.00	Lb.
		Dusting (sulfur)	1.00	Acre
Sucker/Shoot Thin 2x	Apr	VMC: Canopy Management Labor	12.00	Hours
		VMC: Assistant Supervisor labor	0.50	Hours
	July	VMC: Assistant Supervisor labor	0.50	Hours
		VMC: Canopy Management Labor	10.00	Hours
Shoot Position/Move Wires	Apr	VMC: Assistant Supervisor labor	0.50	Hours
		VMC: Canopy Management Labor	8.00	Hours
	May	VMC: Assistant Supervisor labor	0.50	Hours
		VMC: Canopy Management Labor	8.00	Hours
	June	VMC: Assistant Supervisor labor	0.50	Hours
		VMC: Canopy Management Labor	8.00	Hours
Sucker: Trunks/Cordons	Apr	VMC: Assistant Supervisor labor	0.50	Hours
		VMC: Canopy Management Labor	20.00	Hours
Insects: EGVM	May	Intrepid 2F	12.00	FLOz
		Air-blast	1.00	Acre
CC/Unplanted Mow Middles 2x	Mar	Cover Crop: Mowing	1.00	Acre
	May	Cover Crop: Mowing	1.00	Acre

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER

TABLE 7. CONTINUED
North Coast-Napa County-2020

Operation	Month	Labor Type/ Materials	Rate/ Acre	Unit
Irrigation	May	VMC: Irrigation Labor	0.33	Hour
		Water Pumped	0.57	AcIn
	June	VMC: Irrigation Labor	0.66	Hour
		Water Pumped	1.15	AcIn
	July	VMC: Irrigation Labor	0.66	Hour
		Water Pumped	1.15	AcIn
		Water Pumped	1.15	AcIn
	Aug	VMC: Irrigation Labor	0.66	Hour
		Water Pumped	1.15	AcIn
	Sept	VMC: Irrigation Labor	0.66	Hour
Oct	VMC: Irrigation Labor	0.33	Hour	
	Water Pumped	0.57	AcIn	
Disease: Mildew	May	JMS Stylet Oil	2.00	Pints
		Air-blast	1.00	Acre
CC: Disc Middles	Apr	Cover Crop: Discing	1.00	Acre
Insects: VMB EGVM	June	Applaud 70DF	12.00	Oz
		Altacor	3.50	FIOz
		Air-blast	1.00	Acre
Disease: Mildew	June	Rally 40WSP	4.00	Oz
		Air-blast	1.00	Acre
Lateral Leaf Removal	June	Leafing: (mechanical)	1.00	Acre
Fruit Thin 2x	July	VMC: Assistant Supervisor labor	0.25	Hours
		VMC: Fruit Management Labor	8.50	Hours
	Aug	VMC: Assistant Supervisor labor	0.25	Hours
		VMC: Fruit Management Labor	8.50	Hours
Disease: Mildew	July	Flint	2.00	Hours
		Air-blast	1.00	Acre
Hedging mechanical	July	Hedge: (mechanical)	1.00	Acre
Disease: Mildew	Aug	Pristine	10.00	Oz
		Air Blast	1.00	Acre
		Weeds: Discing	1.00	Acre
Weeds: Disc Middles	Oct	Weeds: Discing	1.00	Acre
CC: Plant 50%	Oct	Seed/Soil Build Mix	12.50	Lb.
		Cover Crop Planting	0.50	Acre
		Riparian Area: Maintenance	1.00	Acre
Erosion Control	Oct	Riparian Area: Maintenance	1.00	Acre
Irrigation: Acid Flush	Oct	VMC: Assistant Supervisor labor	0.25	Hours
		Water Pumped	0.10	AcIn
		N-pHuric Acid	0.12	Gal
		Management: Production	10.00	Month
VMC: Management	Oct	Management: Production	10.00	Month
Harvest/Haul	Sept	VMC: Harvest/Haul	4.00	Ton