UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

2012

SAMPLE COSTS TO ESTABLISH A VINEYARD AND PRODUCE

WINEGRAPES

Cabernet Sauvignon

NORTH COAST REGION
NAPA COUNTY

Monica L. Cooper	UC Cooperative Extension Farm Advisor, Napa County
Karen M. Klonsky	UC Cooperative Extension Specialist, Department of Agricultural and Resource Economics, UC Davis
Richard L. De Moura	Staff Research Associate, Department of Agricultural and Resource Economics, UC Davis

SAMPLE COSTS TO ESTABLISH A VINEYARD AND PRODUCE WINEGRAPES
Cabernet Sauvignon
NORTH COAST REGION – Napa County 2012

CONTENTS

Acknowledgment. Appreciation is expressed to the Napa Valley Grapegrowers members who provided time and input for this study. Thank you to Randy Heinzen, Steve Smit, Garrett Buckland, Stan Zervas, and Ron Wicker of the Napa Valley Grapegrowers and Jennifer Kopp Putnam, Executive Director, for coordinating the data collection and providing facilities for the meetings.

INTRODUCTION

Sample costs to establish a vineyard and produce winegrapes 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 or 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 winegrapes in the North Coast – Napa County or Napa Valley Appellation. Within the Napa Valley Appellation are 15 subappellations. For district location and other related information see the websites www.napagrowers.org and www.napavintners.com. 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 study is intended as a guide only. ***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 less than a 5% slope, is owned and operated by the grower. The 35 contiguous acre farm consists of 30 acres of winegrapes of which 10 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 (NVG). 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 Cultural Practices and Material Inputs

The following practices refer to table 1.

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

Vineyard Conversion and Site Preparation. The new vineyard is being planted on land that had an existing vineyard. The 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, 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. 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 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 commercially 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 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, but for this purpose no costs are shown and both will use the same trellis. 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 27 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 protected with a milk carton. In the following year an average of 2% or 31 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 (1/2-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) is shown in the first year and 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 and cordon (fruit) wire are installed after planting.

Second Year. Three pairs of canopy wires 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 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 (miscellaneous 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% 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. Pumping costs from grower input approximated $16.50 per acre inch ($0.0006 per gallon). 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 (155,865 gallons per acre or 5.74 acre inches). Labor is calculated at 0.33 hours per acre per irrigation.

Frost Protection. The three propane powered wind machines (one per 10 acres) were installed on the 30 acres and one is available for use on the replanted 10 acres. The machines are fully depreciated. The machine begins operation in the third year. It is assumed that the wind machine will run 50 hours per season (March, April, May) at five hours per night.

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 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 in this study, 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 (*Erisiphe 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 grower's equipment.

Weeds. In late January/early February of the first year, prior to planting, Glyfos (glyphosate) is applied to the vine row (30-inch band) with an ATV and sprayer. In April the cover crop (middles) is mowed and then disked in early May and August. In July or August, Glyfos is sprayed around the vines. In the second year and third year, Glyfos is applied as a strip spray in February prior to pruning and around the vines in July; the middles (cover crop) are mowed in April, disked in May, August and October (for cover crop seedbed).

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/April of the following year, and then disked in May. In the fall of the first and second year, an annual cover crop (bell bean, oat, vetch) is planted in October and disked in May of the second year. In October of the third 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 October after harvest.

Harvesting. Harvesting starts in the third year. In this study the crop is hand harvested by a custom harvester company. Picking and hauling costs are estimated at $520 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. Prepruning is done during the winter months (January) and final pruned in early March. The prunings are placed in the vine centers 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 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 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 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. In this study 5.74 acre-inches (155,866 gallons per acre) are applied and water 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 50 hours per season, 5 hours per night 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 May 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 http://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 advisers (PCAs). In addition the PCA will monitor the field for pests and nutrition. Growers may hire private PCAs or receive the service as part of a service agreement with an agricultural chemical and fertilizer company. Management companies may have their own PCA. A PCA or PCAs are hired in this study to monitor the field for irrigation, nutrition and pests for $100 per acre

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. In this study, 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 (myclobutanil) in June, Flint (trifloxystrobin) in July and Pristine (pyraclostrobin/boscalid) in August. All applications are made with the grower's equipment. It is recommended that applicators rotate fungicides among different modes of action in order to avoid fungicide resistance in powdery mildew populations. Growers 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.

Weeds. In this vineyard, vine row weeds are controlled with Glyfos (glyphosate) applied as a strip spray (35.7% of the acreage) in January and again in July. A permanent cover crop is planted in the row middles and is described under cover crop.

Permanent Cover Crop. In October of the third 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.

Harvest. The current trend is to use custom services. Therefore a custom harvest company is hired to handpick and haul the grapes. In normal producing vineyards (4-5 tons), costs of $300 per ton are assumed. 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 tractors each with a bin trailer holding one-half ton bins. The grapes are handpicked 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 4.5 tons per acre over the life of the vineyard is used to calculate returns in the production years. The typical yield range for Cabernet Sauvignon in Napa County is 3.0 to 6.0 tons per acre.

Returns. A price of $4,455 per ton for Cabernet Sauvignon winegrapes is used to show a range of yields over a series of returns. The price is an average of the 2007 to 2011 weighted average grower returns as reported each year in Table 10 of the Final Grape Crush Report. Net returns at different yields and prices are shown in Table 5 in this study.

Assessments/Membership. The Napa Valley Grapegrowers, a voluntary organization, charges membership dues of $15.00 per net acre planted, bearing and non-bearing, with a minimum annual fee of $300 for 20 acres or less and a maximum of $3,000 for 200 acres or more. The organization's mission is to "to promote and preserve Napa Valley's world-class vineyards". Membership in the organization is not included as a cost in this study. Other grower assessments not included are the Pierce's Disease/Glassy Winged Sharpshooter assessment in which growers are assessed $1 per $1,000 of crop returns; and the Napa County Pest and Disease Control District Board annual assessment which is $8.00 per acre for 2012. Additionally, Napa growers are assessed $10 per acre by the Napa County Housing Commission for operation of the Napa County farmworker housing facilities.

Pickup/ATV. The grower uses the pickup for business and personal use. The assumed business use for the pickup is 10,000 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, Equipment and Interest Costs

Labor. Labor rates of $20.30 per hour for machine operators and $17.70 for general labor includes payroll overhead of 45%. The basic hourly wages are $14.00 for machine operators and $12.20 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 participating growers' recommendations. Labor for operations involving machinery are 20% higher than the operation time given in Table 2 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 takeoff (PTO) horsepower, and fuel type. Prices for on-farm delivery of red dye diesel and gasoline are $3.43 (excludes excise taxes) and $3.83 per gallon, respectively. The cost includes a 2.5% local sales tax on diesel fuel, but does not include excise taxes. Gasoline costs include a 7.5% sales tax plus federal and state excise tax. Some federal excise tax can be refunded for on-farm use when filing your income tax. The costs are based on 2011, Department of Energy (DOE) monthly data. 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 5.75% 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. The interest rate is the basic rate provided by a farm lending agency as of January 2012.

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 0.803% of the average value of the assets over their useful life. Liability insurance covers accidents on the farm and costs $608 for the entire farm.

Sanitation Services. Sanitation services provide portable toilets for the vineyard and cost the farm $1,295 or $432 per 10 acres 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 ((Purchase Price – Salvage Value) x Capital Recovery Factor) + (Salvage Value x 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 4.75% used to calculate capital recovery cost is the effective long term interest rate effective January 1, 2012. The interest rate is provided by a local farm lending agency and will vary according to risk and amount of loan.

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 on Table 1, in the third year represents the establishment cost. For this study the cost is $37,991 per acre or $379,910 for the 10-acre vineyard. The establishment cost is spread over the remaining 27 years of the 30 years the vineyard is in production.

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

Frost Protection (Wind Machines). Three wind machines were installed on the 30 acres (one per 10 acres) and one machine is available for the 10 replant acres. The machines are assumed to be fully depreciated; therefore only the annual maintenance of $500 per machine and the insurance is shown in the Investment Expenses.

Land. Bare land available for vineyard establishment (2011 Trends & Leases) is valued at $125,000 per acre or $145,833 per net plantable (30) acre. Land planted with resistant rootstock vines is valued from $50,000 to $300,000.

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.

REFERENCES

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.

Boehlje, Michael D., and Vernon R. Eidman. 1984. *Farm Management*. John Wiley and Sons. New York, NY.

California Chapter of the American Society of Farm Managers and Rural Appraisers. 2011. *Trends in Agricultural Land and Lease Values.* California Chapter of the American Society of Farm Managers and Rural Appraisers, Inc. Woodbridge, CA.

California State Department of Food and Agriculture. 2007-2011. Table 10 of Final Grape Crush Report. California Department of Food and Agriculture. Sacramento, CA. Internet accessed March 5, 2012 http://www.nass.usda.gov/ca/bul/crush/

California State Board of Equalization. *Fuel Tax Division Tax Rates.* Internet accessed January 2009. http://www.boe.ca.gov/sptaxprog/spftdrates.htm

Energy Information Administration. 2011. *Weekly Retail on Gasoline and Highway Diesel Prices January – December 2011.* Internet accessed January 2012. http://tonto.eix.doe.gov/oog/info/wohdp

Klonsky, Karen M. and Richard L. De Moura, *Sample Costs to Establish a Vineyard and Produce Wine Grapes. Cabernet Sauvignon, North Coast Region - Napa.* 2009. University of California Cooperative Extension. Davis, CA

University of California Statewide IPM Project. 2011. *UC Pest Management Guidelines, Grapes*. University of California, Davis, CA. http://www.ipm.ucdavis.edu

Weber, Edward A., Karen M. Klonsky and Richard L. De Moura, *Sample Costs to Establish a Vineyard and Produce Wine Grapes. North Coast Region - Napa.* 2003. 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
NORTH COAST - Napa County 2012

Table 1. COSTS PER ACRE TO ESTABLISH A VINEYARD

	Cost Per Acre		
Year:	1st	2nd	3rd
Tons Per Acre:			1.00
Land Preparation Costs:			
Site Prep: Vineyard Removal and Clean Field by Hand (Custom)	1,600		
Site Prep: Rip 1X/Disk 2X (Custom)	600		
Site Prep: Level/Landplane 1X (Custom)	100		
Site Prep: Apply Soil Amendments Gypsum or Lime and Compost (Custom)	620		
Site Prep: Mark , Layout, Stake Vineyard (Custom)	1,400		
Trellis: Install Trellis (Custom)	11,000		
Cover Crop: Plant	75		
TOTAL PRIOR YEAR LAND PREP COSTS	15,395		
Planting Costs:			
Weed: Spray Strip (Glyphos)	30		
Weed: Mow Middles	42		
Vines: 1,555 Per Acre (2% Replant In 2nd Year)	5,443	88	
Plant: Dig, Plant, Place Carton around vine (Custom)	3,421	67	
Irrigate: Install Irrigation System (Drip) (Custom)	3,200		
TOTAL PLANTING COSTS	12,136	155	
Cultural Costs:			
Weed: Disk Middles	59	89	119
Irrigate: (water & labor)	328	328	328
Miscellaneous Labor: (various hand operations)	283		
Fertilize: Through drip (8-8-8)	13	13	13
Weed: Spray Around Vines (Glyphos)	30		
Cover Crop: Plant (3rd yr permanent cover crop planted)	75	63	109
Disease: Eutypa (Rally)		59	59
Weed: Spray Vine Row (Glyphos)		40	59
Prune: Prune to 2 buds		230	
Weed: Mow Middles		42	42
Disease: Mildew (Oil)		65	84
Disease: Mildew (Rally)		54	62
Train: Sucker/Train/Tie		920	389
Disease: Mildew (Pristine)		71	
Train: Sucker/Train/Wrap on wire 2X		936	
Insect: EGVM, VMB (Applaud, Altacor)			111
Insect: EGVM, (Intrepid)			44
Disease: Mildew (Sulfur)			87
Disease: Mildew (Flint)			74
Prune: Winter Prune			566
Train: Shoot Position			142
Prune: Thin Crop			142
Frost Protection			216
Pickup Truck Use	284	284	284
ATV Use	26	26	26
TOTAL CULTURAL COSTS	1,099	3,220	2,956
Harvest Costs:			
Pick and Haul Fruit			520
TOTAL HARVEST COSTS			520
Interest On Operating Capital @ 5.75%	1,689	110	69
TOTAL OPERATING COSTS/ACRE	30,318	3,485	3,544

UC COOPERATIVE EXTENSION

Table 1. continued

	Cost Per Acre		
Year:	1st	2nd	3rd
Tons Per Acre:			1.00
Cash Overhead Costs:			
Office Expense	300	300	300
Liability Insurance	20	20	20
Sanitation Fees	43	43	43
Property Taxes	1,266	1,267	1,256
Property Insurance	13	24	15
Investment Repairs	23	73	73
TOTAL CASH OVERHEAD COSTS	1,665	1,727	1,707
TOTAL CASH COSTS/ACRE	31,983	5,212	5,251
INCOME/ACRE FROM PRODUCTION			4,455
NET CASH COSTS/ACRE FOR THE YEAR	31,983	5,212	796
PROFIT/ACRE ABOVE CASH COSTS			
ACCUMULATED NET CASH COSTS/ACRE	31,983	37,195	**37,991**
Non-Cash Overhead (Capital Recovery):			
Land	5,938	5,938	5,938
Buildings	34	34	34
Shop/Field Tools	26	26	26
Fuel Tanks	7	7	7
Wind Machines	0	0	0
Equipment	659	730	124
TOTAL NON-CASH OVERHEAD COSTS	6,664	6,735	6,129
TOTAL COST/ACRE FOR THE YEAR	38,647	11,947	11,380
INCOME/ACRE FROM PRODUCTION			4,455
TOTAL NET COST/ACRE FOR THE YEAR	38,647	11,947	6,925
NET PROFIT/ACRE ABOVE TOTAL COST			
TOTAL ACCUMULATED NET COST/ACRE	38,647	50,594	57,519

UC COOPERATIVE EXTENSION
NORTH COAST - NAPA COUNTY 2012

Table 2. COSTS PER ACRE TO PRODUCE WINEGRAPES

Operation	Operation Time (Hrs/A)	Cash and Labor Costs per Acre: Labor Cost	Fuel	Lube &	Material Cost	Custom/ Rent	Total Cost	Your Costs
Cultural:								
Prune: Pre-Prune	13.00	230	0	0	0	0	230	
Weed: Spray Strip 2.5' (Glyfos)	2.00	49	3	2	6	0	59	
Prune: (Cordon-Spur Pruned)	27.00	478	0	0	0	0	478	
Prune: Tying (Canes)	12.00	212	0	0	0	0	212	
Weed: Mow Middles	2.00	49	22	13	0	0	84	
Disease/Insect: Mildew (Sulfur)/ Eutypa (Rally)	1.00	24	11	5	37	0	77	
Frost Protection	5.01	89	0	0	216	0	305	
Disease: Mildew (Sulfur)	1.00	24	11	5	4	0	44	
Canopy Mgmt: Trunk/Cordon Suckering	15.00	266	0	0	0	0	266	
Insect: EGVM (Intrepid)	1.00	24	11	5	37	0	77	
Irrigation: (water & labor)	3.30	58	0	0	95	0	153	
Fertilize: through drip (8-8-8)	0.00	0	0	0	13	0	13	
Disease: Mildew (Oil)	1.00	24	11	5	44	0	84	
Canopy Mgmt: Sucker/Shoot Thin/Position	10.00	177	0	0	0	0	177	
Insect: EGVM (Altacor), VMB (Applaud)	1.00	24	11	5	78	0	118	
Disease: Mildew (Rally)	1.00	24	11	5	22	0	62	
Canopy Mgmt: Leaf/Lateral Removal/Wire Lift	40.00	708	0	0	0	0	708	
Canopy Mgmt: Thin Crop (crop thin)	10.00	177	0	0	0	0	177	
Disease: Mildew (Flint)	1.00	24	11	5	34	0	74	
Canopy Mgmt: Thin Crop (color/set thin)	18.00	319	0	0	0	0	319	
Disease: Mildew (Pristine)	1.00	24	11	5	39	0	79	
PCA	0.00	0	0	0	0	100	100	
Pickup Truck Use	6.06	148	106	30	0	0	284	
ATV	1.00	24	1	1	0	0	26	
TOTAL CULTURAL COSTS	172.37	3,178	221	83	624	100	4,206	
Harvest:								
Custom Harvest (pick, haul)	0.00	0	0	0	0	1,350	1,350	
TOTAL HARVEST COSTS						1,350	1,350	
Interest on Operating Capital @ 5.75'%							103	
TOTAL OPERATING COSTS/ACRE	172.37	3,178	221	83	624	1,450	5,659	
Cash Overhead:								
Liability Insurance							20	
Office Expense							300	
Sanitation							43	
Property Taxes							1,446	
Property Insurance							169	
Investment Repairs							70	
TOTAL CASH OVERHEAD COSTS/ACRE							2,048	
TOTAL CASH COSTS/ACRE							7,707	

Non-Cash Overhead:	Per producing Acre	Annual Capital Recovery			
Building 400sqft	533	34			34
Establish Vineyard	37,991	2,526			2,526
Land (35Ac)	125,000	5,938			5,938
Tools	200	26			26
Wind Machine (no capital recovery See page 10)	0	0			0
Equipment	1,128	116			116
TOTAL NON-CASH OVERHEAD COSTS	164,852	8,639			8,639
TOTAL COSTS/ACRE					16,346

UC COOPERATIVE EXTENSION
NORTH COAST - NAPA COUNTY 2012

Table 3. COSTS AND RETURNS PER ACRE TO PRODUCE WINEGRAPES

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre
GROSS RETURNS				
Production	4.50	ton	4,455.00	20,048
TOTAL GROSS RETURNS	4.50	ton		20,048
OPERATING COSTS				
Herbicide:				**6**
Glyfos	1.00	pint	6.17	6
Insecticide:				**115**
Applaud 70DF	12.00	oz	2.82	34
Intrepid 2F	12.00	floz	3.11	37
Altacor	3.50	floz	12.50	44
Fungicide:				**179**
Wettable Sulfur (Sulfur DF)	6.00	lb	1.20	7
Rally 40WSP	10.00	oz	5.50	55
JMS Stylet Oil	2.00	gal	22.01	44
Flint	2.00	oz	16.75	34
Pristine	10.00	oz	3.92	39
Fertilizer:				**13**
8-8-8	51.00	lb	0.26	13
Water:				**95**
Water Pumped	5.74	acin	16.50	95
Custom:				**1,450**
PCA (field/water)	1.00	acre	100.00	100
Harvest (pick & haul)	4.50	ton	300.00	1,350
Frost Protection:				**216**
Wind Machine Operation	50.00	hrac	4.32	216
Labor:				**3,178**
Equipment Operator Labor	22.87	hrs	20.30	464
Non-Machine Labor	153.31	hrs	17.70	2,714
Machinery:				**304**
Fuel-Gas	28.78	gal	3.82	110
Fuel-Diesel	32.41	gal	3.43	111
Lube				33
Machinery Repair				49
Interest on Operating Capital (5.75'%)				103
TOTAL OPERATING COSTS/ACRE				5,659
NET RETURNS ABOVE OPERATING COSTS				14,389
Cash Overhead:				
Liability Insurance				20
Office Expense				300
Sanitation				43
Property Taxes				1,446
Property Insurance				169
Investment Repairs				70
TOTAL CASH OVERHEAD COSTS/ACRE				2,048
TOTAL CASH COSTS/ACRE				7,707
Non-Cash Overhead (Capital Recovery)				
Building 400sqft				34
Establish Vineyard				2,526
Land (35Ac)				5,938
Tools				26
Wind Machine (no capital recovery See page 10)				0
Equipment				116
TOTAL NON-CASH OVERHEAD COSTS				8,639
TOTAL COST/ACRE				16,346
NET RETURNS ABOVE TOTAL COST				3,701

UC COOPERATIVE EXTENSION
NORTH COAST - NAPA COUNTY 2012

Table 4. MONTHLY CASH COSTS PER ACRE TO PRODUCE WINEGRAPES

Beginning 01-12 Ending 12-12	JAN 12	FEB 12	MAR 12	APR 12	MAY 12	JUN 12	JUL 12	AUG 12	SEP 12	OCT 12	NOV 12	DEC 12	TOTAL
Cultural:													
Prune: Pre-Prune	230												230
Weed: Spray Strip 2.5' (Glyfos)	30						30						59
Prune: (Cordon-Spur Pruned)			478										478
Prune: Tying (Canes)			212										212
Weed: Mow Middles			42		42								84
Disease/Insect: Mildew (Sulfur)/ Eutypa (Rally)			77										77
Frost Protection			94	116	94								305
Disease: Mildew (Sulfur)				44									44
Canopy Mgmt: Trunk/Cordon Suckering				266									266
Insect: EGVM (Intrepid)					77								77
Irrigation: (water & labor)					15	31	31	31	31	15			153
Fertilize: through drip (8-8-8)					7					7			13
Disease: Mildew (Oil)					84								84
Canopy Mgmt: Sucker/Shoot Thin/Position					177								177
Insect: VMB, (Applaud) EGVM (Altacor)						118							118
Disease: Mildew (Rally)						62							62
Canopy Mgmt: Leaf/Lateral Removal/Wire Lift						354	354						708
Canopy Mgmt: Thin Crop (crop thin)							177						177
Disease: Mildew (Flint)							74						74
Canopy Mgmt: Thin Crop (color/set thin)								319					319
Disease: Mildew (Pristine)								79					79
PCA	8	8	8	8	8	8	8	8	8	8	8	8	100
Pickup Truck Use	24	24	24	24	24	24	24	24	24	24	24	24	284
ATV	2	2	2	2	2	2	2	2	2	2	2	2	26
TOTAL CULTURAL COSTS	294	34	938	459	531	599	699	463	65	56	34	34	4,206
Harvest:													
Harvest-Custom Pick Haul									1,350				1,350
TOTAL HARVEST COSTS									1,350				1,350
Interest on Operating Capital (5.75'%)	1	2	6	8	11	14	17	19	26	-1	0	0	103
TOTAL OPERATING COSTS/ACRE	295	36	944	468	542	612	716	482	1,441	55	34	34	5,659
Cash Overhead:													
Liability Insurance		20											20
Office Expense	25	25	25	25	25	25	25	25	25	25	25	25	300
Sanitation	4	4	4	4	4	4	4	4	4	4	4	4	43
Property Taxes		723					723						1,446
Property Insurance		169											169
Investment Repairs	6	6	6	6	6	6	6	6	6	6	6	6	70
TOTAL CASH OVERHEAD COSTS	34	946	34	34	34	34	757	34	34	34	34	34	2,048
TOTAL CASH COSTS/ACRE	330	982	978	502	576	647	1,473	516	1,475	90	68	68	7,707

UC COOPERATIVE EXTENSION
NORTH COAST - Napa County 2012
Table 5. RANGING ANALYSIS for WINEGRAPES

COSTS PER ACRE AT VARYING YIELD TO PRODUCE WINEGRAPES

	YIELD (ton/acre)						
	3.00	3.50	4.00	4.50	5.00	5.50	6.00
OPERATING COSTS:							
Cultural Cost	4,206	4,206	4,206	4,206	4,206	4,206	4,206
Harvest Cost	900	1,050	1,200	1,350	1,500	1,650	1,800
Interest on operating capital @ 5.75%	101	102	102	103	104	105	105
TOTAL OPERATING COSTS/ACRE	5,206	5,357	5,508	5,659	5,809	5,960	6,111
Total Operating Costs/ton	1,735	1,531	1,377	1,257	1,162	1,084	1,018
CASH OVERHEAD COSTS/ACRE	2,049	2,049	2,049	2,049	2,049	2,049	2,049
TOTAL CASH COSTS/ACRE	7,255	7,406	7,557	7,707	7,858	8,009	8,159
Total Cash Costs/ton	2,418	2,116	1,889	1,713	1,572	1,456	1,360
NON-CASH OVERHEAD COSTS/ACRE	8,639	8,639	8,639	8,639	8,639	8,639	8,639
TOTAL COSTS/ACRE	15,894	16,045	16,196	16,346	16,497	16,648	16,799
Total Costs/ton	5,298	4,584	4,049	3,633	3,299	3,027	2,800

NET RETURNS PER ACRE ABOVE OPERATING COSTS

PRICE	YIELD (ton/acre)						
$/ton	3.00	3.50	4.00	4.50	5.00	5.50	6.00
3,105	4,109	5,510	6,912	8,314	9,716	11,117	12,519
3,555	5,459	7,085	8,712	10,339	11,966	13,592	15,219
4,005	6,809	8,660	10,512	12,364	14,216	16,067	17,919
4,455	8,159	10,235	12,312	14,389	16,466	18,542	20,619
4,905	9,509	11,810	14,112	16,414	18,716	21,017	23,319
5,355	10,859	13,385	15,912	18,439	20,966	23,492	26,019
5,805	12,209	14,960	17,712	20,464	23,216	25,967	28,719

NET RETURNS PER ACRE ABOVE CASH COSTS

PRICE	YIELD (ton/acre)						
$/ton	3.00	3.50	4.00	4.50	5.00	5.50	6.00
3,105	2,060	3,462	4,864	6,265	7,667	9,069	10,471
3,555	3,410	5,037	6,664	8,290	9,917	11,544	13,171
4,005	4,760	6,612	8,464	10,315	12,167	14,019	15,871
4,455	6,110	8,187	10,264	12,340	14,417	16,494	18,571
4,905	7,460	9,762	12,064	14,365	16,667	18,969	21,271
5,355	8,810	11,337	13,864	16,390	18,917	21,444	23,971
5,805	10,160	12,912	15,664	18,415	21,167	23,919	26,671

NET RETURNS PER ACRE ABOVE TOTAL COSTS

PRICE	YIELD (ton/acre)						
$/ton	3.00	3.50	4.00	4.50	5.00	5.50	6.00
3,105	-6,579	-5,177	-3,776	-2,374	-972	430	1,832
3,555	-5,229	-3,602	-1,976	-349	1,278	2,905	4,532
4,005	-3,879	-2,027	-176	1,676	3,528	5,380	7,232
4,455	-2,529	-452	1,624	3,701	5,778	7,855	9,932
4,905	-1,179	1,123	3,424	5,726	8,028	10,330	12,632
5,355	171	2,698	5,224	7,751	10,278	12,805	15,332
5,805	1,521	4,273	7,024	9,776	12,528	15,280	18,032

UC COOPERATIVE EXTENSION
NORTH COAST - NAPA COUNTY 2012

Table 6. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT, AND BUSINESS OVERHEAD COSTS

ANNUAL EQUIPMENT COSTS

Yr	Description	Price	Yrs Life	Salvage Value	Capital Recovery	Cash Overhead Insur-ance	Cash Overhead Taxes	Total
12	60HP 4WD Narrow Tractor	45,000	15	8,761	3,849	216	269	4,333
12	Air Blast Gil 3Pt 200gal	10,000	15	960	902	44	55	1,001
12	ATV 4WD	6,700	5	3,003	991	39	49	1,078
12	Mower-Flail 5'	8,000	15	768	722	35	44	801
12	Pickup Truck 1/2 T	32,000	7	12,139	3,978	177	221	4,376
12	Sprayer ATV 20gal	350	10	62	40	2	2	44
TOTAL		102,050		25,692	10,481	513	639	11,632
60% of new cost*		61,230		15,415	6,288	308	383	6,979

*Used to reflect a mix of new and used equipment

ANNUAL INVESTMENT COSTS

Description	Price	Yrs Life	Salvage Value	Capital Recovery	Cash Overhead Insur-ance	Cash Overhead Taxes	Repairs	Total
INVESTMENT								
Building 400sqft	16,000	30	0	1,011	64	80	512	1,668
Establish Vineyard (10 Ac)	379,910	27	0	25,262	1,540	1,900	0	28,701
Land-Napa (35 Ac)	4,375,000	30	4,375,000	207,813	0	43,750	0	251,563
Tools	6,000	10	0	768	24	30	100	922
Wind Machine (3) See page 10	0	28	0	0	301	0	1,500	1,801
TOTAL INVESTMENT	4,776,910		4,375,000	234,853	1,929	45,760	2,112	284,654

ANNUAL BUSINESS OVERHEAD COSTS

Description	Farm	Unit	Price/ Unit	Total Cost
Liability Insurance	30	acre	20.27	608
Office Expense	30	acre	300.00	9,000
Sanitation	30	acre	43.17	1,295

UC COOPERATIVE EXTENSION
NORTH COAST - NAPA COUNTY 2012

Table 7. HOURLY EQUIPMENT COSTS for WINEGRAPES PRODUCTION

Yr	Description	Cabernet Hours Used	Total Hours Used	COSTS PER HOUR Capital Recovery	Cash Overhead Insur-ance	Cash Overhead Taxes	Operating Lube & Repairs	Operating Fuel	Operating Total Oper.	Total Costs/Hr.
12	60HP 4WD NarrowTractor	110	1,066	2.17	0.12	0.15	2.66	10.11	12.77	15.21
12	Air Blast Sprayer Gil 3Pt 200gal	80	143	3.78	0.18	0.23	1.55	0.00	1.55	5.75
12	ATV 4WD	30	400	1.49	0.06	0.07	0.69	1.27	1.96	3.58
12	Mower-Flail 5'	20	133	3.25	0.16	0.20	3.73	0.00	3.73	7.34
12	Pickup Truck 1/2 T	61	285	8.37	0.37	0.46	4.99	17.51	22.50	31.71
12	Sprayer ATV 20gal	20	150	0.16	0.01	0.01	0.09	0.00	0.09	0.27

UC COOPERATIVE EXTENSION
NORTH COAST - NAPA VALLEY 2012
Table 8. OPERATIONS WITH EQUIPMENT and MATERIALS

Operation	Operation Month	Tractor	Implement	Labor Type	Labor Hours	Material	Rate/ acre	Unit
Pre Prune	Jan			Non-Machine	13.00			
Spray Strip 2.5' Glyfos	Jan		ATV 4WD SprayerATV20gal	Equipment Operator	1.20	Glyfos	0.50	pint
	July		ATV 4WD SprayerATV20gal	Equipment Operator	1.20	Glyfos	0.50	pint
Prune (Cordon-Spur Pruned)	Mar			Non-Machine	27.00			
Tying (Canes)	Mar			Non-Machine	12.00			
Mow Middles	Mar	60HP4WDNarrowTract	Mower-Flail 5'	Equipment Operator	1.20			
	May	60HP4WDNarrowTract	Mower-Flail 5'	Equipment Operator	1.20			
Disease - Mild Eutypa (Sulf Rally)	Mar	60HP4WDNarrowTract	AirBlastGil3Pt200G	Equipment Operator	1.20	Wettable Sulfur	3.00	lb
						Rally 40WSP	6.00	oz
Frost Protection	Mar			Non-Machine	1.67	Wind Mach	15.00	hrac
	Apr			Non-Machine	1.67	Wind Mach	20.00	hrac
	May			Non-Machine	1.67	Wind Mach	15.00	hrac
Disease - Mildew Wet Sulfur	Apr	60HP4WDNarrowTract	AirBlastGil3Pt200G	Equipment Operator	1.20	Wettable Sulfur	3.00	lb
Trunk/Cordon Suckering	Apr			Non-Machine	15.00			
Insect: EGVM (Intrepid)	May	60HP4WDNarrowTract	AirBlastGil3Pt200G	Equipment Operator	1.20	Intrepid 2E	12.00	oz
Irrigation	May			Non-Machine	0.33	Water Pumped	0.57	acin
	June			Non-Machine	0.66	Water Pumped	1.15	acin
	July			Non-Machine	0.66	Water Pumped	1.15	acin
	Aug			Non-Machine	0.66	Water Pumped	1.15	acin
	Sept			Non-Machine	0.66	Water Pumped	1.15	acin
	Oct			Non-Machine	0.33	Water Pumped	0.57	acin
Fertilizer through Drip	May			Non-Machine		8-8-8	25.50	lb
	Oct			Non-Machine		8-8-8	25.50	lb
Insect: Mealy EGVM	May	60HP4WDNarrowTract	AirBlastGil3Pt200G	Equipment Operator	1.20	Applaud	12.00	floz
						Altacor	3.50	floz
Disease - Mildew (Oil)	May	60HP4WDNarrowTract	AirBlastGil3Pt200G	Equipment Operator	1.20	JMS Stylet Oil	2.00	gal
Sucker/Shoot Thin/Position	May			Non-Machine	10.00			
Disease - Mildew (Rally)	June	60HP4WDNarrowTract	AirBlastGil3Pt200G	Equipment Operator	1.20	Rally 40WSP	4.00	oz
Leaf/Lateral Removal/Wire Lift	June			Non-Machine	20.00			
	July			Non-Machine	20.00			
Thin Crop (crop thin)	July			Non-Machine	10.00			
Disease - Mildew (Flint)	July	60HP4WDNarrowTract	AirBlastGil3Pt200G	Equipment Operator	1.20	Flint	2.00	oz
Thin Crop (color/set thin)	Aug			Non-Machine	18.00			
Disease - Mildew (Pristine)	Aug	60HP4WDNarrowTract	AirBlastGil3Pt200G	Equipment Operator	1.20	Pristine	10.00	oz
PCA	Aug					PCA (field/water)	1.00	acre
Pickup Truck Use	Aug		Pickup Truck 1/2 T	Equipment Operator	7.27			
ATV	Aug		ATV 4WD	Equipment Operator	1.20			
Harvest-Custom Pick Haul	Sept					Harvest Labor	4.50	ton