
UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

2007

SAMPLE COSTS TO
ESTABLISH AND PRODUCE
TABLE GRAPES
THOMPSON SEEDLESS



SAN JOAQUIN VALLEY - South

Stephen J. Vasquez	UCCE Farm Advisor, Fresno County
Jennifer M. Hashim-Buckey	UCCE Farm Advisor, Kern County
William L. Peacock	UCCE Farm Advisor, Tulare County
Karen M. Klonsky	UCCE Specialist, Department of Agricultural and Resource Economics, UC Davis
Richard L. De Moura	Research Associate, Department of Agricultural and Resource Economics, UC Davis

UC COOPERATIVE EXTENSION

SAMPLE COSTS TO ESTABLISH A VINEYARD AND PRODUCE TABLE GRAPES

Thompson Seedless
San Joaquin Valley – South 2007

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INTRODUCTION

Sample costs to establish a vineyard and produce Thompson Seedless table grapes 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 farming operation. 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 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 can be downloaded at <http://coststudies.ucdavis.edu>, requested through the Department of Agricultural and Resource Economics, UC Davis, (530) 752-1517 or obtained from the local county UC Cooperative Extension offices. Some archived studies are also available on the website.

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ASSUMPTIONS

The assumptions refer to Tables 1 to 8 and pertain to sample costs to establish a vineyard and produce Thompson Seedless table grapes in the San Joaquin Valley. The cultural practices described and materials used are considered typical for a well-managed vineyard in the region. The costs, materials, and practices will not apply to all farms. Timing of and types of establishment and cultural practices will vary among growers within the region and from season to season due to variables such as weather, soil, and insect and disease pressure. **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.**

Farm. The hypothetical farm consists of 120 contiguous acres. Thompson Seedless vineyard establishment and table grape production is on 40 acres. Other varieties are on 75 acres and roads, irrigation systems, and farmstead occupy five acres. The farm is owned and managed by the grower.

Establishment Cultural Practices & Material Inputs (Table 1)

Site Preparation. This vineyard is established on ground previously planted to vineyards or orchards. Land coming from vines or trees should be fallowed for two years except for a possible grain crop. The land is assumed to be fairly level. A custom operator chisels the ground (subsoils) twice to a depth of 4 to 5 feet. The grower floats the land to smooth and level the surface. Afterwards the ground is disced twice to apply and incorporate preplant herbicide. Nematode samples should be taken from land formerly in vines or trees and fumigated if necessary. Most operations that prepare the vineyard for planting are done in the year prior to planting, but costs are shown in the first year.

Plant. Planting the vineyard starts by laying out and marking vine sites in early spring. Holes are dug and vines planted and a two-inch by two-inch cardboard carton placed around the vine. The grapevines are planted during the first spring on an 8-foot x 12-foot spacing (vine x row) with 454 vines per acre. In the second year, 2% or 9 vines per acre are replaced.

Vines. The Thompson Seedless plants are dormant, bench-grafted rootstock vines purchased from a commercial nursery. Vines are trained during the second and third years. The grapevines are expected to begin yielding fruit in three years and then be productive for an additional 22 years.

Trellis System. A commercial company installs the trellis system in the second year. The trellis system will be removed when the vineyard is removed; therefore it is considered part of the vineyard and included in the establishment costs. Materials for the open gable trellis are as follows: (1) Stakes with V structure are placed every 24-feet down the row. Metal stakes (2 lbs/ft strength) are 8.5-foot long and placed in the ground 3-feet. The open gable is 72-inches wide from tip to tip. (2) End assemblies consist of 9.5-foot metal post (4 lb/ft) with a V that matches those within the row and with 10-inch helix anchor. (3) Eight wires, 12.5 gauge high tensile, are used for fruit and canopy support, and three wires, 14 gauge high tensile, are used for movable catch wires and drip hose support.

Train/Prune. Vines are pruned to one two bud spur in the first dormant season (December to February). Pruning costs are shown in January in this study.

Train. The following spring (second year), a single shoot is selected and trained up the stake to form the permanent structure of the vine. Training consists of tying the shoot, removing lateral shoots from the base and tipping the shoot when it reaches the top of the stake to form the head of the vine. Most of the training costs

occur during the second summer. The third summer is devoted to replacing and training missing vines or vines delayed in growth.

Prune. In the third year (January), vines are pruned much like an established vine. The exception being the number of canes retained – 2-3 canes on young vines and 5-8 canes on mature vines. Prunings are placed in the row middles and shredded. Selecting and tying canes to fruiting wires is required each year for the life of the vineyard. Suckers from vine trunks are removed in April, a practice that continues each year but diminishes as the vineyard matures.

Irrigate. Water pumping costs plus labor constitute the irrigation cost. In this study, water is calculated to cost \$4.59 per acre-inch or \$55.08 per acre-foot. The pumping cost is based on a 40 horsepower (HP) motor to pump from 130 feet deep. The vineyard is irrigated during the growing season from April through October during the establishment years. Price per acre-foot of water will vary by grower in this region depending on quantity used, water district, power cost, various well characteristics, and other irrigation factors. The amount of water applied to the vineyard varies through the establishment years and is shown in Table A.

Table A. Irrigation Water Applied

Year	AcIn/Year
1	8
2	18
3+	36

Fertilize. Liquid nitrogen fertilizer, UN32, is applied through the irrigation system in April of the first year at five pounds of N per acre. A single application is made in April of the second year and equally split applications in May and June of the third year. The amount of nitrogen applied each year increases as the vineyard matures and is shown in Table B. It is important to identify sources of nitrogen in order to properly manage the nitrogen budget. For example, sources of nitrogen found in irrigation well water should be calculated to determine future irrigation and fertilizer needs.

Table B. Applied Nitrogen (N) Per Acre

Year	Lbs of N
1	5
2	20
3	40
4+	50

Pest Management. For pest identification, monitoring, management and pesticide information, visit the UC IPM website at www.ipm.ucdavis.edu. Written recommendations are required for many commercially applied pesticides, and are available from licensed pest control advisers (PCAs). For information on pesticide use permits, contact the local county Agricultural Commissioner’s office. **Pesticides mentioned in this study are used to calculate rates and costs. Although the pesticides mentioned are commonly used by growers, many other pesticides are available. Check with your PCA and/or the UC IPM website for current recommendations.**

Weeds (Vineyard Floor Management). In October of the year prior to planting, Treflan is applied to the vineyard floor and incorporated by discing. After planting, weeds in the vine rows and middles are managed with discing, mowing, and/or herbicides. From March through July of the first year, the row middles are disced twice and mowed twice. The vine rows are hand weeded in April. The row middles are mowed four times in the second year and three times in the third year. The vine rows are sprayed (strip spray) in January of the second year with Roundup and Surflan. The strip spray is applied to 30% of the acreage. Also in the second year, spot sprays using Roundup are applied to the vine row in April, June, and July. The spot sprays (weedy spots or areas) are applied using an all terrain vehicle (ATV) with a sprayer attached.

Insects. Western grapeleaf skeletonizer (*Harrisina brillians*) is controlled in April of the second and third years with an application of Kryocide insecticide (mixed with micronized sulfur disease sprays). In the third year, Provado insecticide is applied in June to control grape leafhoppers (*Erythroneura elegantula*). Insects such as mealybugs (*Pseudococcus sp.*) are monitored each year beginning in the spring and may increase production costs if found.

Diseases. Although many pathogens attack grapevines, phomopsis cane and leafspot (*Phomopsis viticola*) and powdery mildew (*Erysiphe necator*) are the two diseases managed in this study. In the second year, Microthiol (micronized sulfur) for mildew is applied (with Kryocide insecticide application) in April. In March of the third year, Microthiol plus Abound (strobilurin) are applied for phomopsis and mildew control. Mildew is controlled with various fungicide applications at 7 to 21 day intervals in the third year, depending on the fungicide used. For this study, the grower applies Kocide (copper) and Rubigan (SI), and two Microthiol applications (one with Kryocide) in April; one Rubigan (SI) application and two dusting sulfur applications in May; one Rubigan (SI) application and three dusting sulfur applications in June. Growers have the option of using sulfur (dust, wettable, flowable or micronized), sterol inhibitors (SIs), or strobilurins, as well as other fungicides to control powdery mildew. Sterol inhibitors and strobilurins are two classes of fungicides with different modes of action than sulfur against powdery mildew. It is recommended that fungicides with different modes of action be used to avoid powdery mildew populations from developing fungicide resistance.

Vertebrate. Rabbits, gophers, squirrels and coyotes are pests that can cause damage to the vines and irrigation lines. Various forms of control such as baiting, trapping and/or building a rabbit fence are utilized as necessary throughout the year. For this study no specific control is used, but an estimated cost for one or two management practices are shown in March. Endangered Species: It is important to know if your vineyard is located in an area where endangered species reside (i.e. San Joaquin Kit Fox). Trapping and killing endangered species can result in fines. Contact your County Agricultural Commissioner for additional information.

Harvest/Yield/Returns. Harvest begins the third year and the fruit is picked for wine. A contractor hand harvests the crop for \$60 per ton. Harvest includes hand picking the grapes into bins that are furnished by the contractor. Hauling to the winery will vary depending on the hauling distance. For this study, the haul is less than 20 miles and cost \$10 per ton. A six-ton per acre yield is assumed in the third year.

Mature Production Cultural Practices and Material Inputs (Tables 2-8)

Prune/Sucker/Canopy Management (CM). The vines are cane-pruned during the winter months (December to early February) and the prunings are placed in the row middles and shredded. In mid February, the canes are tied to a trellis wire(s) by wrapping around the trellis wire and tying with twist-ties. Suckers are removed from the vine trunks and crowns beginning in April. Shoot positioning is done in May. Cane cutting is done as needed beginning in June (June only in this study) with the grower's equipment.

Fruit Management (FM). Gibberellic acid (GA), a plant growth regulator, is applied four times. Two times in May during bloom for thinning at 12 grams per acre per application and two times in June, two weeks after full bloom and one week later for berry sizing at 60 grams per acre per application (disease and insect materials are included with these applications). A third sizing application (not included in this study) at 40 grams per acre is sometimes applied about one-week later to delay maturity. Vines are girdled in June at berry set, two to three weeks after full bloom. Cluster tipping and hand thinning are done after berry set in late May to early June to loosen clusters, and adjust cluster length and crop load.

Trellis/Vines. Trellis repairs are done annually and the cost is not taken from any specific data. Sick vines are replaced by layering. One year-old canes from vines are buried in the soil next to the stake and allowed to root. After rooting the canes are cut and the plant trained on the trellis. Trellis repair and vine replacement costs increase with vineyard age.

Irrigate. The vineyard is drip irrigated during the growing season from April through October. Deficit irrigation (80% ET) is applied post-harvest to control vine growth and promote cane maturity. Deficit irrigation may also be applied three to four weeks before harvest to advance maturity and decrease decay, but should be used with caution. Vineyards with poor root systems or high populations of soil pests should be monitored closely under deficit irrigation. Water pumping costs plus labor constitute the irrigation cost. In this study, water is calculated to cost \$4.59 per acre-inch or \$55.08 per acre-foot. The pumping cost is based on a 40 horsepower (HP) motor to pump from 130 feet deep pressurized to 20 pounds per square inch (PSI). A total of 36 acre-inches is applied to the vineyard. Price per acre-foot of water will vary by grower in this region depending on quantity used, water district, power cost, various well characteristics, and other irrigation factors. In some years, irrigation may be needed in March for frost protection.

Fertilize. Nitrogen (N) at 50 pounds per acre as UN32 is applied through the irrigation drip system in April (or can be applied post harvest). Neutral zinc is applied to prevent zinc deficiencies and is combined with the late April mildew (Microthiol, Rally) application.

Pest Management. The pesticides and rates mentioned in this cost study are listed in *UC Integrated Pest Management Guidelines, Grapes*. For information on other pesticides available, pest identification, monitoring, and management visit the UC IPM website at www.ipm.ucdavis.edu. For information and pesticide use permits, contact the local county agricultural commissioner's office. **Pesticides mentioned in this study are used to calculate rates and costs. Although the pesticides mentioned are commonly used by growers, many other pesticides are available. Check with your PCA and/or the UC IPM website for current recommendations.** Adjuvants are recommended for use with many pesticides for effective control, but the adjuvants and their costs are not included in this study. Pesticide costs may vary by location, brand, and grower volume. Pesticide costs in this study are taken from a single dealer and shown as full retail.

Pest Control Adviser (PCA). Written recommendations are required for many commercially applied pesticides and are written by licensed pest control advisers. In addition the PCA will monitor the field for agronomic problems including pests, diseases, and nutritional status. Growers may hire private PCAs or receive the service as part of a service agreement with an agricultural chemical and fertilizer company. Costs for a PCA are not included in this study.

Weeds (Vineyard Floor Management). Vineyard middles are mowed three times each season: March, May, July. Surflan and Roundup herbicides are applied to the vine row in February. Roundup, a contact herbicide, is applied as a spot spray to the vine row in June.

Insects. Mealybug (*Pseudococcus sp.*) is treated with Lorsban insecticide in early March (dormant vines). Western grapeleaf skeletonizer (*Harrisina brillians*) is treated with Kryocide (mixed with a GA and/or sulfur application) during the second bloom thinning spray in May. Grape leafhoppers (*Erythroneura elegantula*) are controlled with Provado insecticide (mixed with GA, Microthiol, Flint) during the second berry size spray in June. An effective alternative material for mealybugs is to apply Admire insecticide through the drip system, but at a higher cost than a Lorsban application. It may be necessary to use multiple insecticides to control some mealybug species.

Diseases. Diseases treated in this study are phomopsis cane and leafspot (*Phomopsis viticola*) and powdery mildew (*Eryshiphe necator*). Phomopsis and powdery mildew are both treated in late March (shoot length 2 inches) with Microthiol (micronized sulfur) and Abound (strobilurin). Mildew is controlled during the season with various fungicide applications at 7 to 21 day intervals, depending on the fungicide used. In this study, Dusting Sulfur is applied three times - April, June, July. Microthiol and Rally, an SI (with zinc) are applied in late April. Microthiol and Flint, a strobilurin (with GA) are applied with the first May bloom thin

spray. Microthiol (with GA and Kryocide) is applied with the second bloom thin spray in May. Microthiol and Rally, an SI (with GA) are applied with the first berry size spray in June and Microthiol and Flint, a strobilurin (with GA and Provado) with the second berry size spray in June. Growers have the option of using sterol inhibitors (SI), quinolins, strobilurins, or sulfur (micronized, wettable, dust, flowable), as well as other fungicides to control powdery mildew. These materials are classes of fungicides with different modes of action. Check the IPM website under grapes for management options to control powdery mildew. It is recommended that applicators use fungicides with different modes of action in order to avoid fungicide resistance in powdery mildew populations.

Vertebrate. Rabbits, gophers, squirrels coyotes and birds are pests that can cause damage to the vines and irrigation lines. Various forms of control such as baiting, trapping and/or building a rabbit fence are utilized as necessary throughout the year. For this study no specific control is used, but per acre costs are shown from March through October and are an estimate not based on any specific data. Endangered Species: It is important to know if your vineyard is located in an area where endangered species reside (i.e. San Joaquin Kit Fox). Trapping and killing endangered species can result in fines. Contact your County Agricultural Commissioner for additional information.

Harvest. Beginning in the fourth year, the grapes are harvested for table grapes and packed in the field. Harvest crews work in teams of three or four people. Depending upon fruit quality, a crew can pick 3 to 6 boxes per hour per individual. In this cost analysis it is assumed that each individual packs four boxes per hour. Two or three crew members field pick and trim grape clusters and place them into boxes, which are then palletized. Approximately four field boxes are loaded on a wheelbarrow and delivered to the packer who finish trims and bags the bunches, which are then placed in shipping boxes. The box holds 9 bags of grapes and contains 19 pounds of fruit. The filled boxes are loaded on a flat bed truck and hauled to a cold storage facility. The swamp and haul costs includes the boxes, plastic bags and related labor. Pre cooling and palletization (P&P) costs may in some cases be a grower cost but are generally charged to the buyer. After 30 days of cold storage, the grower is charged approximately \$0.35 per box per month (\$0.25-0.45) until the fruit is sold. Brokerage fees are paid by the grower and range from 7 to 10% of the selling price. A figure of 9% of the selling price is used in this study.

Yields. This study based on grower input uses an average yield of 800 19-pound boxes over the remaining life of the vineyard. Average yields shown in Table C are the average of all table grape varieties.

Returns. Return prices for grapes at different yields and price are shown in Table 5. Based on grower input, an estimated price of \$12 per box for Thompson Seedless grapes is used in this study.

Assessments/Inspection. The California Table Grape Commission (CTGC) assesses \$0.1156 per 19-pound box or \$0.006087 per pound. Early in the season, growers often have the county Agricultural Commissioner inspect their fruit for maturity at a cost of \$0.035 per box. Approximately one-third of the entire crop is inspected to determine that maturity requirements are met, which includes soluble solids:acid ratios (20:1) and color.

Pickup/ATV. It is assumed that the grower uses the pickup for business and personal use. Estimated business mileage for the ranch is 5,250 miles. The all terrain vehicle (ATV) is used for spot spraying weeds and is included in that cost. It is assumed that the ATV will be used another 800 miles on the ranch for checking the vineyards including the irrigation system.

Average Yields	
Year	Tons/Acre (boxes)
2002	8.13 (856)
2003	7.60 (800)
2004	7.76 (815)
2005	11.34 (1,194)
2006	9.66 (1,016)

Source: Fresno County Crop Reports, 2002-2006.
Boxes = 19 lbs.

Labor. Hourly wages for workers are \$11.00 for machine operators and \$8.50 per hour non-machine labor. Adding 33% for the employer's share of federal and state payroll taxes, workers compensation insurance for vine crops (0040) and other possible benefits gives the labor rates shown of \$14.63 and \$11.31 per hour for machine labor and non-machine labor, respectively. Workers' compensation costs will vary among growers, but for this study the cost is based upon the average industry final rate as of January 1, 2007 (personal email from California Department of Insurance, May 18, 2007, unreferenced). 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 diesel and gasoline are \$2.30 and \$2.80 per gallon, respectively. Fuel costs are derived from American Automobile Association (AAA) and Energy Information Administration 2006 monthly data. The cost includes a 2% local sales tax on diesel fuel and 8% sales tax on gasoline. Gasoline also includes federal and state excise tax, which are refundable for on-farm use when filing your income tax. The fuel, lube, and repair costs per acre for each operation in Table 2 are 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 10.00% 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 rate will vary depending upon various factors, but the rate in this study is considered a typical lending rate by a farm lending agency as of January 2007.

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 0.714% of the average value of the assets over their useful life. Liability insurance covers accidents on the farm and costs \$674 for the entire farm.

Office Expense. Office and business expenses are estimated at \$80 per producing acre or \$9,200 annually for the ranch. These expenses include office supplies, telephones, bookkeeping, accounting, legal fees, road maintenance, etc. The cost is assumed and not taken from any specific data.

Sanitation Services. Sanitation services provide double portable toilets with washbasins for 10 months. The cost includes delivery and weekly cleaning service. The number of sanitation facilities will vary depending upon local regulations and size of labor force. In many cases labor contractors furnish the sanitation facilities for their crews and it is included in the contractor's labor overhead.

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

Investment Repairs. Annual maintenance is calculated as 2% of the purchase price.

Non-Cash Overhead Costs

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

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

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

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

Interest Rate. An interest rate of 7.25% is used to calculate capital recovery. The rate will vary depending upon loan amount and other lending agency conditions, but is the basic suggested rate by a farm lending agency as of January 2007.

Land. The land was formerly a vineyard, but has been out of production for two years. The open land was planted to grain crops. Land values in the San Joaquin Valley with table grape production ranges from \$6,000 to \$13,400 per acre (depending on vineyard age, variety and location). Cropland with district or well water in the area ranges from \$2,500 to \$12,000. For this study, the land value was established based on 2007 real estate values (2007 Trends & Leases); therefore a cost of \$7,000 per acre or \$7,304 per producing acre is used.

Tools. This is an assumed value for shop, hand, and miscellaneous field tools and not based on any grower's tool inventory.

Fuel Tanks. Two 300-gallon fuel tanks using gravity feed are on metal stands. The tanks are setup in a cement containment pad that meets federal, state, and county regulations.

Drip Irrigation System. The drip lines, filters, booster pump and the labor to install the components are included in the irrigation system cost. The previous vineyard is assumed to have a pumping system that had been refurbished and therefore is not included as a cost. Water is delivered from a 130-foot depth using a 40-horsepower pump. The drip irrigation lines are laid directly on the ground prior to planting and the labor cost is included in the drip irrigation system cost.

Establishment Cost. The establishment cost is the sum of the costs for land preparation, trellis system, planting, vines, cash overhead and production expenses for growing the vines through the first year that grapes are harvested (year three). It is used to determine the non-cash overhead expense, capital recovery cost, during the production years. The Total Accumulated Net Cash Cost on Table 1, in the third year represents the establishment cost. For this study the cost is \$8,999 per acre or \$359,960 for the 40 producing acres. The establishment cost is spread over the remaining 22 years of the 25 years the vineyard is in production.

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 shown in Table 6. Equipment costs are composed of three parts: non-cash overhead, cash overhead, and operating costs. Both of the overhead factors have been discussed in previous sections. The operating costs consist of repairs, fuel, and lubrication and are discussed under operating costs.

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

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For information concerning the above or other University of California publications, contact your local county UC Cooperative Extension office or UC DANR Communications Services online at <http://ucanr.org>.

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**Table 1. SAMPLE COSTS PER ACRE TO ESTABLISH A TABLE GRAPE VINEYARD-Thompson Seedless
SAN JOAQUIN VALLEY - SOUTH 2007**

	Cost Per Acre			
	Year:	1st	2nd	3rd
Tons Per Acre:	0	0		6.00
Planting Costs:				
Site Prep: Subsoil 2X	400			
Site Prep: Float (Level)	12			
Site Prep: Disc/Apply Herbicide (Treflan)	17			
Site Prep: Disc/Incorporate Herbicide	12			
Plant: Survey & Layout Vineyard	61			
Plant: Plant, Wrap Vines	145	2		
Vines: 454 Per Acre (2% Replant In 2nd Year)	1,407	28		
Trellis: Install Trellis System		4,000		
TOTAL PLANTING COSTS	2,055	4,030		
Cultural Costs:				
Vertebrate: Rabbit, Squirrel, Gopher (various methods)	40	15	15	
Fertilize: Nitrogen	3	9	18	
Irrigate: Water/Labor	54	109	161	
Weed: Disc Middle - 2X/Yr 1	16			
Weed: Mow Middle - 2X/Yr 1, 4X/Yr 2, 3X/Yr 3	16	31	24	
Weed: Hand Hoe	34			
Prune: (& Tie): Dormant		73	147	
Training: (Sucker, Tie)		271	113	
Insect: Skeletonizer (Kryocide). Disease: Mildew (Microthiol)		36	36	
Weed: Spot Spray (Roundup)		42	42	
Weed: Winter Strip Spray (Roundup, Surflan)		53	53	
Prune: Shred Prunings (every middle)			15	
Disease: Phomopsis (Microthiol, Abound)			51	
Disease: Mildew Control (Microthiol)			20	
Insect: Leafhoppers 1X (Provado)			46	
Disease: Mildew - (Kocide, Rubigan)			50	
Disease: Mildew 5X (Sulfur Dust)			48	
Disease: Mildew 2X, (Rubigan)			56	
Pickup Truck Use	82	82	82	
ATV Use	30	38	38	
TOTAL CULTURAL COSTS	274	760	1,016	
Harvest Costs:				
Harvest: Contract				420
TOTAL HARVEST COSTS				420
Interest On Operating Capital @ 10.00%	213	355		50
TOTAL OPERATING COSTS/ACRE	2,542	5,144		1,485
Cash Overhead Costs:				
Office Expense	80	80	80	
Liability Insurance	6	6	6	
Sanitation Service	19	19	19	
Property Taxes	85	86	87	
Property Insurance	9	9	10	
Investment Repairs	42	42	42	
TOTAL CASH OVERHEAD COSTS	242	242	245	
TOTAL CASH COSTS/ACRE	2,783	5,386	1,730	
INCOME/ACRE FROM PRODUCTION	0	0	900	
NET CASH COSTS/ACRE FOR THE YEAR	2,783	5,386	830	
PROFIT/ACRE ABOVE CASH COSTS	0	0	0	
ACCUMULATED NET CASH COSTS/ACRE	2,783	8,169	8,999	

UC COOPERATIVE EXTENSION

Table 1. continued

	Cost Per Acre			
	Year:	1st	2nd	3rd
	Tons Per Acre:	0	0	6.00
Non Cash Overhead (Capital Recovery) Cost:				
Land		530	530	530
Irrigation System		110	110	110
Shop Building		57	57	57
Shop Tools		14	14	14
Fuel Tank & Pump		2	2	2
Equipment		37	41	76
TOTAL CAPITAL RECOVERY COST		751	755	789
TOTAL COST/ACRE FOR THE YEAR		3,534	6,141	2,519
INCOME/ACRE FROM PRODUCTION		0	0	900
NET COST/ACRE FOR THE YEAR		3,534	6,141	1,619
NET PROFIT/ACRE ABOVE TOTAL COST		0	0	0
TOTAL ACCUMULATED NET COST/ACRE		3,534	9,675	11,294

UC COOPERATIVE EXTENSION
Table 2. COSTS PER ACRE TO PRODUCE TABLE GRAPES – Thompson Seedless
 SAN JOAQUIN VALLEY - SOUTH 2007

Operation	Operation Time (Hrs/A)	Cash and Labor Cost per acre				Total Cost	Your Cost
		Labor Cost	Fuel, Lube & Repairs	Material Cost	Custom/ Rent		
Cultural:							
Vines: Layering Missing Vines	1.00	11	0	0	0	11	
Prune: Vines	35.00	396	0	0	0	396	
Prune: Brush Disposal (Every Middle)	0.50	9	7	0	0	15	
Trellis: Repair	2.00	23	0	10	0	33	
*CM: Tie Canes	9.00	102	0	14	0	115	
Weed: Winter Strip (Surflan, Roundup)	0.49	9	5	40	0	53	
Vertebrate: Gopher, Squirrel, Coyotes, Birds (various methods)	0.00	0	0	15	0	15	
Disease: Phomopsis (Abound)/Mildew (Microthiol)	0.50	9	7	35	0	51	
Insect: Mealybug (Lorsban)	0.50	9	7	25	0	41	
Weed: Mow Middles 3X	0.74	13	11	0	0	24	
Disease: Mildew 3X (Dusting Sulfur)	0.84	15	9	6	0	30	
Sucker: Remove Trunk Suckers	2.00	23	0	0	0	23	
Disease: Mildew (Rally, Microthiol). Fertilize: Foliar Zinc (Neutral Zinc)	0.50	9	7	28	0	44	
Fertilize: N through drip system (UN32)	0.00	0	0	23	0	23	
Irrigate: (Water)	2.55	29	0	165	0	194	
CM: Shoot Positioning	10.00	113	0	0	0	113	
FM: Bloom Thin: (GA). Disease: Mildew (Microthiol, Flint)	0.50	9	7	55	0	70	
FM: Bloom Thin: (GA). Disease: Mildew (Microthiol). Insect: Skeletonizer (Kryocide)	0.50	9	7	40	0	56	
FM: Berry Size (GA). Disease: Mildew (Rally, Microthiol)	0.50	9	7	123	0	139	
FM: Cluster Tipping and Thinning	50.00	566	0	0	0	566	
FM: Girdling	12.00	136	0	0	0	136	
CM: Cane Cutting (Mechanical)	0.31	5	3	0	0	9	
FM: Berry Size (GA). Disease: Mildew (Flint, Microthiol). Insect: Leafhopper (Provado)	0.50	9	7	180	0	195	
Weed: Spot Spray (Roundup)	0.53	9	1	4	0	14	
Pickup: Business Use	2.39	42	40	0	0	82	
ATV Use	2.00	35	3	0	0	38	
TOTAL CULTURAL COSTS/ACRE	134.85	1,596	126	764	0	2,485	
TOTAL CULTURAL COSTS/Box		1.99	0.16	0.95	0.00	3.11	
Harvest: (800 boxes per acre)							
Pick and Field Pack	200.00	2,262	0	0	0	2,262	
Boxes, Spread, Swamp & Haul	1.50	292	12	1,532	0	1,836	
Brokerage Fees	0.00	0	0	0	864	864	
Assessment & Inspection Fees	0.00	0	0	102	0	102	
TOTAL HARVEST COSTS/ACRE	201.50	2,554	12	1,634	864	5,064	
TOTAL HARVEST COSTS/Box		3.19	0.01	2.04	1.08	6.33	
Interest on operating capital @ 10.00%						131	
TOTAL OPERATING COSTS/ACRE		4,150	138	2,398	864	7,681	
TOTAL OPERATING COSTS/Box		5.19	0.17	3.00	1.08	9.60	
CASH OVERHEAD:							
Office Expense						80	
Liability Insurance						6	
Sanitation Fees						19	
Property Taxes						134	
Property Insurance						43	
Investment Repairs						42	
TOTAL CASH OVERHEAD COSTS						324	
TOTAL CASH COSTS/ACRE						8,005	

*CM = Canopy Management. FM = Fruit Management

UC COOPERATIVE EXTENSION

Table 2. continued

Operation	Operation Time (Hrs/A)	Cash and Labor Cost per acre				Total Cost	Your Cost
		Labor Cost	Fuel, Lube & Repairs	Material Cost	Custom/ Rent		
NON-CASH OVERHEAD (Capital Recovery):		Per producing Acre		Annual Cost Capital Recovery			
Land		7,304		530		530	
Drip Irrigation System		1,250		110		110	
Building		696		57		57	
Tools-Shop/Field		130		14		14	
Fuel Tanks 2-300G		30		2		2	
Vineyard Establishment Costs		8,999		831		831	
Equipment		779		104		104	
TOTAL NON-CASH OVERHEAD COSTS		19,189		1,647		1,647	
TOTAL COSTS/ACRE						9,652	
TOTAL COSTS/Box						12.07	

UC COOPERATIVE EXTENSION
Table 3. COSTS AND RETURNS PER ACRE to PRODUCE TABLE GRAPES – Thompson Seedless
 SAN JOAQUIN VALLEY - SOUTH 2007

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS					
Table Grapes Fresh (box = 19 lbs)	800.00	box	12.00	9,600	
OPERATING COSTS					
Trellis System:					
Miscellaneous Repair Materials	1.00	acre	10.00	10	
Vine Aids:					
Tying Materials	4,540.00	each	0.00	14	
Herbicide:					
Surflan 4 AS	2.40	pint	14.52	35	
Roundup Ultra Max	1.10	pint	7.80	9	
Fungicide:					
Abound (Strobilurin)	12.00	floz	2.86	34	
Microthiol Disperss (micronized wettable sulfur)	11.00	lb	0.83	9	
Dusting Sulfur	30.00	lb	0.22	6	
Rally 40W (Sterol Inhibitor)	8.00	oz	5.23	42	
Flint (Strobilurin)	4.00	oz	16.50	66	
Vertebrate Control:					
Shooting, Trapping, Baiting	1.00	acre	15.00	15	
Insecticide:					
Lorsban 4E	4.00	pint	6.35	25	
Kryocide	6.00	lb	3.08	18	
Provado 1.6 Solupak	1.00	oz	44.21	44	
Fertilizer:					
Neutral Zinc 50% (foliar)	5.00	lb	1.08	5	
UN 32	50.00	lb N	0.46	23	
Water:					
Water Pumped	36.00	acin	4.59	165	
Growth Regulator:					
ProGibb 4% Solution (Gibberelic Acid)	144.00	grams	1.68	242	
Harvest Supplies:					
Box (19 lb)	800.00	box	1.60	1,280	
Plastic Bags (9/box)	7,200.00	each	0.04	252	
Contract:					
Brokerage Fees (9% of selling price)	800.00	box	1.08	864	
Assessment:					
Table Grape Commission	800.00	box	0.12	93	
Quality Inspection (1/3 of yield)	264.00	box	0.04	9	
Labor (machine)	15.36	hrs	14.63	225	
Labor (non-machine)	347.05	hrs	11.31	3,925	
Fuel - Gas	11.78	gal	2.80	33	
Fuel - Diesel	22.19	gal	2.30	51	
Lube				13	
Machinery repair				41	
Interest on operating capital @ 10.00%				131	
TOTAL OPERATING COSTS/ACRE				7,681	
NET RETURNS ABOVE OPERATING COSTS				1,919	
CASH OVERHEAD COSTS:					
Office Expense				80	
Liability Insurance				6	
Sanitation				19	
Property Taxes				134	
Property Insurance				43	
Investment Repairs				42	
TOTAL CASH OVERHEAD COSTS/ACRE				324	
TOTAL CASH COSTS/ACRE				8,005	

UC Cooperative Extension
Table 3. continued

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
NON-CASH OVERHEAD COSTS (Capital Recovery)					
Land				530	
Drip Irrigation System				110	
Building				57	
Tools-Shop/Field				14	
Fuel Tanks 2-300G				2	
Vineyard Establishment Costs				831	
Equipment				104	
TOTAL NON-CASH OVERHEAD COSTS/ACRE				1,647	
TOTAL COSTS/ACRE				9,652	
NET RETURNS ABOVE TOTAL COSTS				-52	

UC COOPERATIVE EXTENSION
Table 4. MONTHLY CASH COSTS PER ACRE to PRODUCE TABLE GRAPES – Thompson Seedless
 SAN JOAQUIN VALLEY - SOUTH 2007

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Beginning JAN 07	07	07	07	07	07	07	07	07	07	07	07	07	
Ending DEC 07													
Cultural:													
Vine: Layering Missing Vines	11												11
Prune: Vines	396												396
Prune: Brush Disposal	15												15
Trellis: Repair	33												33
*CM: Tie Canes		115											115
Weed: Winter Strip (Surflan, Roundup)		53											53
Vertebrate: Gopher, Squirrel, Coyotes, Birds (various methods)			2	2	2	2	2	2	2	2			15
Disease: Phomopsis (Abound)/Mildew (Microthiol)			51										51
Insect: Mealybug (Lorsban)			41										41
Weed: Mow Middles 3X			8		8			8					24
Disease: Mildew (Dusting Sulfur)				10		10	10						30
Sucker: Trunk				23									23
Disease: Mildew (Rally, Microthiol)/Fertilize: Foliar Zinc (Neutral Zinc)				44									44
Fertilize: (UN32) through drip				23									23
Irrigate: Water & Labor				6	22	37	48	44	31	6			194
CM: Shoot Position					68		45						113
FM: Bloom Thin (GA). Disease: Mildew (Microthiol, Flint)					70								70
FM: Bloom Thin (GA). Disease: Mildew (Microthiol). Insect: Skeletonizer (Kryocide)					56								56
FM: Berry Size (GA). Disease: Mildew (Rally, Microthiol)						139							139
FM: Cluster Tipping & Thinning						566							566
FM: Girdle						136							136
CM: Cane Cutting (Mechanical)						9							9
FM: Berry Size (GA). Disease: Mildew (Flint, Microthiol). Insect: Leafhopper (Provado)						195							195
Weed: Spot Spray (Roundup)						14							14
Pickup: Business Use	7	7	7	7	7	7	7	7	7	7	7	7	82
ATV:	3	3	3	3	3	3	3	3	3	3	3	3	38
TOTAL CULTURAL COSTS	465	179	111	117	236	1,117	123	55	43	18	10	10	2,485
Harvest: (800 box/acre)													
Pick & Field Pack								2,262					2,262
Spread, Swamp, Haul & Boxes								1,836					1,836
Brokerage Fees								864					864
Assessment & Inspection Fees								102					102
**TOTAL HARVEST COSTS								5,064					5,064
Interest on operating capital @ 10.00%	4	5	6	7	9	19	20	62	0	0	0	0	131
TOTAL OPERATING COSTS/ACRE	469	184	118	125	245	1,136	143	5,182	42	18	10	10	7,681

UC COOPERATIVE EXTENSION
Table 4. Continued
 SAN JOAQUIN VALLEY - SOUTH 2007

Beginning JAN 07	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Ending DEC 07	07	07	07	07	07	07	07	07	07	07	07	07	
OVERHEAD:													
Office Expense	7	7	7	7	7	7	7	7	7	7	7	7	80
Liability Insurance									6				6
Sanitation Fees	2	2	2	2	2	2	2	2	2	2			19
Property Taxes	67						67						134
Property Insurance	22						22						43
Investment Repairs	4	4	4	4	4	4	4	4	4	4	4	4	42
TOTAL CASH OVERHEAD COSTS	101	12	12	12	12	12	101	12	18	12	10	10	324
TOTAL CASH COSTS/ACRE	570	196	130	137	257	1,148	243	5,194	60	30	20	20	8,005

UC COOPERATIVE EXTENSION
Table 5. RANGING ANALYSIS for TABLE GRAPES – Thompson Seedless
 SAN JOAQUIN VALLEY - SOUTH 2007

COSTS PER ACRE AT VARYING YIELDS TO PRODUCE TABLE GRAPES

	YIELD (19 lb box/acre)						
	400	500	600	700	800	900	1,000
OPERATING COSTS:							
Cultural Cost	2,485	2,485	2,485	2,485	2,485	2,485	2,485
Harvest Cost (pick, pack, stack, swamp, haul)	2,049	2,561	3,074	3,586	4,098	4,610	5,123
Brokerage Fees	432	540	648	756	864	972	1080
Assessment/Inspection Cost	51	64	77	89	102	115	128
Interest on operating capital	110	115	121	126	131	136	142
TOTAL OPERATING COSTS/ACRE	5,127	5,765	6,405	7,042	7,680	8,318	8,958
(Total Operating Costs/box)	12.82	11.53	10.68	10.06	9.60	9.24	8.96
CASH OVERHEAD COSTS/ACRE	323	323	324	324	324	325	325
TOTAL CASH COSTS/ACRE	5,450	6,088	6,729	7,366	8,004	8,643	9,283
(Total Cash Costs/box)	13.63	12.18	11.22	10.52	10.01	9.60	9.28
NON-CASH OVERHEAD COSTS/ACRE	1,635	1,638	1,642	1,645	1,647	1,650	1,652
TOTAL COSTS/ACRE	7,085	7,726	8,371	9,011	9,651	10,293	10,935
(Total Costs/box)	17.71	15.45	13.95	12.87	12.06	11.44	10.94

NET RETURNS PER ACRE ABOVE OPERATING COSTS

PRICE \$/box	YIELD (19 lb box/acre)						
	400	500	600	700	800	900	1,000
9.00	-1,527	-1,265	-1,005	-742	-480	-218	42
10.00	-1,127	-765	-405	-42	320	682	1,042
11.00	-727	-265	195	658	1,120	1,582	2,042
12.00	-327	235	795	1,358	1,920	2,482	3,042
13.00	73	735	1,395	2,058	2,720	3,382	4,042
14.00	473	1,235	1,995	2,758	3,520	4,282	5,042
15.00	873	1,735	2,595	3,458	4,320	5,182	6,042

NET RETURNS PER ACRE ABOVE CASH COSTS

PRICE \$/box	YIELD (19 lb box/acre)						
	400	500	600	700	800	900	1,000
9.00	-1,850	-1,588	-1,329	-1,066	-804	-543	-283
10.00	-1,450	-1,088	-729	-366	-4	357	717
11.00	-1,050	-588	-129	334	796	1,257	1,717
12.00	-650	-88	471	1,034	1,596	2,157	2,717
13.00	-250	412	1,071	1,734	2,396	3,057	3,717
14.00	150	912	1,671	2,434	3,196	3,957	4,717
15.00	550	1,412	2,271	3,134	3,996	4,857	5,717

NET RETURNS PER ACRE ABOVE TOTAL COSTS

PRICE \$/box	YIELD (19 lb box/acre)						
	400	500	600	700	800	900	1,000
9.00	-3,485	-3,226	-2,971	-2,711	-2,451	-2,193	-1,935
10.00	-3,085	-2,726	-2,371	-2,011	-1,651	-1,293	-935
11.00	-2,685	-2,226	-1,771	-1,311	-851	-393	65
12.00	-2,285	-1,726	-1,171	-611	-51	507	1,065
13.00	-1,885	-1,226	-571	89	749	1,407	2,065
14.00	-1,485	-726	29	789	1,549	2,307	3,065
15.00	-1,085	-226	629	1,489	2,349	3,207	4,065

UC COOPERATIVE EXTENSION
Table 6. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT, & BUSINESS OVERHEAD COSTS
 SAN JOAQUIN VALLEY - SOUTH 2007

ANNUAL EQUIPMENT COSTS

Yr	Description	Price	Yrs Life	Salvage Value	Capital Recovery	Cash Overhead			Total
						Insur- ance	Taxes		
07	60 HP 4WD Narrow Tractor	47,000	15	9,150	4,885	200	281		5,366
07	ATV 4WD	6,700	5	3,003	1,125	35	49		1,209
07	Brush Shredder 6'	8,000	15	768	862	31	44		937
07	Cane Cutter 12'	3,500	20	182	333	13	18		364
07	Duster - 3 Point 12'	5,500	5	1,792	1,040	26	36		1,103
07	Mower-Flail 8'	10,500	15	1,008	1,132	41	58		1,230
07	Orchard/Vine Sprayer 500 gal	21,000	5	6,840	3,973	99	139		4,211
07	Pickup Truck 1/2 T	28,000	7	10,621	4,023	138	193		4,354
07	Sprayer ATV 20 gal	350	10	62	46	1	2		50
07	Truck Flatbed (10 ton)	56,000	10	16,542	6,882	259	363		7,504
07	Weed Sprayer 3 Point 100 gal	4,000	10	707	526	17	24		566
TOTAL		190,550		50,675	24,826	861	1,206		26,894
60% of New Cost *		114,330		30,405	14,896	517	724		16,136

* Used to reflect a mix of new and used equipment.

ANNUAL INVESTMENT COSTS

Description	Price	Yrs Life	Salvage Value	Capital Recovery	Cash Overhead				Total
					Insur- ance	Taxes	Repairs		
Building 2400 sqft	80,000	20		6,610	286	400	1,600		8,895
Drip Irrigation System 40 acres	50,000	25		4,388	179	250	1,000		5,816
Vineyard Establishment	359,960	22		33,220	1,285	1,800	0		36,305
Fuel Tanks 2-300 gal	3,500	30	350	286	14	19	70		389
Land	840,000	25	840,000	60,900	0	8,400	0		69,300
Tools-Shop/Field	15,000	15	1,500	1,614	59	83	300		2,056
TOTAL INVESTMENT	1,348,460		841,850	107,017	1,822	10,952	2,970		122,761

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/ Farm	Unit	Price/ Unit	Total Cost
Liability Insurance	115	acre	5.86	674
Office Expense	115	acre	80.00	9,200
Sanitation Fee	115	acre	19.35	2,225

UC COOPERATIVE EXTENSION
Table 7. HOURLY EQUIPMENT COSTS
 SAN JOAQUIN VALLEY - SOUTH 2007

Yr	Description	Actual Hours Used	COSTS PER HOUR						Total Costs/Hr.
			Capital Recovery	Cash Overhead			Operating		
				Insur- ance	Taxes	Repairs	Fuel & Lube	Total Opera.	
07	60 HP 4WD Narrow Tractor	1,066	2.75	0.11	0.16	1.12	7.79	8.91	11.93
07	ATV 4WD	400	1.69	0.05	0.07	0.49	1.07	1.56	3.37
07	Brush Shredder 6'	133	3.91	0.14	0.20	3.49	0.00	3.49	7.74
07	Cane Cutter 12'	101	1.97	0.08	0.11	1.29	0.00	1.29	3.45
07	Duster - 3 Pt 12'	240	2.60	0.07	0.09	0.79	0.00	0.79	3.55
07	Mower-Flail 8'	133	5.12	0.19	0.26	4.58	0.00	4.58	10.15
07	Orchard/Vine Sprayer 500 gal	400	5.96	0.15	0.21	3.67	0.00	3.67	9.99
07	Pickup Truck 1/2 T	286	8.46	0.29	0.41	2.04	14.76	16.80	25.96
07	Sprayer ATV 20 gal	148	0.19	0.01	0.01	0.09	0.00	0.09	0.30
07	Truck Flatbed (10 ton)	200	20.65	0.78	1.09	5.30	2.64	7.94	30.46
07	Weed Sprayer 3 PT 100 gal	199	1.59	0.05	0.07	0.68	0.00	0.68	2.39

UC COOPERATIVE EXTENSION
Table 8. OPERATIONS WITH EQUIPMENT for TABLE GRAPES – Thompson Seedless
 SAN JOAQUIN VALLEY - SOUTH 2007

Operation	Operation			Material	Broadcast Rate/acre	Unit
	Month	Tractor	Implement			
Weed: Winter Strip	March	60HP 4WD	Weed Sprayer	Surflan	2.40	pt
				Roundup	0.60	pt
Weed: Mow Middles	March	60HP 4WD	Mower Flail 8'			
	May	60HP 4WD	Mower Flail 8'			
	July	60HP 4WD	Mower Flail 8'			
Weed: Spot Spray	June	ATV 4WD	ATV Sprayer	Roundup	0.50	pt
Fertilize: N through drip	April			UN 32	50.00	lb N
Irrigation	April			Water	1.00	acin
	May			Water	4.00	acin
	June			Water	7.00	acin
	July			Water	9.00	acin
	August			Water	8.00	acin
	September			Water	6.00	acin
	October			Water	1.00	acin
Disease: Phomopsis/Mildew	March	60HP 4WD	Air Blast Sprayer	Abound	12.00	floz
				Microthiol	1.00	lb
Vertebrate: Squirrels, Gophers, Coyotes, Birds	Mar – Oct			Various methods	15.00	acre
Disease: Mildew 3X	April	60HP 4WD	Duster	Dusting Sulfur	10.00	lb
	June	60HP 4WD	Duster	Dusting Sulfur	10.00	lb
	July	60HP 4WD	Duster	Dusting Sulfur	10.00	lb
Disease: Mildew. Fertilize: Foliar Zinc	April	60HP 4WD	Air Blast Sprayer	Microthiol (Mildew)	2.00	lb
				Rally (Mildew)	4.00	oz
				Neutral Zinc	5.00	lb
*FM: Bloom Thin. Disease: Mildew	May	60HP 4WD	Air Blast Sprayer	GA (Thin)	12.00	floz
				Microthiol (Mildew)	2.00	lb
				Flint (Mildew)	2.00	oz
FM: Bloom Thin. Disease: Mildew. Insect: Skeletonizer	May	60HP 4WD	Air Blast Sprayer	GA (Thin)	12.00	floz
				Microthiol (Mildew)	2.00	lb
				Kryocide (Skeletonizer)	6.00	lb
FM: Berry Size. Disease: Mildew	June	60HP 4WD	Air Blast Sprayer	GA (Thin)	60.00	floz
				Microthiol (Mildew)	2.00	lb
				Rally (Mildew)	4.00	oz
FM: Berry Size. Disease: Mildew. Insect: Leafhopper	June	60HP 4WD	Air Blast Sprayer	GA (Thin)	60.00	floz
				Microthiol (Mildew)	2.00	lb
				Flint (Mildew)	2.00	oz
				Provado (Leafhopper)	1.00	oz
Insect: Mealybug	March	60HP 4WD	Air Blast Sprayer	Lorsban	4.00	pt
FM: Cluster Tipping & Thinning	June			Labor	50.00	hrs
FM: Girdle	June			Labor	12.00	hrs
Trellis: Repair	January			Labor	2.00	hrs
				Trellis Materials	10.00	acre
Vine: Layering Vines	January			Labor	1.00	hrs
Prune	January			Labor	35.00	hrs
Prune: Shred Brush	January	60HP 4WD	Brush Shredder 6'			
Sucker: Remove Trunk Suckers	April			Labor	2.00	hrs
CM: Tie Canes	February			Labor	7.00	hrs
				Materials	11.50	acre
CM: Shoot Positioning	May			Labor	6.00	hrs
	July			Labor	4.00	hrs
CM: Cane Cutting	June	60HP 4WD	Cane Cutter			
Pickup: Business Use	Annual	Pickup 1/2 ton				
ATV	Annual	ATV				
Harvest: Pick & Field Pack	August			Labor	200.00	hrs
Harvest: Swamp, Spread, Haul	August	Truck Flatbed		Labor	23.50	hrs
				Boxes	800.00	boxes
				Plastic Bags	7,200.00	bags

*CM = Canopy Management. FM = Fruit Management